Researches regarding environmental management system as a complex process at the organizational level

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Recherche sur le système de management environnemental comme un processus complexe au sein des organisations

JURY

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THESE DE DOCTORAT

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Summary

Introduction

Today globally over a million organizations have implemented a Environmental management system (in compliance with ISO 14001) and an Quality management system (in compliance with ISO 9001) taking into account that these two standards are based on similar management practices. Even if it can be observe this expansion of ISO 14001 and ISO 9001 certifications of organizations, the human resource involved (managers and employees) in different management activities specific to these two systems, mention that the main problems and the factors that determine the successful implementation and integration of these systems at organizational level, have remained largely unstudied (Boiral, 2011).

Thereby from the beginning we can see that it exist a stringent need to investigate the the amount of various aspects that which determine and which characterize the complexity of the Environmental management system.

The structure of the doctoral thesis

From structural point of view the doctoral thesis contains 428 pages, 66 figures, 81 tables, 17 annexes, and 285 references, and is divided into six chapters, which highlights three main parts:

(a) a first part which shows the research methodology used, the research objectives, the needs of research undertaken and the current state of research in related to Environmental management system - Chapter 1 and 2 of the doctoral thesis,

(b) a second part which develops the content of the research, respectively the results and the original contributions brought to the development of knowledge in this issue - Chapter 3, 4 and 5, and

(c) a third part that synthetically presents the main findings, the theoretical and practical contributions brought to the development of knowledge in this issue, the research limitations, and also the future research directions.

In **"Introduction"** it's presented the idea that the main problems and the factors that determine the successful implementation and integration of the Environmental management system at organizational level, have remained largely unstudied, and thus is realized a symbolic referring the first chapter of the doctoral theses; also in this part is synthetic presented the structure of the doctoral thesis.

Chapter 1: "Objective and Research Methodology" is organized into three sections: the first section are defining the research issue through the presentation of the pertinence and importance of the research issue; the second section shows the purpose and the objective of the research; and the third section approaches the research methodology used at the level of the entire doctoral thesis.

Chapter 2: "State of the art regarding the Environmental management system" is structured in in three main parts: a first part which shows the conceptual approaches of the Environmental management system

and of the organisational factors that could determine it (e.g.: specific features of the Environmental management system/ general description of the environmental practices – an effect of the implementation and integration of an Environmental management system/ description of the organisational factors that determine the implementation of an Environmental management system and that describe the organisation's orientation in the environmental management issues); a second part that present the current stage of the research on the Environmental management system (ISO 14001) and also the factors that could detemine this system; and a third part that approaches the Environmental management sistem as a complex process at the organizations level.

Chapter 3: "Evaluation of the relation between the Organisation orientation to environmental issues and the Environmental management system implementation quality" summarize three main sections: the section that present the development of the research methodology applied in the analysis of the relation between the organisation orientation to environmental issues and the Environmental management system implementation quality; the Results of the Research section; and a third section that present the theoretical and practical proposed solutions to improve the Environmental management system implementation and integration quality.

Chapter 4: "Research and contribution regarding the transformation and adaptation of the Environmental management system architecture relying on the principles of the fractal philosophy" is organized into four major parts, as it follows: first part present the research methodology applied in the analysis of the possibility to improve the quality of the implementation and operation stage of the Environment management system by transforming and adapting its architecture relying on the principles of the fractal philosophy; second part identify and describes the main specific features of the fractal philosophy; in the third part is present the identification and description of the Environmental management system implementation and operation stage at the organisation's level; and finaly the fourth part present the development of the theoretical framework regarding the transformation and the adaptation of the architecture of the Environmental management system relying on principles of the fractal philosophy, that should allow the improvement of this system's implementation and operation.

Chapter 5: "Pilot testing regarding the aplicability of the conceptual framework developed according to the fractal philosophy principles at the level of the Quality-Environment-Laboratories Department at S.C. ApaVital S.A. Iaşi, Romania" is divided in three parts: a firs part that present the methodology used in the pilot testing the aplicability of the fractal paradigm at the level of the Quality-Environment-Laboratories Department within the company S.C. APAVITAL S.A. Iaşi, Romania; the secont part which develops an overview of S.C. APAVITAL S.A. Iaşi, Romania; and finally the last part that present the development of the theoretical - functional real framework based on the principles of the fractal paradigm for the EMS

management at the level of the Quality-Environment-Laboratories Department within the S.C. APAVITAL S.A. Iaşi.

Chapter 6: "Final conclusions, Theoretical and practical contributions, Limitations of the research and Future research directions" present, as it can be noticed also from the name of the title, a synthetic overview of the main results obtained in this research (theoretical and practical), final conclusions, the most important limitations of the research and future research directions.

Chapter 1 : Objective and Research Methodology

The complexity of the activities carried out by an organisation, as well as the complexity of the relation between the consumer and the producer (irrespective of the "production" type and/ or of the products/ services) has led, during the last decade, to an increase in the negative impact that they have on the environment. The consumers' needs are various, dynamic and sometimes unpredictable in the actual context. Therefore, the organisations find it difficult to maintain the market share and to reach fast economic growth; at the same time, this process of meeting consumers' needs has a direct impact on the organisation, which makes efforts in order to become dynamic or which acknowledges the fact that it should become more dynamic in order to maintain its position at the market level (Ryu and Jung, 2003; Herghiligiu *et al.*, 2012a).

Nevertheless, today, more than ever, the organisations acknowledge the fact that, if they do not take into account their impact on the environment and if these do not undertake sustainable environmental actions, cannot interact with other organisations and with the market in an effective way and cannot contribute in a sustainable way to the economics welfare (Herghiligiu and Lupu, 2012a; Herghiligiu *et al.*, 2012b).

1.1. Defining the research issue

Organisations aim at flexibility, having the main objective to promptly satisfy the consumers' needs. The problem is that the dynamic change of the consumers' needs, in the context of the uncertain and unstable features of the organisational environment can perturb severely all the levels of an organisation (Deming, 1994; Meyer and Rowan, 1977; Herghiligiu *et al.*, 2012a; Gavronski I. *et al.*, 2013; DiMaggio and Powell, 1983).

This ambition of the organisations to satisfy consumers' needs has, unfortunately, negative impacts on the environment, manifested by delayed responses offered to the various environmental issues and, certainly, by a negative impact on the environment. Therefore, it was and it is urgent for an organisation to effectively manage its relation with the environment; this can be carried out in a competitive context only by implementing an Environmental management system (EMS) (Herghiligiu *et al.*, 2012a).

We can find in the specialty literature a large number of authors who approached directly or indirectly various aspects concerning the issue referring to the management of the relation between the organisation

and the environment, a relation made clear and formalised through the development, during the last decades, of the environmental standards defining the structure of the Environmental management system[1] (Teodosiu, 2005; Lupu *et al.*, 2006; Lupu *et al.*, 2012; Ionescu, 2005; Ionescu 2000; MacDonald, 2005; Tambovceva, 2010; Kit-Fai *et al.,* 2002; Rowland-Jones and Cresser, 2005; Melnyk *et al.*, 2003; Fortunski, 2008; Perotto *et al.*, 2008, and many others).

Some authors from the specialty literature, like Epstein and Roy (1997) or Boiral and Sala (1998), state and emphasise the fact that the ISO 14000 series and, indirectly, the implementation of the Environmental management system at the organisational level lead to major benefits for the organisational management:

> "The ISO 14000 series has the potential to create dramatic improvements in organisational management that extend far beyond the management of organisational environmental impacts. ...." (Epstein M.J. and Roy M.J., 1997);

Thus, taking into consideration **the complexity and the dynamics of the effects resulting from the certification of an organisation in the environmental field** (according to the requirements from the ISO 14000 series), we can notice, first of all, the importance of the research that we have carried out.

Through the analysis of the publications from various international databases, we can see that researchers take into account, in a general way, the following aspects:

(a.) the environmental certification of the organisations and the implementation at the organisational level of the Environmental Management System (Ionescu, 2005; Darnal, 2001; Jiang and Bansal, 2003);

(b.) the level of the environmental certifications at the international level of different organisations (Christman and Taylor, 2001; Christman and Taylor, 2004);

(c.) the impact of the organisational environmental certification on the environmental performance (Lupu *et al.*, 2012, Lupu *et al.*, 2006; Hart and Dowell, 2010; Rondinelli and Vastag, 2000; Ammenberg *et al.*, 2002; Potoski and Prakash, 2005; Anton *et al.*, 2004; King *et al.*, 2006).

We must emphasise the fact that some of the researches **previously mentioned do not analyse the relation between the organisational context and the environmental management practices resulting from the certification with ISO 14001** of the organisations. In other words, there is a relation between the "organisational barriers" – concerning the environment (Tinsley and Pillai, 2006) and the real impact of the certification, quantified through different actual environmental practices (and through the current implementation, in a positive way, of these practices) – in their turn, these impacts seem to differ from one company to another (Christman and Taylor, 2006; Lupu *et al.*, 2006; Naveh *et al.*, 2006). Therefore, we can state again the importance of the research that we have carried out.

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[1] The concept of Environmental Management System (EMS) was introduced for the first time in Holland in 1985; nowadays, it is used all over the world (the European Union, Asia, the USA, Canada, and so on) (Rojanski and Teacă, 1998; Teodosiu, 2005).

Another aspect that we should take into account is the fact that, **during our bibliographical research, it was found few specialty works analysing, in an unifying way, the organisational factors (internal and external factors) that influence incontestably the quality of the Environmental management system implementation process** (Darnall, 2003; Tinsley and Pillai, 2006). If we analyse this idea, we should stress again the importance of our research.

The vast majority of the authors treat (a.) the various external factors that influence the organisational measures meant to modify the environmental strategy (King and Lenox, 2000; Darnall, 2003; Khanna and Damon, 1999; Welch *et al.*, 2000), or (b.) the various internal factors (Egri and Herman, 2000; Sharma, 2000; Cordano and Frieze, 2000; Christmann, 2000; Klassen 2000; Darnall, 2003) that have a major role in determining the quality defining the management of environmental issues; however, these authors did not analyse in a concrete manner the relation between the factors that influence / determine the quality that defines the implementation of the Environmental Management System.

At the same time, there are **few works in the specialty literature analysing the impact of the "subtle" elements on the process of implementing an Environmental Management System** (Daily *et al.*, 2003, 2007; Daily and Huang, 2001; Fernandez *et al.*, 2003; Govindarajulu and Daily, 2004; Wee and Quazi, 2005).

We can state the fact that the research issue is important and actual; we can also notice **the dynamics of the relations between (a) the external organisational environment and the Environmental Management System, implemented at the organisational level, (b) the internal organisational environment and the implemented Environmental management system**. These relations are presented in Table 1.

Table 1 : Synthetic matrix: "The importance/ the actuality of the research issue"
(for the aspects defining the general context, considered to be the most important ones, other than the aspects previously mentioned)

No.	Relation between EMS – F {x, y, z….*n*}	Argument
I.	EMS (implemented at the organisational level) – External organisational environment	The instability and **the continual change of the external organisational environment** perturb seriously the management process at all organisational levels[2] (and, thus, the management at the level of the Environmental Management System) (Meyer and Rowan, 1977; Gavronski I. *et al.*, 2013;

[2] We must mention the fact that a broad research concerning this relation can be carried out, also taking into account in an indirect manner the Institutional Theory: the corporations, besides their competitive relation leading to the competition for knowledge/ information/ raw materials and so on, must meet some environmental requirements, as the environment designs and maintains various organisational structures. Thus, in case of the corporations acting in similar environments, we can notice a similarity – the effect of the need for lawfulness (process known in the literature as **isomorphism**) (Gavronski *et al.*, 2013).

		DiMaggio and Powell, 1983; Ryu and Jung, 2003; Angell and Klassen, 1999). a. **The dynamic change of the consumers' needs** influences the organisation directly; it influences indirectly the EMS (Herghiligiu *et al.*, 2012a; Deming, 1994). b. **The modification of legal regulations** (at the local/ regional/ state/ community level – the UE level) has an impact on the management of an EMS, after a certain period (Klassen and Whybark, 1999).
II.	EMS (implemented at the organisational level) – Internal organisational level	**The dynamics of the organisational measures** taken as the result of a factor or of several internal factors (the process of resource allocation: human/ financial resources and so on, the strategic leadership referring to the environmental issue, and so on) have an impact that determines modifications at the EMS management level (the practices specific to the environmental management) (Azzone and Noci, 1998; Klassen and Whybark, 1999; Angell and Klassen, 1999; Hart, 1995; Gavronski *et al.*, 2013; Hart and Dowell, 2010).

Legend:
EMS – Environmental management system
F – various entities or factors that can exert a influence on EMS, where F ϵ {x, y, z....*n*}

Analysing the issue through another perspective, **the Environmental management system (EMS) can be considered nowadays a hierarchical management system, used (conceived/ implemented/ integrated/ operated) by those organisations that have a well-defined organisational system – hierarchical management system** and that "produce goods" in stable environmental conditions (Herghiligiu *et al.*, 2012a).

Taking into account the complexity of the environment in which the organisations coexist and the features defining the traditional hierarchical patterns that are usually noticeable at the level of these patterns, we noticed and demonstrated the fact that **these pattern types are limited, having in view the explosive modifications that define the current social reality** (Espinosa *et al.,* 2007).

The traditional production systems managed through hierarchical management (and through decisional methods based on hierarchical control) are no longer able to meet the actual needs, having in view the complexity of the environment (Ren *et al.,* 1997; Dooleby, 2002; Shoham and Hasgall, 2005).

Even if the hierarchical control is easy to understand and has a low redundancy level, it has a major disadvantage: the reduced capacity to register all modifications produced at all the hierarchical levels (Ryu and Jung, 2003a/b; Herghiligiu *et al.*, 2012a.; Herghiligiu *et al.*, 2013); we can notice the same phenomenon in case of the decisional process that sometimes generates inadequate environmental decisions.

It is also necessary to mention that, according to **the Laws and Axioms of the Needed Variety** (Ashby, 1964)[3], **a structure that is referred to as being hierarchically managed (a hierarchical authority) does not have the necessary variety in order to provide the adaptation of their own systems in their niche** (Espinosa *et al.,* 2007).

Having in view the main ideas previously exposed, as well as the previous ideas, **we can state that the research we carried out is of maximum importance**; in other words, we can see that the adaptation and transformation of the Environmental Management System implementation and operation (functioning) process at the organisational level is of crucial importance; in other words, this type of system should have the following attributes: flexibility/ "intelligence"/ configurability/ fast adaptability to the environment/ it should also include entities characterised by the attributes previously mentioned/ and autonomy, in order to really become an "advantage lever" in this strong competitive environment.

Taking into account the aforementioned premise related to the need of transforming the implementation and operation (functioning) of the Environmental management system at the organisational level, based on the operation's decentralization principle, as well as the implementation of the (functional) basic entity concept, we must say that the main process, (a process of great importance at the level of these entities), is the environmental decisional process.

Resuming the idea that the environment in which the organisations coexist is extremely complex and dynamic because of the changes produced in short periods of time, and that the features defining the traditional hierarchical patterns, usually present at the level of these organisations, is extremely limited, sometimes leading to inefficiency and to lack of effectiveness, we may conclude that this "limited perspective" also characterises the environmental decisional process (Dooleby, 2002; Shoham and Hasgall, 2005; Ryu and Jung, 2003a/b).

If we should tie up, we must also mention the fact that the approach of this research issue will also result in a practical substantial component, as it will offer the environmental managers from the organisational level, and not only, methodologies, patterns and work tools that have as a main objective to improve the quality of the implementation and functioning process defining an Environmental management system.

We also have to mention the fact that the research herein, having in view the approach of this subject, treats the Environmental management system through a new perspective, particularly in the Romanian literature, but also in the international literature.

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[3] This law was set forth for the first time by Ross Ashby (1964). It is characteristic to cybernetic systems and it refers to the fact that the output diversity of a system can be modified only through a sufficient input diversity of the same system [explained by analogy to the variety – constraint report; the constraint represents a relation existing between two elements (subsystems) that determines the maintenance of the variety at a constant level (the reduction of the variety that describes an element through the variation of the other element)].

1.2. The purpose and the objective of the research

1.2.1. The research purpose

Analysing the various information and knowledge specific to the actual context, as the environmental issues are a key element of the actual and future development of society and, implicitly, of organisations, including theoretical elements specific to the environmental management and mainly to the organisational theory, our scientific research includes various **researches on the Environmental management system as a complex process at the organisations' level**.

The analysis of the implementation and integration process, at the organisational level, concerning the Environmental Management System includes aspects referring to the following fields:

- General management
- Environmental management
- Process management
- Human Resource Management
- Econometrics
- Statistics
- Organisation/ system/ process analysis and development, according to principles belonging to fractal approaches

Taking into account the facts previously exposed, **the purpose/ aim of our scientific research** can be concretely defined in Table 2.

Table 2 **:** Aim of the research

*	Elaborating various quantitative and qualitative methodologies, methods and work tools to improve implementation, integration and functioning process that define the Environmental management system at the organisational level.

1.2.2. The research objectives

The process of planning and defining the research objectives represents the t_0 step in any research project. Even if this part of the research process is time-consuming and requires a substantial effort of documentation and comprehension of some information and knowledge specific to the studied field, it is crucial for the success of the investigation carried out (Lazarsfeld, 1965).

The scientific research that we undertook in order to fulfill the stated goal has in view several **objectives and sub-objectives**, presented in Table 3.

Table 3: Research objectives

No.	Main objective and secondary objectives
O_1	**Analysis of the specialty literature regarding the Environmental management system and the factors that may determine this system**
O_{11}	Identification of specific features (development, general definition, objectives, characteristics, advantages and disadvantages for the implementation of an EMS, the structure of an EMS in accordance with ISO 14001) of the Environmental management system
O_{12}	Identification and general description of the environmental practices – an effect of the implementation and integration of an Environmental management system
O_{13}	Identification and description of the organisational factors that determine the implementation of an Environmental management system and that describe the organisation's orientation in the environmental management issues
O_{14}	Elaboration and description of the current stage of the undertaken research regarding the Environmental management system
O_2	**Development of a synthetic conceptual framework regarding the Environmental management system as a complex process at the organisations' level**
O_{21}	Identification of general specific features of the process-based approach
O_{22}	Elaboration of the conceptual framework regarding the Environmental management system as a complex process
O_3	**Development of a methodology that should analyse the relationship between (a) the organisation's orientation in the environmental management issues and (b) the implementation and the integration quality of the Environmental management system**
O_{31}	Identification and description of the most representative variables that characterise the organisation's orientation in the environmental management issues and implicitly in the determination of the implementing process of the Environmental management system
O_{32}	Identification and description of the most representative variables that characterise the implementation quality of the Environmental management system
O_{33}	Evaluation and quantitative/ qualitative analysis of the connections and of the influence intensity between the variables that describe the organisation's orientation in the environmental management issues and the variables that characterise the implementation quality of an Environmental management system at the organisations' level
O_{331}	Development of patterns that should present under certain conditions the architecture of all the influences between the variables that describe the organisation's orientation regarding the environmental issue and the variables that describe the implementation and integration quality of the Environmental management system
O_{332}	Elaboration and proposal of solutions whose main purpose is to improve the quality of the

implementation and integration of the Environmental management system

O_4 Development of a theoretical framework based on the fractal philosophy principles that should improve the quality of the implementation and operation stage of the Environmental management system

O_{41} Identification and description of the main characteristics of the fractal philosophy/ paradigm

O_{42} Identification and description of the implementing and operating stages of the Environmental management system (in accordance with ISO 14001)

O_{43} Re-thinking and adapting the architecture of the Environmental management system based on the fractal philosophy principles, that should allow the improvement of the implementation and operation of the Environmental management system

O_5 Pilot testing of the applicability of the conceptual framework developed according to the fractal philosophy principles at the level of the Department Quality-Environment-Laboratories of the company S.C. APAVITAL S.A. Iaşi

O_{51} Identification and description of the company S.C. APAVITAL S.A. Iaşi Romania and of the Quality-Environment-Laboratories Department

O_{52} Developing a theoretical and functional framework based on the principles of the fractal paradigm regarding to the specific activities of the EMS at the level of the Quality-Environment-Laboratories Department within the company S.C. ApaVital S.A. Iaşi

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1.3. Research methodology used

1.3.1. Defining the concept of methodology

The concept of methodology, in its broad meaning, includes all the techniques and methods used during the research that is carried out. It is the process that leads to the achievement of the stated objectives (Hutu, 2001).

According to the etymology of the word "methodology" (methodos – method, logos – science / study), present in the Explanatory Dictionary of the Romanian Language (DEX '09), we can say that the word "methodology" describes the study of the methods used during a certain research that is carried out.

The research methodology is "a system of methods, procedures, techniques, rules, postulations, principles and tools, as well as the corresponding know-how, involved in the process of scientific knowledge" (Zaiţ and Spalanzani, 2006).

In other words, the research methodology concerns the manner in which the scientific knowledge is achieved and it comprises all the elements that are involved during the respective research. The main aim of the methodology is to correctly structure (step by step) the knowledge process (Figure 1) (Lazarsfeld, 1965).

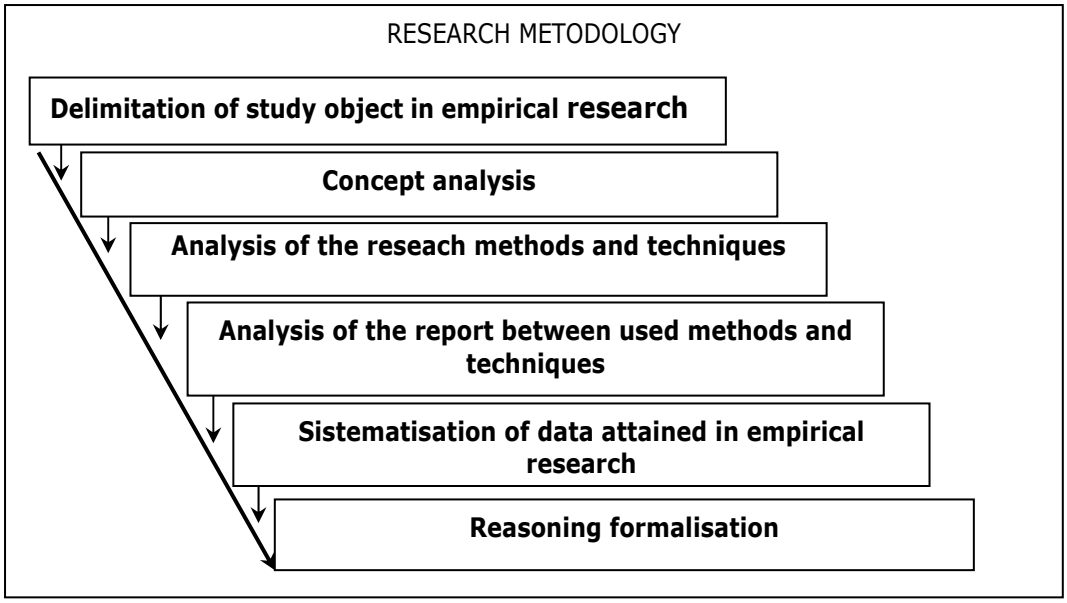


Figure 1 : Research methodology steps
Source: processed after Lazarsfeld, 1965

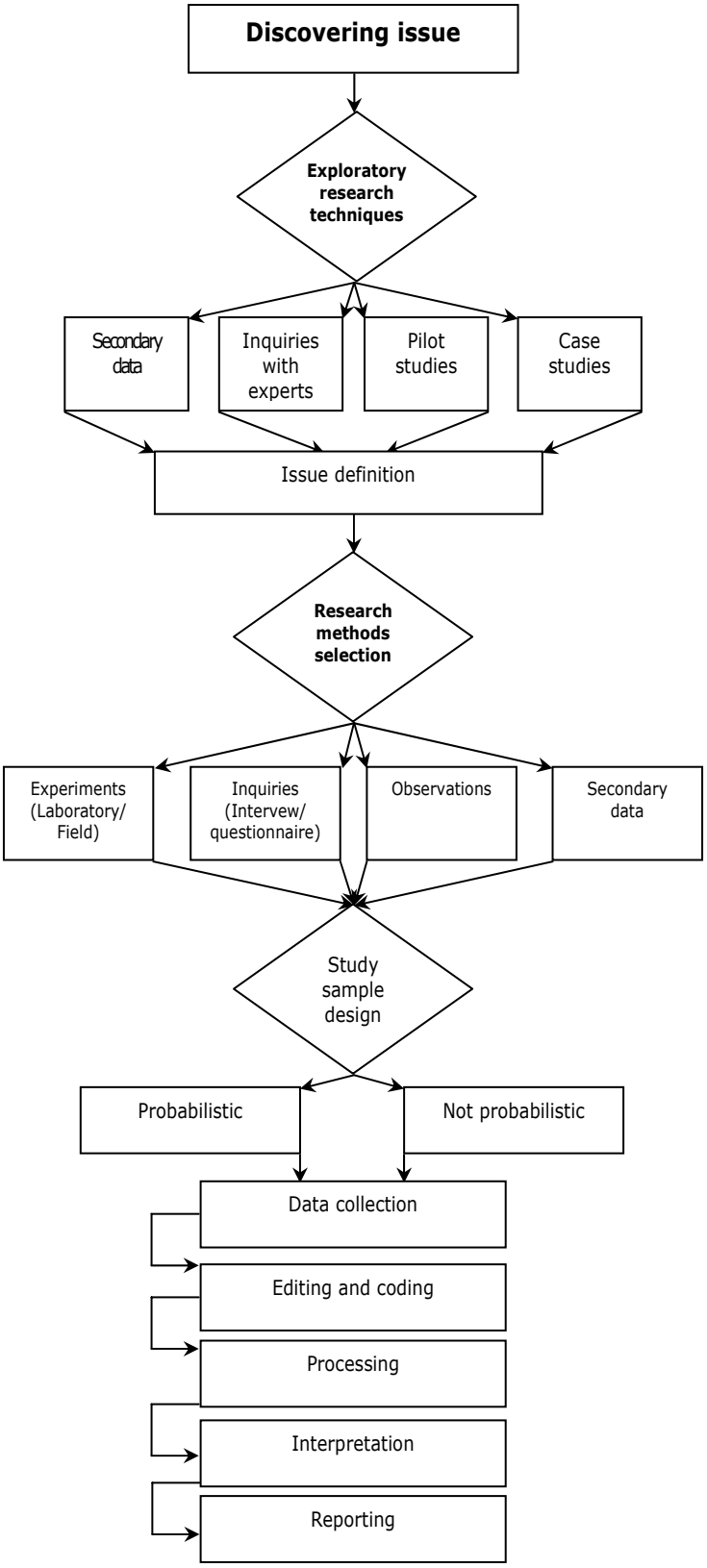


Figure 2 : Logical scheme of research model
Source : Huţu, 2005

1.3.2. The research process, methods, techniques and investigation tools

The research concept, ultimately "implies a systematic, objective and thorough investigation of a subject or of an issue, in order to discover important information or principles" (Rusu, 2010), while the research process implies a series of successive steps (detailed in Figure 3); if these steps are respected, they will successfully lead to pertinent results.

It is necessary to mention the fact that there are two types of researches, namely (Rusu, 2010):

(a.) fundamental research (named "theoretical"), that has the main objective to expand the knowledge from a certain field, with the mention that this type of research does not have in view to immediately implement some solutions to the existing issues, and

(b.) applied research that has as a main objective to use the existing knowledge in order to find a solution to various existing issues.

A high-quality research in the organisational field has in view the following items (Hutu, 2005):

a. it is based on the theory, comprising several analysis levels that include multiple methods;

b. has an interdisciplinary character;

c. is more process-oriented than description-oriented;

d. has in view the answer to the questions "Why?" and "Why?";

e. mainly uses the qualitative interpretation when it is appropriate.

Irrespective of the research type carried out, the research process includes certain steps, considered to be crucial, as one can see by analysing Figure 3.

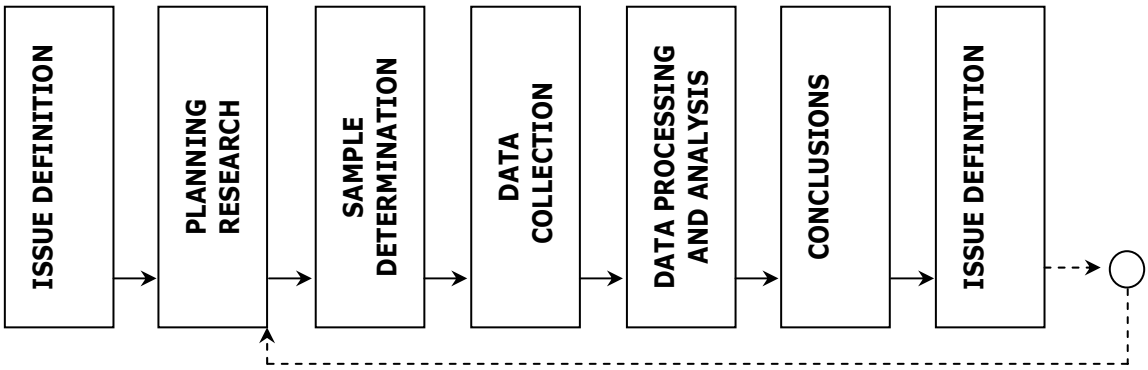


Figure 3 : Research process phases
Source : Hutu, 2005

The method is defined as "… the research mode, the system of rules and principles of knowledge and of changing the objective reality" (Chelcea, 2001).

The methods have the property to interfere, inform, act and interpret, and their choice is determined by the general conception of the researcher, starting with the theoretical and general principles on which he/she builds the research, commonly named *the research methodology.*

The concept of research "technique" describes the concrete approach meant to analyse the studied phenomenon; it represents the ways of data collecting. There are three types of techniques: (a.) techniques of mediated data collection (they concern the collection of the preexisting data, already systematised in different documents at the organisational level); (b.) collection techniques through direct contact (the observation/ the interview/ the survey); (c.) stimulation techniques or techniques based on built scenarios and on probabilistic data selection (Chelcea, 2001; Zaiţ and Spalanzani, 2006).

The research survey represents the investigation tool / the data collection technique that includes several written questions, as well as possible images and graphs logically ordered that, through their administration by the survey operators, determine the investigated persons to provide answers that will be registered. The manner in which this technique is developed determines the researcher to clearly define the theoretical and practical context in which the research will be carried out (Zaiţ and Spalanzani, 2006).

The structure of the survey must include several steps (Hutu, 2005):

a.explaining the relation between the method and the issue/ hypotheses;

b.drafting the survey – the researcher will take into account the following aspects: adaptation to the respondents' language/ the researcher should avoid long questions/ the researcher cannot suppose that the respondents own factual information or quality opinions/ the researcher must protect the respondents' ego/ the researcher should decide if he/she should ask a direct or an indirect question/ the researcher should decide if the questions must be closed or open/ the researcher must decide if the questions should be general or specific/ the researcher should avoid guided questions/ the questions should concern a single reference field, and so on

c. organising the survey – a step in which the research should take into account the following recommendations: he/she should start with simple questions (he/she should not start with e questions concerning the respondent's features)/ the possible answers should not depend on the previous answers/ the researcher should decide if he/she needs one or several questions in order to get a maximum quantity of information/ the questions should be ordered in such a way that they are as clear as possible for the respondent.

d. pre-testing the survey: this step is necessary in order to made clear the possible misunderstandings, ambiguities and errors.

e. the cost elements.

1.3.3. The general research methodology

1.3.3.1. The general structure of the research

The general structure of the PhD thesis "Researches Concerning the Environmental management system as a complex process at the organisations' level" is detailed in Figure 4.

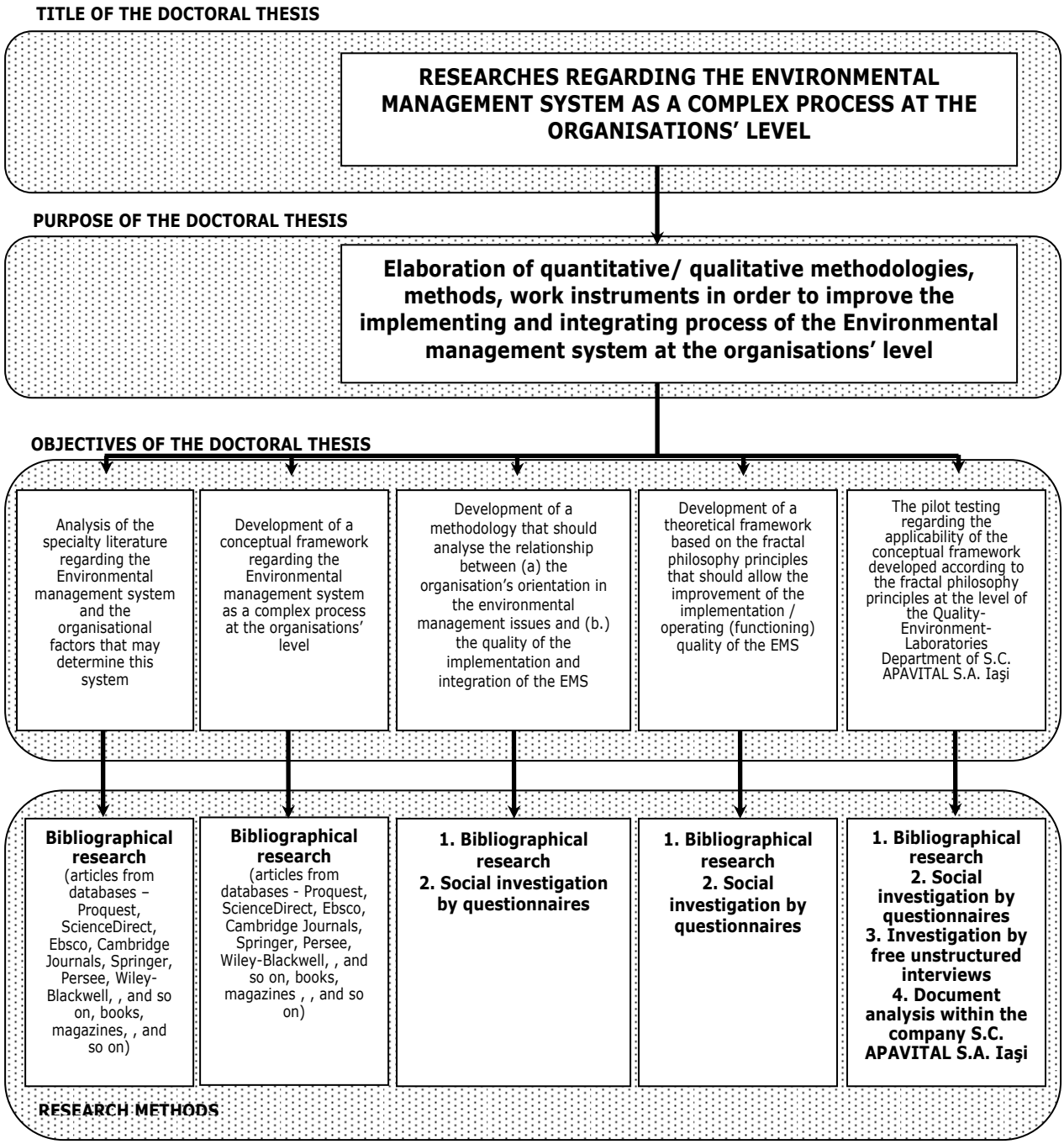


Figure 4 : General scheme of the research

1.3.3.2. General description of the research process structure

The research process implies a series of successive steps, which shows the most important phrase that leads to the achievement of the proposed objectives. Thereby the detailed presentation and explanation of the research process structure (presented in Figure 5) can be oserved in the following.

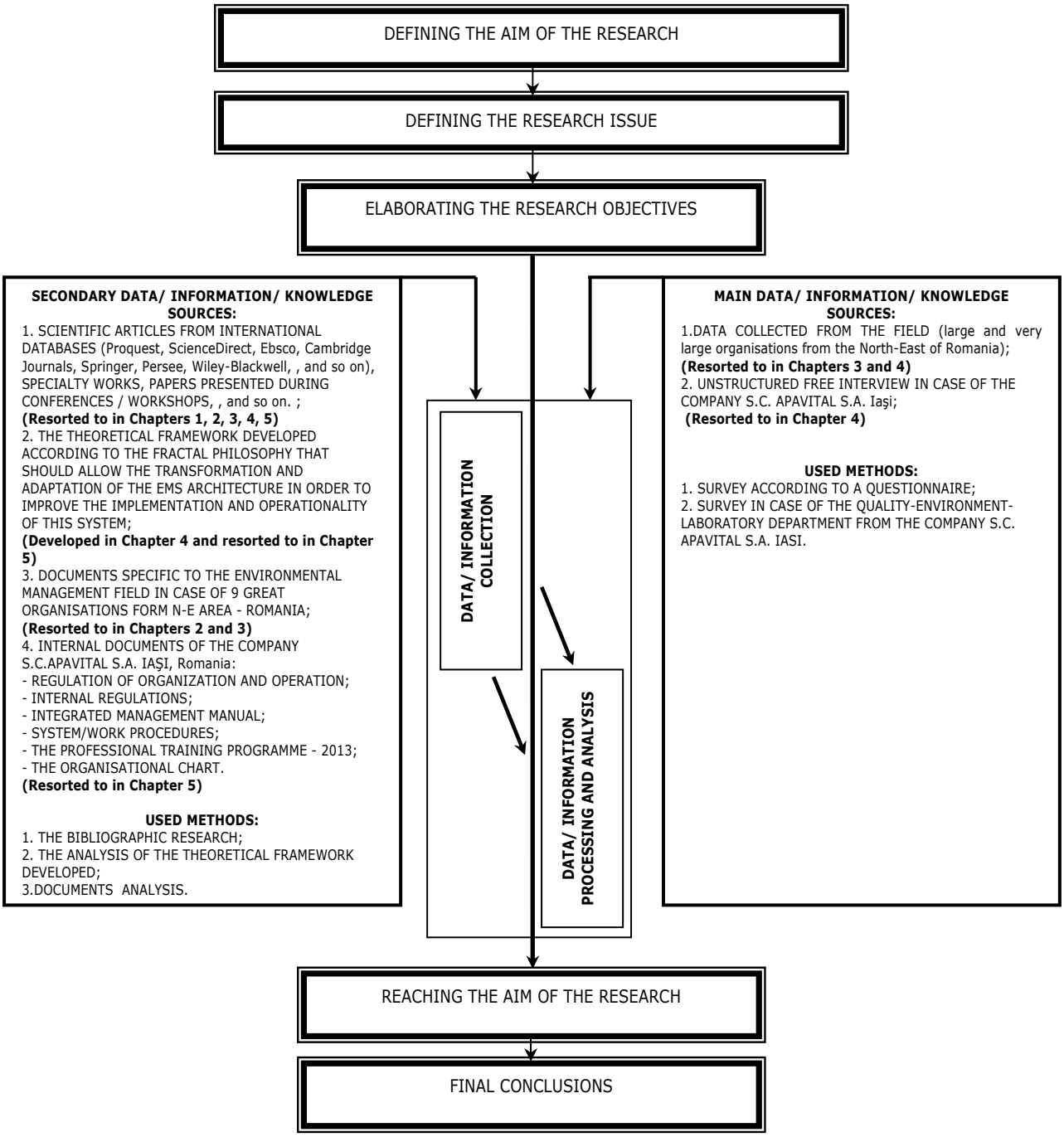


Figure 5 : Description of the research process structure

1. The Preliminary Part

a. defining the importance of the research for the PhD thesis "Researches Concerning the Environmental Management System as a Complex Process at the Organisations' Level";

In an essential manner, apart from the ideas previously mentioned in the subchapter "The Pertinence and Importance of the Research Issue", the very principle of continual improvement applied at the level of the Environmental management system generates the need for new methodologies, patterns and work tools for managers so that they notice the change that took place in a context based on efficiency.

b. setting the aim of the research: "Elaborating various methodologies, methods, qualitative and quantitative tools in order to improve the implementation, integration and functioning process of the Environmental management system at the organisations' level";

c. identifying the main objectives considered during the research process;

2. The Design Phase

a. choosing the information sources (scientific articles and scientific works / using the national and international databases/ consulting specialists – concerning the issue of the quality defining the implementation, integration and functioning process of the Environmental Management System);

b. selecting the method for data collection and systematisation.

3. The Performance Phase (Materialisation of the Formulated Objectives)

<u>a. collecting data concerning the following aspects:</u>

a1. analysing the relevant literature concerning the Environmental Management System and the organisational factors that may lead to this system, consisting in the identification of the information type and source that should be studied as follows:

- secondary information sources: the scientific literature.

a2. developing a conceptual framework concerning the Environmental management system as a complex process at the organisations' level; it consists in the identification of the information type and source that should be studied as follows:

- secondary information sources: the scientific literature.

a3. determining the most important factors that influence the quality of the implementation process of an Environmental Management System; it supposes the use of the following exploratory research techniques that consist in the identification of the information type and source that should be studied as follows:

- secondary information sources: the scientific literature, environmental documentations belonging to some of the largest organisations from the North-Eastern development area, Romania, and so on;

- primary information sources: unstructured interviews, involving specialists from the environmental management field, belonging to some large organisations from the North-Eastern development area in Romania.

a4. determining the essential aspects, including the quality of the implementation and integration of the Environmental management system; this step supposes the use of the following exploratory research techniques that consisted in the identification of the information type and source that should be studied as follows:

- secondary information sources: the scientific literature, environmental documentations belonging to some of the largest organisations from the North-Eastern development area in Romania, and so on;

- primary information sources: the unstructured interviews involving specialists from the environmental management field, belonging to some large organisations from the North-Eastern development area in Romania.

a4. investigating the intensity of the relations between the most important factors that influence the implementation quality of an Environmental management system and also characterise the organisation orientation on the environmental management issues (F_1) and the essential aspects that sum up the implementation and integration quality of the Environmental management system (C_C). In order to study the intensity of the relations, we used a survey - questionnaire based (the Annex no. 2), with an ordinal scale[4] in seven (the Likert scale), and with 179 items, applied in case of 171 (final validated number) managers (specialists in the environmental management field (environmental managers), or organizational managers that are involved in various environmental actions) in case of the largest organisations from the North-Eastern development area in Romania (questionnaire presented in the Annex no. 1, Annex no. 2).

a5. identifying and describing the main features of fractal philosophy; the exploratory research technique resorted to supposes the identification of the information type and source that should be studied as follows:

- secondary information sources: the scientific literature;

a6. identifying and describing the implementation and operation phases of the Environmental management system; it assume the use of the following exploratory research technique that consisted in the identification of the information type and source that should be studied as follows:

- secondary information sources: the scientific literature, the ISO 14001 standard, environmental documentations belonging to some of the largest organisations from the North-Eastern development area in Romania, and so on;

[4] The ordinal scales: imply a measurement level in which the objects belonging to different categories of a scale are in a certain relation with the respective categories (Huţu, 2005).

a7. elaborating the theoretical framework based on the fractal philosophy principles; this framework will allow us to improve the Environmental management system implementation and operation stage; the development of this theoretical framework assume the use of the following exploratory research techniques that consisted in the identification of the information type and source that should be studied as follows:

- secondary information sources: the ISO 14001 standard, the scientific literature, environmental documentations belonging to the largest organisations from the North-Eastern development area in Romania, and so on;

- primary information sources: investigation of different aspects [a. EMS implementation and operation/functioning stage (a1. defining the environmental responsibilities taking into account the factors/ influence aspects; a2. training sessions concerning the environmental management issues; a3. the environmental comunication; a4. performing controls at the level of the EMS; b. the flexibility of the organisation to implement the transformation and adaptation of the EMS architecture (b1. flexibility of the organisational structure/ the organisational managers should take measures in order to decentralise the environmental objectives and targets/ b2. decentralisation of the environmental decisional process)] considered to be important for the research, using data from the applied survey – Annex no.2.

b. information processing/ coding:

In order to fulfill the research objective, the questions from the survey will be introduced and coded in the SPSS (version 16) statistical analysis program, in order to obtain statistical and graphical representations that will allow us to formulate accurate interpretations concerning the considered "aspects" and to fulfill the stated objectives.

c. data analysis and interpretation/ analysis and interpretation of the collected information:

c1. in order to evaluate the link between F_1 and C_C and to design patterns under certain conditions that show the architecture of these links and influences, we proceeded to a qualitative and quantitative analysis. The data and information processing was carried out using the SPSS statistical program (which evaluates the internal consistency corresponding to the variables used within the research tool – the Cronbach Alpha index/ testing the normality of variable distribution – One-Sample Kolmogorov-Smirnov Test/ use of Spearman non-parametrical tests/ regression testing, and so on);

The research result: development of patterns/ models that show under certain conditions the architecture that defines all influences existing between F_1 and C_C.

c2. in order to analyse the possibility to improve the quality of the implementation and functioning of the Environmental management system, having in view the transformation and adaptation of the architecture belonging to this system based on the philosophy principles/ fractal paradigm, the analysis process consisted in the following phases:

1. the qualitative analysis and the processing of data collected through the survey and included in the Annex 2 were carried out through the use of the SPSS statistical programme (that evaluates the internal consistency corresponding to the set/ used variables within the research tool – the Cronbach Alpha index/ descriptive statistics (average/ standard average deviation), frequency analysis) for the considered aspects;

2. the qualitative analysis of the information collected through the quantitative analysis, as well as the analysis of the information/ knowledge from the scientific literature consisted in the processing and adaptation of this information and knowledge or in the comprehension of some crucial aspects implied by them (t_0 points within the previous structures);

The result of the research consists in: the development of a conceptual framework based on principles from fractal philosophy for the Environmental management system, that allows the transformation and adaptation of the EMS architecture, with a view to improve the implementation and functioning of this system at the organisational level.

1.3.3.3. Processing of the results – methods and analysis techniques

According to the objectives considered in this research, during the processing of the results, we resorted to several descriptive methods and to explanatory interference methods. Therefore, we applied (a) *the rational method*, as it allows the consolidation and prioritisation of the research objectives / the recourse to human knowledge means, methodologically filtered and transformed into observation, classification, demonstration, and so on; (b) *the deductive method*, as it helps us go from the general aspects (the synthesis of the components belonging to the investigated phenomenon, taken from the analysis) to the particular ones. If the premises from which we start are not true, through an accurate deduction process, this method allows us to come to a certain conclusion; *mathematical and statistical methods: the correlation method*, as it is a quantitative analysis method concerning the causality relations existing between the particular managerial factors or processes, components of a complex managerial system, as well as the causality relations existing between these factors and the investigated managerial phenomenon. The essence of this method consists in the identification and selection of the crucial factors, determined according to the existing statistical data corresponding to them or, if this data is missing, it can be obtained through statistical surveys and questionnaires.

The research concerning the implementing and integrating process of the Environmental Management System generally involves the evaluation and analysis of the complexity that defines the relations between the system and the possible organisational factors – internal and external factors that can influence this

system. Therefore, in our research we resorted to the correlation and regression analysis, having in view the existing stochastic links[5].

[5]A stochastic (statistical) link takes place when the modification of a variable is the complex result of the influence exercised by several variables. If we take into account two variables – X and Y, then the statistical link takes place when for each value of the X variable, the Z random variable has different values distributed around its average (Jaba and Grama, 2004).

Chapter 2 : State of the art regarding the Environmental management system

2.1. Conceptual approaches on the Environmental management system and the organisational factors that may determine it

2.1.1. The Environmental management system – objectives and general definition

The introduction of the environmental legislative regulations stimulated the organisations to search for modalities of minimising the induced impact upon the environment as an effect of the performed activities. Thus, a system was introduced on the level of the organisation's activities with the purpose of minimising the environmental risk, of utilising the resources efficiently and of developing, respectively of implementing different environmental responsibilities. The development of this system was considered the most viable solution for the efficient management of the environmental issues (Tinsley and Pillai, 2006; Hui *et al.*, 2001; Gonzalez-Benito, 2005).

The environmental management system is at the same time an instrument that identifies issues, but also an instrument that solves them relying on the continual improvement concept – this principle could be implemented at the level of an organisation by taking into account the way it is perceived by the management and having in view the activity sector of the companies (Perotto *et al.,* 2008).

According to the International Standardisation Organisation ISO 14001, the environmental management system is characterised as being "a component of the general management system that includes the organisational structure, planning activities, responsibilities, practices, procedures, processes and resources in order to elaborate, implement, achieve, analyse and maintain the environmental policy" (ASRO, 2005; Lozano and Valles, 2007).

Most of the environmental management systems are developed according to the pattern "*Plan, Do, Check, Act*" – Figure 6 (Deming's principle) and that is why they can be presented as being a continual cycle of planning, implementation, re-evaluation and improvement of the organisation's processes and activities in order to allow the continual improvement of the environmental performance; similarly to a continuous complex process – Table 4 (Stapleton *et al.*, 2001; Perotto *et al.*, 2008).

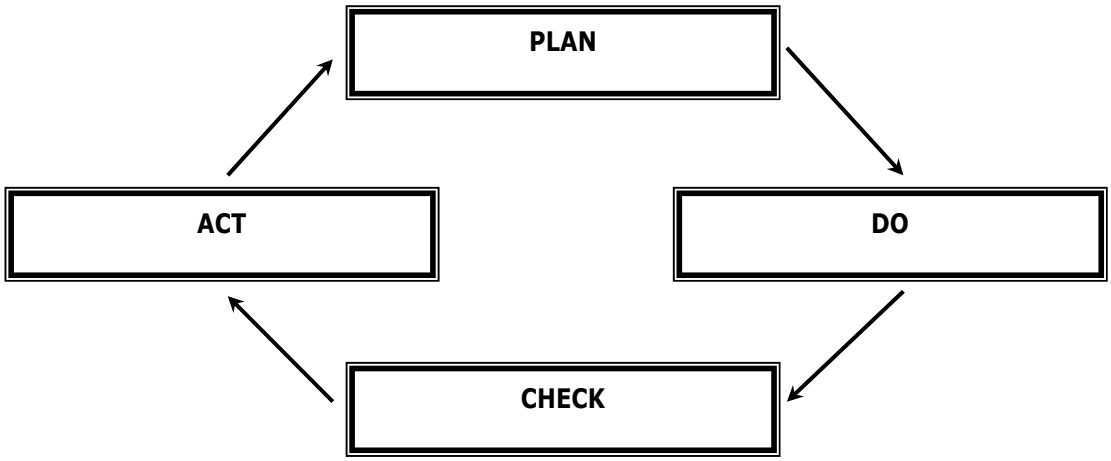


Figure 6 : Deming principle concerning continual improvement
Source: Teodosiu, 2005; Stapleton et al., 2001 Perotto et al., 2008

The Environmental management systems have their origins in the need of integrating the environmental management – of the environmental protection issues at the level of the organisations' general management (Teodosiu, 2005).

The concept of environmental management system was first introduced in the Netherlands, and nowadays it is utilised almost all over the world – in the European Union, Asia, Canada, the United States of America and so on, taking into account the fact that this system managed to convince not only by the attained financial benefits, but also by the increase of the organisations' credibility (Teodosiu, 2005).

The environmental management system can be considered as being a method of incorporating the environmental issues to the level of the organisational structure with the purpose of improving the relationship with the present environmental legislation, of diminishing the pressure of the persons who are interested in this matter, of improving the company image and of increasing the environmental awareness degree at the level of the entire organisation (Perotto *et al.*, 2008; ASRO, 2005).

Taking into account the aforementioned, **the implementation purpose** of an environmental management system can be identified and it consists in the continual improvement of the environmental performances – and thus the provision of a positive image and of competitive advantages of organisations; the implementing purpose of the environmental management system **does not consist in** the diminution of the organisations' financial risks and in their compliance with the environmental legislation (they are a consequence of the implementation of the environmental management system (Teodosiu, 2005).

Table 4 : The environmental management system as a process – in accordance with ISO 14001: 2005
Source: adapted after Perotto *et al.*, 2008/ ASRO, 2005.

Continual improvement	Environmental policy	The global intentions and the direction of an organisation in relation with the environmental performance
	Planning	The development of the environmental objectives and processes necessary for the compliance with the organisation's environmental policy
	Implementation and operation	The implementation of the designed processes
	Verification	The monitoring and the measuring of the organisation's processes with the purpose of reporting the results that are to be operated – if it is the case, the necessary corrections at their level, in order to be compliant with the environmental policy, objectives and targets, with the legal regulations or to which the organisation subscribed.
	Management analysis	The start-up of different actions with the purpose of continually improving the performance of the environmental management system

According to Teodosiu (2005), the objectives of an environmental management system elaborated for a productive organisation can be considered as being the following ones:

(a) to identify and to control the environmental aspects, the relevant impacts and risks at the organisation's level;

(b) to comply with the environmental policy, the proposed environmental objectives and targets, including the compliance with the environmental legislation in force;

(c) to define a set of principles that should guide the subsequent activities aiming at the environmental responsibilities;

(d) to set out a program of following the increase of the organisation's performance level, according to a balance sheet of costs – benefits;

(e) to define the responsibilities, the authority and the procedures that should ensure the involvement of each employee in the process of reducing the induced negative impact upon the environment;

(f) to achieve an efficient communication system at the organisation's level and to provide good training for the staff;

(g) to diminish the impact upon the environment of the new processes, of the new products and of the new services introduced and/or developed at the organization's level and so on

As a conclusion, at the level of this theoretical approach of the Environmental management system, it is also appropriate to present synthetically the main specific features of this kind of system, as it can be noticed below in Figure 7 and Table 5.

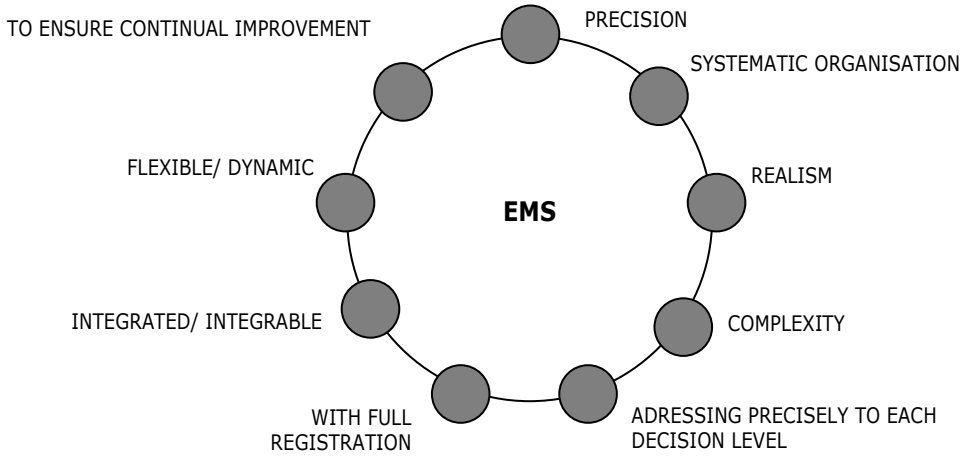


Figure 7 : Summary of basic specific features of an Environmental management system
Source: developed after Ionescu, 2000

Table 5 : Description of main specific features of an environmental management system
Source: Ionescu, 2000; Teodosiu, 2005

1. PRECISION	The environmental management system must include ambiguities and clarity at the level of the proposed environmental objectives and targets.
2. SYSTEMATIC ORGANISATION	The components of the environmental management system must be approached in an integrating manner.
3. REALISM	The environmental management system must be adapted to the organisations' specific features and to the level of the entire organisational structure.
4. COMPLEXITY	The environmental management system must "cover" all the activities and the entire staff.
5. WITH PRECISE ADDRESS TO EACH DECISION LEVEL	The design, the implementation and the operation of the environmental management system must include all the levels of the organization.
6. WITH COMPLETE REGISTRATION	The conception and the carrying out of the environmental management system must involve the recording of all the data, information, environmental knowledge and performed activities.
7. INTEGRATED/ INTEGRABLE	The design of the environmental management system is necessary as it should be integral at the level of all the management systems (standardised or non standardised) existing or possibly future on the organisation's level.
8. FLEXIBLE/ DYNAMIC	The environmental management system must be flexible in order to be able to answer fast and adequately to all the modifications arisen during its implementation and operation.
9. TO PROVIDE CONTINUAL IMPROVEMENT	(in order to answer indirectly to the principle of the continual improvement). The environmental management system must be elaborated, implemented and operated so that it should allow the existence of a continual circuit of the data/information that present the attained results (feed-back).

2.1.2. The Development of the Environmental management systems

2.1.2.1. Creation of the Environmental Consultative Strategic Group

The Environmental Consultative Strategic Group was established in 1991 at the initiative of two large organisations: (a) International Standardisation Organisation, and (b) International Electrotechnical Commission, with the purpose of evaluating the standardisation need in the field of the environmental management in order to have a common approach (common vision) that should allow the improvement of the economic and environmental performances (Ionescu, 2005).

After many international consultations and debates, the Environmental Consultative Strategic Group started its activity by establishing six working groups in the following fields (Teodosiu, 2005):

(a) environmental management;
(b) environmental audit;
(c) environmental labelling;
(d) environmental performance;
(e) the analysis of the life cycle;
(f) the environmental aspects on the level of the proposed standards.

The debates that followed resulted in the conclusion that it was recommended to create a new technical committee ISO for the environmental management, committee that was established in 1993 and it was called: **ISO/TC 207, Environmental management**. This new structure had at the strategic level the elaboration of several standards ISO 14000 that should be accepted at the international level and offer efficient means to improve the organisations' environmental performances, which should eventually contribute to a sustainable development (Tinsley and Pillai, 2006; Ionescu, 2005).

In order to have a global vision upon the preliminary events ISO/TC 207, Ionescu (2005) elaborates and presents these events synthetically, as it can be noticed in Table 2.3 presented below.

Table 6 : Preliminary events ISO/TC 207

Source: Ionescu, 2005

DATE	EVENT	REMARKED ASPECTS
1972	Conference of United Nations on Human Environment	It represents the first event that tackled the environmental issue
	Adoption of the International Action Plan in the environmental protection field	Adopted at the end of the United Nations' Conference on the Human Environment; foundations laid for the Programme of the United Nations on Environment.
	Adoption of Programme of the United Nations on Environment	Its purpose was to raise the awareness of the population and of all the persons involved in the environmental issues, in the necessity to protect the environment.
1972, Stockholm	Creation of International Commission on Environment and Development	The commission's main objective was the environmental analysis in the context of the

		accelerated human development.
1987	Publishing of the report "Our Common Future" (Brundtland Report)	It is the report considered as being historical as it introduced the term "sustainable development" and at the same time it recommended to the industrial organisations to utilise efficient systems of environmental management.
1987	Signing of the Montreal protocol regarding the substances that deteriorate the ozone layer	This protocol turns the volunteer treaty aiming at the ozone into an international law.
1989	Decision to organise a conference of the United Nations' Organization aiming at the environment and development	
1991	Creation of Consultative Strategic Group on Environment	It evaluates the standardisation need.
1992, Rio de Janeiro	"Rio Conference" takes place	The analysis of the report "Our Common Future" (Brundtland Report)
	Creation of the Commission for Sustainable Development	It evaluates the activity of the Consultative Strategic Group on Environment and the activity of International Standardisation Organisation, respectively of the International Electrotechnical Commission
	Development of the document "Agenda 21"	It represents a document of global political orientation
	Adoption of "Rio Declaration"	It elaborates and it synthesises the application principles of the sustainable development concept.

2.1.2.2. The BS 7750 Standard

The BS 7750 standard is the first standard in the world to approach the environmental management issue. It was elaborated and published in 1992 by the British Institute of Standardisation (BSI) and presents an approach that is very close to the approach of the current existing standards regarding the quality management (Standard series SR EN ISO 9000). The standard was used as a model for the design of a successful Environmental management system that should allow its auditing (Tinsley and Pillai, 2006; Ionescu, 2005; Teodosiu, 2005).

This standard was monitored, evaluated and analysed for a period of one year being utilised in a pilot programmed at the organisations' level in 40 activity sectors, and eventually as a consequence of the attained results, it was revised in 1994 in order to be compatible with the Eco-Management and Audit Scheme (EMAS) that had just appeared (Ionescu, 2005; Teodosiu, 2005; Ball, 2002).

2.1.2.3. The regulations of EMAS

The Eco-Management and Audit Scheme (EMAS) is the name of the Regulation no. 1836/ 1993 of the European Commission, and it is also known under the name Eco-Audit Regulation. This environmental and audit management system allows voluntarily to the industrial profile organisations to participate to the community scheme of eco-management and audit. Its elaboration is due mainly to the British Institute of

Standardisation (BSI), as the BS 7750 Standard is also utilised as a model. EMAS entered into force on 13th July 1993 and became completely operational only in 1995 (Teodosiu, 2005; Ionescu, 2005).
It is also necessary to mention that the European Commission, by means of the Regulation 761/ 2001, replaced in 2001 the EMAS version with a modified version known under the name of EMAS II. This new version of EMAS brings along several new elements among which there are: the alignment to the environmental global policies, the enlargement of the application framework of EMAS II, the assimilation of ISO 14001 requirements as a basis for the implementation of the Environmental management system, an easier level of addressing to the organisations and so on (Ionescu, 2005).

2.1.2.4. The ISO 14001 Standard

The ISO 14001 standard, known in the Romanian version as "SR EN 14001 – The Environmental management system. Specifications and user's guide" is the main component of the ISO 14000 standard series (Teodosiu, 2005).
This standard was designed and adopted in 1996 (respectively revised in 2004) in order to offer on an international level an acknowledged framework for the environmental management, measurement, evaluation and auditing. It offers the organisations an instrument for the evaluation and the control of the induced impact upon the environment as an effect of the developed activities (Robert, 2000; Glavic and Lukman, 2007; Oliveira *et al.*, 2010).
The standard approaches the following principles at its level: environmental audit, environmental labeling, the evaluation of the environmental performance, environmental management and the evaluation of the life cycle (Oliveira *et al.*, 2010).
This standard presents the general instructions for the development and the operation of an Environmental management system. At the same time we have to mention that it does not present at its level specific instructions on the way in which certain specific routines to the environmental management system should be elaborated, managed or adapted to the organisations' level (the routinisation of the environmental practices) (Oliveira *et al.*, 2010).
As a completion of the ISO 14001 standard were developed several standards that refer to the environmental protection: the most representative of them is the ISO 14004 standard: "Environmental management systems – Guidelines on the principles, systems and techniques of application", taking into account its connection to the implementation issues of the Environmental management system (Ionescu, 2005).

2.1.3. The structure of the Environmental management system in accordance with ISO 14001: 2004

Any organisation that wishes to implement an environmental management system – in accordance with ISO 14001: 2004, whether they use a consultancy firm, whether they design and implement it by their own means, must meet two essential requirements: (a) to comply with the implementing stages, (b) to respect

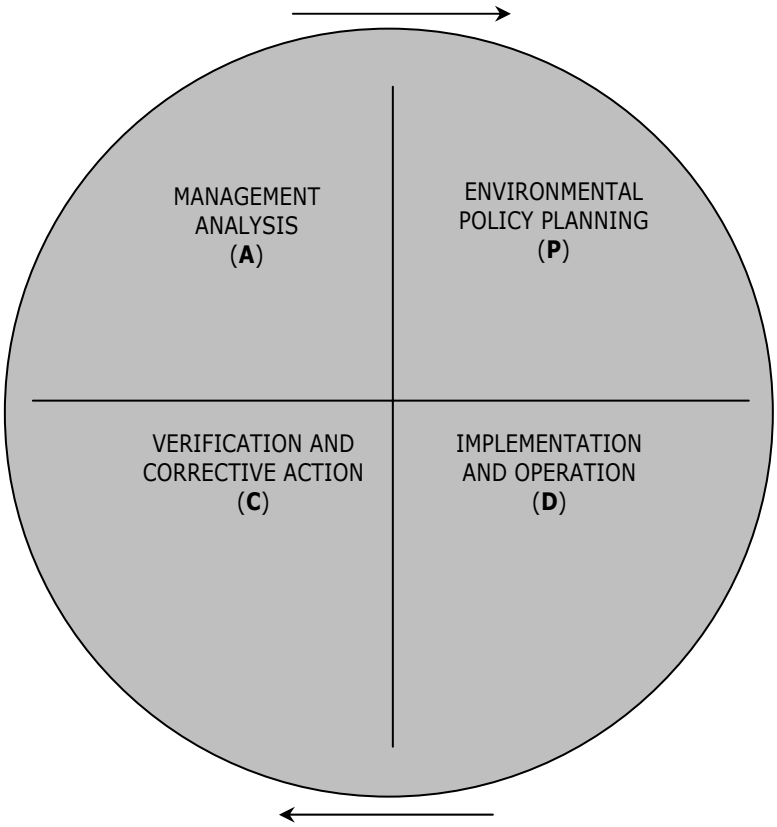
the ISO 14001 vision which mentions that the Environmental management system is not an addition to the organisation's management, but an integral part (Teodosiu, 2005).
According to ISO 14001, any organisation that wishes to implement an Environmental management system must meet the following general requirements presented in Table 7.

Table 7 : The main structural requirements of an Environmental management system in accordance with ISO 14001

Source: ASRO, 2005

Chapter of ISO 14001	Structural requirement
4.2.	**Environmental policy**
4.3.	**Planning**
4.3.1.	Environmental aspects
4.3.2.	Legal regulations
4.3.3.	Objectives and targets
4.3.4.	Environmental management program
4.4.	**Implementation and functioning**
4.4.1.	Structure and responsibility
4.4.2.	Training, awareness and competence
4.4.3.	Communication
4.4.4.	Documentation of the EMS
4.4.5.	Control of documents
4.4.6.	Operational control
4.4.7.	Prevention of emergency situations
4.5.	**Verification and corrective action**
4.5.1.	Monitoring and measuring
4.5.2.	Nonconformity, corrective action and preventive action
4.5.3.	Recordings
4.5.4.	Audit of the Environmental management system
4.6.	**Management analysis**

Having in view the Deming principle to which the ISO 14001 requirements are subordinated, in order to provide continual improvement, the following correlation can be developed – presented by Teodosiu (2005) in the following figure (Figure 8):



Legend:
P – planning/ A – relieving/ C – certifying/ D – executing (DEMING principle)

Figure 8 : Correlation between Deming principle and general structure of Environmental management sistem in compliance with ISO 14001
Source: Teodosiu, 2005

An architecture considered efficient of the Environmental management system elaborated by Welford and Gouldson (1993), taking into account the quality management, and adapted by Tinsley and Pillai (2006) in order to comply with ISO 14001, is presented in Figure 9.

Even if the architecture model for an Environmental management system – Figure 9 meets all the requirements both in practice and in the ISO 14001 standard, in order to simplify and to understand easily the structure of the Environmental management system, there follows a schematic presentation of the essential constructing and implementing stages of the Environmental management system according to ISO 14001, as it can be noticed in Figure 10.

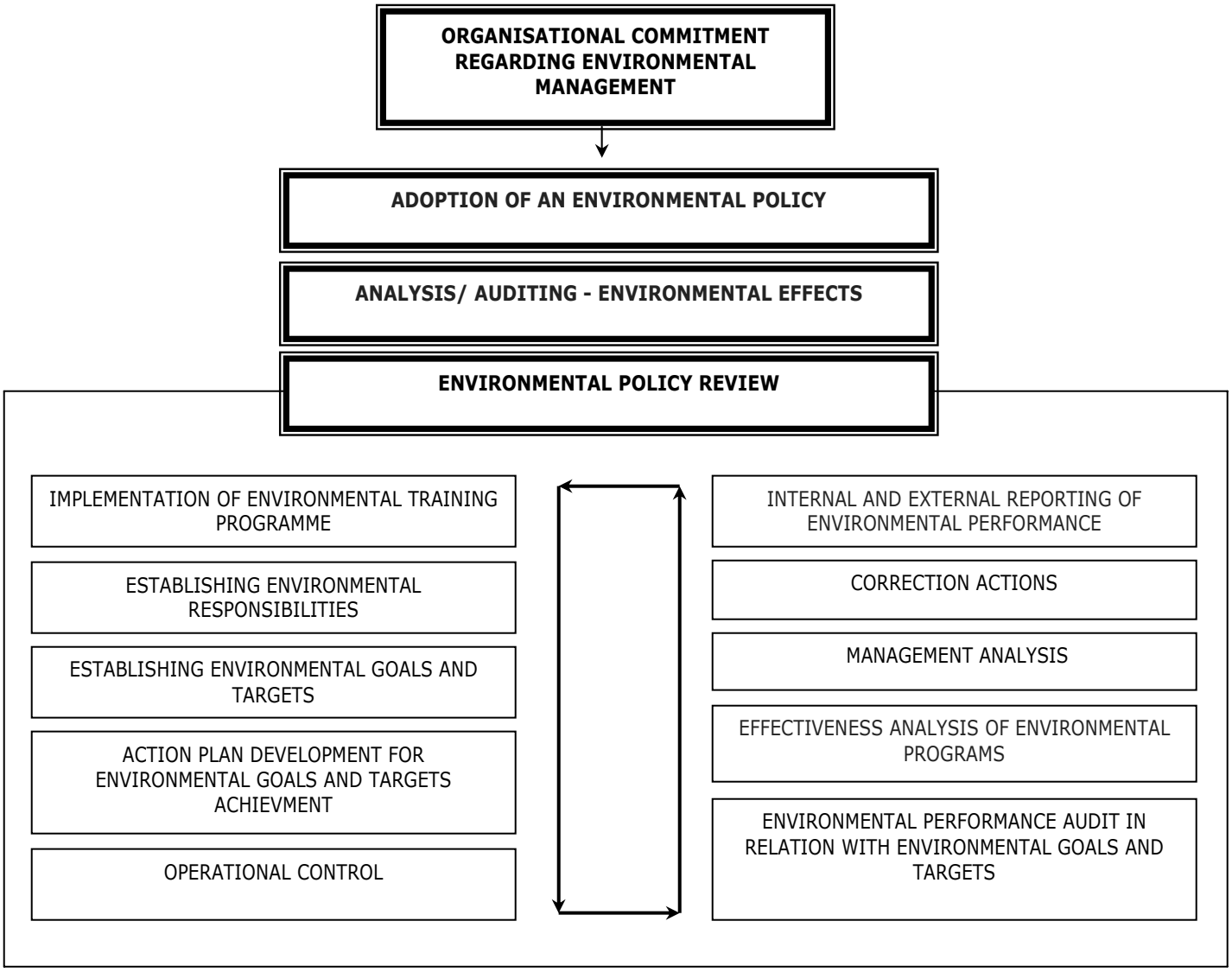


Figure 9 : Arhitecture of Environmental management sistem
Source: Tinsley and Pillai, 2006 adapted after Welford and Gouldson 1993

Having in view Figure 10 presented previously, it is necessary to mention that these stages are essential for the construction and the implementation of an Environmental management system, as it can be seen below: The elaboration of the environmental policy and the commitment of the organisation's management (Tinsley and Pillai, 2006) regarding its compliance and real adoption can be considered "the main key" of the entire system. Even if the ISO 14001 standard offers a very big flexibility to the elaboration process of the environmental policy, it can be considered as having an extremely high degree of importance because at the level of its content there must be three essential commitments: (a) the organisation's commitment to comply with all the environmental legislation in force and with other regulations to which it subscribed, (b)

the commitment to really observe and implement the continual improvement principle and (c) the commitment of the pollution prevention. At the same time the environmental policy reflects the fact that the organisation's principles and priority directions regarding the environmental performance are real and effectively implemented on all the levels.

The environmental objectives represent the general directions (identified in the environmental policy) which the organisation aims at reaching within a certain period of time. The organisations at the level of their elaboration must take into consideration (a) the different findings attained from the environmental analyses whose main objective is the identification and the quantification of the environmental aspects and of the impacts associated with these aspects upon the environment, and (b) the environmental legislative regulations in force, or any other requirement necessary on this elaboration level.

The specific objectives (the environmental targets) represent detailed performance requirements which are quantifiable and fixed within a specified period of time, resulted from the environmental objectives, and which can be applied to an organisation in its ensemble or only to a part of it.

The environmental management programme represents the operative instrument utilised in order to meet the proposed environmental objectives and targets. This instrument must have at its level the allotted means, the developed and implemented responsibilities, as well as the deadlines set for the reach of the proposed environmental objectives. At the same time we must also mention that, in order to be efficient and effective, this instrument must be flexible, integrated into the general strategy of the organisation and it must be updated all the time.

The monitoring and the measuring represent the stages that provide to the evaluation process the necessary information for a successful implementation of the continual improvement principle; that is why Figure 10 presents a functional connection between the environmental management programme and the following stage of monitoring/ measuring, a connection filtered by different preventive and corrective actions, and by different programmes of training respectively of skills upgrading (it could be considered the first loop of the continual improvement of the Environmental management system).

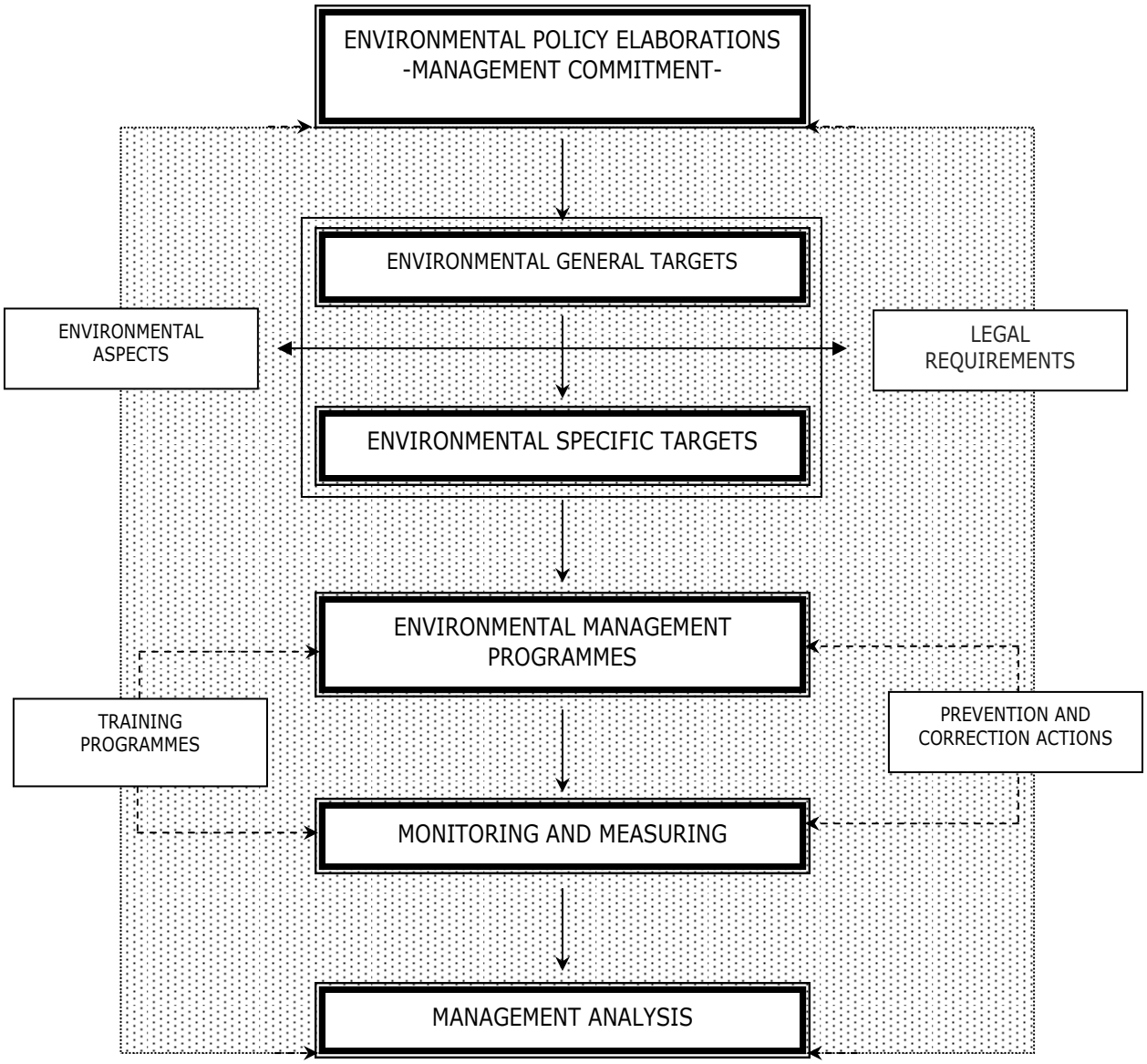


Figure 10 : Construction and implementing steps of EMS
Source: Teodosiu, 2005

The management analysis represents the stage which evaluates the global functioning way of the Environmental management system. The management on the highest level analyses the current level of the environmental global performance and decides the need to change the environmental policy, the environmental general objectives or of other parameters of the Environmental management system, with the purpose of improving the functionality and the quality of the system's implementation (it could be considered the second loop of the continual improvement of the Environmental management system; it closes the cycle that begins and ends at the organisation's top management).

2.1.4. Environmental management system and environmental practices

The organisations' preoccupations and commitment in the environmental issues have become a real variable in all the scenarios of the present competitive context (Gonzalez-Benito and Gonzalez-Benito, 2005). Thus, the implementation of an Environmental management system at the organisations' level represents an important "strategic move" which can bring along benefits on average term and long term, and can become that advantage lever in front of the rivalry.

The implementation of the Environmental management system and its integration at the level of the general management bring along the reutilisation of certain environmental practices[6], which will be the topic of the analysis below.

Having in view the reference works, by means of different authors such as Sarkis and Gonzalez-Torre (2010), Sarkis (2001), Hunt and Auster (1990), Roome (1992), Winsemius and Guntram (1992), Azzone et al. (1997), Sharma and Vredenburg (1998), Klassen and Angell (1998), Aragon-Correa (1998), Henriques and Sadorsky (1999), Klassen and Whybark (1999), Bansal and Roth (2000), Buysse and Verbeke (2003), Gonzalez-Benito and Gonzalez-Benito (2005), the specialty literature mentions that the organisations mainly adopt two types of attitudes towards the environmental issues (extreme types of attitudes), as follows: (a) a reactive attitude towards the environment as an effect of the necessity to comply with and (b) a proactive attitude towards the environment that can be characterised as a volunteer action of the organisations that wish to reduce the negative impact upon the environmental factors. These works approach the dynamics of the road taken by the organisations between these two extremes of the attitudes towards the environmental protection issues; they present the diversity of environmental practices implemented having in view the diverse environmental strategies elaborated and adopted at the organisations' level.

2.1.4.1. Environmental practices – planning and organising

The practices specific to the environmental management which are in a direct relationship with the planning and the organising at the level of an organisation, having in view the specialty literature, should present different aspects that aim at (a) the environmental policy (b) the environmental objectives and targets, (c) the environmental responsibilities, (d) the information, the training and the involvement of this human resource in the environmental management (environmental training/ positions in the environmental management at the level of an organisation), (e) the analysis of the environmental performance, (f) plans for emergency situations , and so on – as it can be noticed synthetically from Table 8.

[6] Environmental practices which according to Gonzalez-Benito *et al.* (2005) represent the level at which an Environmental management system was developed and implemented.

Table 8 : Environmental management practices – part 1
Source: adapted after Gonzalez-Benito and Gonzalez-Benito, 2005; Henriques and Sadorsky, 1999; Aragon-Correa, 1998; Klassen and Whybark, 1999

No.	PLANNING AND ORGANISATION
1.	A clear and explicit definition of the environmental policy
2.	Clear environmental objectives and long-term environmental plans
3.	Clearly defined environmental responsibilities
4.	Full-time existing employees with jobs specific to the environmental management
5.	Training and environmental professional formation for employees and managers
6.	Systems for the measuring and analysis of the environmental performance
7.	Plans for emergency situations

2.1.4.2. Environmental practices – operational

The environmental operational practices can be characterised as being the practices specific to the environmental management that involve different operational changes at the level of the production system. Sarkis (2001) classified the environmental operational practices in two categories: (a) environmental operational practices at the product level, and (b) operational practices at the process level (Sarkis, 2001; Gonzalez-Benito and Gonzalez-Benito, 2005).

Environmental Operational Practices at the Product Level (a):
This category of environmental practices involves the elaboration and the development of the ecological products together with a long-term commitment to protect the environment and thus to diminish as much as possible the induced negative impact upon the environment as an effect of the productive activities carried out at the level of an organisation.
As an effect of such practices' integration on the management level, the organisations should reduce the consumption of the non-renewable resources and replace the polluting materials with the ones that have a reduced negative impact upon the environment. They should design and develop products that can be utilised again, recycled or reintroduced into the production process.
A general synthesis of the environmental operational practices at the product level can be noticed in Table 9.

Table 9 : Environmental management practices – part 2
Source: adapted after Sarkis and Gonzalez-Torre, 2010; Klassen and Angell, 1998; De Ron, 1998; Gonzalez-Benito and Gonzalez-Benito, 2005

No.	OPERATIONAL (AT THE PRODUCT LEVEL)
1.	The reduction of the pollution level and the replacement of the raw materials that can generate the environmental pollution
2.	Plans regarding the consumption reduction of resources and wastes generated in the production and distribution process
3.	Plans regarding the consumption reduction of resources and wastes generated in the utilisation process of different products
4.	Plans regarding the re-utilisation and the recycling of different materials

Environmental Operational Practices at the Process Level (b)

The environmental operational practices at the process level (Table 10) can be considered as being those practices that have as a main purpose to develop and to implement methods and processes (at the operational level and at the production process level), in order to reduce the impact upon the environment. Some environmental practices involve different internal processes carried out on the organisation's level from the viewpoint of the implemented solutions and of the control, whereas others involve different external processes. Thus they influence the distributing and providing activities or any other activity that involves an exchange between the organisation and the external environment (Gonzalez-Benito and Gonzalez-Benito, 2005).

Table 10 : Environmental management practices – part 3

Source: adapted after Gonzalez-Benito and Gonzalez-Benito, 2005; Klassen and Angell, 1998; Min and Galle, 2001.

No.	OPERATIONAL (AT THE PROCESS LEVEL)
1.	The utilisation of filters for emissions and techniques of diminishing the pollution directly at the source (English: end-of-pipe control)
2.	The process development by focusing on the reduction of energy and natural resources at the operational level
3.	The control and the planning of production by focusing on the reduction of the wastes level and on the optimum utilisation of different materials
4.	The purchase of clean technologies and equipment that have a minimum negative impact upon the environment
5.	The orientation towards the purchase of ecological products
6.	The utilisation of criteria specific to the environmental management in the choice of suppliers
7.	The utilisation of methods with a minimum impact upon the environment at the transport level
8.	The utilisation on the logistic level of recyclable/ re-utilisable materials
9.	Existence of recovery/ recycling systems
10.	Responsible with the depositing of wastes and residues

2.1.4.3. Environmental practices – communicational

The communicational practices specific to the environmental management represent those practices that contribute to the improvement of the organisation's image by developing cordial relationships with all the involved parties – especially with clients, regulating institutions of the environmental issues, and so on. These practices have in essence a purely commercial objective and they are associated in the specialty literature with the organisation's commitment to protect the environment (Florida and Davison, 2001).

A general synthesis of the environmental practices at the communicational level can be studied in Table 11.

Table 11 : Environmental management practices – part 4

Source: adapted after Florida and Davison, 2001; Gonzalez-Benito and Gonzalez-Benito, 2005

NO.	COMMUNICATIONAL
1.	Regular elaboration of reports specific to the environmental management
2.	Performing sponsorship actions of different activities that have as a main purpose the environmental protection
3.	Collaboration in different projects with the ecological organisations

4.	Utilisation of specific arguments to the environmental management at the marketing level
5.	Regular information for the stakeholders (employees/ clients/ institutions/ local community) by presenting different environmental reports

Gonzalez-Benito *et al*. (2005) consider that these environmental practices influence indirectly the level of the organisations' market performance having in view that they determine directly the company image. Thus we can say that the orientation of the organisations' attitude towards the environmental issue should not be measured by the environmental performance indicators, but by the implementing level of the environmental practices. In conclusion we can say that these environmental practices (planning and organising/ operational/ communicational) characterise the implementation quality of the Environmental management system on an organisation's level, and indicate the integrating level of this system at the level of the general management.

2.1.5. Advantages and disadvantages for the implementation of an Environmental management system

The implementation and the integration of an Environmental management system on the organisations' level involves the development of different practices specific to the environmental management, that can have multiple beneficial results for companies over the years (Tari *et al.*, 2012).

Especially the benefits that result after the certification with ISO 14001 are extremely important for organisations, and that is why different specialists pay special attention to this research direction because it expresses the tangible result of the integration of the Environmental management system.

Essentially the advantages or the benefits attained after the certification with ISO 14001, as it is suggested at the level of the same standard, can be divided into two large groups, and precisely: internal benefits and external benefits. The internal benefits are in relation with the improved financial performance of an organisation and the improvements at the level of the production process , and so on, whereas the external benefits characterise the attitude of the stakeholders (clients, employees, management, providers, local community , and so on) – essentially the organisation's image determined by its orientation towards the environmental protection (Gavronski *et al.*, 2008; Oliveira *et al.*, 2012).

The specialty literature (Ann *et al.*, 2006; Oliveira *et al.*, 2012; Arimura *et al.*, 2008; Barla, 2007; Emilsson and Hjelm, 2002; Lupu *et al.*, 2012; Daddi *et al.*, 2011; Gavronski *et al.*, 2008; Hillary, 2004; Hui *et al*., 2001; Zutshi and Sohal, 2004; King *et al*., 2005; Szymanski and Tiwari, 2004; Link and Naveh, 2006; Melnyk *et al*., 2002; Melnyk *et al*., 2003; Padma *et al*., 2008; Pan, 2003; Potoski and Prakash, 2005; Russo, 2009; Schylander and Martinuzzi, 2007; Tan, 2005; Wahba, 2008; Yin and Schmeidler, 2009; Yiridoe *et al*., 2003; Zeng *et al*., 2005; Nawrocka and Parker, 2009) presents by very many performed researches the fact that these benefits are multiple; they can be measured and analysed, as well as classified. Starting from the classification elaborated by Tari *et al*. (2012), the bibliographical research had as an objective the study of the most important articles connected to the aforementioned topic, and the synthetic presentation of the most important benefits generated by the implementation of an Environmental management system (Table 12).

An extremely valuable work from the viewpoint of the presented results belongs to Zutshi and Sohal (2004), who performed the researches and presented the most important benefits resulted after the certification with ISO 14001, as follows: the reduction of the costs as a result of the reduction in the quantity of wastes, recycling, the reduction in the quantities of electrical power, water, gas and raw materials / the improvement of the operational processes, and the increase of the motivation degree for employees/ the improvement of the communication within the organisation/ the improvement of the company's image and the improvement of the relationship with the clients, the community and other stakeholders/ the improvement of the long-term relationship with providers, contractors and subcontractors/ the reduction of fines as a consequence of the compliance with the environmental legislation , and so on

Oliveira et al. (2012) consider that the main benefits resulted after the implementation of an Environmental management system in accordance with ISO 14001 are the following ones: the access to new markets/ the increase of the market share, the compliance with the environmental legislation/ the risk reduction/ access to financial credits/ the improvement of the production process/ the improvement of the environmental performance/ the improvement of the organisation's management / the improvement of the relationships at the human resources level / the improvement of the company's image / meeting the clients' requirements / the improvement of life's quality/ the improvement of the provided products or services/ the increase of the awareness degree upon the importance of the environmental protection , and so on

Table 12 : Resulting benefits from the implementation and operation of the Environmental Management System (EMS)

Source: completed and adapted after Tari *et al.*, 2012

No.	EMS benefits	Researchers
1.	Market quote	Hillary, 2004; Pan, 2003; Zeng *et al*., 2005; Oliveira *et al.*, 2012
2.	Exports	Link et Naveh, 2006; Melnyk *et al*., 2002; Melnyk *et al*., 2003; Padma *et al*., 2008; Zutshi and Sohal, 2004
3.	Sales growth	Link and Naveh, 2006
4.	Profitability	Ann *et al*., 2006; Emilsson and Hjelm, 2002; Gavronski *et al*., 2008; Hui *et al*., 2001; Link and Naveh, 2006; Melnyk *et al*., 2002; Melnyk *et al*., 2003; Padma *et al*., 2008; Pan, 2003; Wahba, 2008; Yiridoe *et al*., 2003; Zeng *et al*., 2005
5.	Improving the competitive position / competitive advantage	Ann *et al*., 2006; Gavronski *et al*., 2008; Hillary, 2004; Melnyk *et al* ., 2002; Melnyk *et al*., 2003; Schylander and Martinuzzi, 2007; Tan, 2005; Yiridoe *et al.*, 2003; Zutshi and Sohal, 2004;
6.	Improving the organisations' management (documentation improvement, procedures, responsibility improvement)	Hillary, 2004; Melnyk *et al*., 2002; Pan, 2003; Oliveira *et al.*, 2012; Rondinelli and Vastag, 2000; Schylander and Martinuzzi, 2007; Yiridoe *et al*., 2003; Zeng *et al*., 2005;
7.	Efficiency (productivity, cost reduction, shorter time, managerial control improvement	Gavronski *et al*., 2008; Hillary, 2004; Melnyk *et al*., 2002; Melnyk *et al*., 2003; Padma *et al*., 2008; Pan, 2003; Rondinelli and Vastag, 2000; Schylander and Martinuzzi, 2007; Tan, 2005; Yin and Schmeidler, 2009;

		Zeng *et al.*, 2005; Zutshi and Sohal, 2004;
8.	Improving the quality level of product/ service	Hillary, 2004; Melnyk *et al*., 2002; Melnyk *et al*., 2003; Yiridoe *et al*., 2003
9.	Image improvement	Gavronski *et al*., 2008; Hillary, 2004; Hui *et al*., 2001; Melnyk *et al*., 2002; Melnyk *et al*, 2003; Pan, 2003; Schylander and Martinuzzi, 2007; Tan, 2005; Yiridoe *et al.*, 2003; Zeng *et al*., 2005; Oliveira *et al.*, 2012 ;
10.	Improving the employees' results (motivation, satisfaction, teams, communication, knowledge)	Gavronski *et al*., 2008; Hillary, 2004; Hui *et al*., 2001; Padma *et al*., 2008; Pan, 2003; Rondinelli and Vastag, 2000; Schylander and Martinuzzi, 2007; Zeng *et al*., 2005; Zutshi and Sohal, 2004
11.	Increasing the customers' satisfaction (reducing complaints, , and so on)	Ann *et al*, 2006; Gavronski *et al*., 2008; Hillary, 2004; Hui *et al*., 2001; Melnyk *et al*, 2002; Melnyk *et al*., 2003; Padma *et al*., 2008; Pan, 2003; Schylander and Martinuzzi, 2007; Zeng *et al*., 2005; Zutshi and Sohal, 2004
12.	Improving relationships with suppliers	Emilsson and Hjelm, 2002; Gavronski *et al*., 2008; Hillary, 2004; Melnyk *et al*., 2002; Melnyk *et al*., 2003; Padma *et al*., 2008; Yin and Schmeidler, 2009
13.	Improving relations with authorities and other concerned parts	Ann *et al*., 2006; Arimura *et al*., 2008; Barla, 2007; Emilsson and Hjelm, 2002; Gavronski *et al*., 2008; Hillary, 2004; King *et al*., 2005; Link and Naveh, 2006; Pan, 2003; Schylander and Martinuzzi, 2007; Yiridoe *et al*., 2003; Zutshi and Sohal, 2004; Oliveira *et al.*, 2012
14.	Environmental performance improvement	Ann *et al*., 2006; Oliveira *et al*, 2012; Arimura *et al*., 2008; Barla, 2007; Emilsson and Hjelm, 2002; Gavronski *et al*., 2008; Hillary, 2004; Hui *et al*., 2001; King *et al*., 2005; Link and Naveh, 2006; Melnyk *et al*., 2002; Melnyk *et al*., 2003; Padma *et al*., 2008; Pan, 2003; Potoski and Prakash, 2005; Russo, 2009; Schylander and Martinuzzi, 2007; Szymanski and Tiwari, 2004 ; Tan, 2005; Wahba, 2008; Yin and Schmeidler, 2009; Yiridoe *et al*., 2003; Zengan *et al*., 2005; Zutshi and Sohal, 2004; Nawrocka and Parker, 2009; Lupu *et al*., 2012; Daddi *et al*., 2011

Although the implementation of an Environmental management system generates benefits to the organisations, as it can be seen in Table 12, it is necessary to mention that this process may create certain disadvantages, classified by Ionescu (2000) in Table 13.

Table 13 : Possible disadvantages resulted after the implementation and operation of an Environmental management system

Source: Ionescu, 2000

No.	Level	Possible disadvantages
1.	Management	The possibility of a contradiction with the existing programmes and procedures/ the possibility of existing difficulties while using several standards simultaneously , and so on;
2.	Costs	The implementation and the integration suppose significant resources/ the amortisation of the investment made by organisations by implementing and

		integrating the Environmental management system is not always achieved in a quantifiable manner/ the existence of several costs: functioning, maintenance, revision, continual improvement, certification renewal , and so on;
3.	Monitoring	The modification of existing programmes and procedures/ the possibility of generating confusions, difficulties on the devices usage level, faulty processing and interpretation of data and information, , and so on;
4.	Human resource training	It supposes costs on the level of the training and professional formation programs in the environmental issues/ it may lead to staff reorganization/ it may suppose the withdrawal from the production of the human resources involved in the environmental training programmes;
5.	At other levels	It may suppose the generation of endurance to the change of the human resource.

Having in view the work of Zutshi and Sohal (2004), and taking into account the classification of Ionescu (2000), while approaching the disadvantages generated by the implementation of an Environmental management system, it is imposed to mention that these ones are connected to a series of impediments and obstacles. These impediments may be: the absence of the available resources for the implementation and operation of an Environmental management system, the lack of commitment in the environmental issues of the organisation's managers, the lack of the management support, the lack of the environmental knowledge of the human resources, the lack of clear instructions on the implementing and integrating process of an Environmental management system, the faulty interpretation of articles in ISO 14001, the increased costs of the auditing process of the Environmental management system, the lack of directory lines regarding the continual improvement , and so on

As it can be noticed from the aforementioned, the implementation of an Environmental management system generates benefits to the organisations over the years on condition that the organisations understand and become aware of this system's necessity, and eliminate on time the impediments that obstruct the implementation/ integration/ operation process of the system.

2.1.6. Organisational factors that determine the implementation of an Environmental management system

2.1.6.1. General context

The identification, the characterisation and the analysis of the factors on the organisational level which influence the implementation of an Environmental management system are considered necessary because this type of approach can offer the organisations different correction measures that may even have a preventive character.

The specialty literature presents these **factors as being those "organisational barriers"** identified by managers, barriers that determine the successful implementation of an Environmental management system. Thus the correct identification of these factors, respectively the determination of the correct level of each

factor's influence upon the implementing process of the Environmental management system on an organisation's level may determine an increased efficiency of the utilised available resources, the increase of the efficiency degree on the level of the proposed environmental objectives and targets of the Environmental management system, an increased global level of the attained environmental benefits (Tinsley and Pillai, 2006).

The necessity of identifying and evaluating the relationship between these **organisational barriers – barriers that in essence characterise the orientation of the organisations in the environmental management issues**, and the implementation of the Environmental management system, could help the managers take the necessary corrective measures and, at the right time, improve the quality of the implementing process of this system.

All the organisations are "affected" by the environmental protection issues, only that they have different attitudes to this aspect; some companies are more active in protecting the environment, and others are not (Hunt and Auster, 1990). In order to clarify the previous idea, it is necessary to mention, as it is presented by the specialty literature, that the difference between having an environmental proactive attitude and doing nothing as an organisation is given by the availability of the resources. Thus the large organisations probably have implemented an Environmental management system by means of which they manage the relationship between the environment and the organisation (Tinsley and Pillai, 2006; Welford, 1996).

2.1.6.2. Organisational factors that determine the implementation of an EMS

The specialty literature[7] presents, as it can be seen in Figure 11 below, a series of possible factors with a general character, unanimously valid for any organisation, factors that can react similarly to "barriers" in the implementing process of an Environmental management system (Stone, 2000; Tinsley and Pillai, 2006).

[7] The specialty literature both in the environmental management field and organisational theory field

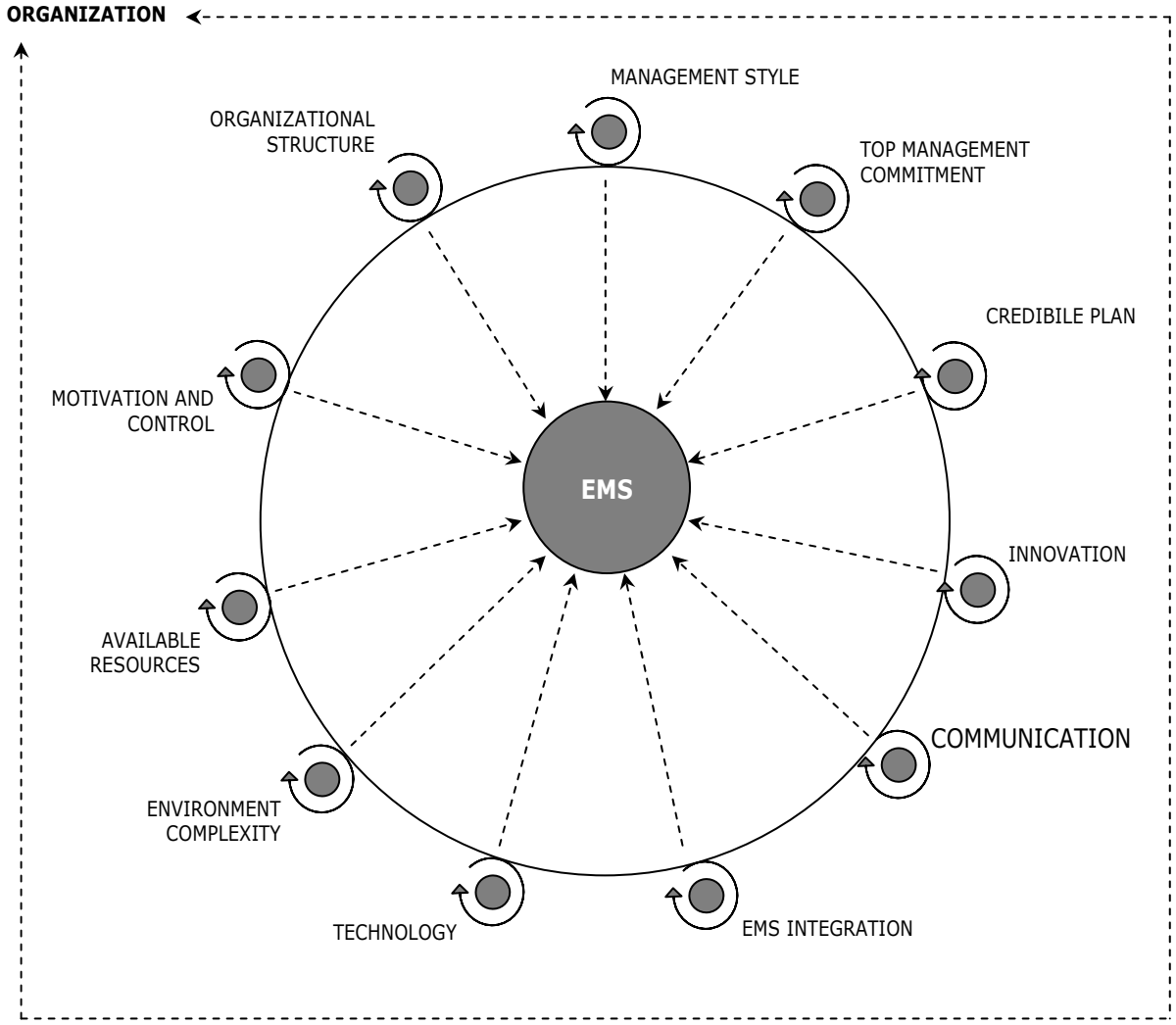


Figure 11 : Organisational barriers/ influence factors on the Environmental management system level
Source: adopted after Tinsley and Pillai, 2006

1. Management style

The organizations nowadays can be found in a competitive environment that is especially unstable as an effect of the changes that are produced from a period of time to another. Nevertheless these organisations manage to develop themselves and at the same time to increase the level of the environmental performance; they have managers who know when to distribute the decisional power by qualifying the subordinates in different activities/ environmental issues. The support of an organisation's management in the environmental issues can be considered much more important than a written assumption regarding the environmental performance (Tinsley and Pillai, 2006; Ramus, 2000; Ionescu, 2000).

The specialty literature presents different styles of leadership and management, but in essence they are based on two completely different characteristics, namely (a) the autocratic one, and (b) the democratic one (Tinsley and Pillai, 2006):

(a) The autocratic style, as a general characteristic, can be considered as being the classical approach of the management in which the manager holds most of the power and authority at the level of the decisional process – it excludes as much as possible the employees' implication in the decisional process; this style can be considered as being efficient the moment when there are emergency situations or when the organisation recruits the human resource for different positions with a high degree from the viewpoint of the environmental risk. It is also necessary to mention that this style may aim at hindering the development of the organisation's environmental management as an effect of excluding the employees' suggestions from the process of continual improvement;

(b) The democratic style, in comparison to the autocratic style, encourages the employees' participation to the environmental decisional process. The managers exchange the environmental information and knowledge with the employees and qualify them with decisional power at the level of the different current environmental activities performed at the organisation's level (Daily and Huang, 2001; Daily *et al.*, 2007; Govindarajulu and Daily, 2004). This style involves all the employees' information and opinions in making the final environmental decisions. The democratic management may create at the organisations' level the conditions for the development of a working climate that should be extremely favourable to the implementation of an Environmental management system, having in view the fact that the implementation of an Environmental management system is a long-standing process. This democratic style also encourages the employees to trust each other and to trust the superior management, and thus as a positive effect, to be cooperative in relation to the continual improvement of the proposed environmental performances. Nevertheless the democratic style involves high costs: the making of environmental decisions under the environmental performance conditions requires different training programmes and environmental vocational training programmes (academic or post-academic studies , and so on).

In the specialty literature there is not a certain style of leadership or of management which should be acknowledged or recommended as being the most suitable for an organisation's managers who implement an Environmental management system or who have preoccupations related to the environmental management. Each manager is different as an individual having in view their psychological specific features, theoretical and practical environmental knowledge as well as personal objectives.

Having in view the aforementioned, the specialty literature, and the fact that the strategic leadership of an organisation can be considered a progress connector, it is necessary to present briefly the components from the viewpoint of this leadership's objectives. Thus by adaptation after the main objectives of the strategic leadership classification described at a general level by Stephen Covey (1996) and presented by Aslan *et al*. (2011), and after the classification structure of the organizational capacity's audit for the strategic leadership elaborated by Wachira – GeSCI (2009), (a) the first objective focuses on the organisations' vision, (b) the second objective aims at the organisational structure and its capacity to adapt easily to the change, plus different aspects of the systems on the organisations' level, (c) and the third objective points to the increase of productivity by regular analysis and evaluation.

By resuming, it is also necessary to mention that regardless of the kind of management style that would be adopted by a manager who is involved in different activities specific to the environmental management, their success is determined by the efficiency with which it answers to the external stimuli that come from the environment. According to what Mintzberg states (1987), the interpretation of these external stimuli is materialised in a decision or several decisions that change different internal aspects on the organisational level, and thus indirectly/ directly different aspects of the implementing process of the Environmental management system (for the organisations where it is applicable) (Tinsley and Pillai, 2006).

Tinsley (2002) mentions that the ideal solution to eliminate, at the organisations' level, the different "inefficient" interpretations of the proposed environmental objectives and of the late or inexistent reactions to the stimuli from the external environment would be the increase in the collaboration degree among an organisation's managers and directors (if there are several) by a mutual agreement at the beginning of each year with respect to all the proposed objectives (including the environmental ones), to the personal objectives and to the benefits – especially the financial ones (Daily and Huang, 2001; Daily *et al.*, 2007), which should be about to be received after the organisational objectives are met.

It can be noticed very easily why the management style is a factor that determines the implementing process of an Environmental management system, especially if it is utilised, by managers similarly to a "protection" mechanism against the change. In the same connection, Ramus (2002) even affirms that managers are less cooperative the moment they perform their different environment activities, in comparison with the other organisational activities deployed, whereas others (managers) even adopt the attitude of ignoring the environmental issues in the idea that maybe it finds a solution itself (Tinsley and Pillai, 2006).

Passing from purely descriptive ideas to even more visionary ones, ever since 1992, Taylor has affirmed that the environmental management requires a holistic approach of an organisation that can be seen as a collection of entities or units that serve the proposed strategic objectives.

Thus we can say that ever since 1992 there has been noticed the need to change the perception of the environmental management issues, and the new development directions of this management type from the level of an organisation's general management.

2. Organisation's top management commitment

Ther organisation's top management commitment, in other words its dedication in the environmental management issues, is emphasised in many specialty works, as being very important for a successful implementation and functionality of an Environmental management system (Kaur, 2011; Tinsley and Pillai, 2006; Strachan *et al.*, 2003; Daily and Huang, 2001; Rezaee and Elam, 2000; Kitazawa and Sarkis, 2000; Wee and Quazi, 2005).

Beginning with the '90s the specialty literature (Shelton, 1994; Hunt and Auster, 1990; Buzzelli, 1991; Cohen and Levinthal, 1990) has presented the fact that the Environmental management systems from the organisations' level were functioning independently from the general management. It was a phenomenon owed especially to the non implication of the top management, which nevertheless expected the environmental management to be flexible and to adapt itself to the new changes within the organisation (Tinsley and Pillai, 2006).

This aforementioned phenomenon was observed by researchers and was called "the organisational absorption capacity" that describes the relationship between the environmental knowledge level held on the organisation's level and the real need of the Environmental management system in order to be implemented and to function adequately. Thus it can be explained why sometimes an organisation has no top management commitment in the environmental issues, and thus the lack of support for the activities performed at the implementing and operating level of an Environmental management system.

An organisation's top management must support the proposed environmental objectives and make resource allotting decisions in order to reach them; only that the typology of the classical decisional process of managers may affect the commitment at the level of these proposed objectives. Concretely, having in view that (a) the environmental objectives generally bring along medium-term and long-term benefits and not all the time financially quantifiable, whereas (b) the classic decisional process is based on the continual analysis of the collected information at the level of the activities/measures taken in order to meet the proposed objectives, it can happen in many cases that the reach of objectives requires additional resources. Thus this new need of resources which should be allotted by new decisions and corroborated with the environmental knowledge deficit of the deciding manager creates a new situation characterised by the lack of commitment.

Another essential element at the level of an organisation's top management commitment in the environmental issues is the commitment towards the continual improvement principle achievable only by the management orientation to the support of all the training and professional formation programmes of all the employees in the environmental management field; thus it is almost impossible to implement different environmental practices on an organisation's level (Wee and Quazi 2005; Zutshi and Sohal, 2004; Kaur, 2011).

3. Credible plans

The elaboration of credible plans, with regard to different actions, to resources involved at the level of these actions, to the elaborated environmental procedures , and so on, which are correlated with the implementation of an Environmental management system, represent the strategy that guarantees a successful introduction of an Environmental management system at the organisational level.

The utilisation of plans that are well formulated and adequately motivated at the environmental management level can bring benefits to the organisation from several points of view. First of all, the environmental issues encountered by organisations lead to complex decisional situations and thus the elaborated plans must simplify the content of these issues as much as possible. Secondly, the credible plans should reduce the error degree on the management level (in essence from the level of the environmental decisional process) and contribute to the minimisation of the endurance to the change produced by the implementation of an Environmental management system. And thirdly, the elaboration of credible plans should increase the awareness level of the environmental issues; it should reduce the risk on the level of the environmental decisional process; it should identify correctly the environmental aspects on the organisations' level and the impacts generated upon the environment and associated with them; it should clarify the organisations' priorities (Tinsley and Pillai, 2006).

4. Innovation

Nowadays the organisations must cope first with the requirements of consumers or other stakeholders and with the legislative regulations, fact that determines the rate, the scale and the type of the innovation at their level. That is precisely why the development of the organic products or the improvement of the existing ones is a process that takes very long time. On the other hand the innovation or its inexistence is presented as being an important factor at the implementation level of an Environmental management system (Tinsley and Pillai, 2006).

The specialty literature presents by different studies that there is a connection between the implementation of an Environmental management system and the environmental innovation (the eco-innovation) (Frondel *et al.*, 2007, 2008; Ziegler and Rennings, 2004; Naveh *et al.*, 2006; Wagner, 2007, 2008; Rehfeld *et al.*, 2007; Horbach, 2008; Ziegler and Nogareda, 2009).

The technological innovation in the environmental issues on the level of the products and processes has the main purpose of eliminating or of reducing the burden of the environmental management (Ziegler and Rennings, 2004; Wagner, 2007).

The technological innovation[8] was found to generate long-term improvements of the environmental operational performance (Wagner, 2007), whereas the clean technologies (non polluting) reduce different costs on the organisations' level, create competitive advantages, reduce the long-term risk and avert the future changes of the legal environmental regulations; they also lower the risk of the possible fines that could be given by the qualified bodies in the environmental management issues, and even have a positive impact upon the financial performance on the organisations' level (Angell and Klassen, 1999).

While analysing the specialty literature, the innovation in the environmental management can be divided into two categories: (a) the innovation at technologies' level with an effect of withholding tax of the polluting factors (end-of-pipe technologies) in order to comply with the environmental legislation, and (b) the innovation at the integrating level of technologies – concretely the modification of the existing equipments or the installation of equipments in order to obtain a clean production aiming at removing the negative impact directly to the source by means of the process (Tinsley and Pillai, 2006).

Ramus (2002) emphasises the role of the most important component of the innovation process in the environmental issues, and namely the human resource. The employees of an organisation should be encouraged by their managers to come up with propositions or ideas that should improve the environmental management and implicitly the implementation and the functioning of the Environmental management system (for example: to reduce the induced negative impact upon the environment/ to settle a current environmental issue/ to contribute to the development of more efficient products or services from an ecological point of view).

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[8] The environmental technological innovation is connected to the conventional understanding of the technological innovation, only that it is necessary to make the distinction between the product innovation and the process innovation; the aspects that define the technological innovation are the following: the innovation must be based on new technological knowledge, it must be already implemented (there must be a result: new products or new processes implemented on the organisation's level), and it must be something new for the organisation (Ziegler and Nogareda, 2009).

5. Communication

Communication as an expression of all the methods, techniques, technology channels , and so on, the transfer of data, information and environmental knowledge, in the specialty literature, represents one of the factors with a barrier potential at the implementing and functioning level of Environmental management system (Tinsley, 2001; Tinsley and Pillai, 2006).

The implementation of an Environmental management system at an organisation's level brings along a change in the organisation's conduct and in its values; thus a possible inefficiency of the communication process combined with the lack of environmental knowledge of the human resource may have negative consequences upon the quality of this system's implementation and functioning. (Tinsley and Pillai, 2006).

Following the same coordinate we can assert that the lack of communication at the organisational level of the new directions, new objectives and new roles played by the employees (in the environmental management issues) may have a negative impact upon the management of the environmental performance. That is precisely why it is necessary to use formal methods of communicating the change (meetings on the departments' level, seminars at the organisation's level, working groups, the intranet use , and so on). At the same time, beside these formal methods of communication, it is considered necessary to utilise the informal methods, too (a mixture between the informal methods and the formal ones) as long as the environmental data, information and knowledge are communicated (Tinsley and Pillai, 2006).

At the internal level it is necessary to emphasise the fact that the communication system (in other words the informational management must be able to function on double ways of information circulation according to the specific features of each analysed situation) is the fundament of the environmental decisional process; without environmental data, information and knowledge there may be major decisional slips – concretely decisions taken without knowing all the aspects of the decisional issue (for example discrepancies between the real situation on the field and the reported one/ discrepancies between the possible allotted resources for the environmental issues and the real necessary ones , and so on) (Herghiligiu *et al.*, 2012).

Another manner by which the communication can be a factor which reacts similarly to a barrier at the implementing level of an Environmental management system is materialised by the lack of communication with the external stakeholders (consumers, local community, different bodies qualified in the environmental issues) (Jiang and Bansal, 2003; Buysse and Verbeke, 2003; Eesley and Lenox, 2006; Sarkis *et al.*, 2010; Herghiligiu and Lupu, 2012). One of the major objectives in the implementation of an Environmental management system is to generate an improvement of the organisation's image in order to offer a competitive advantage, but this objective can be reached only by an efficient communicational process (Hui *et al.*, 2001).

6. The integration of the Environmental management system

The development of the specialty literature in this field – beginning with the 1990s (Roome, 1992; Rothenberg *et al.*, 1992; Avila and Whitehead, 1993; Shrivastava and Hart, 1994) has mentioned ever since the system itself, **its complexity**, the integration level, its adjustment and adaptation to the existing organisational structure and the organisational culture determine the successful implementation of an Environmental management system.

The integration concept supposes in essence the integration of the practices and techniques specific to the environmental management and managed by the Environmental management system on the level of the general management (Lupu *et al.*, 2006).

The integration of the Environmental management system on the level of the general management supposes the integration of the environmental tasks on the managers' level from all the hierarchical levels, taking into account the complexity degree of the applications that need to be integrated (Lupu *et al.*, 2006; Teodosiu, 2001, 2005).

It is also necessary to mention that the major difficulty for the organisations' managers consists in managing the relationship between the complexity of the Environmental management system – the organisational complexity, and the complexity of the external environment to the organisation which is in a continual change. The differences from an organisation to another are the ones that characterise the difficulty of the implementing and integrating process of the Environmental management system, as it must "suit from a synergic point of view" the existing policies, operational and economic needs , and so on of each organisation (Tinsley and Pillai, 2006; Tinsley, 2002).

7. Technology

The technology term can describe the total of the tools/ equipments or software, and of other existing systems at an organisation's level for the processing of (a) raw materials transforming them into finite products – for the productive organisations, and/ or (b) data, information, knowledge, aiming at giving them another shape and a meaning that should serve the proposed objectives – for all the organisations (Tinsley and Pillai, 2006).

In the first case emphasised previously, the one of the utilised technologies at the level of the productive units, we can mention that they determine the efficient resource consumption and the level of the impact upon the environment quantified by the emissions' and wastes' level. Many of the organisations' environmental issues are determined by the utilised technology and by their environmental inefficiency. Even if apparently it would seem that the organisations are inflexible to technological changes, it must be emphasised that the speed with which is produced the change on the level of technologies innovation and improvement (clean – non polluting technologies) require new competencies of the human resources, new training sessions, even a new "management infrastructure" that supposes first of all a financial effort on the organisations' level, and that is why some organisations cannot be retrofittable in a short period of time (Angell and Klassen, 1999).

In the second case of the utilised technologies on the level of elaboration, transmission, processing , and so on of environmental data, information and knowledge, we must mention that the most important aspects of this case are: the source of the data and information, the utilised software at the organisation's level, the competences of the human resource in utilising efficiently and effectively the informational resources or the existing systems , and so on (Tinsley and Pillai, 2006).

8. The complexity of the environment

The organisations nowadays interact among them in an extremely complex environment that changes very rapidly, and thus in order to be efficient, they must have knowledge on the clients, market tendencies, and the new different technologies that might be utilised while solving different issues. They must also have different management systems (for example in accordance with ISO 14001/ ISO 9001/ ISO 18001), designed and implemented so that they should be flexible, intelligent, easily configurable, and so on (Herghiligiu *et al.*, 2012; Herghiligiu *et al.*, 2013).

The consequence of the previously mentioned idea is the organisations' need of flexibility because their main objective is to satisfy the consumers' demand promptly; except that the complexity and the instability of the environment in which the organisation exists (the dynamics of the competitive market, the financial crisis, the different needs of the stakeholders , and so on) may disturb all its levels fundamentally (Deming, 1994; Meyer and Rowan, 1977; Herghiligiu *et al.*, 2012; Gavronski I. *et al.*, 2013; DiMaggio and Powell, 1983).

In another connection, the organisations' haste of meeting the consumers' needs unfortunately has some negative effects upon the environment, materialised by late response to diverse environmental issues and undoubtedly a negative effect upon the environment. As a consequence, it was and it is absolutely necessary for an organisation to manage efficiently its relationship with the environment, which can be achieved under performance conditions only by implementing an Environmental management system (Herghiligiu *et al.*, 2012).

At the internal organisational level, from the viewpoint of the environmental management, it is necessary to mention that another factor which gives complexity to the environment is the complexity of the environmental strategy. Thus, in case the complexity degree of the environmental strategy is higher, there will be a friction between its formulation and its implementation. Even if the top management generally perceives the implementation of the environmental strategy as an action of the hierarchically inferior managers, the success of its implementation is determined by the clarity of the strategically formulated objectives, by the mentioned priorities, by the commitment degree of all the managers (and not only), and by the level of understanding its complexity (Tinsley and Pillai, 2006).

The main purposes of the Environmental management system are the identification, the evaluation, the analysis and the settlement of an organisation's environmental issues. Nevertheless both managers and the other stakeholders perceive this system as a complex process which adds to the organisation's complexity, and thus they consider it as a burden (Kirkland and Thompson, 1999; Tinsley and Pillai, 2006).

9. Available resources

The implementation of an Environmental management system on an organisation's level may be burdened by the lack of ignorance of the necessary resources for the good functioning of this process. The financial resource and the human resource are considered as being the most important barriers that determine the quality of the implementation and functioning of an Environmental management system (Tinsley and Pillai, 2006).

The specialty literature presents the human resource (beside the management support, the environmental trainings, the increase of the employees' responsibility degree, the teamwork, the motivation system and so on) as a key-element for the implementation of an Environmental management system (Daily and Huang, 2001; Kaur, 2011; Sammalisto and Brorson, 2008).

Having in view the aforementioned, we have to assert that, in the case of the human resource, a very important role in the formation of the environmental competences is represented by the environmental training sessions and/or the specialisations because they represent the method by which increases the environmental knowledge level of the staff involved in the different environmental actions performed on the organisation's level (Daily and Huang, 2001). The environmental training sessions and specialisations do not have a role only in the initial development of the environmental knowledge of the organisations' employees in order to implement an Environmental management system, and to adopt certain environmental practices, but also in the current functioning and maintenance of this system (Balzarova and Castka, 2008).

At the same time the activities performed on the organisations' level that have as an objective the production of goods and/or services generate an impact upon the environment at the level of this process (Lupu, 2008; Herghiligiu *et al.*, 2012). Thus, this relationship must be managed by organisations by means of the integration and absorption at the management level of environmental practices, practices which undoubtedly must be financially supported.

10. Motivation and control

The specialty literature presents the fact that the Environmental management system can be implemented on an organisation's level only if the employees' motivation by a rewarding system and the control are very well specified; thus all the employees of an organisation are committed in the process of implementing the environmental practices (Tinsley and Pillai, 2006). The rewarding system in the environmental management issues, regardless of its constitution type (monetary rewarding/ non monetary and/or the acknowledgement prizes) (Daily *et al.*, 2007; Govindarajulu and Daily, 2004; Ramus, 2002; Ramus, 2001) influence positively the environmental decisional system and the active implication of the employees in the diverse environmental activities performed, and so on (Daily and Huang, 2001).

Strachan *et al*. (2003) present the idea that the rewarding system in the environmental management issues is the most important method utilised for the motivation of the employees in the implementation and integration of an Environmental management system (Kaur, 2011).

In terms of the control concept, we must mention that the process of monitoring and controlling the environmental practices implemented on an organisation's level (especially the environmental performance and the control of the documents specific to these environmental practices – which represent the effect of the implementation and of the integration of an Environmental management system is extremely important, especially that in this manner the possible malfunctions arisen may be observed and the necessary corrections may be made (Balzarova *et al.*, 2006).

It must also be mentioned that the environmental monitoring and control play a very important role in the process of quantifying and analysing the impact that the organisation's activities have upon the environment (Angell and Klassen, 1999; Stuart *et al.*, 1999).

11. Organisational structure

The organisational structure represents a framework that allows the organisations to implement and to follow the current different elaborated strategies. This relationship is considered as being defining for an organisation to meet its proposed strategic objectives successfully (Tinsley and Pillai, 2006).

The inter-disciplinarily and inter-functionality character of the environmental issues (from the level of the Environmental management system) leads to the necessity of re-thinking about the organisational structure, according to Rome (1994). This need of flexibility and adaptation of the organisational structure to new different demands is emphasised by Mintzberg (1987).

The specialty literature presents the fact that the need to adapt and transform the organisational structure has been acknowledged since a long time, with the purpose of supporting the environmental management for implementing different environmental practices (Hunt and Auster, 1990; Maxwell *et al.,* 1997; Shrivastava, 1994; Lopez-Fernandez and Serrano-Bedia, 2007).

Boiral (2007) presents the following fact: even if the implementation of an Environmental management system requires different changes at the level of the organisational structure, this phenomenon of the change produces a disturbance of the existing situation and thus it modifies different conducts of the human resource; even if this transformation of the organisational structure is necessary for the integration of the new environmental objectives at the level of the organisation's general objectives, it is often produced very slowly, being postponed and thus leads to a loss of the organisational and environmental efficiency (Lopez-Fernandez and Serrano-Bedia, 2007).

2.2. Current stage of the research on the Environmental management system (ISO 14001) and factors that could detemine it

Specialty literature presents a number of authors who treated, in a direct or indirect way, various aspects on the management issue concerning the relation between the environment and the organisations, a relation made clear and formalised through the development of the environmental standards during the last decades (the ISO 14000 series), these standards defining the structure of the Environmental Management System (Teodosiu, 2005; Lupu *et al.*, 2006; Lupu *et al.*, 2012; Ionescu, 2005; Ionescu 2000; MacDonald, 2005; Tambovceva, 2010; Kit-Fai *et al.*, 2002; Rowland-Jones and Cresser, 2005; Melnyk *et al.*, 2003**;** Fortunski, 2008; Perotto *et al.*, 2008 and many others).

Through the analysis of the specialty literature, we discovered some crucial research directions embraced by the majority of the authors as a consequence of the fact that these directions are important for the development of the environmental management. The adoption of these research directions result in the publication of scientific papers containing various theoretical and practical contributions that can improve the quality of the implementation and integration of the Environmental Management System at the organisational level.

Thus, Ionescu (2005), Darnal (2001), Jiang and Bansal (2003) emphasise in their researches the organisations' environmental certification and the implementation of the Environmental Management System at the organisational level; Christman and Taylor (2001), Christman and Taylor (2004) study the status of the environmental certifications belonging to several organisations at the international level; Lupu *et al.* (2012), Lupu *et al.*, (2006), Hart and Dowell (2010), Rondinelli and Vastag (2000), Ammenberg *et al.* (2002), Potoski and Prakash (2005), Anton *et al.* (2004), King *et al.* (2006) evaluate and analyse the impact of the ISO 14001 certification on the environmental performance at the organisational level.

We must emphasise here the fact that many of the previously mentioned studies do not analyse the relation between the organisational context and the environmental management practices generated by the ISO 14001 certifications received by the organisations. In other words, there is a relation between the "organisational barriers" – the environmental barriers (Tinsley and Pillai, 2006) and the real impact of the certification quantified through various current environmental practices (routinisation, in a positive way, of such practices) – impacts that, in their turn, seem to differ from an organisation to another (Christman and Taylor, 2006; Lupu *et al.*, 2006; Naveh *et al.*, 2006).

Another aspect that should be mentioned here is the fact that, in the analysed studies, we found **very few specialty works** that examine in a unifying way the factors (internal and external organisational ones)

(Kaur, 2010/ 2011) that undeniably influence the quality of the Environmental Management System implementation (Darnall, 2003; Tinsley and Pillai, 2006).

The vast majority of the authors treat (a.) various external factors that have an impact on the measures taken by the organisation in order to modify the environmental strategy (King and Lenox, 2000; Darnall, 2003; Khanna and Damon, 1999; Welch *et al.*, 2000), or (b.) various internal factors (Egri and Herman, 2000; Sharma, 2000; Cordano and Frieze, 2000; Christmann, 2000; Klassen 2000; Darnall, 2003) that have a role in determining the quality of the management process concerning environmental issues, but that do not analyse in a concrete manner the relation between the factors that influence / determine the quality of the Environmental Management System implementation.

The Environmental management system is a tool that identifies the issues, but also that contributes to the resolution of these issues, according to the continual improvement concept – this principle can be implemented at the organisational level taking into account the way in which it is perceived by the management and having in view the companies' activity sector (Perotto *et al.*, 2008).

First of all, the most important aspect for a successful implementation of an Environmental Management System, according to Pun and Hui (2001) is the support and the commitment of an organisation. This commitment in what concerns the environmental field was also emphasised by Fernandez *et al.* (2003) in their studies; these authors state that the nature (positive or negative) of the human resource orientation to environmental actions can represent an obstacle or a successful factor of the EMS.

Daily and Huang (2001), according to the idea that the successful implementation of an Environmental Management System and the improvement of the environmental performance are determined by the integration of the environmental practices at the level of the human resource (Mallak and Kurstedt, 1996), design a conceptual pattern meant to improve the programme concerning the environmental management system of an organization. This pattern includes the top management support, environmental trainings, trainings delivered to the senior policy makers in fields such as the environmental activities, the team work, the advertising and motivation system, as the most important factors within the process of EMS implementation.

Daily *et al.* (2007), using a sample of 437 employees from an organisation that implemented an Environmental Management System, according to ISO 14001, studied the perception of the human resource concerning the environmental performance. Thus, according to the analysis of the collected data, these authors discovered that the managerial involvement in environmental issues, the environmental training, the employee assignment/ training, as well as the various motivational benefits are directly proportional to the way in which the environmental performance is perceived.

Kaur (2010), based on a study involving 5 organisations, supports the theoretical framework developed by Govindarajulu and Daily (2004) that shows the managerial involvement in environmental issues, the

monitoring, the control and the employee motivation as crucial factors for the successful implementation of an Environmental Management System; the author also states that the relation between motivational benefits and the environmental performance is very weak and cannot be supported.

Radonjic and Tominc (2006/ 2007), according to the research involving organisations from Slovenia, identified a relation between the ISO 14001 certification, organisational investments concerning non-polluting technologies and the development of those products that have a low impact on the environment. At the same time, the paper of Radonjic and Tominc published in 2007 shows that there is a link between the implementation of an Environmental Management System and the economical performance of an organisation. Therefore, investments concerning new non-polluting technologies – and, implicitly, the pollution prevention, besides the fact that they contribute to the improvement of the environmental performance, have an impact on the production process, as they stimulate productivity.

Bansal and Hunter (2003), Christmann (2000), Kaur (2010/ 2011) emphasise the fact that the investments carried out in order to improve technologies and processes – and, thus, in order to reduce pollution, generate changes at the level of an organisation's production system.

Rondinelli and Vastag (2000) identify and demonstrate that the pollution prevention at the organisational level may improve efficiency, may reduce the cost of the energy consumption, of the material consumption or the fines received from the institutions that are certified for environmental issues.

In a different approach, another direction considered to be important for the treatment of the Environmental Management System and for its integration at the level of general management is represented by the so-called environmental practices. They will constitute the theme of the analysis below and include three categories, according to Gonzalez-Benito *et al.* (2005): environmental practices, to which we may add the planning and organisation process / operational environmental practices (concerning the good / process) / communicative environmental practices.

If we should synthesise the papers of the authors Gonzalez-Benito and Gonzalez-Benito (2005), Henriques and Sadorsky (1999), Aragon-Correa (1998), Klassen and Whybark (1999), we may notice that the practices specific to the environmental management, directly linked to the planning and organisation process, have in view: the environmental policy, the environmental objectives and targets, the environmental liabilities, the information, training and involvement of the human resource in the environmental management (environmental trainings / jobs offered in the field of the organisational environmental management), the environmental performance analysis, contingency plans, , and so on

Sarkis and Gonzalez-Torre (2010), Klassen and Angell (1998), De Ron (1998), Gonzalez-Benito and Gonzalez-Benito (2005) state that the operational environmental practices concerning goods involve the elaboration and development of ecological goods, as well as a long-term commitment to protect the environment and thus to reduce to minimum the negative impact on the environment.

Gonzalez-Benito and Gonzalez-Benito (2005), Klassen and Angell (1998), Min and Galle (2001) state that the environmental operational practices concerning processes have as a main objective the development and implementation of methods and processes, in order to reduce the negative impact on the environment.

The communicative practices specific to the environmental management are, according to Florida and Davison (2001), Gonzalez-Benito and Gonzalez-Benito (2005), Florida and Davison (2001), those practices that contribute to the improvement of the organisation's image through the development of cordial relations with all the parties involved in the process; these practices have, in their essence, a purely commercial objective, being associated in the scientific literature to the organisation's commitment to protect the environment.

We can find in the specialty literature **few papers that show in a relatively unifying way** the factors that have an impact on the successful implementation of an Environmental Management System; among these authors, we should mention Kitazawa and Sarkis (2000), Babakri *et al.* (2003), Zutshi and Sohal (2004), Wee and Quazis (2005), Sambasivan and Feis (2008), Padma *et al.* (2008). Therefore below, we will present synthetically the results of the researches carried out by the authors previously mentioned, in order to systematise and classify the most important factors that may have an impact on the successful implementation of an Environmental Management System.

Kitazawa and Sarkis (2000), using the case study technique for 3 great organisations, analysed the crucial factors that determine the implementing process of an Environmental Management System. Thus, they noticed that (a) the trainings delivered to senior policy makers in the field of current environmental activities or issues, (b) the adoption of various ideas/ suggestions coming from the employees and concerning the improvement of current environmental activities carried out in the company, and (c) the managerial effort meant to encourage and to support the employees' involvement in the environmental decisional process represent the key elements for a successful implementation of an EMS and for the continual improvement of the environmental performance.

Babakri *et al.* (2003), according to a study involving 584 industrial organisations from the United States of America, found out that (a) the identification of the environmental aspects, (b) the documentation of the Environmental Management System, (c) the trainings delivered to the organisational human resource concerning environmental issues, (d) the EMS audit, (e) the operational control, (f) the environmental management program, (g) the environmental objectives and targets, and (h) the document control require long periods of time and a great effort in order to be implemented; these aspects are considered to be the crucial factors that determine the successful implementation of an EMS.

Zutshi and Sohal (2004), analysing the data collected from a survey carried out for 286 organisations and then correlating the results and the conclusions generated by 9 preliminary interviews and 12 detailed interviews addressed to managers from the field of the environmental management and of the occupational

health and security, came to the conclusion that: (a) the management support and the leadership in the environmental management field, (b) the training delivery and the acquirement of environmental knowledge, (c) the internal analysis and, respectively, (d) the sustainability are the main factors that determine the successful implementation of an Environmental Management System. The first factor taken into consideration by Zutshi and Sohal, "the management support and the leadership in the environmental management field", may involve different aspects, such as the top management commitment to environmental issues, the internal modification and the existence of an environmental organisational perspective, the resource allotment, the environmental communication, and so on. The second factor, "the training delivery and the acquirement of environmental knowledge" may involve the analysis of the experience acquired by other organisations and the benchmarking, aspects concerning the environmental standards, professional training and environmental trainings delivered to the employees, the awareness concerning the importance of environment protection in case of suppliers or of other interested parties. The third factor, "the internal analysis", may involve aspects concerning the cost-benefit analysis, the initial environmental analysis, the identification of the environmental aspects and of the impact associated to these aspects on the environment, the environmental objectives and targets, the need and performance of environmental audits, the document control, the integration of Environmental Management Systems, , and so on The fourth factor, "the sustainability", may include in its structure aspects describing the analysis of the life cycle, elements from the industrial ecology, , and so on

Wee and Quazis (2005) identified and validated, according to an empirical analysis of 151 organisations, (a) the top management commitment, (b) the employees' involvement in environmental management issues, (c) environmental trainings, (d) the development of ecological goods, (e) the supplier management, (f) the monitoring and (g) the informational management as important factors for the implementation of an Environmental Management System.

Sambasivan and Feis (2008), according to their research, concluded that (a) the managerial approach, (b) the organisational change, (c) the social and external aspects, (d) the technical aspects represent the elements/ factors that may contribute to the implementation of an Environmental Management System. The choice of these factors by Sambasivan and Feis was done according to the five essential steps of the elaboration and implementation of an Environmental Management System, according to ISO 14001 – the environmental policy/ planning/ implementation and performance/ monitoring and evaluation/ management analysis, as well as the external factors that have an impact on the implementation of an EMS at the organisational level. The first factor, "the managerial approach", can be linked to the following phases of the elaboration and implementation of an EMS, namely the environmental policy/ planning/ management analysis. The second factor, "the organisational change", is directly linked to the implementation and performance phase, according to ISO 14001. The third factor, "the social and external aspects", can be

associated to the environmental legal regulations, the market pressure, the customers' requirements, , and so on The fourth factor, "technical aspects", is associated to the monitoring and evaluation phases of the EMS architecture, according to ISO 14001.

According to the analysis of 36 organisations, Padma *et al.* (2008) came to the conclusion that the most important factors that can influence the implementation of an Environmental Management System are the following: (a) the top management commitment, (b) the compliance with the environmental regulations and the identification of environmental issues, (c) the environmental product management, (d) the training sessions delivered in case of emergency situations, (e) the continual improvement, (f) the monitoring, evaluation and control, (g) the human resource management.

2.3. The Environmental management sistem as a complex process at the organizations level

According to the ISO 14001 International Standard, the Environmental Management System is characterised as "a component of the general managerial system that includes the organisational structure, the planning activities, liabilities, practices, procedures, processes and resources for the elaboration, implementation, performance, analysis and maintenance of the environmental policy" (ASRO, 2005; Lozano and Valles, 2007).

Taking into account the definition of the ISO 14001 standard, we may state that the aim of implementing an Environmental Management System consists in the continual improvement of the environmental performances and, thus, in the provision of a positive image, respectively of some competitive advantages for organisations (Teodosiu, 2005).

2.3.1. Process-based approach

A process is defined as the preparation activities that transform inputs (human resource, equipment, materials, logistic resources, financial resources, and so on) in a product or a service – Figure 12 (Pall, 1987). Ittner and Larcker (1997) characterise this process as a set of activities that produce together a valuable result for the interested parties – this idea is also emphasised by Oprean and Kifor (2002).

The previous definitions may lead us to a process, but it would be an extremely simple concept; the way from theory to practice shows us the existence of several aspects of great complexity that can be noticed in case of process implementation and integration (Bizzo and Bernardi, 2003).

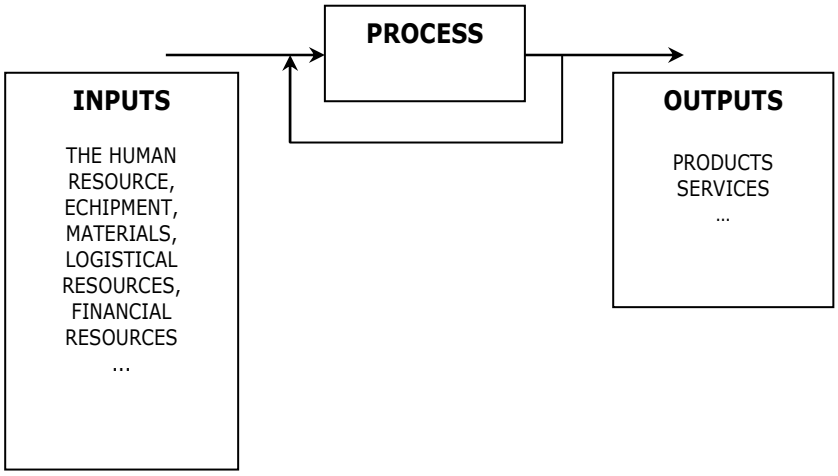


Figure 12: The outline scheme of a process

The scientific literature includes the process-based approach as a more effective method to reach the desired result (Oprean and Kifor, 2002). Oprea *et al.* (2002) states that the implementation of this principle at the organisational level supposes the following essential steps:

(a) Identification and definition of the process in order to fulfill the desired result / results;
(b) Identification and evaluation of the most important input and output data of the process;
(c) Identification of the interferences of processes and of the organisational functional entities;
(d) Evaluation of the consequences and of the impact that the respective process has on suppliers, customers and on all interested / involved parties;
(e) Clear assignment of liabilities and authorities concerning the process management;
(f) During the process planning phase, we will take into account: the order of the process phases, the specific activities, the control measures, the need for personnel training, equipment, methods, information, materials and other resources required in order to attain the desired result (s).

The process management, according to Juran *et al.* (1999), supposes the existence of three components: (a) the process preparation, (b) the process improvement and (c) the process control. According to the performed research, Hammer (2002) states that the process management includes three essential elements: (a) process planning and definition, (b) process implementation, (c) and, respectively, process optimisation and control. Silver (2004) considers that the process management and integration are the key elements of any business.

2.3.2. The Environmental management system as a complex process at the organisations' level

The identification of processes at the organisational level is not a simple and automatic procedure, but an attempt at interpreting the functioning of a company. The integration of a predefined set of activities in a certain **process** is a choice based on the phenomenon monitoring and not on the objective existence of the phenomenon. Taking into account the facts previously mentioned, the difficulty to use the "process" concept is probably explained by the subjective nature of the structure defining **the organisational process architecture** (Bizzo and Bernardi, 2003).

The association between the activities belonging to a certain **system** and a certain concept / name – a certain **process**, according to Bizzo and Bernardi (2003), should not represent a matter of concern. The main reason that stresses the decision to aggregate / put together the activities (of a system) into a process (es) has a managerial nature. Thus, the identification of a series of activities in order to emphasise the transformations that took place in case of the existing sub-systems has as a main objective to monitor, evaluate and improve the functioning method.

In order to avoid the possible ambiguities, it is necessary to define **the complex process** that describes, in a conceptual manner and at the organisational level, the system taken into account in the study herein. Therefore, a process can be defined as: a system of activities, subjectively identified, in order to be managed in a holistic and systematic way that uses the resources for the transformation of inputs into outputs (Bizzo and Bernardi, 2003).

One of the most important features of the Environmental management system is its **complexity** (Ionescu, 2000; Teodosiu, 2005). The complexity need is a practical feature, as the EMS must "cover" all activities and the entire personnel. In an essential way, the EMS must balance and "adjust in a synergic way" the existing policies, the operational and economical needs, , and so on of every organisation.

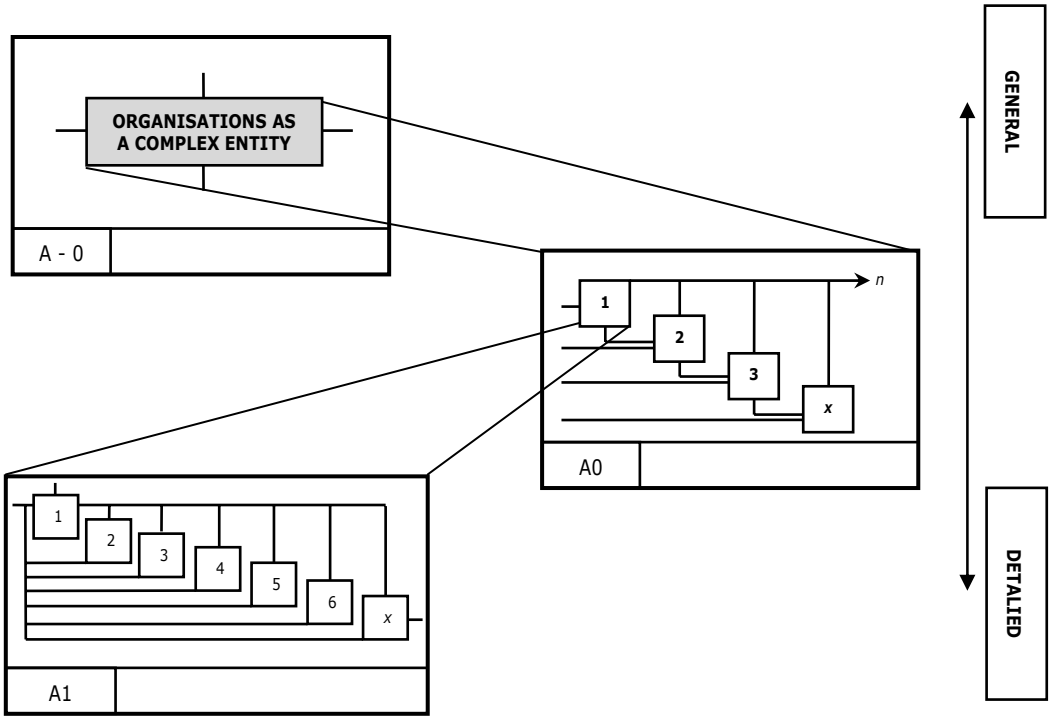
The specialty literature (Roome, 1992; Rothenberg *et al.*, 1992; Avila and Whitehead, 1993; Shrivastava and Hart, 1994) mentions that **the complexity** that defines the Environmental management system in itself (besides the adjustment and adaptation to the organisational structure, the integration level and the organisational culture) determines the success of its implementation.

Every organisation is a complex entity – Figure 13, and all differences, sometimes important, between the organisations, lead to the difficulty of implementing and integrating the Environmental management system and, thus, they justify the **complexity** that characterises the respective system (Tinsley and Pillai, 2006; Tinsley, 2002).

If we take an organisation into account, we could state that it may be defined as the amount of all management systems existing at the organisational level, standardised or non-standardised systems, that work together in a synergic way in order to reach the desired objectives. Thus, an organisation can be

considered a complex entity based on a continual process of interconnected systems (designed, implemented, integrated, monitored, audited and adjusted at different levels), that uses the organisational resources in order to attain the desired objectives and standards (Herghiligiu *et al.*, 2013a).

The Environmental Management System has the main objective to identify, evaluate, analyse and solve environmental problems and, therefore, to improve the environmental performances of an organisation. However, the managers and the other parties involved consider this system as a **complex process** added to the organisational complexity; therefore, it is seen as a necessary burden (Kirkland and Thompson, 1999; Tinsley and Pillai, 2006).



Legend:
n – the organisation's general objectives: accomplished, realised, designed;
***at level A0**: 1.Environmental management system; 2.Quality management system; 3. Health and occupational safety management system; *x* – other management systems within the organisation;
***at level A1**: 1.Management of objectives and environmental targets; 2.Responsiveness management at organisational internal/external level; 3.Environmental responsibilities management; 4. Environmental knowledge management process; 5.resource administration for various management activities at SMM level; 6.management of human resource development involved in environmental managementi; *x* – other issues.

Figure 13: Organisation as a complex entity
Source: Herghiligiu *et al.*, 2013a

The continual improvement of the organisational environmental performances and, thus, the creation of some competitive advantages is a **complex process**, as it is the direct effect of the development of some

environmental practices generated by the integration of the Environmental Management System at the organisational level.

The difficulty and, at the same time, **the complexity of the implementing and integrating process** of the Environmental Management System is justified by the need to mediate the relation existing between the requirements of the ISO 14001 standard and the specific of every organisation.

In the same connection, the integration of the Environmental Management System at the general management level supposes the integration of the environmental tasks in case of managers of all hierarchical levels, taking into account the complexity degree of the applications that need to be integrated (Lupu *et al*., 2006; Teodosiu, 2001, 2005).

Having in view the facts previously described, as well as the specialty literature analysed and systematically presented in Chapter 2, we can formulate the following definition for the EMS as a complex process at the organisational level, namely: **a complex process including a system of specific environmental activities/ practices, identified in a holistic and systematic way, in order to be continuously monitored, evaluated and analysed with a view to improve the environmental performances of the organisation** (Figure 14).

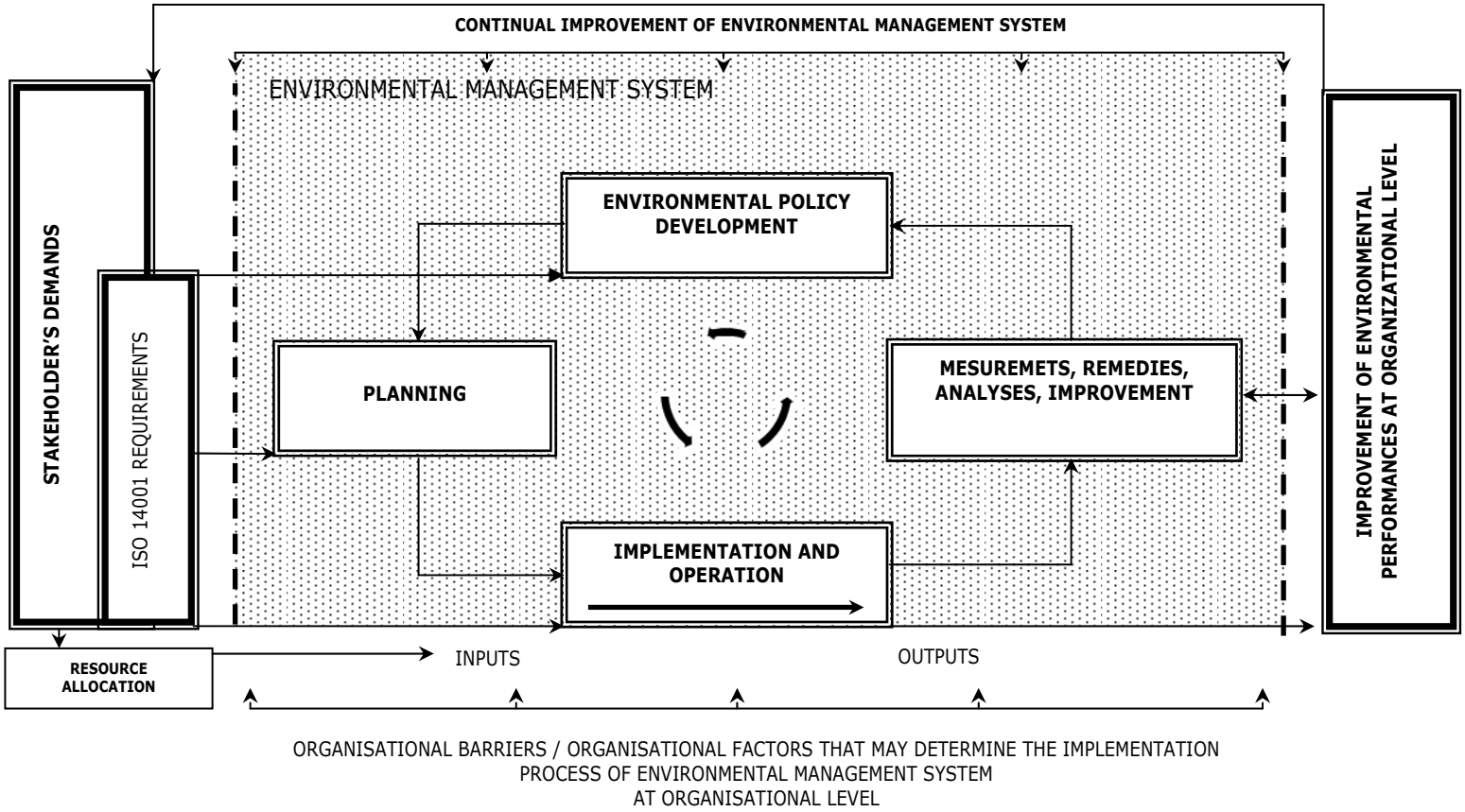


Figure 14 : Proposed model for Environmental management system (according to ISO 14001) as a complex process

In the same way, this complex process that mediates the transformation of the inputs (human resource, equipment, materials, logistical resources, financial resources, and so on) into outputs (environmental performance improvement) is determined by certain organisational barriers that have an impact on the transformation of the existing sub-systems.

Resuming the idea, we can state that the Environmental Management System implemented at the level of an organisation could be considered a set of elements through which one can fulfill the managerial process in order to attain the desired environmental objectives and targets (management through the objectives – in case of the EMS, and not only). From another angle, an EMS can be seen as a methodology through which the organisations operate in a structural manner in order to provide the environmental protection. In its essence, the main aim of an EMS is to control and reduce in a continual manner the negative impact on the environment (Herghiligiu *et al.*, 2012a).

In order to better understand the pattern described in Figure 14, we will present every phase synthetically in the following tables (the phase concerning the elaboration of an environmental policy – Table 14; the preparation phase – Table 15; the implementation and operation phase – Table 16; the phase consisting in measurements, corrective measures, analysis and improvement – Table 17). The presentation is a detailed one.

Table 14 : A detailed approach of the EMS as a complex process - elaboration of the environmental policy phase
Source: elaborated according to ISO 14001/ ISO 14031/ ISO 14004/ Lupu, 2006/ Ionescu, 2000

Phase name	**Names of the component sub-phases**	**Input vectors**	**Output vectors**
ELABORATION OF THE ENVIRONMENTAL POLICY	-	1.Reports concerning the various previous analyses of the management 2.Environmental aspects identified at the organisational level as the consequence of the developed activities 3.Possible impacts on the environment 4.Environmental laws 5.Regulations providing various environmental stipulations accepted by the organisation 6.Involvement of the interested parties (stakeholders) 7.Qualified staff 8. Other important aspects	1.Organisational environmental policy 2.Entries in the organisational database

Table 15 : A detailed approach of the EMS as a complex system – planning phase
Source: elaborated according to ISO 14001/ ISO 14031/ ISO 14004/ Lupu, 2006/ Ionescu, 2000

Phase name	**Names of the component sub-phases**	**Input vectors**	**Output vectors**
PLANNING	Identifying the environmental aspects	1.Audit reports 2.Identified environmental aspects 3. Quantified environmental	1.Environmental aspects identified at the organisational level as consequence of the developed

		impacts 4. Environmental certifications 5.Environmental laws 6.Regulations concerning environmental stipulations 7.Qualified staff to evaluate the impact on the environment 8. Other relevant aspects	activities 2.Possible impacts on the environment 3.Entries in the organisational database
	Identifying the necessary legal regulations	1.Legal regulations 2.Regulations accepted by the organisation 3.Trained staff for the environmental legislation field 4. Other important aspects	1.Necessary environmental requirements 2.Entries in the organisational database
	Elaborating the general objectives and the specific environmental objectives (targets)	1.Environmental aspects identified at the organisational level as a consequence of the performed activities 2.Possible impacts on the environment 3.Financial aspects 4.Available technological choices 5.Trained staff 6. Other important aspects	1.General objectives and environmental targets 2.Entries in the organisational database
	Elaborating the environmental management programme (s)	1.General objectives and environmental targets 2.The organisational structure 3.Other important aspects	1.The environmental management programme (s) 2.Entries in the organisational database

Table 16 : A detailed approach of the EMS as a complex system - implementation and operation phase
Source: elaborated according to ISO 14001/ ISO 14031/ ISO 14004/ Lupu, 2006/ Ionescu, 2000

Phase name	**Names of the component sub-phases**	**Input vectors**	**Output vectors**
IMPLEMENTATION AND OPERATION	Defining the environmental liabilities	1.Current liabilities 2.Organisational structure 3.Previous audits 4.Responsible managers 5.Other important aspects	1.Environmental responsibilities 2.Entries in the organisational database
	Elaborating and developing environmental training programmes	1.Organisational staff 2.Reports concerning the previous training sessions 3.Environmental objectives and targets 4.Staff trained to deliver environmental trainings (internal and external instructors) 5.Required documentation 6.Other important aspects	1.Trained staff 2.Environmental knowledge level of the staff / Environmental competence level 3.Entries in the organisational database
	Environmental communication	1.Environmental objectives and targets 2.Internal communicational requirements of the organisation 3.External communicational requirements of the organisation	1.Communicational answers at the internal organisational level 2.Communicational answers on the external organisational level

	4.Other important aspects 5.Responsible managers	3.Entries in the organisational database
Documentation	1.Environmental objectives and targets 2.Internal communicational requirements of the organisation 3.External communicational requirements of the organisation 4.Trained staff in the environment management field 5.Other important aspects	1.Documents specific to the environmental management at the organisational level 2.Documents specific to the environmental management outside the organization 3.Entries in the organisational database
Document control	1.Documents specific to the environmental management on the inner organisational level 2. Documents specific to the environmental management outside the organisation 3.Environmental objectives and targets 4.Internal communicational requirements of the organisation 5.External communicational requirements of the organisation 6.Trained staff in the environmental management field 7.Data concerning the operational control process 8.Data concerning the preparation process in case of emergency situations and the response capacity 9. Other important aspects	1.Responses to various internal requirements 2.Responses to various external requirements 3.Entries in the organisational database
Operational control	1.Environmental responsibilities 2.Environmental objectives and targets 3.Environmental aspects identified at the organisational level as the result of the performed activities 4.Possible impacts on the environment 5.Qualified staff in the environmental management field 6.Prepared (trained) staff in the environmental management field 7.Other important aspects	1.Responses to various internal requirements 2.Responses to various external requirements 3.Entries in the organisational database
Preparing for emergency situations and response capacity	1.Environmental aspects identified at the organisational level as the result of the performed activities 2.Possible impacts on the environment that were identified 3.Previous programmes in case of emergency situations 4.Trained staff in the environmental management field	1.Training plan in case of emergency situations and response capacity 3.Entries in the organisational database

		5. Other important aspects

Table 17 : A detailed approach of the EMS as a complex process - measurements, corrective measures, analyses, improvement phase
Source: elaborated according to ISO 14001/ ISO 14031/ ISO 14004/ Lupu, 2006/ Ionescu, 2000

Phase name	**Names of the component sub-phases**	**Input vectors**	**Output vectors**
MEASUREMENTS, CORRECTIVE MEASURES, ANALYSES, IMPROVEMENT	Monitoring and measurement	1.Internal procedures elaborated for the audit 2.General objectives and environmental targets 3.Environmental regulations 4.Environmental aspects identified at the organisational level 5.Posible impacts on the environment that were identified 6.Reports concerning the previous monitoring, measurements 7.Current managerial practices 8.Reports containing the current non-compliances 9.Trained staff in the environmental management field – monitoring and measurement 10. Other important aspects	1.Current processes that should be monitored and quantified 2. Entries in the organisational database
	Prevention and corrective measures	1.Environmental management programme 2.Reports containing the situations considered to be non-compliant 3.Other problems on the EMS level 4.Current managerial practices 5.Trained staff in the environmental management field – prevention and corrective measures 6. Other important aspects	1.Reports containing the current non-compliances 2.Entries in the organisational database
	Maintaining the entries from the organisational database	1.Reports containing current non-compliances 2.Current management practices 3.Trained staff 4.Other important aspects	1.Reports for all interested parties (the stakeholders) 2.Entries in the organisational database
	The EMS auditing	1.Current processes that need auditing 2.Procedures elaborated for auditing 3.Trained staff in the environmental management field – environmental auditing 4.Other important aspects	1.Reports containing the results attained from the auditing 2.Entries in the organisational database

Conclusions and Contributions

1. Conclusions

The progress of the contemporary society characterised by the expansive development of the different industrial activities determined a negative impact upon the environment as well as the introduction of environmental legislative regulations.

The effect after the introduction of these environmental regulations stimulated the organisations to search for modalities of minimising the induced impact upon the environment as an effect of the performed activities. Thus the development of a system that should minimise at the level of the organisations' activities the environmental risk which should also utilise the resources efficiently and develop, respectively implement different environmental responsibilities was considered the most viable solution for the efficient management of the environmental issues.

The Strategic Consultative Group on Environment was established in 1991 from an institutional point of view, at the initiative of two large institutions: (a) International Standardisation Organisation, and (b) International Electrotechnical Commission. It has the purpose of evaluating the standardisation need in the environmental management field in order to have a common approach (a common vision) that should allow the improvement of the economic and environmental performances. However, after the debates that followed, they reached the conclusion that it was recommendable to create a new ISO technical committee for the environmental management, a committee that was established in 1993 by the name: **ISO/TC 207, Environmental Management.** This new structure had as a strategic objective the elaboration of several ISO 14000 standards that should be accepted worldwide and that should offer efficient means of improving the organisations' environmental performances, which should eventually contribute to the sustainable development.

In terms of the specific standards to the environmental management, the first standard in the world to approach this issue was elaborated and published in 1992 by the British Standardisation Institute (BSI) and was called **BS 7750**. This standard was characterised by an approach which was very close to the approach of the existing standards today regarding the quality management and it was utilised as a model to design a successful environmental management system that should allow it's auditing.

At the European level, by the Regulation no. 1836 – also known by the name Eco-Management and Audit Scheme - **EMAS[9],** the European Commission created the necessary framework in 1993 in order to allow voluntarily the industrial profile organisations to participate to the community eco-management and audit scheme; the elaboration of this standard was due mainly to the British Standardisation Institute (BSI) by utilising the BS 7750 Standard as a model.

[9]It is also necessary to mention that the European Commission replaced the EMAS version with a modified version known by the name of EMAS II in 2001 by means of the Regulation 761/2001. This new version of EMAS brings along several new elements: alignment to the environmental global policies, the enlargement of the application framework of EMAS II, the assimilation of ISO 14001 requirements as a basis for the implementation of the EMS, an easier addressing level to the organisations , and so on

In the same connection, the international standard that nowadays offers a widely known framework for the environmental management, measurement, evaluation and auditing is the **ISO 14001 Standard**[10]. This standard was designed and adopted in 1996 (respectively revised in 2004); it offers to the organisations the general instructions for the development and operation of an Environmental management system – an instrument for the evaluation and control of the induced impact upon the environment.

In terms of the "Environmental Management System" concept, it could be sad the following:

- The Environmental management systems have their origins in the necessity of integrating the environmental management – the environmental protection issues, at the level of the organisations' general management;
- The purpose of implementing the EMS consists in the continual improvement of the environmental performances – and thus the creation of a positive image and competitive advantages for the organisations;
- It is characterised as being "a component of the general management system that includes the organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for the elaboration, implementation, achievement, analysis and maintenance of the environmental policy" (ISO 14001);
- It represents an instrument that identifies issues, but also an instrument that settles them relying on the continual improvement concept; this principle can be implemented on an organisation's level by taking into account the way it is perceived by the management and having in view the companies' activity sector;
- By designing and implementing the EMS, two essential requirements must be met: (a) the compliance with the implementing stages (the elaboration of the environmental policy and the commitment of the organisation's management related to its compliance and real adoption/ the elaboration and the implementation of the environmental general objectives/ the elaboration and the implementation of the specific environmental objectives (targets) / the elaboration and the implementation of the environmental management programme/ the monitoring process/ the management analysis), (b) compliance with the vision of ISO 14001 which mentions that the EMS is not an addition to the organisation's management, but an integral part;
- The implementation of the EMS develops the different practices specific to the environmental management which are in a direct relationship with the planning and organising at an organisation's level, and it aims at different aspects such as: (a) the environmental policy, (b) the environmental objectives and targets (c) the environmental responsibilities, (d) the information, formation and

[10] The ISO 14001 standard does not present on its level specific instructions on how to elaborate, implement, manage or adapt certain specific routines to the EMS (the routinisation of the environmental practices) on the organisations' level.

implication of the human resources in the environmental management, (e) the analysis of the environmental performances, (f) plans for emergency situations;

- The implementation and the integration of an EMS at the organisations' level involves the development of different practices specific to the environmental management, which may have multiple beneficial results for the companies over the years;
- The implementation of an EMS and the certification with ISO 14001 generates benefits at the organisations' level, benefits that express the tangible result of the EMS's integration;
- The success of the EMS's implementation, in accordance with the specialty literature, is determined by certain factors with a general character unanimously valid for any organisation – "organisational barriers".

The specialty literature mentions that the correct identification of these influence factors, respectively the determination of the correct influence level induced by each factor upon the implementing process of the EMS may determine an increase in the efficient utilisation of the available resources, an increase in the efficacy degree on the level of the proposed environmental objectives and targets of the EMS, an increase in the global level of the attained environmental benefits.

The necessity to identify and to evaluate the relationship between these organisational barriers (influential factors) – barriers that in essence characterise the organisations' orientation in the environmental management issues and the implementation of the EMS, might help the managers take the necessary corrective measures, and at the right time, in order to improve the quality of the implementing process of this system.

A systematic review of the scientific papers presented in this chapter reveals that are several research priority directions/ areas addressed by most authors as a consequence of the importance of these directions in the development of environmental management system, among which it coud be mentioned the following:

(a) general description regarding the environmental certification process (ISO 14001) of organizations and their adoption of the Environmental Management System (Ionescu, 2005; Darnal, 2001; Jiang and Bansal, 2003; and so on);

(b) the international level regarding the environmental certification of various organizations (Christman and Taylor, 2001; Christman and Taylor, 2004; and so on);

(c) the impact of environmental certification organizations on environmental performance (Lupu *et al.,* 2012, Lupu *et al.,* 2006; Hart and Dowell, 2010; Rondinelli and Vastag, 2000; Ammenberg *et al.,* 2002; Potoski and Prakash, 2005; Anton *et al.,* 2004; King *et al.,* 2006; and so on).

The bibliographic research undertaken identified very few papers that analyze the relationship between specific organizational factors that characterize organization's orientation towards environmental management issues, and Environmental management system implementation/ integration quality.

In order to perform a global analysis of the important papers previously mentioned, as well as of the chapter that presents a theoretical approach regarding the Environmental Management System and of the factors that can influence it, it will be developed a series of clarifications in the following.

A part of the international papers included quantitative methods in the analysis of the collected secondary data (Darnall (2003), King *et al.* (2005), Daily *et al.* (2007), Wee and Quazis (2005), Zutshi and Sohal (2004), Padma *et al.* (2008), and so on) in order to analyse different aspects concerning the complex process of implementing an Environmental Management System.

On the other hand, Brio *et al.* (2001), Christmann and Taylor (2001), Corbett and Kirsch (2001), Damall (2001), Delmas (2001, 2002), Melnyk *et al.* (2003), Nakamura *et al.* (2001), Quazi *et al.* (2001) preferred to use primary data in their research. Other researchers chose to use the case study technique at the objectives level, proposed for the approach of the Environmental Management System (Bansal and Bogner (2002), Jiang and Bansal (2003), Zutshi and Sohal (2004), Kitazawa and Sarkis (2000), , and so on)

According to the conclusion drawn by Epstein and Roy (1997), stating that, if the organisations are certified with standards from the ISO 14000 series, this brings major benefits to the managerial system, benefits that go far beyond the management of the impact that the organisation has on the environment. Taking into account also the complexity and the organisational profile, it can certainly be state that the synergic relation between an organisation and the Environmental Management System will be a crucial element in the organisations development and achievement.

Every organization is a complex entity and all sometimes substantial differences between organizations, characterize the difficulty of Environmental management system implementation and integration, and justify the complexity of this type of system. Therefore an organization can be seen as a complex entity that has on its base, a process of continuous interconnected systems (designed, implemented, integrated, monitored, audited and adapted to the different levels) that use the organization's resources to achieve the proposed objectives and targets.

The main purpose of Environmental Management System is to identify, to evaluate, to analyze and to solve the environmental problems and thus to improve the organization environmental performance. On the same judgment, the managers and other organizational stakeholders perceive this system as a complex process which practically demonstrates the existence of many very complex issues that occur at the level of implementation and integration.

From theoretical point of view a process is generaly defined as a goup of activities that transform inputs (human resources, equipment, materials, logistics resources, financial resources, and so on) in a product or service - a value result to organization stakeholders.

Related to Environmental Management System (EMS) as a complex process, it could be said that:

- The literature presents that the process approach is a more efficient way of achieving the desired result (this statement is applies to any process);

- Continuous improvement of the organization environmental performance is a complex process because it is an direct effect of environmental practices development, that results from the implementation/ integration of the Environmental management system at the organizational level;
- One of the essential characteristics of the Environmental Management System is complexity. The need for complexity is a practical feature because EMS has to "cover" all activities and all staff. Essentially EMS must balance and be "synergistic match" to existing policy, operational and economic needs (and so on) of each organization;
- Main reason that underlines decision of aggregating/ assembling Environmental Management System activities in a process it is of managerial nature. Therefore the identification of a series of activities in order to emphasize the transformation of the existing subsystems is mainly focused on monitoring, evaluation and improvement of operation method;
- Complexity of Environmental Management System itself (in addition to matching and adaptation to the organizational structure, the level of integration and organizational culture) determine the success of implementing this type of system.

Given all the information and knowledge obtained from specialized literature analysis the following definition is proposed for specific Environmental Management System as a complex process at organizations level as follows: **EMS can be considered to be a complex process composed from a system of activities/ practices identified in a holistic and systematic manner so that it can be monitored, evaluated and analyzed continuously to improve the organization environmental performances**. In the same context, this complex process that mediates the transformation of inputs (human resources, equipment, materials, logistics resources, financial resources, and so on) into outputs (improved environmental performances) is determined by the specific organizational barriers that influence transformations at the existing subsystems levels.

2. Contributions

The original organisation of the material in Chapter 2 whose purpose was to reach the proposed objectives brought along the following contributions, as follows:

- The clarification and the systematisation of the basic terminology utilised at the level of the Environmental management systems;
- The clarification and the synthetic presentation of the environmental practices developed at the organisations' level as an implementing effect of an Environmental management system;
- The identification in the specialty literature of the most important benefits resulted from the implementation of an Environmental management system;

- The clarification and the synthesis of the most important potential factors that have a general character unanimously valid for any organisation, factors that may act as "barriers" in the implementing process of an Environmental management system.

The original way for developing subchapter 2 of this chapter, mainly aimed to achieve the objective: **analysis of the specialty literature regarding the Environmental management system and the factors that may determine this system** (O_1), and it's represents a synetic continuation of the previous subchapter.
Through main contributions brought on the level of this chapter, it can be mention the following:

- Identification of the important research directions addressed by most authors in the consulted literature, as a consequence of the importance of these directions in the development area of Environmental management system;
- Synthetic presentation of the most important environmental practices developed in organizations as a result of implementing an environmental management system;
- Identification and systematic presentation of the articles in the literature that presents the factors that determine/ influence the complex process of implementation and integration of an environmental management system;
- Group into categories of articles from the scientific literature that addresses the issue of environmental management system depending on the research methods/ type of data, or preferred information.

Environmental Management System implementation and integration approach as a complex process at organizations level represent an original demarche that doesn't exist in the specialty literature form the performed research.
Among the main contributions brought also in this chapter (mainly in subchapter 3 of this chapter), can be mentioned the following:

- Environmental Management System implementation and integration definition and characterization as complex process;
- Defining in a synthetic manner the "process" concept;
- Development and proposal of EMS theoretical model - in accordance with ISO 14001, as a complex process; this scientific approach is unique and original in the specialized literature level consulted;
- Clarify and detailed developed model (EMS as complex process) by presenting each stage synthetic tabulated (development of environmental policy stage/ planning stage/ implementation and operation stage/ measurements stage, corrective measures, analysis;
- Proposal of Environmental Management Systems definition (according to ISO 14001) as a complex process.

Chapter 3 : Evaluation of the relation between the Organisation orientation to environmental issues and the Environmental management system implementation quality

The organisations aim at flexibility. The problem is that the dynamic change of the market requirements, associated to certain features of the organisational environment can seriously perturb all levels of an organisation (Herghiligiu *et al.* 2012a; Gavronski *et al.*, 2013). Therefore, in the actual context, more than ever, the organisations acknowledge the fact that, if they do not take into account their impact on the environment and if they do not carry out sustainable environmental actions, they will not be able to interplay with other organisations and with the market in an effective manner and they will not be able to contribute in a sustainable manner to the welfare economics (Herghiligiu and Lupu, 2012a; Herghiligiu *et al.*, 2012b).

The need to identify and evaluate the relation between these organisational barriers – barriers / factors that, in their essence, characterise the measures taken by organisations concerning environmental management issues, as well as the implementation of the Environmental management system – is rather a practical issue. The possible results, as well as the conclusion generated by the analysis of this relation could help managers to take the necessary corrective measures in due time and could lead to the improvement of the quality defining the EMS implementing process.

Therefore, the accurate calculation of the influence level corresponding to each factor and exercised on the implementing process of the Environmental Management System at the organisational level can determine an increase in the effectiveness of using the available resources, an increase in the degree of effectiveness concerning the environmental targets and objectives of the EMS, as well as an increase in the global level of the acquired environmental benefits (Tinsley and Pillai, 2006).

3.1. The research methodology applied in the analysis of the relation between the organisation orientation to environmental issues and the EMS implementation quality

The research methodology treats the way in which the scientific knowledge is acquired and is focalised on all the elements that are interconnected in the research project. The main aim of the research methodology is to correctly consolidate (step by step) the knowledge process (Lazarsfeld, 1965).

3.1.1. Structure and General Description of the Research Process

The main **aim** of this chapter is to determine and analyse the relation between the factors that characterise the direction followed by the organisation orientation on the environmental management issues and the implementation and integration quality of an Environmental management system.

During the design phase, the choice of the information sources (articles and specific works/ use of national and international databases/ discussions with specialists from the field – concerning the issue of the implementation and functioning quality of the Environmental management system), as well as the selection of the method meant to collect and systematise the information represented an extremely important phase of the considered research.

In order to consolidate **the main objective**, namely the development of a methodology that analyses the relation between **(a) the organisation orientation on the environmental management issues (essentially considered to characterize and to sums those organizational "barriers" or factors) and (b.) the Environmental management system implementation and integration quality** (O_3 – Table 3, Chapter 1) and of the stated objectives, the performance phase had in view:

a. the information collection in order to: a1.determine the most important factors that influence the implementation quality of an Environmental management system/ a2.determine the essential aspects that sum up the implementation and integration quality of the Environmental Management System/ a3.investigate the intensity of the relations between the most important factors that influence the implementation quality of an Environmental management system and also characterise the organisation orientation on the environmental management issues (F_1) and the essential aspects that sum up the implementation and integration quality of the Environmental management system (C_C). In order to study the intensity of the relations, we used a survey - questionnaire based (the Annex no. 2), with an ordinal scale[11] in seven (the Likert scale), and with 179 items, applied in case of 171 (final validated number) managers (specialists in the environmental management field (environmental managers), or organizational managers that are involved in various environmental actions) in case of the largest organisations from the North-Eastern development area in Romania (questionnaire presented in the Annex no. 1, Annex no. 2).

b. the information processing/ coding was performed using the statistical analysis programme SPSS 16, in order to get some statistical and graphical representations that will allow us to formulate accurate interpretations concerning the considered "aspects", as well as to obtain the patterns that present the architecture of these relations.

[11] The ordinal scales: imply a measurement level in which the objects belonging to different categories of a scale are in a certain relation with the respective categories (Huţu, 2005).

c. the analysis and interpretation of the collected information, in order to analyse the link between F_1 and C_C, and, eventually, the design of the standard patterns that present the architecture of these links and that may have an impact in a certain context. The quantitative analysis and the processing of data and information were carried out through the SPSS statistical programme (by testing the internal consistency corresponding to the variables used within the research tool – the Cronbach Alpha index/ by testing the normality of the variable distribution – the One-Sample Kolmogorov-Smirnov Test/ by using the Spearman non-parametrical tests/ by testing the regression, and so on).

According to "The Logical scheme of the research process" (Figure 2), to "Research process phases" (Figure 3) presented by Huţu (2005) and to "Description of the research process structure" from our PhD thesis (Figure 5), in order to make clear the scientific approach, we adopted in this chapter a working plan that shows in detail the research methodology applied in order to analyse the relation between the direction followed by the organisation orientation on the environmental management issues (essentially considered to characterize and to sums those organizational "barriers" or factors) and the implementation quality of the Environmental management system - Figure 15.

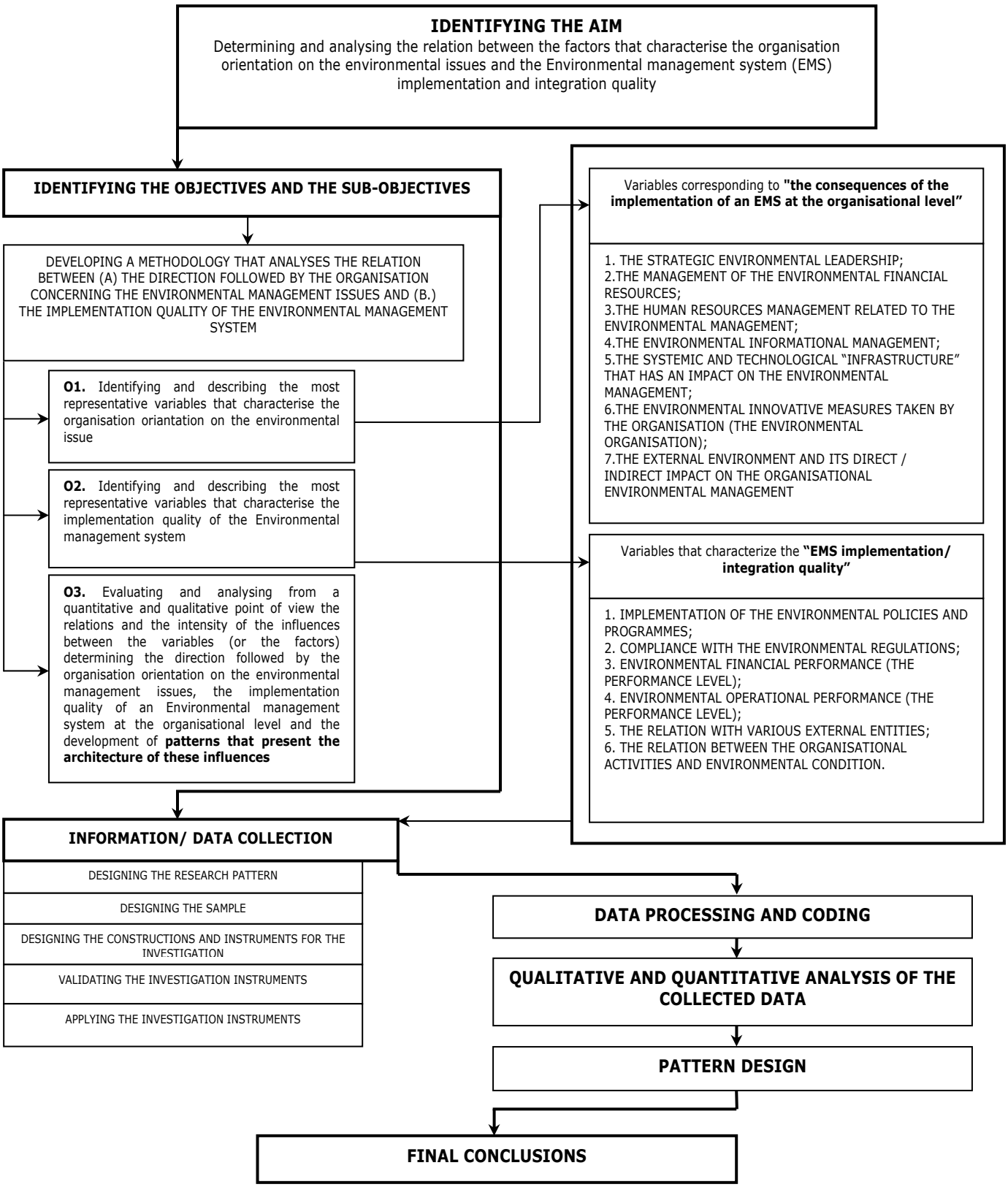


Figure 15 : The research methodology applied in the analysis of the relation between the organisation orintation on the environmental management issues (main barriers/ factors) and the Environmental management system implementation quality

3.1.2. Designing the Research Pattern

The specialty literature contains several classifications of the endogenous and exogenous factors that influence in a direct or indirect manner the implementation of an Environmental management system; these classifications contributed more or less to the clarification of the impact factors, as we can notice through the synthetic analysis from Table 18.

Table 18 : Main factors that influence in a direct or indirect manner the implementation and the integration of an Environmental management system
Source: Chapter 2 – State of the art regarding the Environmental management system (ISO 14001) – PhD thesis

No. crt.	**AUTHORS**	Impact factors – the result of the **research** or of the **use** of different research patterns
1.	Kitazawa and Sarkis (2000)	(a) the capacity of the senior policy makers in what concerns the environmental activities or the current issues; (b) the adoption of various ideas/ suggestions coming from the employees and concerning the improvement of the current environmental activities that are developed; (c) the managerial effort to encourage and support the employees' involvement in the decisional process concerning the environment;
2.	Babakri *et al*. (2003)	(a) the identification of the environmental aspects; (b) the documentation of the Environmental Management System; (c) training sessions concerning environmental issues, delivered to the human resource at the organisational level; (d) the EMS auditing; (e) the operational control; (f) the environmental management programme; (g) the environmental objectives and targets; (h) the document control;
3.	Zutshi and Sohal (2004)	(a) the management support and the leadership concerning environmental management issues; (b) training sessions and acquirement of environmental knowledge; (c) internal analysis and, respectively, (d) sustainability;
4.	Wee and Quazis (2005)	(a) the top management involvement; (b) the employees' involvement in environmental management issues; (c) environmental training sessions; (d) the production of ecological goods; (e) the supplier management; (f) the monitoring; (g) the informational management;
5.	Sambasivan and Feis (2008)	(a) the management approach; (b) the organisational change; (c) the social and external aspects; (d) the technical aspects;
6.	Padma *et al*. (2008)	(a) the involvement of the top management; (b) the compliance with the environmental regulations and the identification of environmental issues; (c) the environmental processes management; (d) training sessions for emergency situations; (e) the continuous improvement;

(f) the monitoring, evaluation and control;
(g) the human resource management;

The specialty literature shows that the authors carried out researches focusing only on certain impact factors concerning the implementation success; they paid attention to the environmental certification delivered to the organisations and to the adoption at the organisational level of an Environmental management system, to the environmental certification level in case of different organisations or to the impact of the environmental certification of the organisations on the environmental performance. We did not find in the analysed works a simple and efficient pattern concerning the process of investigating the factors that influence the implementation quality of an Environmental management system for an organisation; such a pattern would have been easily understood by any researcher or specialist in the environmental management field who would like to carry out an investigation concerning the mentioned subject.

Along the same line, we propose the following research pattern, presented in Figure 16, Figure 17 and Figure 18.

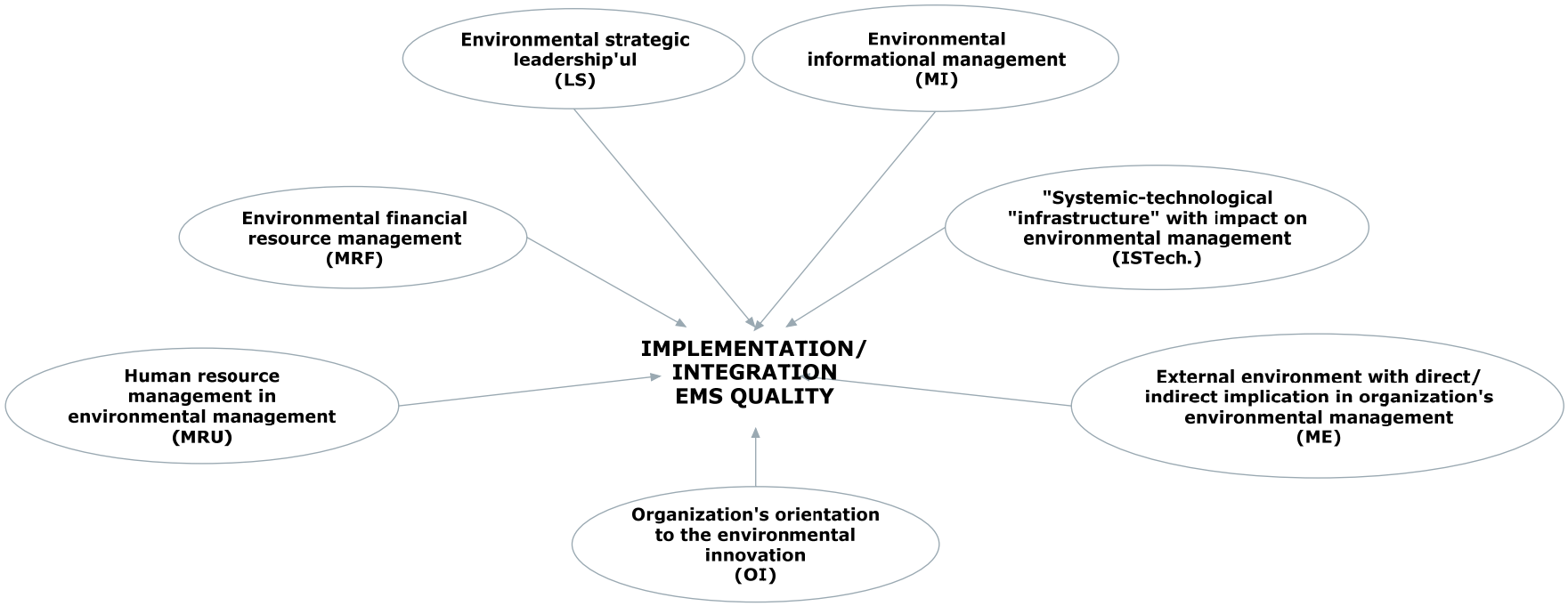


Figure 16: The general research pattern – global factors that have an impact on the implementation/ integration quality of the Environmental management system (EMS)

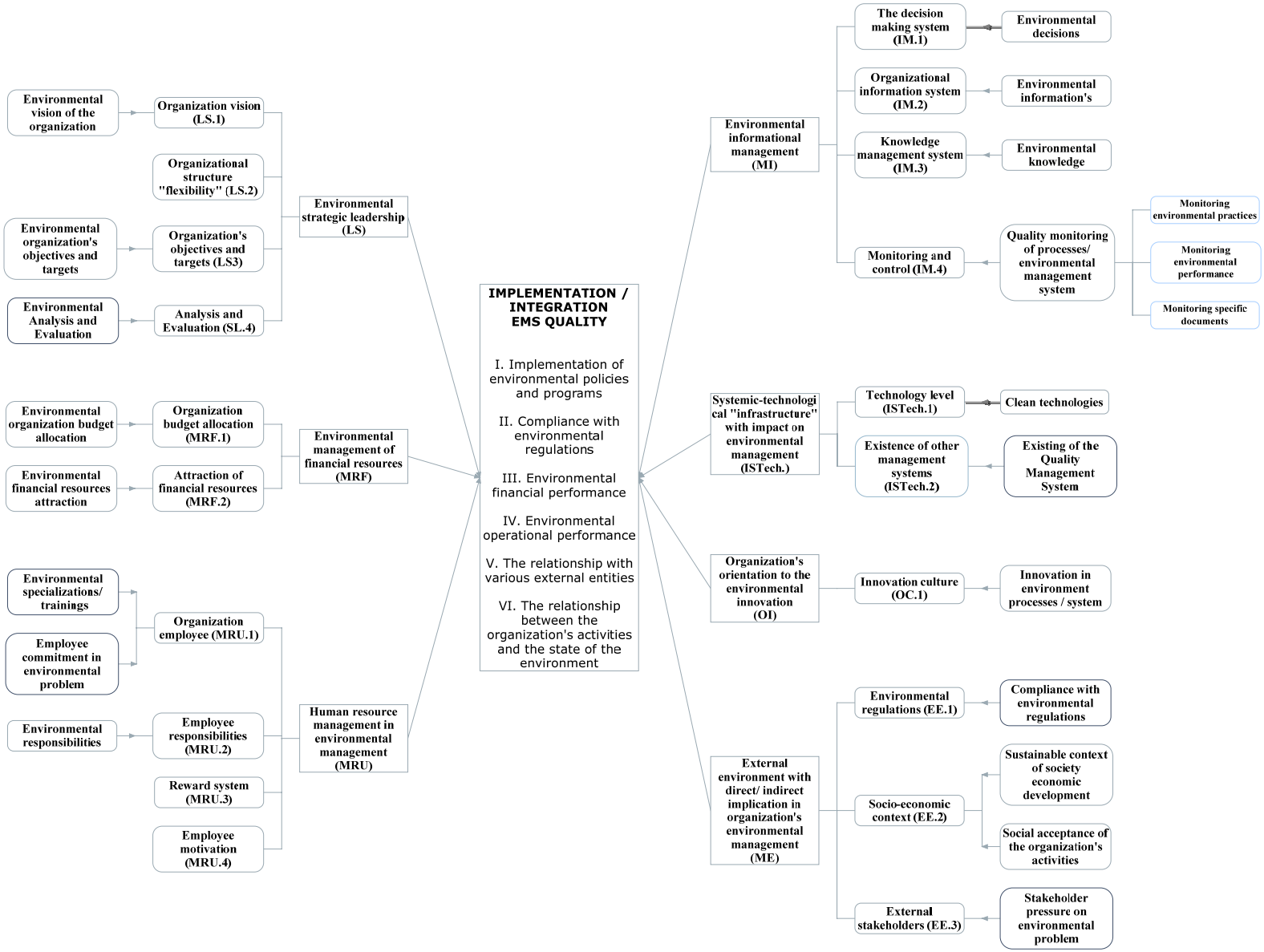


Figure 17 : Detailing the research model – aspects (factors) that determine/ influence the EMS implementation/ integration qulity

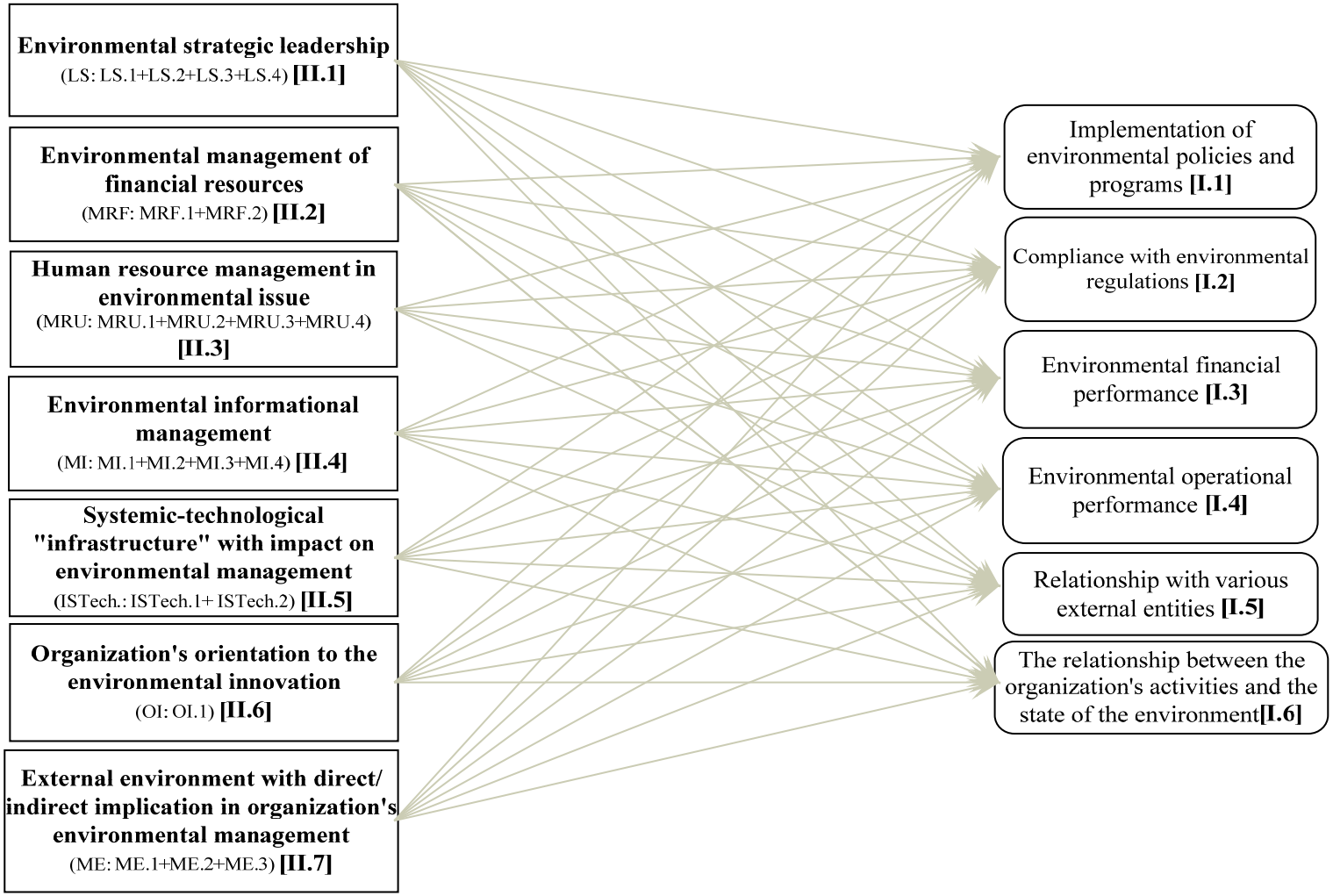


Figure 18 : Relationships beteween (a.) influence general factors, and (b.) considered aspects that describe the EMS implementation/ integration qulity

3.1.3. Sampling Method, Representative Character of the Sample, General Description of the Survey

The sampling method that we chose was *the random sampling method* concerning the respondents (specialised managers (environmental managers) and managers with experience related to the environmental actions developed at the organisational level); we added *the purposing sampling* to this method, having in view the largest organisations from the North-Eastern development area in Romania.

When we designed the sample, we took into account only the large organisations, because, according to Tinsley and Pillai (2006), Welford (1996), only such organisations are representative and have probably implemented an Environmental Management System through which they manage the relation between the environment and the organisation.

In order to attain the objectives set in this research, the main technique that we chose was the inquiry based on a questionnaire. The questionnaire, according to Zaiţ and Spalanzani (2006), represents the investigation tool/ the data collection technique consisting in several written questions. Through its administration, it generates different answers from the respondents; these answers will be recorded. The elaboration of the questionnaire used in our research (Annex no. 2) supposed the design of an ordinal scale[12] in seven (the Likert scale) and 179 items. The questionnaire includes three categories:

1. 96 items concerning the direction followed by the organisation concerning the environmental management issues, as follows: "The environmental strategic leadership"/ "The management of the environmental financial resources"/ "The management of human resources in what concerns the environmental management issues"/ "The environmental informational management"/ "The Systemic and Technological "infrastructure" that has an impact on the environmental management" / "The innovative measures taken by the organisation in the environmental field"/ "The External Environment that has direct/ indirect impacts on the organisational environment management".

2. 74 items concerning the implementation and integration quality of an Environmental Management System, as follows: "Implementation of the environmental policies and programmes"/ "Compliance with the environmental regulations"/ "The environmental financial performance"/ "The environmental operational performance"/ "The relation with various external entities"/ "Te relation between the organisational activities and the condition of the environment", and

3. general variables (belonging to the respondents and to the organisation) – 10 items.

During the phase of the questionnaire design, the flexibility of the interpretation was the main feature considered for the item drafting (the questionnaire is presented in detail in Annex no. 1). We intended to include

[12] The ordinal (collation) scales: involves a measurement level in which objects from different categories of a scale are in a certain relation with the respective categories (Huţu, 2005).

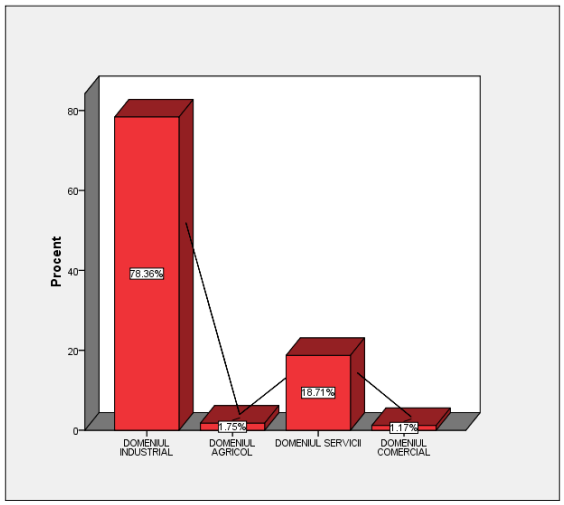
in the questionnaire all possible aspects concerning the complexity of the Environmental Management System, in order to allow a large range of approaches and to finally obtain a clear and accurate report concerning the phenomenon treated in the research herein.

The questionnaires were distributed in large organisations from the North-Eastern development area in Romania; these organisations belong to different activity fields – the industrial field, services and the commercial and agricultural fields. The data collection was carried out during the first part of the year 2013, while the questionnaires were distributed online, using the application offered by Google – Form, but also on paper.

After the preliminary processing of the collected data, we obtained finally a number of 207 questionnaires filled in by managers (specialists in the environmental management field (environmental managers)/ or organizational managers involved in various environmental actions), but only 171 questionnaires were validated because of the various errors (technical errors and/ or partially filled-in questionnaires, and so on).

The structure of the respondent sample, according to the specific activity of the organisation

According to the specific activity of the organisations, the respondent sample is structured as shown in Graph no. 1.



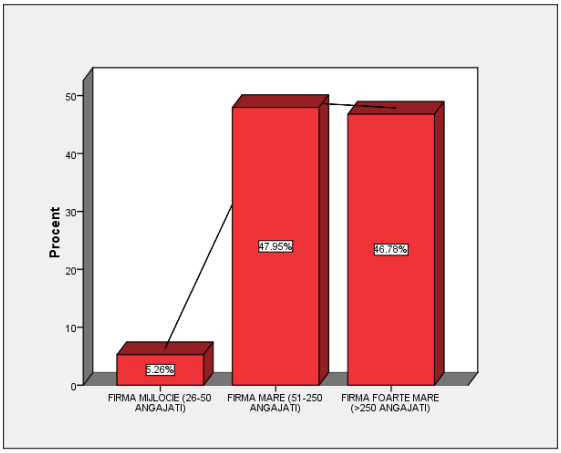
Graph no. 1: Distribution of the respondents, according to the organisation profile

The graph no. 1 shows that the sample structure, according to the specific activity of the organisation, involves the following categories:

a. 78,36% of the respondents work in organisations from the industrial field;
b. 18,71% of the respondents work in organisations from the service field;
c. 1,75% of the respondents work in organisations from the agricultural field;
d. 1,2% of the respondents work in organisations from the commercial field.

The structure of the respondent sample, according to the organisation's size

In what concerns the activity field of the organizations, the respondent sample is structured as shown in Graph no. 2.



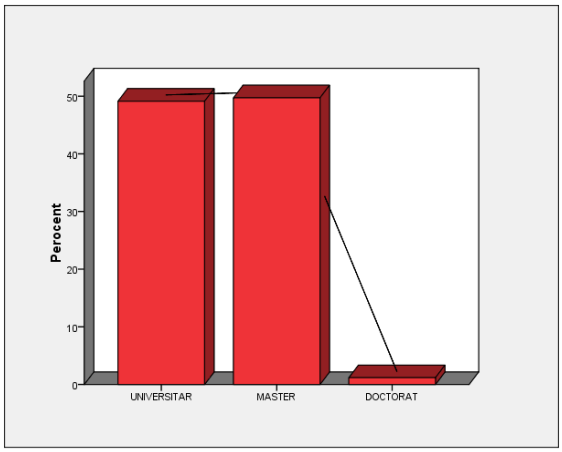
Graph no. 2: Distribution of the respondents, according to the organisation's size

The graph no. 2 shows that the sample structure, according to the organisation's size involves the following categories:

a. 47,95% of the respondents work in large organisations (51-250 employees);
b. 46,78% of the respondents work in very large organisations (>250 employees);
c. 5,26% of the respondents work in medium-sized organisations (26-50 employees).

<u>The structure of the respondent sample, according to the respondents' level of study</u>

The structure of the respondents, according to their level of study, may be seen in Graph no. 3.



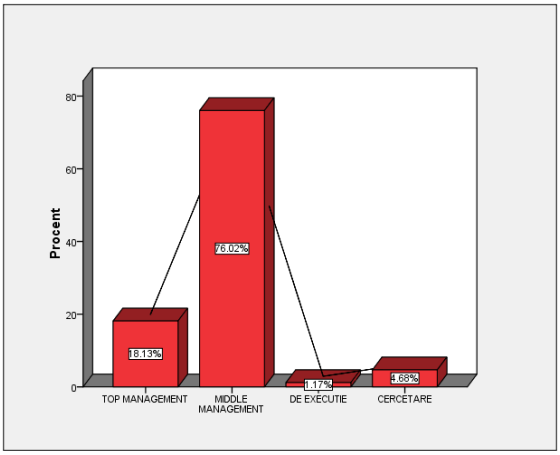
Graph no. 3: Distribution of the respondents, according to the level of study

The graph no. 3 shows that the sample structure, according to the respondents' level of study, implies the following categories:

a. 49,12% of the respondents have university degrees;
b. 49,12% of the respondents have master degrees;
c. 1,17% of the respondents have doctoral degrees.

<u>The structure of the respondent sample, according to the respondents' job level within the organisation</u>

According to the respondents' job level within the organisation, the respondent sample is structured as shown in Graph no. 4.



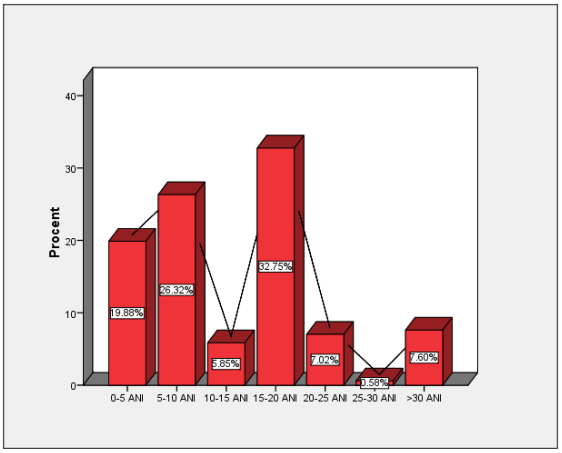
Graph no. 4: Distribution of the respondents, according to their job level within the organisation

The graph no. 4 shows that the sample structure, according to the respondents' job level within the organisation, involves the following categories:

a. 76,02% of the respondents have a middle-management job;
b. 18,13% of the respondents have a top-management job;
c. 4,68% of the respondents have a research job;
d. 1,2% of the respondents have an executive job.

<u>The structure of the respondent sample, according to the respondents' experience level in the management field</u>

The structure of the respondents, according to their experience level in the management field, is presented in Graph no. 5.



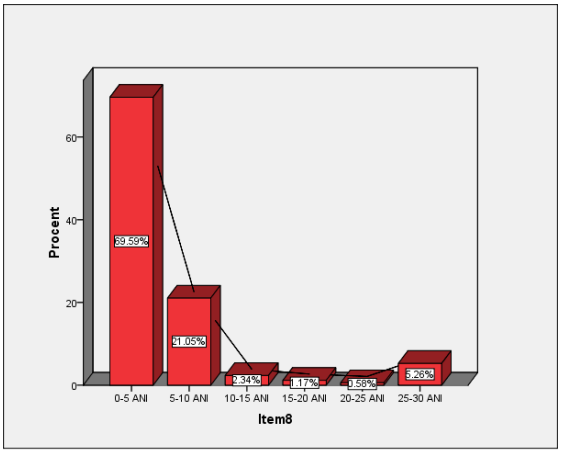
Graph no. 5: Distribution of the respondents, according to their experience level in the management field

Graph no. 5 shows that the sample structure, according to the respondents' experience level in the management field, involves the following categories:

a. 32.75% of the respondents have 15-20 years of experience in the management field;
b. 26.32% of the respondents have 5-10 years of experience in the management field;
c. 19.88% of the respondents have 0-5 years of experience in the management field;
d. 7.60% of the respondents have more than 30 years of experience in the management field;
e. 7.02% of the respondents have 20-25 years of experience in the management field;
f. 5.85% of the respondents have 10-15 years of experience in the management field;
g. 0.58% of the respondents have 25-30 years of experience in the management field.

The structure of the respondent sample, according to the respondents' experience level in the environmental management field

The structure of the respondents, according to their experience level in the environmental management field, may be analysed in Graph no. 6.



Graph no. 6: Distribution of the respondents, according to the experience level in the environmental management field

Graph no. 6 shows that the sample structure, according to the respondents' experience level in the environmental management field, involves the following categories:

a. 69.59% of the respondents have 0-5 years of experience in the environmental management field;
b. 21.05% of the respondents have 5-10 years of experience in the environmental management field; 5,26% of the respondents have 25-30 years of experience in the environmental management field;
c. 1.17% of the respondents have 15-20 years of experience in the environmental management field;
d. 0.6% of the respondents have 20-25 years of experience in the environmental management field.

3.1.4. The design of the variables (constructs) taken into consideration

In order to make the presentation of the research methodology as clear and transparent as possible, we will describe below the variables sets and the used variables. In our research we had in view three variables sets, classified as follows:

Set I: Variables for the "consequences of the Environmental management system implementation/ integration at the organisation level" (designed according to ISO 14031/ the general reasons for the implementation of an EMS / the specialty literature) (Annex no. 1/ Annex no. 2).

We find appropriate to use the syntagm "the quality of the Environmental management system", as the quality of the implementing and integrating process of an EMS is determined by the environmental performance level –

being formally regulated by the indicators proposed for the ISO 14031 standard. At the same time, the quality of the implementing and integrating process of the EMS is characterised by the implementing level of various environmental practices (planning and organisation/ operational practices/ communicational practices), considered by Gonzalez-Benito *et al*. (2005) as being of maximum importance for the success of this process.

In terms of the questionnaire elaboration phase, the aspects previously mentioned, as well as the specialty literature, were the main pillars that supported the item construction in this part.

The main objective of the variables set: to analyse the implementation quality of the Environmental Management System at the organisational level;

The components of the variables set:

I.1. Implementation of the environmental policies and programmes;

I.2. Compliance with the environmental regulations;

I.3. Financial environmental performance;

I.4. Operational environmental performance;

I.5. The relationship with various external entities;

I.6. The relationshop between organisational activities and the state of the environment.

Set II: Variables for the "organisation orientation to environmental issue and, implicitly, EMS implementation and integration" - (Annex no. 1/ Annex no. 2).

The main objective of these variables set: to identify the influence of the most important factors (internal and external organisational factors) on the implementation quality of an Environmental Management System;

The components of the explained variables set:

II.1. Environmental strategic leadership (LS: LS.1+LS.2+LS.3+LS.4);

II.2. Environmental management of financial resources (MRF: MRF.1+MRF.2);

II.3. Human resource management in environmental issues (MRU: MRU.1+MRU.2+MRU.3+MRU.4);

II.4. Environmental informational management (MI: MI.1+MI.2+MI.3+MI.4);

II.5. Systemic - technological "Infrastructure" with impact on environmental management (ISTech.: ISTech.1+ ISTech.2);

II.6. Organization's orientation to the environmental innovation (OI: OI.1);

II.7. External environment with direct/ indirect implication in organization's environmental management (ME: ME.1+ME.2+ME.3);

Set III: General variables – (Annex no. 1 / Annex no. 2).

The main objective of these variables set: to identify some features of the respondents and of the organisation that play an important role in the various correlations and analyses of the research.

The components of the variables set:

III.1. Features of the respondent;

III.2. General features of the organisation.

Resuming the idea previously mentioned, to each variables set correspond variables characterised by certain dimensions, as follows:

3.1.4.1. Variables Set no. 1 for "consequences of the Environmental management system implementation/ integration at the organisation level"

For the first variables set, the following component was proposed for each separately analysed variable, as follows:

*** For the variable: "Implementation of environmental policies and programmes"** four dimensions were taken into account, as follows in Table 19.

Table 19 : The variable "Implementation of the environmental policies and programmes"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONNAIRE
I.1.	"Implementation of the environmental policies and programmes" **(QUESTIONNAIRE ITEMS: I.1 – I.34)**	I.1.1. General environmental objectives and targets	a. the clarity of the objectives and of the environmental targets; b. the architecture of the involvement of the managers employed by the organisation in the objectives and environmental targets development process; c. the characteristics of the objectives and of the environmental targets (establishing, changing, updating, monitoring, , and so on); d. various influences on the organisational structure, , and so on
		I.1.2. Environmental policy	a. the clear formulation of the environmental policy.
		I.1.3. The suggestions of the employees/ management team/ shareholders/ suppliers/ customers/ representatives of various public institutions with which the organisation interacts/ representatives of NGOs aiming at the improvement of the environment quality	a. the assimilation of the employees' suggestions with regard to the procedures or various environmental practices; b. the assimilation of the suggestions of other stakeholders in the organisation; c. aspects of environmental knowledge management; d. the public information activities performed by the organisation, , and so on

	I.1.4. The implemented actions regarding the environmental pollution prevention	a. the existence of a long term environment management programme; b. the manager – decisional process relation in the case of various pollution prevention actions; c. the relation between the managers' environmental responsibilities (from the job description) and the various environmental protection actions; d. the environmental training sessions performed at the organisation's level; e. various influences on the organisational structure (plus the direction of the informational circuit); f. aspects of environmental knowledge management; g. the planning and the control of documents concerning the environmental management, , and so on

This variable has been taken into account in this research work because it reflects through its component (the environmental policy[13] + the general environmental objectives and targets[14] + the suggestions of the stakeholders[15] + the implemented actions regarding the environmental pollution prevention) the essence of the entire design and development of the Environmental management system.

The development of its dimensions implies a logical reasoning process, starting from the existence of a clear and properly formulated environmental policy (in accordance with the requirements in the ISO 14001 standard), the general environmental objectives and targets development manner, the implemented actions that target the protection of the environment (which represents the "starting up" of the environmental objectives and targets) and the factors that could determine the quality of the elaboration, and respectively, of the operation of what was previously reminded (the stakeholders of the organization).

Thus, taking into account the importance of the previously mentioned dimensions, it was impetuously necessary for them to be taken in account when evaluating the quality of the implementation of the Environmental management system, especially as they differ a lot from one organization to the other, and they were approached and researched by different authors in the scientific literature. (Lupu *et al.* 2006; Teodosiu, 2005; Ionescu, 2000; Link and Naveh, 2006; Christman and Taylor, 2006; Naveh *and collab.*, 2006; Zutshi and Sohal, 2004).

[13] The environmental policy can be considered to represent the strategic environment declaration to which the organisation can voluntarily subscribe and which has as its main purpose the change of the orientation of the organization towards sustainability; also, the environmental policy can be considered the "formal means" that will determine the change of the organisation and the transformation over time of all activities performed, in light of pollution prevention and the continual improvement of this aspect.

[14] The general environmental objectives represent that environmental target that the organisation has to reach in a certain time period; these are a result of the environmental policy development. Similarly, the specific environmental objectives (the environmental targets) represent the detailed performance requirements, which must be established by accomplishing the general objectives that were proposed.

[15] The suggestions of the organisation stakeholders are considered as being of extreme importance because they can contribute positively both to the development of the Environmental Management System and to its operation. It is logical to perform the reasoning that the person/ or group of persons directly involved will know much better the observed phenomenon than someone who is not directly involved.

*** For the variable: "Compliance with the environmental regulations"**, four dimensions were taken into account, as follows in Table 20.

Table 20 : The variable "Compliance with the environmental regulations"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONNAIRE
I.2.	"Compliance with the environmental regulations" **(QUESTIONNAIRE ITEMS: I.35 – I.42)**	I.2.1. Compliance with the environmental regulations (national/ European/ global/ to which the organisation adhered)	a. the analysis of the connection between the organisation and the institution competent in the environmental problems (the level of fines received by the organisation); b. the connection between the organisation priorities and the environmental regulations, , and so on
		I.2.2. Legal liability regarding the compliance with environmental regulations	a. the connection between the internal organisational operating regulations and the employees' responsibilities; b. the connection between the environmental management department objectives/ employee in charge with environmental issues and the environmental laws in force; c. various influences on the organisational structure, , and so on
		I.2.3. Internal findings regarding the environmental aspects	a. monitoring the environmental aspects at the level of the organisation;
		I.2.4. The analyses that were performed regarding the environmental impact induced by the specific activities	a. the periodicity of the measurements for determining the pollution level resulting from the activities performed by the organisation; b. the connection between the allocated budget for environmental issues and monitoring the impact induced on the environment; c. the outsourcing level of the field measurements in the environmental impact issue; d. various influences on the organisational structure, , and so on

The chosen component for the dimensions of the variable: "Compliance with the environmental regulations" presents several aspects that should offer a global vision on the problem of environmental regulations. Therefore, in the development of the variable, the essential connection is the starting point: the observance of the legal environmental regulations, towards the micro: the practical implications of observing the regulations and requirements of the ISO 14001 standard, more concretely the dynamics of the quantification regarding the impact induced on the environment as an effect of the performed activities.

The specialty literature clearly presents by the work of several authors who approached this issue that the pressure exercised by the legal environmental regulations is an extremely important factor that determines the change of the activities and environmental actions performed at the organisations' level (Henriques and Sadorsky, 1999; Hart, 1995; Khanna and Damon, 1999; Arora and Cason, 1996; Welch *et al.*, 2000; Porter and van der Linde, 1995; Darnall, 2001, 2003; Lupu *et al.*, 2006; Schoffman and Tordini, 2000; Zobel and Burman, 2004); this change is approached in steps and structured through the implementation of an Environmental Management System, and through the concrete integration at the level of general management.

From what we have previously presented, it is obvious why the variable "Compliance with the environmental regulations" was chosen in this research work as an integral part of the variables set that characterises the implementation quality of the Environmental Management System.

*** For the variable: "Environmental financial performance"**, four dimensions were taken into account, as follows in Table 21.

Table 21 : The variable "Environmental financial performance"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONNAIRE
I.3.	„Environmental financial performance" **(QUESTIONNAIRE ITEMS: I.43 – I.51)**	I.3.1. The (a. operational and b. capital) costs associated to the environmental aspects corresponding to the performed activities	a. the relation between the legislation in force and the activities performed by the organisation; b. the relation between the costs and the implementation of a Environmental management system; c. the existence of a set of financial performance indicators regarding the environment, , and so on
		I.3.2. The research and development funds associated with environment management (for various environmental projects)	a. the existence of environmental research activities at the level of the organisation; b. aspects of environmental knowledge management; c. the orientation of the organisation towards pollution minimisation; d. the carrying out at the organisation's level of projects financed from various sources.
		I.3.3. The legal liability associated to the financial management corresponding to the environmental management (for various environmental projects)	a. the connection between the non-compliance with the environmental responsibilities and the good management of the financing of the budgets/ programmes/ environmental projects.
		I.3.4. The environmental benefits (direct and indirect benefits)	a. the orientation of various processes at the organisation's level; b. the purpose of the activities performed at the organisation's level , and so on

The environmental financial performance at the organisation's level represents an extremely important component of the environmental performance because it approaches the operational and capital costs associated to the activities performed, the funds managed in environmental projects performed at an organisation's level, the way in which the legal liability of managing this type of funds is approached and not least, the various environmental benefits that could be obtained (Lupu *et al.*, 2006).

We can consider that this variable which describes the performance of managing this type of funds determines in a direct manner the operational environmental performance and not only (the investments made at the organisation's level/ the good management of the financial resource allocated for the environmental issues/ the

legal liability in managing the financial resources) (Klassen and Whybark, 1999) – therefore it was chosen as representative for this study.

*** For the variable: "Environmental operational performance"**, eight dimensions were taken into account, as follows in Table 22.

Table 22 : The variable "Environmental operational performance"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONNAIRE
I.4.	" Environmental operational performance" **(QUESTIONNAIRE ITEMS: I.43 – I.51)**	I.4.1. reported to the materials	a. recycling/ reusing the materials at the level of the organisation; b. the connection between the environmental benefits and the Environmental management system; c. the relation between the used water set free in the natural emissary and the competent institutions that set fines for exceeding the maximum allowed quote; d. the reuse of the raw materials at the level of the organisation, , and so on
		I.4.2. reported to the services (by third parties) that support the organisation's activities	a. the connection between the organisation and the suppliers that use recycled materials / reused materials in the production process; b. the attitude of the organisation with respect to dangerous materials; c. the use as a criterion at the level of the organisation in choosing the business partners for the waste generated by them, , and so on
		I.4.3. reported to the used energy	a. the analyses performed by an organisation with respect to the used energy in a certain time period (e.g. in a year/ in a trimester/ in a month); b. the quantitative level of used energy (for each type of energy used); c. the importance given by the organisation to the quantitative level of used energy (by activity/ product/ service/ client), , and so on
		I.4.4. reported to the fixed assets and equipment	a. the relation between the operation of the equipment at the level of the organisation and the impact induced directly/ indirectly on the environment; b. the preventive maintenance of the equipment; c. the location of the organisation, , and so on
		I.4.5. reported to the product/ service/ supply process	a. the level/ type of fuels used in the organisation in order to supply products/ services to clients.
		I.4.6. reported to products	a. the use of recycled products; b. the orientation of processes (the analysis of the lifecycle of a product); c. reusing products in the production process, , and so on

	I.4.7. reported to waste	a. the environmental authorities for waste; b. the level of waste for each unit of product obtained; c. the total waste level for the organisation's activities, , and so on
	I.4.8. reported to emissions	a. the frequency of the measurements performed for the noise existent at the level of the organisation's location; b. the relation between the polluting emissions (in the AIR / WATER / GROUND) specific to the activities performed at the level of the organisation and retechnologisation; c. the relation between the level of emissions resulting per product / service unit and the legislation in force, , and so on

The environmental operational performance is defined differently by authors in scientific articles, being qualitatively analysed from several points of view. Despite these, when analysing the operational environmental performance, in the specialty literature there are two categories: (a.) the first category approaches the concept by means of the performance indicators that involve the resources used, the resulting waste, the emissions, the water consumption, and so on – concrete aspects from ISO 14001/ 14031; (b.) the second category defines the operational performance as being the expression of different environmental benefits (Nawrocka and Parker, 2009).

Taking into account the fact that the environmental performance of the organisation, managed through the Environmental management system, is the "engine" that pushes the organisation towards sustainability, it is absolutely necessary, as the authors Nawrocka şi Parker (2009) mention, to approach the quality of the implementation and integration of the Environmental management system through the perspective of the influence of various internal factors in the organisation, but also through external factors, because an independent evaluation of the internal quality of the system is just a temporary finding.

The environmental operational performance, as the "means" of the Environmental management system, plays an essential role for organisations because it is direct and positive (Christmann, 2000; Hart and Ahuja, 1996; Klassen and McLaughlin, 1996; Judge and Douglas, 1998; Al-Tuwaijri *et al.*, 2004; Sharma and Vredenburg, 1998; Melnyk *et al.*, 2003; De Burgos and Céspedes, 2001; King and Lenox, 2002; Wahba, 2008; Heras-Saizarbitoria *et al.*, 2010) or negatively connected (Khanna and Damon, 1999; Hamilton, 1995; Cordeiro and Sarkis, 1997; Link and Naveh, 2006; Gilley *et al.*, 2000; Wagner *et al.*, 2002; Watson *et al.*, 2004; González-Benito and González-Benito, 2005; Canon and Garcés, 2006; Menguc and Ozanne, 2005; Heras-Saizarbitoria *et al.*, 2010; Wagner, 2005), strongly or weakly, to their financial performance (certainly together with other environmental practices, like those from the category: planning and organisation or/ and communication (Gonzalez-Benito and Gonzalez-Benito, 2005)).

The variable "environmental operational performance" can be considered to represent the most important dynamic coordinate of the Environmental management system – an expression of the implementation quality of this system, and it is the result of a series of aspects at the level of the organisations.

The integration, development and routinisation (seen as a positive aspect) of such environmental operational practices, measured through the operational environmental performance, should represent for organisations a

key progress factor in what concerns the environmental management and not only, and should play an extremely important role in quantifying the general performance of the organisations.
Due to the extremely important role of the environmental operational performance at the level of the Environmental management system, the investigation of this variable deserves to be studied from all points of view and undoubtedly concerning all factors that influence it.

*** For the variable: "The relationship with various external entities"**, three dimensions were taken into account, as follows in Table 23.

Table 23 : The variable "The relationship with various external entities"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONAIRE
I.5.	„The relationship with various external entities" **(QUESTIONNAIRE ITEMS: I.79 – I.83)**	I.5.1. The relation with the state institutions that monitor the compliance with the environmental regulations	a. the connection with the competent institutions in the environmental issue (Environmental Protection Agency/ Environmental Guard, and so on).
		I.5.2. The relation of the organisation with the local community	a. the organisation's involvement in the community projects; b. the source of the human resource at the organisation's level; c. performing at the organisation's level the various educational actions (student internship).
		I.5.3. The relation of the organisation with the interested parties (the internal/ external stakeholders)	a. the interest balance related to the environmental issues between the shareholders and/ or the top management of the organisation and the external stakeholders.

The variable "The relationship with various external entities" was chosen because, through the dimensions taken into account, it reflects indirectly the mainly external effects of implementing an Environmental management system. As an internal development of the variable, the following aspects are followed: (a.) the degree of the connection between the organisation and the competent institutions in the environmental issues (the Environmental Protection Agency/ Environmental Guard), (b.) the organisation's involvement in various projects that are linked to the local community, (c.) the interest balance in the environmental issues between the shareholders and/ or the top management of the organisation and the external stakeholders.
The external entities can be considered to be that component named "social pressure" in the specialty literature that influences the organisation in performing various environmental actions (Darnall, 2001; Welch *et al.*, 2000; Hoffman, 2000). This is why these entities are the first that notice a dysfunction of the implementation and operation of an Environmental management system, and that indirectly provide information about the implementation quality of this system.

*** For the variable: "The relation between the organizational (organisation's) activities and the state of the environment"**, six dimensions were considered, as follows in Table 24.

Table 24 : The variable "The relation between the organizational (organisation's) activities and the state of the environment"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONNAIRE
I.6.	"The relation between the organizational (organisation's) activities and the state of the environment" **(QUESTIONNAIRE ITEMS: I.84 - I.96)**	I.6.1. The quality (state) of the environmental factor – AIR	a. the frequency of the measurements regarding the noise at the level of the organisation's location; b. the frequency of the measurements regarding air emissions at the level of the activities performed by the organisation; c. the connection between the modernisation of some tools and the relation with the state environmental authorities.
		I.6.2. The quality (state) of the environmental factor – WATER	a. the frequency of the measurements regarding the water emissions of polluting substances at the level of the activities performed by the organisation; b. the frequency of the monitoring of all variables regarding the water released into the emissary (for example, temperature).
		I.6.3. The quality (state) of the environmental factor – GROUND	a. the frequency with which the measurements regarding the release into the ground of polluting substances are performed at the organisation's level; b. the monitoring frequency of all ground variables as a result of performing the organisation's activities (for example, the erosion degree of the ground surface at the location of the organisation).
		I.6.4. The relation organisation – human population	a. the connection between the location of the organisation and the demographic increase / decrease of the local community.
		I.6.5. The relation organisation – flora	a. the variable monitoring frequency for specific species from the locally defined area in the vicinity of the organisation (e.g. the quality of the vegetation); b. the connection between the activities of the organisation and the disappearance of some species belonging to the local flora.
		I.6.6. The relation organisation – fauna	a. the variable monitoring frequency for the specific species from the locally defined area in the vicinity of the organisation (e.g. the quality of the habitat); b. the connection between the activities of the organisation and the disappearance of some species belonging to the local fauna.

The development of this variable mainly took into account from the point of view of its dimensions just the main environmental factors (air/ water/ ground) managed by an Environmental management system wich is

implemented at the level of an organisation, plus the effects of these environmental factors concretised in the relations: organisation – human population/ flora/ fauna.

In the specialty literature, the environmental factors (aspects) are considered by authors that performed concrete research in this domain as being the most important elements for the Environmental management system (Zobel and Burman, 2004; Lupu *et al.*, 2006), some authors reaching the point where they characterise these as representing "the most important part of the standard (ISO 14001)" (Whitelaw, 1997).

At the same time, we find in the mentioned specialty literature that the environmental aspects are confusing for organisations, being the most problematic part in implementing an Environmental management system. The organisations have great difficulties in interpreting the definition of environmental aspects provided in the ISO 14001 standard (Zobel and Burman, 2004; Cascio *et al.*, 1996; Schoffman and Tordini, 2000; Woodside *et al.*, 1998).

Irrespective of whether the environmental aspects are associated to main processes performed at the organizations' level (Schoffman and Tordini, 2000; Sayre, 1996), or to the sub-processes of the main processes (Roberts and Robinson, 1998) or whether they are associated to legal regulations (Schoffman and Tordini, 2000), it is important that they reflect, both through the quantification, as well as through the effects highlighted by the relations between the organisation and the human population/ flora/ fauna, the implementation quality of the Environmental management system.

3.1.4.2. Variables Set no. 2 for "organisation orientation to environmental issue and implicitly in the Environmental management system implementation and integration"

In terms of the second set of variables, the following component was proposed for each variable taken into account separately, as follows:

*** For the variable: "Environmental strategic leadership"**, four dimensions have been taken into account, as follows in Table 25.

Table 25 : The variable "Environmental strategic leadership"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONNAIRE
II.1.	"Environmental strategic leadership" **(QUESTIONNAIRE ITEMS: II.1 – II.8)**	II.1.1. The environmental vision of the organisation II.1.2. The "flexibility" of the organisational structure	a. the clarity with which the environmental vision of the organisation is established and expressed. a. the dynamics of the organisational structure change process (time period/ department establishment or disestablishment); b. the flexibility of internal organisational regulations (e.g. Organization's regulation regarding it's organization and functioning - ROF, Organization's regulation regarding it's internal organization - ROI, others).

	II.1.3. The organisation's environmental objectives and targets	a. the clarity with which the environmental objectives and targets of the organisation are established and expressed; b. the relation between the environmental objectives and targets of the organisation and the main organizational objectives and targets.
	II.1.4. Analysis and Evaluation	a. the periodicity of the auditing processes of all internal systems at the level of the organisation; b. the relation between the informations obtained from the Environmental management system audit and its usage in order to improve the functioning of this type of system; c. the periodicity of the evaluations and analyses of the environmental performance.

The development of the variable "Environmental strategic leadership" took into account for the chosen dimensions, by adapting, from the main objectives of the strategic leadership classification described at a general level by Stephen Covey (1996) and presented by Aslan *et al.*, (2011), as well from the audit's classification structure of the organisational capacity for strategic leadership, elaborated by Wachira – GeSCI (2009). The first objective presented by Covey focuses on the vision of an organisation, from which derives the development of the dimension <environmental vision>; the section objective concerns (a.) the organisational structure and its capacity in easily adapting to change, plus (b.) various aspects of the systems at the level of the organisation, from this objective resulting the dimensions <the "flexibility" of the organizational structure> and <The organization's environmental objectives and targets>; and the third objective indicates the increase of productivity, which generates the last proposed dimension <analysis and evaluation>.

The dimensions of this variable have been chosen and developed taking into account only the observational aspects, mainly the existence and orientation of these towards the environmental management issue. Thereby (a.) the existence and clarity of expressing the environmental vision can indirectly denote the support or opposition of the top management in various environmental actions; (b.) the flexibility of the organisational structure expresses endurance to change and, therefore, the efficiency with which certain environmental practices that represent the result of implementing an Environmental management system can be implemented at the level of an organisation; (c.) the way in which the environmental objectives and targets are developed and communicated (Daily *et al.*, 2003, 2007; Daily and Huang, 2001; Govindarajulu and Daily, 2004), plus their connection with the general objectives and targets, can present indirectly the way in which the management controls the environmental issues and how integrated (or not) an Environmental management system is; (d.) the analysis and evaluation denotes the level at which the organisation follows the environmental practices and, therefore, the Environmental management system continues to follow the organisation's needs. This dimension takes into account the performed audits and the way in which the utility of the information obtained from these audits is perceived. The internal environmental audits should generally analyse the following aspects: the relation between the currently obtained information and the information from previous audits, the up-to-date degree of the environmental objectives and targets, the new processes or technologies used and, therefore, the continual improvement process (Rezaee and Elam, 2000; Chin and Pun, 1999; Rondinelli and Vastag, 2000; Aboulnaga, 1998; Strachan *et al.*, 2003).

Taking into account what was previously mentioned, we may conclude that the choice of the variable and the construction of its dimensions represent an integral part of the variables set that describe the orientation of the organisation on the environmental issues.

*** For the variable: "Environmental management of financial resources",** two dimensions have been taken into account, as follows in Table 26.

Table 26 : The variable "Environmental management of financial resources"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONNAIRE
II.2.	„Environmental management of financial resources" **(QUESTIONNAIRE ITEMS: II.9 – II.11)**	II.2.1. Budget allocation (for environmental issues)	a. the existence of a budgetary allocation for various environmental activities; b. the connection between the allocation level of the financial resources for the environment and the actual requirements.
		II.2.2. Attracting financial resources (for various environmental activities)	a. the existence of actions meant to access funds for various environmental projects.

The activities performed at the organisations' level have as objectives the production of goods and/ or services, but the organisations must not forget the surrounding environmental component with which they interact throughout this process (Lupu, 2008; Herghiligiu *et al.*, 2012.b.). This relation is managed by organisations through the Environmental Management System; as a result of the management process, the Environmental Management System provides the integration and absorption (routinisation) of some environmental practices, practices that undoubtedly must be financially supported.

Taking into account the aspects that were previously mentioned, the variable "Environmental management of financial resources" tries through its dimensions (the budget allocation for environmental issues – as a level of allocation and as a ratio between the actual needs and the budgetary allocation/ the attraction of financial resources for various environmental activities) to determine to what extent the organisation pays the proper "attention" to this coordinate – namely the ambiental environment; it denotes more concretely "the organisation orientation on the environmental issue and, implicitly, in the EMS implementation and integration".

*** For the variable: "Human resource management in environmental management",** four dimensions have been taken into account, as follows in Table 27.

Table 27 : The variable "Human resource management in environmental management"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONNAIRE

II.3.	"Human resource management in environmental management" **QUESTIONNAIRE ITEMS: II.12 – II.20)**	II.3.1. The personnel involved in environmental issues	a. the specialisations/ environmental training sessions (the opportunities offered by the organisation); b. the trust level among the employees from the organisation; c. aspects regarding the environmental knowledge management; d. the environmental commitment of the employees.
		II.3.2.The environmental responsibilities	a. the general orientation of the organisation management to the environmental responsibilities.
		II.3.3.The reward system	a. the relation reward system – environmental performance. b. the fairness level for the work performed in the field of environmental activities.
		II.3.4. The motivation	a. the relation between the employees' motivation – the environmental performance.

The specialty literature presents the human resources (together with the management support, the environmental training sessions, the increase of the employees' responsibility degree, the teamwork, the motivational system, and so on) as a key element in implementing an Environmental Management System (Daily and Huang, 2001; Kaur, 2011; Sammalisto and Brorson, 2008).

Training sessions and/ or environmental specialisations, the first dimension chosen at the level of this variable, can play an important role because it represents the method through which the organisational capacity is developed and it increases the level of environmental knowledge of the personnel involved in such programmes (Daily and Huang, 2001). These (training sessions and environmental specialisations) do not play a role only in the initial development of the environmental knowledge of the organisation's employees concerning the implementation of an Environmental management system and in the adoption of certain environmental practices, but also in the curent functioning and maintenance of this system (Balzarova and Castka, 2008).

The commitment of the personnel, or its dedication, in case of environmental management issues, is highlighted in several scientific articles, as being of special importance for the successful implementation and functioning of an Environmental management system (Strachan *et al.*, 2003; Daily and Huang, 2001; Rezaee and Elam, 2000; Kitazawa and Sarkis, 2000; Wee and Quazi, 2005).

Regarding the second dimension of this variable, namely <the environmental responsibilities>, it is extremely important to present the way in which these are established (Lupu *et al.*, 2006); they play an essential role for the environmental activities performed and they undoubtedly show the orientation of the organisation on the implementation and integration of an Environmental management system.

The reward system for diferent environmental activities, is the third dimension of the variable taken into account, irrespective of its structure type (monetary/ non-monetary reward and/ or recognition prizes) (Daily *et al.*, Govindarajulu and Daily, 2004; Râmuş, 2002; Râmuş, 2001) positively influences the environmental decisional system and the active involvement of the employees in the various performed environmental activities, and so on (Daily and Huang, 2001).

Strachan *et al.*, (2003) present the idea that the reward system in environmental management issues is the most important method used to motivate employees (the fourth dimension of the analysed variable) in implementing and integrating an Environmental management system (Kaur, 2011).
From another perspective, the researches performed in the last few years have shown that human resources, together with the factors previously mentioned, are directly correlated to the environmental performance (research performed in case of 473 employees) (Daily *et al.*, 2003, 2007; Kaur, 2011; Fernandez *et al.*, 2003), and highlights once more the extreme importance of the chosen variable.

*** For the variable: "Environmental informational management"**, four dimensions have been taken into account, as follows in Table 28.

Table 28 : The variable "Environmental informational management"

NO.	VARIABLE	DIMENSIONS TAKEN INTO ACCOUNT	ASPECTS FOLLOWED BY THE ITEMS PROPOSED IN THE QUESTIONNAIRE
II.4.	"Environmental informational management" **(QUESTIONNAIRE ITEMS: II.21 – II.50)**	II.4.1. The environmental decisional system	a. aspects of the environmental decisional process (the deciding agent/ the main purpose of the environmental decisions/ the need for decentralising the environmental decisions); b. the management credibility; c. aspects of environmental knowledge management.
		II.4.2. The environmental informational system	a. aspects of the environmental informational system at the level of the organisation (the informational needs/ the information processing degree/ the efficiency of the information/ the competency of the information processing/ the transfer speed of information); b. aspects of environmental knowledge management.
		II.4.3.The environmental knowledge management system	a. the level of understanding the syntagm "environmental knowledge management" at the level of the organisations; b. the level of understanding of the environmental tasks; c. the architecture of the environmental knowledge management system.
		II.4.4. Environmental monitoring and control	a. aspects of monitoring the environmental practices/ environmental performance/ specific documents; b. aspects of environmental knowledge management.

Variable generically called "environmental informational management", it has been constructed taking into account the importance of the chosen dimensions, dimensions which directly determine the EMS implementation/ integration quality and thus defines the organisation's orientation regarding the management issues of this kind.

The environmental decision system expresses its essence through the phrase <environmental decision> and the way in which the environmental power is exercised orients positively or negatively the quality of the EMS implementation and integration.

There are many authors in the specialty literature who have attempted at (a.) defining the environmental decision, either by describing its foundation as a relationship between different entities (Srinivas, 2011), or by describing the process (as a component) and description of possible impacts on the environment (Ewing, 2003; Herghiligiu *et al*., 2012.b.) even by describing what the issues of the environmental decision involve (Filar and Hauri, 2010), and (b) at describing certain phenomena in the field of environmental decision (Mori, 2010; Mahmoud, 2009, Sigel *et al*., 2010; Zendehdel *et al*., 2010 Appelt *et al*., 2011; Maier, 2008). No matter how the environmental decision is described, defined, analysed, all the above authors agree with the idea that this type of decision has an overwhelming role in the environmental management and in the Environmental management system.

In another way of thoughts, it coud be said that the second dimension for the variable considered in the analysis, namely "environmental information system" is the system that "trades" the environmental information and which through its various features contributes substantially to the foundation of the environmental decision process. This is why the following aspects were taken into consideration: the environmental information necessary/ the processing degree of the environmental information/ the effectiveness of the environmental information/ the authority of the environmental information processing/ the form of distributing the environmental information/ the velocity of the environmental information, and so on, in the construction of this dimension.

The dimension "environmental knowledge management system"[16], together with the prior dimension is an underlying part of the foundation of the environmental decision and plays an important role in the scope and complexity of environmental issues (Herghiligiu and Lupu, 2012.a.; Olsson and Folke, 2001; Cash *et al*., 2003).

Starting from the characterisation of the knowledge management system in an organisation made by Housel and Bell (2001), we define environmental knowledge system[17] as the system that must generate, store, manage, access and internalise, for future use, the environmental knowledge level within an organization. Thus, we can only say that, like the environmental information system, the environmental knowledge system plays an important role in the implementation of the Environmental management system, and in characterising the orientation of the organisation, positive or negative towards the environmental management issue.

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[16] We must mention that there is a strong connection between environmental knowledge and environmental innovation (dimension of the variable "organization's orientation to the environmental innovation") (Plessis, 2007).

[17] If we focus on the environmental knowledge management system, it is also necessary to define the management of environmental knowledge as it follows: Environmental knowledge management brings together all the methods, mechanisms, processes, structures, policies, strategies, people, data and information which have the ability to create, capture, collect, store, query, use and transfer the environmental knowledge with the main aim to improve the environmental impact of the organisation (adapted from Finster et al., 2001) (Herghiligiu and Lupu, 2012.a.).

The last dimension of the variable "Environmental informational management", the <environmental monitoring and the control> presents the organisation's oriantations in monitoring and controlling its environmental practice, its environmental performance and the specific documents (which is the effect of the implementation and integration of an Environmental management system - an idea previously mentioned in the text), in order to control them and thus determine how improvements can be made in different performance conditions (Balzarova *et al*., 2006). It should be noted that this dimension was chosen and constructed because environmental monitoring and control plays a very important role in quantifying and managing the environmental impact of the organisation (Angell and Klassen, 1999 Stuart *et al*., 1999).

To sum up, from those mentioned above, we can very easily deduce why this variable was chosen and why it's dimensions were built like this; it expresses in a clear manner the organisation's orientation towards the environmental issue and the implementation of an Environmental management system in organisations.

*** For the variable: "Systemic-Technological <infrastructure> with impact in the environmental management",** two dimensions were considered as follows in Table 29.

Table 29: The variable:"Systemic-Technological <Infrastructure> impact in environmental management

NR.	VARIABLE	DIMENSIONS CONSIDERED	ISSUES FOLLOWED BY THE ITEMS IN THE QUESTIONNAIRE
II.5.	Systemic-Technological <infrastructure> with impact in environmental management **(QUESTIONNAIRE ITEMS: II.51 – II.56)**	II.5.1.Technological Level (Clear technologies with minimum negative impact on the environment)	a.the type of the manufacturing process at the organisation's level; b.the secondary result of the production process (relates to the quantity of waste / the quantity of emissions); c. relationship between the organisation's orientation towards clean technology (clean) and implementing an environmental management system.
		II.5.2.The existence of other management systems (The existence of Quality Management Systems)	a. existence of the implementation in the organisation of the quality management system (according to ISO 9001); b. relationship between the existence of a quality management system and implementation of an environmental management system (according to ISO 14001).

The variable "Systemic-Technological Infrastructure with impact in the environmental management" starts with the premises that the kind of organization's existing technology significantly contributes to the determination (taking into account the way in wich is managed the organizational orientation to the retooling - if is applicable) (Klassen and Angell, 1998; Angell and Klassen, 1999), contributes significantly to the EMS implementation quality (for the first considerate variable).

The second dimension <the existence of other management systems ("the existence of the Quality management system")> was taken into consideration because there is a connection between the management experience

after ISO 9001 certification and the implementation of an Environmental management system; the existence of a similar management system should bring positive contribution to implementing and integrating the environmental practice.

*** For the Variable "Organization's orientation to the environmental innovation",** one dimension was considered as follows in Table 30.

Table 30 **:** The variable "Organization's orientation to the environmental innovation"

NR.	VARIABLE	DIMENSIONS CONSIDERED	ISSUES FOLLOWED BY THE ITEMS IN THE QUESTIONNAIRE
II.6.	"Organization's orientation to the environmental innovation" **(QUESTIONNAIRE ITEMS: II.57 – II.59)**	II.6.1.Innovation[18] (at Environmental management system level) ->conjunction with items I.46.+I.4	a. frequency of use different techniques to find new ideas for improvement process (for example brainstorming); b. periodicity of organising working groups aiming at improving environmental procedures; c. relationship between feedback of the employees/ managers and real improvement of environmental performance.

The variable "Organization's orientation to the environmental innovation" is based on a collaboration with items I.46 and I.47 (variable "Environmental financial performance") and considers the general orientation towards innovation and to the innovation process in the Environmental management system, of the organisations (methods used/ working groups/ suggestions of the employees).

Technological innovation in environmental issues, in products and processes is mainly aimed at eliminating or reducing the burden of environmental management (Ziegler and Rennings, 2004; Wagner, 2007).

Technological innovation[19] has been found to generate long-term improvements to operational environmental performance (Wagner, 2007) and clean technology reduce various costs in organisations, creates benefits in competition, reduce long-term risk, prevent future changes in legal environmental regulations, decrease the risk of potential fines that could be received from authorised agencies in environmental management issues, and even have a positive impact on financial performance in organisations (Angell and Klassen, 1999).

Specialty literature presents through various studies that there is a link between the implementation of an Environmental management system and the innovation process, and the "factor" that links them is the

[18] Innovation in general can be classified as follows: (a) radical innovation - creating new technologies, (b) technological innovation - or the development of new generations of existing technologies, (c) innovation at product level - or incremental improvement and change, (d) innovation at process level - focusing on the relationship between resources and capabilities (Rainey, 2006).

[19] Environmental technological innovation is related to the conventional understanding of technological innovation, but it is necessary to distinguish between product innovation and process innovation; aspects that define technological innovation are: it must be based on new technological knowledge, it must already be implemented (the result must already exist: new products or new processes implemented in the organisation), and it should bring something new for the organisation (Ziegler and Nogareda, 2009).

organisation's orientation towards innovation – environmental innvovation (Frondel *et al*., 2007, 2008, Ziegler and Rennings, 2004; Naveh *et al*., 2006; Wagner, 2007, 2008; Rehfeld *et al*., 2007; Horbach, 2008; Ziegler and Nogareda, 2009.

Therefore, from the above mentioned we can see the importance of this variable and why it was chosen to be used in these investigations.

*** For the Variable "External environment with direct/ indirect implication in organization's environmental management"** three dimensions were considered as follows in Table 31.

Table 31 : The variable "External environment with direct/ indirect implication in organization's environmental management"

NR.	VARIABLE	DIMENSIONS CONSIDERED	ISSUES FOLLOWED BY THE ITEMS IN THE QUESTIONNAIRE
II.7.	"External environment with direct/ indirect implication in organization's environmental management" **(ITEMS: II.60 – II.74)**	II.7.1 Environmental regulations	a. relationship between environmental regulations and implementation of Environmental management systems.
		II.7.2. Socio-economic context	a. link between the implementation of an Environmental management system and: a1. competing companies certification with ISO 14001/ a2. massive existing on common market of different products from companies certified ISO 14001/ a3. financing priority development orientation (national/ European); b. level of social acceptance of the organisation's activities; c. aspects of environmental knowledge management;
		II.7.3. External stakeholders (and indirectly internal stakeholders)	a. the stakeholders pressure on environmental issues.

Regarding the variable "External environment with direct/ indirect implication in organization's environmental management", we can say that it has been developed to capture different aspects such as (a) the relationship between environmental regulations and implementing an Environmental management system and thus integrate environmental practices (first dimension whose importance has been analysed and highlighted in the literature (Boire, 2011; Arora and Cason, 1996; Welch *et al*., 2000 Darnall, 2001, 2003, Lupu *et al*., 2006; Schoffman and Tordini, 2000, Zobel and Burman, 2004)), (b) the relationship between socio-economic context and the implementation of an Environmental Management System (Christmann and Taylor, 2001; Jiang and Bansal, 2003) (second dimension developed), and (c) the link between external stakeholders and their pressure on organisations to be responsible with the ambiental environment (Buysse and Verbeke, 2003; Eesley and Lenox, 2006; Sarkis *et al*., 2010; Herghiligiu and Lupu, 2012b).

We must mention the idea that large companies (which is also what this research aims at), taking into account the third dimension, it is necessary to specify that they respond to external pressure because they are visible

and integrated in the local community[20] (Jiang and Bansal, 2003), and thus it was necessary to incorporate the external pressure at this variable's level.

In the construction of the items related to the variable's dimensions it was taken into account that this variable examines the orientation degree of organisations in environmental management issues and how this orientation determines environmental management system implementation.

3.1.4.3. Variable Set no. 3 – "general variable"

Regarding the third variables set, the following analysis of each variable was proposed, as follows:

Table 32: General variables

NR.	VARIABLE	DIMENSIONS CONSIDERED	ISSUES FOLLOWED BY THE ITEMS IN THE QUESTIONNAIRE
III.1.	Characteristics of the interviewed **(ITEMS 1-4, 7, 8)**	III.1.1.Study level	☐ university/ ☐ master/ ☐ doctorate/ ☐ postdoctorate
		III.1.2.Age	☐ 18/ ☐ 25/ ☐ 26/ ☐ 35/ ☐ 36/ ☐ 45/ ☐ 46/ ☐ 55/ ☐ 56/ ☐ 65
		III.1.3.Sex	☐ F/ ☐ M
		III.1.4.Hierarchical position in the organisation	Management position: ☐ top management/ ☐ middle management/ ☐ executive/ ☐ research/ ☐ academic
		III.1.5.Management knowledge of the interviewed	☐ 0-5 years/ ☐ 5-10 years / ☐ 10-15 years / ☐ 15-20 years / ☐ 20-25 years / ☐ 25-30 years / ☐ > 30 years
		III.1.6.Level of environmental management skills of the interviewed	☐ 0-5 years / ☐ 5-10 years / ☐ 10-15 years / ☐ 15-20 years / ☐ 20-25 years / ☐ 25-30 years / ☐ > 30 years
III.2.	General features of the organisation **(ITEMS: 5, 6, 9, I.97)**	III.2.1.The organisation's field of activity	☐ industrial/ ☐ agriculture/ ☐ customer service/ ☐ commercial/ ☐ nonprofit (ONG)/ ☐ university
		III.2.2.The size of the organisation	☐ Microenterprise (1-10 employees)/ ☐ Small firm (11-25 employees)/ ☐ Medium firm (26-50 employees)/ ☐ Large firm (51–250 employees)/ ☐ Very large firm (>250 employees)
		III.2.3.The existence of an environmental management system in the organisation	☐ YES/ ☐ NO/ ☐ DON'T KNOW
		III.2.4.How long the organisation has been involved in environmental activities	☐ 0-1years /☐ 1-3 years/ ☐ 3-5 years/ ☐ 5-7 years/ ☐ 7-10 years/ ☐ > 10 years

[20] In specialty literature we find the idea that implementing an Environmental Management System enhances the relationship with the local comunity; another subject in the construction of the variable's dimension (Jiang and Bansal, 2003)

In order to build the general variables only a few aspects of the interviewee characteristics and some aspects that reflect the characteristics of the (Table 32) were taken into consideration, these variables were chosen to describe the sample and to serve various statistical analyses (such as the control variables).

3.2. The Results of the Research. Quantitative and Qualitative Analysis of Collected Data

The main objective of the analysis of the collected data (responses frequently levels also presented detailed in Annex no.14) is to establish a specific relationship between various factors and aspects considered the most important and to examine the nature of this relationship.

The purpose of the analysis is to discover the causes of the links between factors that determine (characteristic to the organisation orientation to environmental issue) and the issues determined (that characterises the implementation quality of the environmental management system).

3.2.1. Testing for internal consistency construct confidence (the validation of the research tool)

In order to test the internal consistency appropriate to the constructs used in the research instrument, the Cronbach Alpha index level was applied (Jaba and Gram, 2004).

A. For the set of variables **"consequences of the Environmental management system implementation/ integration at the organisation level"**

Table 33 : Testing the internal consistency regarding the specific constructs for "the consequences of implementing/ integrating an EMS on the organisation's level" – the quality of implementing/ integrating an EMS

No.	Construct	Average	Standard medium deviation	Cronbach Alpha index
1.	I.1 Implementation of environmental policies and programmess	5.03	0.55	0.734
2.	I.2. Compliance with environmental regulations	5.20	0.6	0.65
3.	I.3. Environmental financial performance	3.80	0.99	0.729
4.	I.4. Environmental operational performance	3.99	0.53	0.595
5.	I.5. The relationship with various external entities	4.13	0.82	0.61
6.	I.6. The relationship between the activities of the organisation and the state of the environment	3.82	0.97	0.832

After analysing the six variables/ major dimensions that define the component on "consequences of the Environmental management system implementation/ integration at the organisation level" (Annex 3), we can see that the scales that measure the implementation of environmental policies and programmes (0.734), compliance with environmental regulations (0.65), average financial performance (0.729), environmental operating performance (0.595), relationship with various external entities (0.61) and the relationship between

the organisation's activities and the environment (0.832), the Cronbach Alpha index values indicate the presence of a high internal consistency of the scales (Table 33).

B. For the set of the variable **„organizations orientation to environmental issues and implicitly in the EMS implementation and integration"**

Table 34 : Testing the internal consistency regarding the specific constructs for „organizations orientation to environmental issues and implicitly in the EMS implementation and integration"

No.	Construct	Average	Standard medium deviation	Cronbach Alpha index
1.	II.1. Environmental strategic leadership	4.95	0.63	0.671
2.	II.2. Environmental management of financial resources	3.95	1.56	0.717
3.	II.3. Human resource management in environmental management	4.61	1.14	0.86
4.	II.4. Environmental informational management	5.11	0.74	0.9
5.	II.5. Systemic-technological "infrastructure" with impact on environmental management (or issue)	4.68	0.61	0.57
6.	II.6. Organization's orientation to the environmental innovation	4.55	1.65	0.904
7.	II.7. External environment with direct/ indirect implication in organization's environmental management	4.41	0.72	0.736

After analysing the seven variables/ dimensions that define the major component related to "the organisation's focus on management and hence the implementation of an EMS" (Annex 3), we see that the scales that measure the environmental management of financial resources (0.717), human resource management in environmental management issues (0.86), environmental information management (0.9), orientation towards the organisation's environmental innovation (0.904) and external environment with direct / indirect environmental management organisation (0.736) have Cronbach Alpha index values which correspond to the acceptable level of 0.7, indicating the presence of internal consistency of the analysed scales (Table 34).

3.2.2. Testing the normality of the variables' distribution

To test the hypothesis of normality, the non-parametric test Kolmogorov-Smirnov-Lilliefors was applied (Jaba and Gram, 2004).

The null hypothesis

H0: The score of each variable I.1. - I.6. (Table 5.18) follows a normal distribution law $\approx$ N (0. $\sigma^2{}_\varepsilon$).

The alternative hypothesis

H1: The score of each variable I.1. – I.6. (Table 5.18) follows a distribution role different from the normal one $\neq$ N (0. $\sigma^2{}_\varepsilon$).

The decision rule

If Sig > α then H0 is accepted. If not, the H1 alternative hypothesis is accepted.

Table 35 : Notes (N_t) used for the involved variables

N_t	**Consequences of the Environmental management system implementation/ integration at the organisation level** (dependent variables)	N_t	**Organizations orientation to environmental issues and implicitly in the EMS implementation and integration** (independent variables)
I.1	Implementation of environmental policies and programs	**II.1.**	Environmental strategic leadership
I.2	Compliance with environmental regulations	**II.2.**	Environmental management of financial resources
I.3	Financial performance environment	**II.3.**	Human resource management in environmental management
I.4	Environmental operational performance	**II.4.**	Environmental informational management
I.5	Relationship with various external entities	**II.5.**	Systemic-technological "infrastructure" with impact on environmental management (or issue)
I.6	Relationship between the activities of the organisation and the state of the environment	**II.6.**	Organization's orientation to the environmental innovation
		II.7.	External environment with direct/ indirect implication in organization's environmental management

A. For the set of variables **"consequences of the Environmental management system implementation/ integration at the organisation level"**

Table 36 : Testing the normality of the values' distribution of the study variables

One-Sample Kolmogorov-Smirnov Test

		I.1	I.2	I.3	I.4	I.5	I.6
N		171	171	171	171	171	171
Normal Parameters[a,,b]	Mean	5.0332	5.2098	3.8012	3.9963	4.1368	3.8255
	Std. Deviation	.55374	.60279	.99002	.53085	.82133	.97543
Most Extreme Differences	Absolute	.073	.141	.115	.146	.191	.157
	Positive	.073	.062	.077	.129	.110	.106
	Negative	-.064	-.141	-.115	-.146	-.191	-.157
Kolmogorov-Smirnov Z		.958	1.844	1.510	1.903	2.504	2.057
Asymp. Sig. (2-tailed)		**.318**	**.002**	**.021**	**.001**	**.000**	**.000**

a. Test distribution is normal.

b. Calculated from data.

From Table 36 we can note that the value of Sig. is greater than 0.05, only for the variable measuring the *Implementation of environmental policies and programmes* (0,318), all other variables recording a score below the reference value of 0.05, therefore, with a 95% confidence we can assert that the normality hypothesis of the data is confirmed for the variable - *Implementation of environmental policies and programs* (sig = 0.318) and invalidated for the variables - *Compliance with environmental regulations* (sig = 0.002), *Environmental financial*

performance (sig = 0.021), *Environmental operational performance* (sig = 0.001), *The relationship with various external entities* (sig = 0.000), and for the variable *Relationship between the activities of the organisation and the state of the environment* (sig = 0.000).

Therefore, in order to apply the correlation analysis, Spearman[21] nonparametric tests were used (Appendix 4).

B. For the variables set **„organizations orientation to environmental issues and implicitly in the EMS implementation and integration"**

Table 37: Testing the normality distribution values of the studied variables

One-Sample Kolmogorov-Smirnov Test

		II.1	II.2	II.3	II.4	II.5	II.6	II.7
N		171	171	171	171	171	171	171
Normal Parameters[a,,b]	Mean	4.9598	3.9591	4.6121	5.1147	4.6834	4.5556	4.4172
	Std. Deviation	.63197	1.56481	1.14531	.74216	.61177	1.65288	.72532
Most Extreme Differences	Absolute	.105	.133	.211	.120	.177	.151	.159
	Positive	.074	.129	.211	.058	.104	.119	.159
	Negative	-.105	-.133	-.156	-.120	-.177	-.151	-.106
Kolmogorov-Smirnov Z		1.375	1.746	2.763	1.574	2.315	1.979	2.082
Asymp. Sig. (2-tailed)		**.046**	**.005**	**.000**	**.014**	**.000**	**.001**	**.000**

a. Test distribution is normal.

b. Calculated from data.

From Table 37 it can be observe that the Sig. value for all specific variabes of „organizations orientation to environmental issues and implicitly in the EMS implementation and integration" was below the reference value of 0.05, therefore with a 95% confidence. So it can be conclude that the normality assumption of the variables' values was invalidated; fact that requires the use of nonparametric tests (Appendix 4).

[21] Nonparametric Spearman correlations were chosen at the expense of parametric Pearson because the distribution of the variable values correlated afterwards are not normal distributions. The procedure followed in SPSS: Analyse/ Correlate/ Bivariate/ select the variable for correlation and Spearman correlation coefficient is chosen. In addition, the option was checked to indicate significant correlations indicated with ** or *, depending on the level of confidence associated with 99% or 95% (Jaba and Gram, 2004).

3.2.3. Correlation analysis between specific factors for the organisation's orientation on the environmental issue and the variables which define the quality of implementing/integrating an EMS

Table 38 : Correlations between the variables of the model research

Corelations	I.1.		I.2.		I.3.		I.4.		I.5.		I.6.	
	R	R^2	R	R^2	R	R^2	R	R^2	R	R^2	R	R^2
II.1.	0,460**	21.1%	0.508**	25.8%	0.561**	31.4%	0.396**	15.6%	0.452**	20.4%	**0.659****	43,4%
II.2.	0,722**	52.1%	0.378**	14.2%	**0.813****	66%	0.105	-	0.530**	28%	**0.841****	70,7%
II.3.	0,539**	29%	0.501**	25%	**0.593****	35%	0.097	-	**0.682****	46.5%	**0.636****	40,4%
II.4.	0,732**	53.5%	0.667**	44.4%	0.472**	22.2%	-0.006	-	0.567**	32.1%	**0.744****	55,3%
II.5.	0,216**	4.6%	0.302**	9%	0.221**	4.8%	0.399**	16%	0.501**	25.1%	0.009	-
II.6.	0,479**	23%	0.498**	24.8%	0.432**	18.6%	-0.124	-	0.294**	8.6%	**0.642****	41,2%
II.7.	0,030	-	-0.028	-	0.213**	4.5%	0.076	-	0.199**	3.9%	0.075	-

** - Confidence level of 99%
* - Confidence level of 95%

A. According to Table 38, regarding the link between the **Environmental strategic leadership** factor (II.1.) and the specific variable for the implementation/ integration quality of the EMS - *The relationship between the organisation's activities and the state of the environment* (I.6.) it can be can observe a significant link to a confidence level of 99%, which is highly intense, indicating a positive linear relationship between the two variables (r = 0.659). Also, looking at the determination coefficient R^2 between the two variables above, we can conclude that the 43.4% of the variation in the quality aspect for *The relationship between the organisation's activities and the state of the environment* is determined by the *Environmental strategic leadership* factor. The link between "Environmental strategic leadership" (II.1.) and the variable specific to the implementation/ integration quality of the EMS - *Environmental operational performance* can be characterised as being weak in intensity, but also indicating the positive linear relationship between the two variables (r = 0.396) (Figure 19) (Appendix 4).

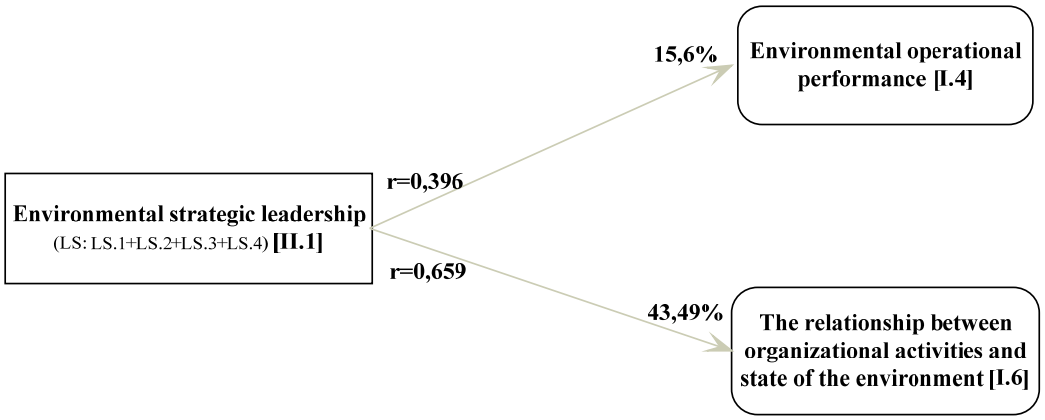


Figure 19 : The most representative relations between "Environmental strategic leadership" variable and the EMS quality aspects

In qualitative terms, for the first case, namely the relationship between the variable "Environmental strategic leadership" (the factor variable) and the "Environmental operational performance" variable (Figure 19) it could be said that synergistic combination of the elements that constitute the first variable (the organization's environmental vision, the organizational structure "flexibility",the environmental objectives and targets, and the evaluation and analysis of EMS) determine in a direct but relatively reduced level (15.6%) the organization's environmental operational performance quality. Thus even if (a) would improve and clarify the organization's environmental vision of North-Eastern Romania organizations, and/ or (b) their organizational structure would be more conducive to change associated with the implementation of an EMS, and/ or (c) the enviroenmental objectives and targets should be clearly drafted and would not be confused with other management systems implemented goals, and/ or (d) the EMS internal audit would improve, it would result, in a small percentage, a positive change in the organizations environmental operational performance quality[22]. Concretely it can be notice a formalism at the EMS operation, whether as a result of a low level regarding the enviroenmental aweareness, or as a consequence of the organizations decision to do not to allocate more resources to EMS development than necessary.

In the second case of the relationship between the considerate factor represented by the variable "Environmental strategic leadership" and "The relationship between the organisation's activities and the state of the environment" variable (Figure 19) we can see that is a close relation of determination (43.49%) between the constituent elements of the factor, mentioned above, and the (a) noise monitoring, level of air pollutants emissions, and respectively the modernization possible measures - for air quality, the (b) monitoring level of pollutants in water, monitoring process of the water variables that is released into the environment, respectively the compliance process with the maximum permissible rates on levels of pollutants discharged into the environment – for water quality, (c) monitoring the emission levels of pollutants inside the soil, monitoring soil variables (eg. levels of surface erosion at the site of the organization), and the compliance with environmental regulations concerning soil - soil quality, (d) monitoring the effects on human population as a result of the organization activities, (e) monitoring of the flora variables on the organization site, and (f) monitoring the fauna variables of the organization site. This phenomenon can be considered to be mainly a consequence of the level of environmental regulations that organizations are required to comply, taking into account the qualitative interpretation of the first relationship examined.

B. Regarding the relationship between the **Environmental management of financial resources** factor (II.2.) and specific variables of the implementation/ integration quality of the EMS, it can be see from the above table that there are statistically significant correlations for most couples of variables, except II.2. - I.4.. This enables

[22] constitutive aspects proposed for the variable "environmental operational performance" can be observed in Annex 1

us to conclude that between the *Environmental management of financial resources* factor (II.2.) and the *Environmental operational performance* (I.4.) its no exist a significant statistical link. The strongest connections occur between *Environmental management of financial resources* factors and the aspects of the implementation quality of an EMS - *Environmental financial performance* (I.3.) - R = 0.813, respectively the relationship with *The relationship between organizational activities and state of the environment* (I.6.) - r = 0.841. We thus conclude that among the variables mentioned above there is a very intense bond, direct and positive. By interpreting the determination coefficients, we can see from the above table that *Environmental management of financial resources* factor determines in approximately 66% the quality variation of the I.3. variable, and the quality variation of I.6. variable in 70.7% level (Figure 20) (Appendix 4).

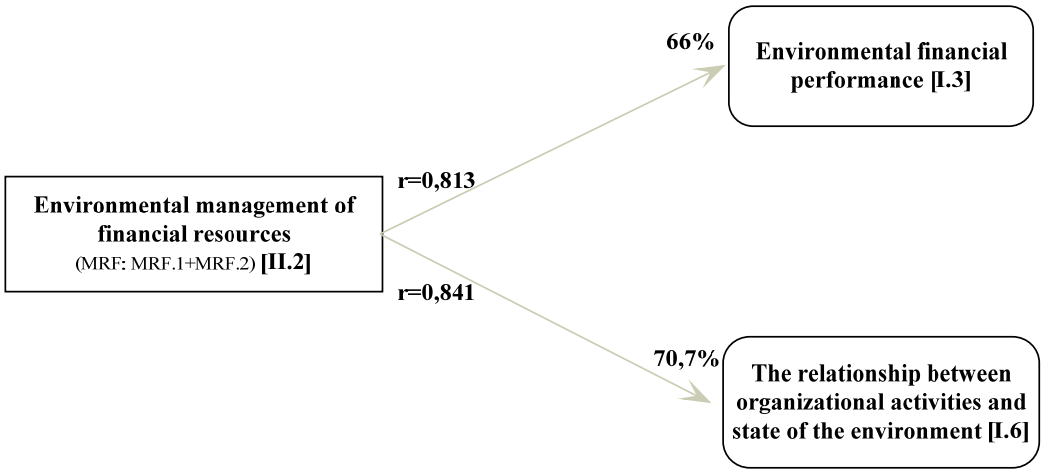


Figure 20 : The most representative relations between "Environmental management of financial resources" variable and the EMS quality aspects

C. Regarding the realationship between the **Human resource management in environmental management** factor (II.3.) and the specific variables of the EMS implementation/ integration quality, it can be seen in Table II.6 that there are statistically significant correlations for most couples of variables, except for II.3. - I.4.. Thus, between the *Human resource management in environmental management* factor and *Environmental operational performance* variable (I.4.) does't exist a significant statistical link. Between factor II.3. and the rest five variables that define the implementation/ integration quality of the EMS, significant links were obtained for a confidence level of 99%, positive and straightforward. Nevertheless the factor II.3. has the strongest influence on the aspects - *The relationship with various external entities* (I.5.) - r = 0.682, respectively with *The relationship between organizational activities and state of the environment* (I.6.) - r = 0.636. In other words by analysing the determination coefficient, the factor II.3. influences at a rate of 46.5% the quality variation of I.5., and in 40.4% the quality variation of I.6. variable. Another statistically significant influence of the factor

II.3. is exerted on the quality aspect of I.3. - *Environmental management of financial resources,* by an average rate of 35% (Figure 21) (Appendix 4).

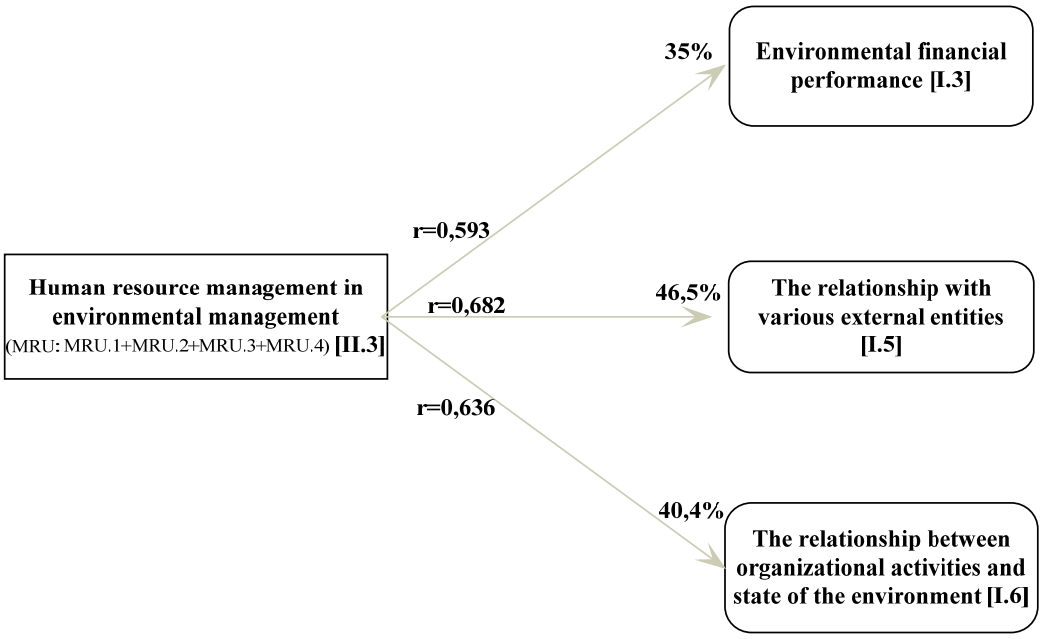


Figure 21 : The most representative relations between "Human resource management in environmental management" variable and the EMS quality aspects

D. The link between the factor **Environmental information management** (II.4.) and the variables that characterizes the EMS implementation/ integration quality is statistically significant for most qualitative aspects except for I.4 - *Environmental operational performance*. By analysing the relationship between II.4. and all the other quality aspects of the EMS, we can conclude that they are positive, direct, of average and above average intensity. The strongest intensity occurs between the *Environmental information management* factor and the qualitative aspects of the *Implementation of environmental policies and programmes* (I.1.) - R = 0.732, respectively with the *The relationship between organizational activities and state of the environment* (I.6.) - R = 0.744. Interpreting the determination coefficients, we can see in Table 38 that the influence of qualitative aspects I.1., respectively I.6. is achieved by the action of the II.4 factor in a proportion of 53.5% and respectily 55.3%. The influence of the *Environmental Information Management* (II.4.) factor it manifests also on the quality variantion of *Compliance with environmental regulations* (I.2.) aspect at a rate of 44.4,% (Figure 22) (Appendix 4).

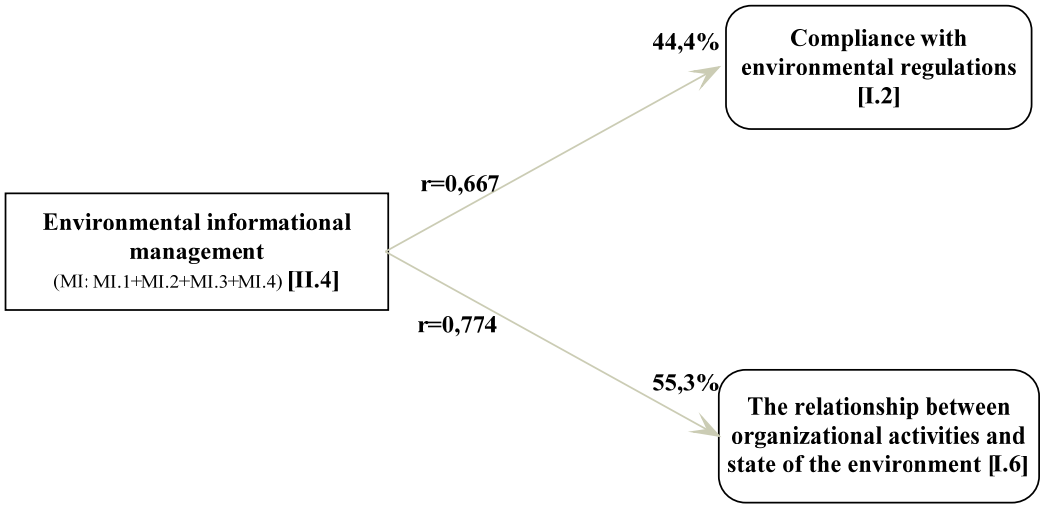


Figure 22 : The most representative relationships between "Environmental Information Management" variable and the quality aspects of the EMS

E. According to Table 38 a significant influence (with 99% confidence) of the factor **Systemic-technological "infrastructure" with impact on environmental management** (II.5.) is exerted on the qualitative aspects related to the EMS implementation/ integration, with the exception of the variable *External environment with direct/ indirect implication in organization's environmental management* (I.6.). Overall, the links are characterised by a direct direction, positive, but of low intensity. The highest intensity occurs between II.5. and I.5 - *The relationship with various external entities,* r = 0.501. Thus the variation of the I.5. quality aspect is determined in proportion of 25.1% by the influence of the factor II.5 (Figure 23) (Appendix 4).

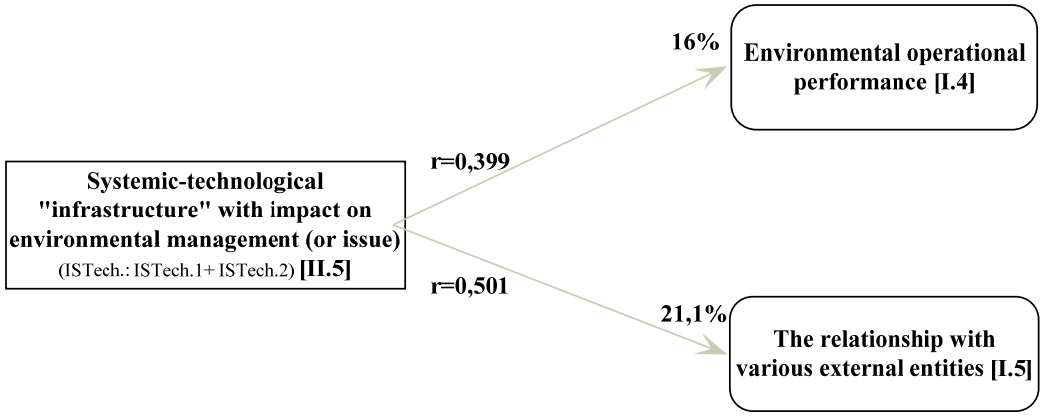


Figure 23 : The most representative relationships between "Systemic-technological "infrastructure" with impact on environmental management" variable and the quality aspects of the EMS

F. The **Organization's orientation to the environmental innovation** factor (II.6.) is significantly correlated with most variables related to the EMS implementation/ integration quality, with the exception of *Environmental operational performance*. The *Organization's orientation to the environmental innovation* does not determine a significant impact on the *Environmental operational performance*. The II.6 factor is strongly correlated with the variable I.6. - *The relationship between organizational activities and state of the environment* (r = 0.642), respectively with I.2 - *Compliance with environmental regulations* (r = 0.498), and I.1. - *Implementation of environmental policies and programmes* (r = 0.479). Therefore, with a 99% confidence it can be conclude that the *Organization's orientation to the environmental innovation* factor causes a significant influence I.2. (24.8%) I.1. (23%) and I.6. (quality determined in proportion of 41.2%) (Figure 24) (Appendix 4).

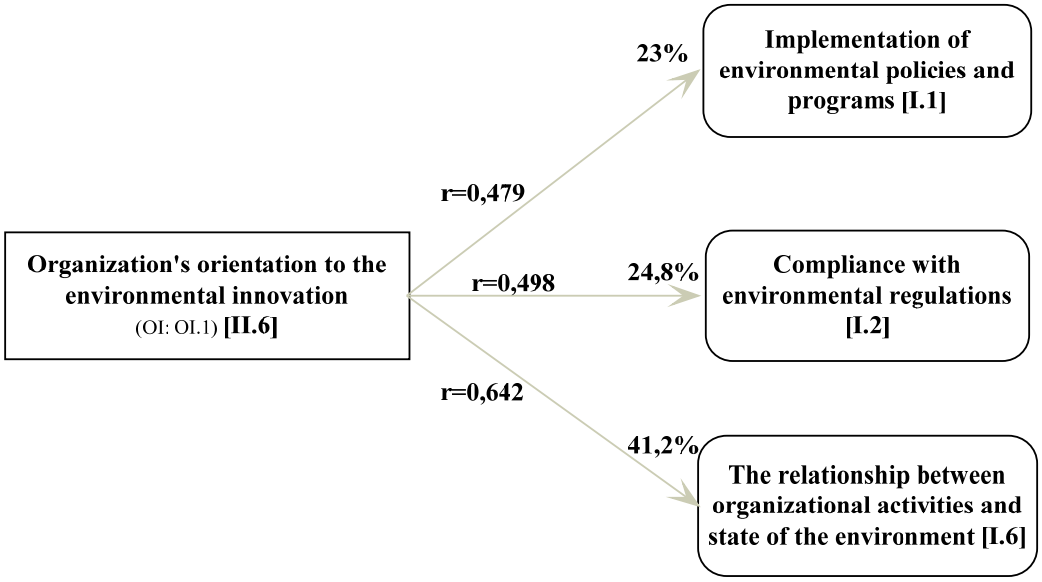


Figure 24 : The most representative relationships between "Organization's orientation to the environmental innovation" variable and the quality aspects of the EMS

Conclusions

The relations: *External environment with direct/ indirect implication in organization's environmental management* (II.7.) - *Environmental financial performance* (I.3.), respectively *External environment with direct/ indirect implication in organization's environmental management* (II.7.) - *Relationship with various external entities* (I.5.), are positive, statistically significant for a confidence level of 99%, but of low intensity. The II.7 factor does not cause a significant influence on other variables specific for the EMS implementation/ integration quality.

By analysing the influence of the „organizations orientation to environmental issues and implicitly in the EMS implementation and integration" over the quality aspect of *Implementing environmental policies and programmes*, it can be observed that the strongest influences are given by the factors *II.2. - Environmental management of financial resources* (52.1%), and the *II.4 - Environmental informational management* (53.5%).

By studying the influence of the „organizations orientation to environmental issues and implicitly in the EMS implementation and integration" factors over the *Compliance with environmental regulations* quality aspect, we can see that the strongest influence is exerted by the *Environmental informational management* (II.4) factor (44, 4%).

By analysing the influence of the „organizations orientation to environmental issues and implicitly in the EMS implementation and integration" factors over the quality aspect of *Environmental financial performance*, we can see that the strongest influence is manifested by the action of the factors *II.2.- Environmental management of financial resources* (66%), *II.3. Human resource management in environmental management* (35%), respectively *II.1. Environmental strategic leadership* (31.4%).

Regarding the influence of „organizations orientation to environmental issues and implicitly in the EMS implementation and integration" over the quality aspect *Environmental operational performance,* we can observe that the only influences are given by the factors *II.1. - Strategic environmental leadership* (15.6%), respectively by *II.5. - Systemic-technological "infrastructure" with impact on environmental management* (16%).

By analysing the influence of „organizations orientation to environmental issues and implicitly in the EMS implementation and integration" over the quality aspect of the *The relationship with various external entities,* we can see that the most significant influences are manifested through the factors *II.3. Human resource management in environmental management (46.5%)* and *II.4 Environmental information management (32.1%).*

By analysing the influence of „organizations orientation to environmental issues and implicitly in the EMS implementation and integration" over the quality aspect of the *The relationship between organizational activities and state of the environment,* we can see that the most significant influences are manifested through the factors *II.2. - Environmental management of financial resources* (70.7%), *II.4. - Environmental information management* (55.3%) and the factor *II.1 - Environmental strategic leadership* (43.4%).

The model developed after the analysis, showing the architecture of all the influences of the variables that describe the „organizations orientation to environmental issues and implicitly in the EMS implementation and integration" and variables that characterized the implementation and integration quality of the EMS can be seen in Figure 25.

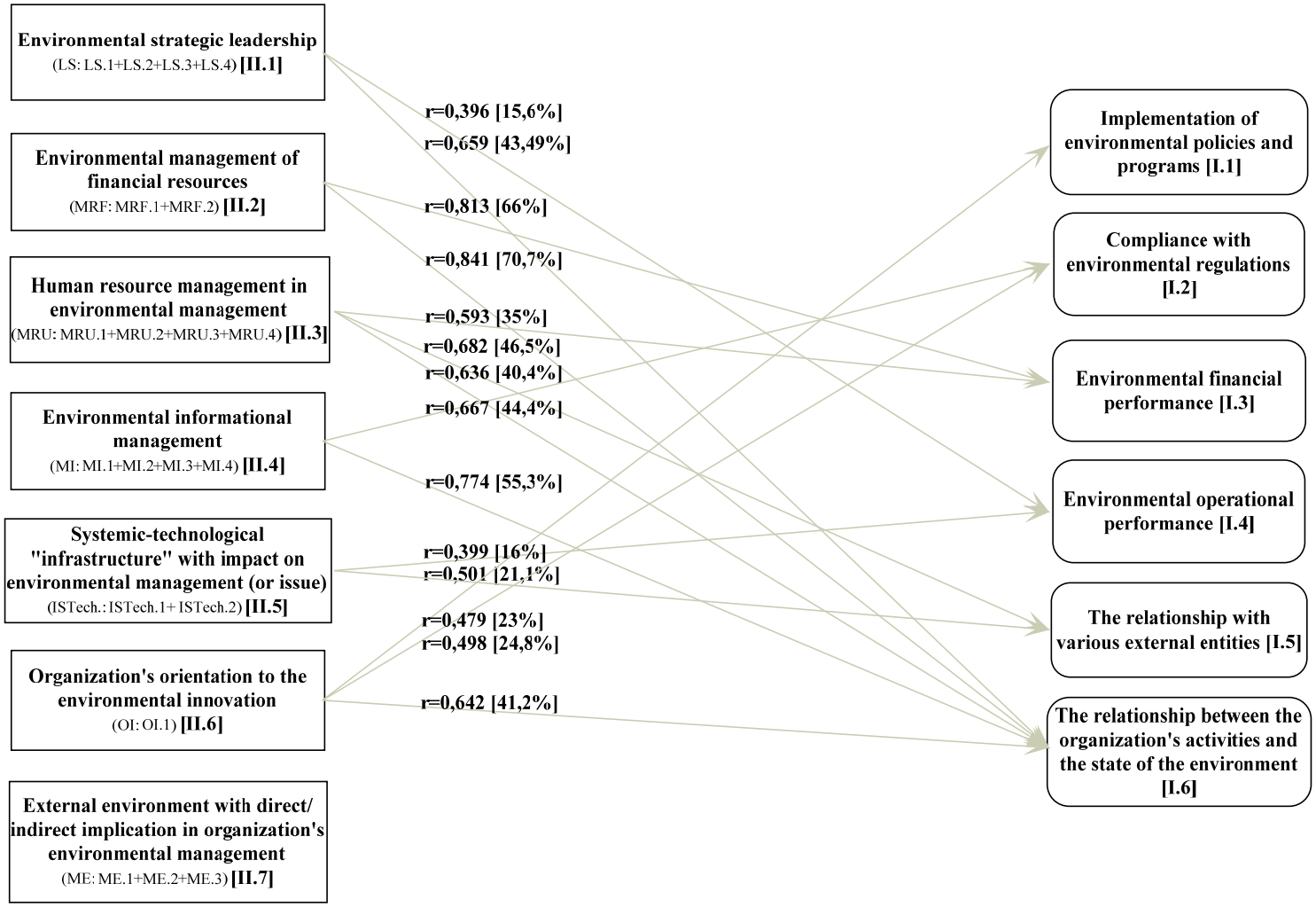


Figure 25 : Model I - the architecture of the influences between the variables that describe the organisation's orintation on the environmental issue and variables which describes the implementation and integration quality of the EMS
Source of model construction : Spearman correlations (Appendix 4)

3.2.4. Regression analysis between specific factors of organisation's orintation on the environmental issue and the variables that define the implementation/ integration quality of the EMS

The objective of this part of the research is the realisation of a multiple regression analysis that aims at investigating the relationships that occur between different phenomena by analysing the existence of links between the variables chosen, the approximation of the study models, by choosing the best model, testing and verifying the selected model. In this way six multiple regression models will be achieved, determined by considering the dependent variable aspects of the implementation/ integration quality of EMS, and the predictor variables will be represented by seven factors specific to the organisation's orientation towards the environmental management**,** trying to determine whether there is a significant relationship between the considered variables, the direction and the intensity of this link. The analysis aims at identifying the extent to which the variables that determine the implementation/ integration quality of the EMS depend on factors that define the organisation's orientation to the environmental management.

In order to achieve a multiple regression analysis, the following were established:

The null hypothesis

H0: Each of the variables I.1. - I.6. (Table 6) is not directly influenced by each of the variables II.1. - II.7.

The alternative hypothesis

H1: Each of the variables I.1. - I.6. (Table 6) is directly influenced by each of the variables II.1. - II.7.

Decision rule (Jaba and Grama, 2004)

a.The sig value associated to t-statistic, for each of the parameters of the regression model should be smaller than the chosen risk α (0.05), for these to be statistically significant.

b.If Sig. > α: H0 hypothesis is accepted, Sig. < α: H0 hypothesis is rejected.

Regression analisys between specific factors of the organisation's orintation on the environmental issue and the variables that define the implementation/ integration quality of EMS - Implementation of environmental policies and programes

The relationship pattern between the dependent variable *The implementation of environmental policies and programes* (Y1) and the independent variables X („Implementation of environmental policies and programs", „Compliance with environmental regulations", „Environmental financial performance", „Environmental operational performance", „The relationship with various external entities", „The relationship between

organizational activities and state of the environment") was approximated using simple graphical representation of the relationship (Y, X).

After analysing the data[23], it was observed that, as they grow, each of the independent variables determines an average increase of the quality aspect related to the *Implementation of environmental policies and programes*. Therefore there is a strong connection, direct and linear between the considered variables: Y = a + b * X1 + X2 + ... + c * k * Xk + ε.

In order to choose the best regression model, the Backward[24] method was used; the resulted models are presented in Table 39.

Table 39 : Simple regression models for dependent variable I.1 - *Implementation of environmental policies and programmes*

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.806[a]	.649	.634	.33498
2	.806[b]	.649	.636	.33396
3	.805[c]	.648	.637	.33368
4	.802[d]	.643	.635	.33471
5	.799[e]	.639	.633	.33561

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.5, II.2, II.3, II.6, II.4

c. Predictors: (Constant), II.7, II.5, II.2, II.3, II.4

d. Predictors: (Constant), II.7, II.5, II.2, II.4

e. Predictors: (Constant), II.7, II.2, II.4

f. Dependent Variable: I.1

The estimated value of the correlation coefficient R = 0.806 shows that between the independent and dependent variables (implementation of environmental policies and programes) there is a strong link, the coefficient approaching a value of + 1, and the sign indicates that there is a direct connection between them, meaning that the variation of the variables takes place in the same direction (in a proportion of 64% by simultaneous change of variables factor).

By applying ANOVA for the testing of resulted models (Table 39), it was observed that the selected model (regression model showing the highest value of the determination ratio, which was the first model) is statistically significant (sig = 0.000 <0.05 sig =0.05).

[23] The shape of the point cloud in the resulting Scatter plot Matrix diagram suggests a linear link (Annex No. 5)

[24] Backward method is based on the complete regression models (with all predictors) afterwards eliminating all predictors, the first being that for which the partial correlation criterion is the lowest. The procedure continues until there are no predictors or until the partial correlations with the criterion are so high that they cannot be removed. Using this method, we can identify the best predictive model, and they can be ranked according to their importance (Jaba and Gram, 2004).

Since the probability is below 5%, the null hypothesis can be rejected, which says that the variables factor does not influence the dependent variable quality of the implementation of an EMS (Appendix 5).

In order to estimate precisely the regression parameters, we used the model of minimising the sum of squared deviations criterion between the observed *values* - y_i, and the *theoretical values* - $\widehat{y}_i$.

We observed that under the chosen model, all coefficients are statistically significant, and given the fact that the value of sig. is lower than the reference value 0.05, so the hypothesis H0 is rejected.

Considering the above facts, we can say that the dependent variable and the independent variables are related, and the estimated equation is:

$$\boxed{\mathbf{Y_1 = 3.104 + 0.097 * II.2. + 0.478 * II.4. - 0.203 * II.7}}$$

It should be noted that some estimates of the regression parameters are positive (II.2., II.4.), therefore the relationship between the dependent variable (Implementation of environmental policies and programmes) and the independent variables is straightforward, while the relationship between the dependent variable and the predictor II.7 (External environment with direct/ indirect implication in organization's environmental management) is reversed, this variable is accompanied by a negative regression coefficient.

In concluding over the regression analysis of specific factors "organisation's orintation on the environmental issue" and the variable that defines "implementation/ integration quality of the EMS" - Implementation of environmental policies and programmes, it is necessary to specify, according to the estimated equation:

a the medium level of the quality aspect for the „Implementation of environmental policies and programs" on the environment when no factor acts is 3.104 (parameter β0);

b the average quality of the „Implementation of environmental policies and programs" will increase by an average of 0,097 units, if „Environmental management of financial resources" factor improves by one unit, while the other variables remain unchanged (parameter β2);

c. the average quality of the „Implementation of environmental policies and programs" will increase by an average of 0.478 units if the „Environmental informational management" improves by one unit, while the other variables remain unchanged (parameter β4);

d. the average quality of the „Implementation of environmental policies and programs" will fall by an average of 0,203 units if the „External environment with direct/ indirect implication in organization's environmental management" factor improves by one unit while the other variables remain unchanged (parameter β7).

Regression analysis between specific factors of the organisation's orintation on the environmental issue and the variables that define the quality of the implementation / integration of EMS - Compliance with environmental regulations

The relationship between the dependent variable *Compliance with environmental regulations* (Y2) and the independent variables X belonging to "organisation's orintation on the environmental issue" will be approximated using simple graphical representation of the relationship (Y, X), as in the previous paragraph.

After the analysis of the resulted shape of the point cloud (Annex 6), we found a strong, direct and linear link (of the shape: Y = a + b * X1 + X2 + ... + c * k * Xk + ε) between the dependent variable *Compliance with environmental regulations* and each of the considered factor variables, and as the values of the independent variables grow, there is an average increase of the quality appearance for the *Compliance with environmental regulations*.

Table 40 : Simple regression models for variable dependent I.2 – *Compliance with environmental regulations* (Backward method)

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.827[a]	.684	.670	.34632
2	.827[b]	.683	.672	.34541

a. Predictors:(Constant)II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.5, II.2, II.3, II.6, II.4

c. Dependent Variable: I.2

The estimated value of the correlation coefficient R = 0.827 (Table 40) indicates that between the independent and dependent variables there is a very strong bond, the coefficient approaching +1, and the sign indicates that there is a direct connection between them, meaning that the variables' change takes place in the same direction (in a proportion of 68% by simultaneous changes in variable factor).

After applying ANOVA for the resulted models, we observed that they are are statistically significant (sig = 0.000 <sig = 0.05), and considering that the probability is below 5%, we can reject the null hypothesis, which says that the factor variables do not influence the variable dependent on the quality of the implementation of an EMS (Appendix 6).

Therefore, considering the Sig. regression coefficients for the model 2, we see that they record the value 0.000, which is lower than the reference value of 0.05 and therefore statistically significant, explaining the variation in terms of quality aspect of *Compliance with environmental regulations*. Therefore the hypothesis H0 will be rejected, since there is a connection between the dependent variable and the independent variables.

Some estimations of the regression parameters are positive (II.4., II.5., II.6.), therefore the relationship between the dependent variable and the independent variables is straightforward, while the relationship between the dependent variable and predictors of II.2, II.3., respectively II.7. is reversed, these variables being accompanied by negative regression coefficients.

Given the above facts, we can say that between the dependent variable and the independent variables there is a connection, and the estimated equation is:

$$Y_2 = 2{,}296 - 0{,}121 * II.2. - 0{,}168 * II.3. + 0{,}840 * II.4. + 0{,}175 * II.5. + 0{,}123 * II.6. - 0{,}342 * II.7$$

Given the above and the estimated equation, we can mention the following conclusions:

a. the medium level of quality aspect for "Compliance with environmental regulations" when it does not work on any factor is 2.296 (parameter β0);

b. the average quality level of the "Compliance with environmental regulations" will decrease by an average of 0.121 units if „Environmental management of financial resources" factor improves by one unit while the other variables remain unchanged (parameter β2);

c. the average quality level of the "Compliance with environmental regulations" will decrease by an average of 0.168 units if the factor „Environmental management of financial resources" improves by one unit and if the other variables remain unchanged (parameter β3) ;

d. the average quality level of the "Compliance with environmental regulations" will increase by an average of 0.840 units if the „Environmental informational management" improves by a unit, while the other variables remain unchanged (parameter β4);

e. the average quality level of the "Compliance with environmental regulations" will increase by an average of 0.175 units if the „Systemic-technological "infrastructure" with impact on environmental management" improves by one unit, while the other variables remain unchanged (parameter β5);

f. the average quality level of the "Compliance with environmental regulations" will increase by an average of 0.123 units if the „Organization's orientation to the environmental innovation" improves by one unit, while the other variables remain unchanged (parameter β6);

g. the average quality level of the "Compliance with environmental regulations" will decrease by an average of 0.342 units if the „External environment with direct/ indirect implication in organization's environmental management" improves by one unit, while the other variables remain unchanged (parameter β7).

Regression analysis between specific factors of the organisation's orintation on the environmental issue and the variables that define the quality of the implementation/ integration of EMS – Environmental financial performance

The link between the dependent variable *Environmental financial performance* (Y3) and the independent variables X was approximated using the graphical representation of the simple relationship (Y, X).
Starting from the shape of the point cloud resulted from the statistical analysis (Appendix 7), we can observe that there is a linear bond (Y = a + b * X1 + X2 + ... + c * k * Xk + ε) between the dependent variable *Environmental financial performance for the* and each of the factor variables considered.

Table 41 : Simple regression models for the dependent variable I.3 - *Environmental financial performance* (Backward method)

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.914[a]	.836	.829	.40955
2	.914[b]	.836	.830	.40832

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.4

c. Dependent Variable: I.3

The estimated value of the correlation coefficient R = 0.914 (Table 41) indicates that there is a very strong bond between the independent and dependent variables (Environmental financial performance), the coefficient approaching +1, and the sign indicates that there is a direct connection between them, meaning that the variables' change takes place in the same direction (in a proportion of 83.6% by simultaneous changes in factor variables).

After applying ANOVA for the resulted models, we observed that they are statistically significant (sig = 0.000 <sig = 0.05), and considering that the probability is below 5%, we can reject the null hypothesis, which says that the factor variables do not influence the variable dependent on the quality of the implementation of an EMS (Appendix 7).

Therefore, considering the Sig. regression coefficients for the model 2, we see that they record the value 0,000, which is lower than the reference value of 0.05 and therefore statistically significant, explaining the variation in terms of quality aspect of *Environmental financial performance*. Therefore the hypothesis H0 will be rejected, since there is a connection between the dependent variable and the independent variables.

Given the above facts, we can say that between the dependent variable and the independent variables there is a connection and the estimated equation is:

$$\mathbf{Y_3 = 2.228 + 0.315 * II.1. + 0.343 * II.2. + 0.468 * II.3. - 0.454 * II.4. + 0.231 * II.5. - 0.514 * II.7}$$

Some estimations of the regression parameters are positive (II.1., II.2., II.3., II.5., II.6.), therefore the relationship between the dependent variable and the independent variables is direct, while the relationship between the dependent variable and predictors of II.4, respectively II.7. is reversed, these variables being accompanied by negative regression coefficients.

Concluding the analysis of specific factors "the organisation's orientation on the environmental issue" and the variable that defines "the quality of EMS implementation/ integration" - Environmental financial performance, it is necessary to specify, based on the equation, the following:

a. the medium level of the quality aspect of the "Environmental financial performance" when no factor is active is 2.228 (parameter β0);

b. the medium level of the quality aspect of the "Environmental financial performance" will increase by an average of 0.315 units if „Environmental strategic leadership" factors improves by one unit, while the other variables remain unchanged (parameter β1);

c. the medium level of the quality aspect of "Environmental financial performance" will increase by an average of 0.343 units if the „Environmental management of financial resources" factor improves by one unit, while the other variables remain unchanged (parameter β2);

d. the medium level of the quality aspect of "Environmental financial performance" will increase by an average of 0.468 units if the factor „Human resource management in environmental management" improves by one unit, while the other variables remain unchanged (parameter β3);

e. the medium level of the quality aspect of "Environmental financial performance" will decrease by an average of 0.454 units if the „Environmental informational management" improves by one unit while the other variables remain unchanged (parameter β4);

f. the medium level of the quality aspect of "Environmental financial performance" will increase by an average of 0.231 units if the „Systemic-technological "infrastructure" with impact on environmental management" improves by one unit while the other variables remain unchanged (parameter β5);

g. the medium level of the quality aspect of "Environmental financial performance" will decrease by an average of 0.514 units if the „External environment with direct/ indirect implication in organization's environmental management" improves by one unit while the other variables remain unchanged (parameter β6).

Regression analysis between specific factors of the organisation's orintation on the environmental issue and the variables that define the quality of the implementation/ integration of EMS – Environmental operational performance

The link between the dependent variable *Environmental operational performance* (Y4) and the independent variables X was approximated using the graphical representation of the simple relationship (Y, X).

Starting from the shape of the point cloud resulted from the statistical analysis (Appendix 8), we can observe that there is a linear bond (Y = a + b * X1 + X2 + ... + c * k * Xk + ε) between the dependent variable *Environmental operational performance* and each of the considered factor variables.

As some values for independent variables grow, an average increase of the quality aspects related to *Environmental operational performance* occurs (Appendix 8).

Table 42 : Simple regression models for the dependent variable I.4 – *Environmental operational performance* (Backward method)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.670[a]	.449	.426	.40235
2	.670[b]	.449	.429	.40114

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.1, II.5, II.3, II.6, II.4

The estimated value of the correlation coefficient R=0,670 (Table 42) indicates that there is a very strong bond between the independent and dependent variables (*Environmental operational performance*), the coefficient approaching +1, and the sign indicates that there is a direct connection between them, meaning that the variables' change takes place in the same direction (in a proportion of 44.9% by simultaneous changes in factor variables). After applying ANOVA for the resulted models, we observe that they are are statistically significant (sig = 0.000 <sig = 0.05), and considering that the probability is below 5%,we can reject the null hypothesis, which says that the factor variables do not influence the variable dependent on the quality of the implementation/ integration of an EMS (Appendix 8).

Therefore, considering the Sig. regression coefficients for the model 2, we see that they record the value 0.000, which is lower than the reference value of 0.05 and therefore statistically significant, explaining the variation in terms of quality aspect of *Environmental operational performance*. Therefore the hypothesis H0 will be rejected, since between the dependent variable and the independent variables there is a connection.

Some estimations of the regression parameters are positive (II.1., II.3., II.5., II.7.), therefore the relationship between the dependent variable and the independent variables is straightforward, while the relationship between the dependent variable and predictors of II.4, respectively II.7. is reversed, these variables being accompanied by negative regression coefficients.

Concluding the analysis of specific factors "organisation's orintation on the environmental issue" and the variable that defines the "quality of implementation/ integration of EMS" - *Environmental operational performance*, we can say that there is a connection between the dependent variable and the independent variables, and the estimated equation is:

$$\mathbf{Y_4 = 1.529 + 0.650 * II.1. + 0.160 * II.3. - 0.405 * II.4. + 0.164 * II.5. - 0.144 * II.6. + 0.105 * II.7}$$

It is necessary to specify, based on the equation, the following:

a. the medium level of the quality aspect of "Environmental operational performance" when no factor is active is 1.529 (parameter β0);

b. the medium level of the quality aspect of "Environmental operational performance" will increase by an average of 0.650 units if the „Environmental strategic leadership" factors improve by one unit while the other variables remain unchanged (parameter β1);

c. the medium level of the quality aspect of "Environmental operational performance" will increase by an average of 0.160 units if the „Environmental management of financial resources" factor improves by one unit while the other variables remain unchanged (parameter β2);

d. the medium level of the quality aspect of "Environmental operational performance" will increase by an average of 0.405 units if the factor „Human resource management in environmental management" improves by one unit while the other variables remain unchanged (parameter β3) ;

e. the medium level of the quality aspect of "Environmental operational performance" will decrease by an average of 0.164 units if the „Environmental informational management" improves by one unit while the other variables remain unchanged (parameter β4);

f. the medium level of the quality aspect of "Environmental operational performance" will increase by an average of 0.144 units if the „Systemic-technological "infrastructure" with impact on environmental management" improves by one unit while the other variables remain unchanged (parameter β5);

g. the medium level of the quality aspect of "Environmental operational performance" will decrease by an average of 0.105 units if the „External environment with direct/ indirect implication in organization's environmental management" improves by one unit while the other variables remain unchanged (parameter β7) .

Regression analysis between specific factors of the organisation's orintation on the environmental issue and the variables that define the quality of the implementation/ integration of EMS - Relationship with various external entities

The link between the dependent variable *Relationship with various external entities* (Y5) and the independent variables X was approximated using the graphical representation of the simple relationship (Y, X).

Starting from the shape of the point cloud resulted from the statistical analysis, we can observe that there is a linear bond (Y = a + b * X1 + X2 + ... + c * k * Xk + ε) between the dependent variable *Relationship with various external entities* and each of the factor variables considered. As some values for independent variables grow, an average increase of the quality aspects related to *Relationship with various external entities* occurs (Appendix 9).

Table 43 : Simple regression models for the dependent variable I.4 – *Relationship with various external entities* (Backward method)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.670[a]	.449	.426	.40235
2	.670[b]	.449	.429	.40114

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.1, II.5, II.3, II.6, II.4

The estimated value of the correlation coefficient R=0,768 (Table 43) indicates that there is a very strong bond between the independent and dependent variables (*Relationship with various external entities*), the coefficient approaching +1, and the sign indicates that there is a direct connection between them, meaning that the variables' change takes place in the same direction (in a proportion of 59% by simultaneous changes in factor variables).

After applying ANOVA for the resulted models, we observe that they are are statistically significant (sig = 0.000 <sig = 0.05), and considering that the probability is below 5%, we can reject the null hypothesis, which says that the factor variables do not influence the variable dependent on the quality of the implementation of an EMS (Appendix 9).

It can be said with certainty that the dependent variable and the independent variables are related, and the estimated equation is:

$$\boxed{\mathbf{Y_5 = 1.057 + 0.430 * II.1. - 0.062 * II.2. + 0.781 * II.3. - 0.576 * II.4. + 0.217 * II.5. - 0.105 * II.6}}$$

Some estimations of the regression parameters are positive (II.1., II.3., II.5), therefore the relationship between the dependent variable and the independent variables is straightforward, while the relationship between the dependent variable and predictors of II.2, II.4, respectively II.. is reversed, these variables being accompanied by negative regression coefficients.

Concluding the analysis of specific factors "organisation's orientation on the environmental issue" and the variable that defines the "quality of implementation/ integration of EMS" - *Relationship with various external entities*, it is necessary to specify, based on the equation, the following:

a. the medium level of the quality aspect of "Relationship with various external entities" when no factor is active is 1.057 (parameter β0);

b. the medium level of the quality aspect of "Relationship with various external entities" will increase by an average of 0.430 units if „Environmental strategic leadership" factors improve by one unit while the other variables remain unchanged (parameter β1);

c. the medium level of the quality aspect of "Relationship with various external entities" will increase by an average of 0.062 units if the „Environmental management of financial resources" factor improves by one unit while the other variables remain unchanged (parameter β2);

d. the medium level of the quality aspect of "Relationship with various external entities" will increase by an average of 0.781 units if the „Human resource management in environmental management" factor would improve by one unit, while the other variables remain unchanged (parameter β3);

e. the medium level of the quality aspect of "Relationship with various external entities" will decrease by an average of 0.576 units if the „Environmental informational management" improves by one unit while the other variables remain unchanged (parameter β4);

f. the medium level of the quality aspect of "Relationship with various external entities" will increase by an average of 0.217 units if the „Systemic-technological "infrastructure" with impact on environmental management" improves by one unit while the other variables remain unchanged (parameter β5);

g. the medium level of the quality aspect of "Relationship with various external entities" will decrease by an average of 0.105 units if the „External environment with direct/ indirect implication in organization's environmental management" improves by one unit while the other variables remain unchanged (parameter β6).

Regression analysis between specific factors of the organisation's orintation on the environmental issue and the variables that define the quality of the implementation/ integration of EMS - The relationship between organizational activities and state of the environment

The link between the dependent variable *The relationship between organizational activities and state of the environment* (Y6) and the independent variables X was approximated using the graphical representation of the relationship simple (Y, X).

Starting from the shape of the point cloud resulted from the statistical analysis, we can observe that there is a linear bond (Y = a + b * X1 + X2 + ... + c * k * Xk + ε) between the dependent variable *The relationship between organizational activities and state of the environment* and each of the considered factor variables. As some values for independent variables grow, there is an average increase in the quality aspects related to *The relationship between organizational activities and state of the environment* (Appendix 10).

Table 44 : Simple regression models for the dependent variable I.5 - *The relationship between organizational activities and state of the environment*
(Backward method)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.949[a]	.901	.897	.31290
2	.949[b]	.901	.898	.31203

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.1, II.5, II.2, II.6, II.4

The estimated value of the correlation coefficient R=0,949 (Table 5.44) indicates that there is a very strong bond between the independent and dependent variables (*The relationship between organizational activities and state of the environment*), the coefficient approaching +1, and the sign indicates that there is a direct connection between them, meaning that the variables' change takes place in the same direction (in a proportion of 90,1% by simultaneous changes in factor variables).

After applying ANOVA for the resulted models, we observed that they are statistically significant (sig = 0.000 <sig = 0.05), and considering that the probability is below 5%, we can reject the null hypothesis, which says

that the factor variables do not influence the variable dependent on the EMS implementation quality (Appendix 10).

After analysing the regression model parameters, we can say that there is a connection between the dependent variable and the independent variables and the estimated equation is:

$$\boxed{\mathbf{Y_6 = -0.254 + 0.493 * II.1. + 0.236 * II.2. + 0.746 * II.4. - 0.531 * II.5. - 0.091 * II.7}}$$

Concluding the analysis of specific factors of "organisation's oriantation on the environmental issue" and the variable that defines the "quality of implementation/ integration of EMS" - *The relationship between organizational activities and state of the environment*, it is necessary to specify, based on the equation, the following:

a. the medium level of the quality aspect of "The relationship between organizational activities and state of the environment" when no factor is active is 0.254 (parameter β0);

b. the medium level of the quality aspect of "The relationship between organizational activities and state of the environment" will increase by an average of 0.493 units if the „Environmental strategic leadership" factors improve by one unit while the other variables remain unchanged (parameter β1);

c. the medium level of the quality aspect of "The relationship between organizational activities and state of the environment" will increase by an average of 0.236 units if the „Environmental management of financial resources" factor improves by one unit while the other variables remain unchanged (parameter β2);

d. the medium level of the quality aspect of "The relationship between organizational activities and state of the environment" will increase by an average of 0.746 units if the „Human resource management in environmental management" factor improves by one unit while the other variables remain unchanged (parameter β4);

e. the medium level of the quality aspect of "The relationship between organizational activities and state of the environment" will decrease by an average of 0.531 units if the „Environmental informational management" improves by one unit while the other variables remain unchanged (parameter β5);

f. the medium level of the quality aspect of "The relationship between organizational activities and state of the environment" will increase by an average of 0.091 units if the „Systemic-technological "infrastructure" with impact on environmental management" improves by one unit while the other variables remain unchanged (parameter β7);

3.2.5. Partial correlation analysis between factors specific to the organisations' orientation towards the environmental management and the synthetic/ global variable which defines the EMS implementation/ integration quality

The analysis of the correlation between (a) factors specific to the organisation's orientation on the environmental issue and (b) the variables that define the quality of the implementation/ integration of an Environmental management system, in addition to independent approach to the intensity and nature (positive/ negative) of each relationship - shown in Figure 25, implies the relationship of these factors to the overall quality of the EMS implementation. This would create a synthetic and general vision on the relationship between the determinant factors and the implementation/ integration process of EMS in organisations.

Table 45 : Notes (N_t) used for the variables involved

N_t	**Consequences of the Environmental management system implementation/ integration at the organisation level** (dependent variables)	N_t	**Organizations orientation to environmental issues and implicitly in the EMS implementation and integration** (independent variables)
I.1	Implementation of environmental policies and programs	**II.1.**	Environmental strategic leadership
I.2	Compliance with environmental regulations	**II.2.**	Environmental management of financial resources
I.3	Financial performance environment	**II.3.**	Human resource management in environmental management
I.4	Environmental operational performance	**II.4.**	Environmental informational management
I.5	Relationship with various external entities	**II.5.**	Systemic-technological "infrastructure" with impact on environmental management
I.6	Relationship between the activities of the organisation and the state of the environment	**II.6.**	Organization's orientation to the environmental innovation
		II.7.	External environment with direct/ indirect implication in organization's environmental management

In the construction of the structural model of estimating the correlations between (a) factors specific of the organisation's orientation on the environmental issue (independent variables) and (b) synthetic/ global variable which defines the quality of implementation/ integration of EMS, it was considered hypothetically that each of the independent variables develops a relationship with each dependent variable, and ultimately with the overall quality of the EMS implementation (model completed after the analysis of the resulted data - Figure 26).

During the scientific approach, in order to reach a result, it was considered appropriate to analyse the factors influencing each relationship (II.1 - II.7) and the quality of the EMS's implementation, described by a synthetic variable that contains all the variables which were considered to be found in its composition (I.1 - I.6) (Table 45)

In order to obtain a statistically valid result that meets the research objective, it was necessary to take the following actions:

A. evaluate the partly zero-degree correlations among each factor of the organisation's orientation on the environmental issue (II.1 - II.7) and the variable that defines the implementation quality of an EMS.

B. evaluate the partial correlations identified in the quality of the EMS's implementation and the factors that influence it, in terms of control variables usage.

In order to evaluate the zero-order correlations between each factor of the organisation's orientation towards the environmental issue and the variable that defines the implementation/ integration quality of the EMS, no control variables were used and thus it was established that, besides the factor External environment with direct/ indirect implications over the environmental management of the organization (sig = 0.602> 0.05), all the other six factors are correlated with the variable "implementation/ integration quality of the EMS" (sig = 0.000 <0.05) - Table 46.

Table 46 : Zero-order correlations between the quality of the EMS's implementation and the factors that influence it

Source: elaborated based on Appendix no.12.

Control Variables			EMS implementation quality	„Environmental strategic leadership"	„Environmental management of financial resources"	„Human resource management in environmental management"	„Environmental informational management"	„Systemic-technological "infrastructure" with impact on environmental"	„Organization's orientation to the environmental innovation"	„External environment with direct/ indirect implication in organization's environmental management"
-none-[a] (Z)	EMS implementation quality	Correlation	1.000	**.752**	**.749**	**.755**	**.746**	**.330**	**.571**	**-.040**
		Significance (2-tailed)	.	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.602**
		df	0	169	169	169	169	169	169	169
		R^2		56,5%	56,1%	57%	55,6%	10,9%	32,6%	

The quality of the implementation/ integration of the EMS is significantly correlated with the „Environmental strategic leadership" (r = 0.752, p <0.01), explaining 56.5% of variance, with the „Environmental management of financial resources" (r = .749, p <0.01), explaining 56.1% of variance, with „Human resource management in environmental management" (r = 0.755, p <0.01), explaining 57% of variance, with „Environmental informational management" (r = 0.746, p <0.01), explaining 55.6% of variance, with „Systemic-technological "infrastructure" with impact on environmental" (r = 0.330, p <0.01), explaining 10 9% of the variance, and also with the „Organization's orientation to the environmental innovation" (r = 0.571, p <0.01), the latter explaining 32.6% of the variance (Table 46).

Although it would be possible to build a structural model showing the architecture of these correlations, given Table 46, for a more accurate prediction of the direction of association (causality), each correlation between X (the independent variable considered) and Y (dependent variable = the EMS implementation/ integration quality) was evaluated, with the "controlled" effect of other independent variables - Z.

Therefore, after statistical evaluation (Annex No. 12) the following (Figure 26) final issues (AF) can be seen:

a. *The EMS implementation/ integration quality* is directly influenced positively (significantly) by the „Environmental strategic leadership" factor (II.1);

b. *The EMS implementation/ integration quality* is directly influenced positively (significantly) by the „Environmental management of financial resources" factor - (II.2);

c. *The EMS implementation/ integration quality* is directly influenced positively (significantly) by the „Human resource management in environmental management" factor - (II.3);

d. *The EMS implementation/ integration quality* is directly influenced positively (significantly) by the „Environmental informational management" factor - (II.4);

e. *The EMS implementation/ integration quality* is directly influenced positively (significantly) by the „Systemic-technological "infrastructure" with impact on environmental management" factor - (II.5);

f. *The EMS implementation/ integration quality* is directly influenced negatively by the „Organization's orientation to the environmental innovation" factor - (II.6);

g. *The EMS implementation/ integration quality* is directly influenced negatively (significantly) by the „External environment with direct/ indirect implication in organization's environmental management" factor - (II.7).

As it can be seen from the above mentioned, and from the structural model II used to estimate the correlations between (a) factors specific to the organisation's orientation on the environmental issue, and (b) the synthetic/ global variable that defines the implementation/ integration quality of the EMS (Figure 26), the factors considered representative influence in different "ways" the implementation and integration of the Environmental management system, and thus we may notice various phenomena that describe features of large organisations in the developing area of North-East Romania.

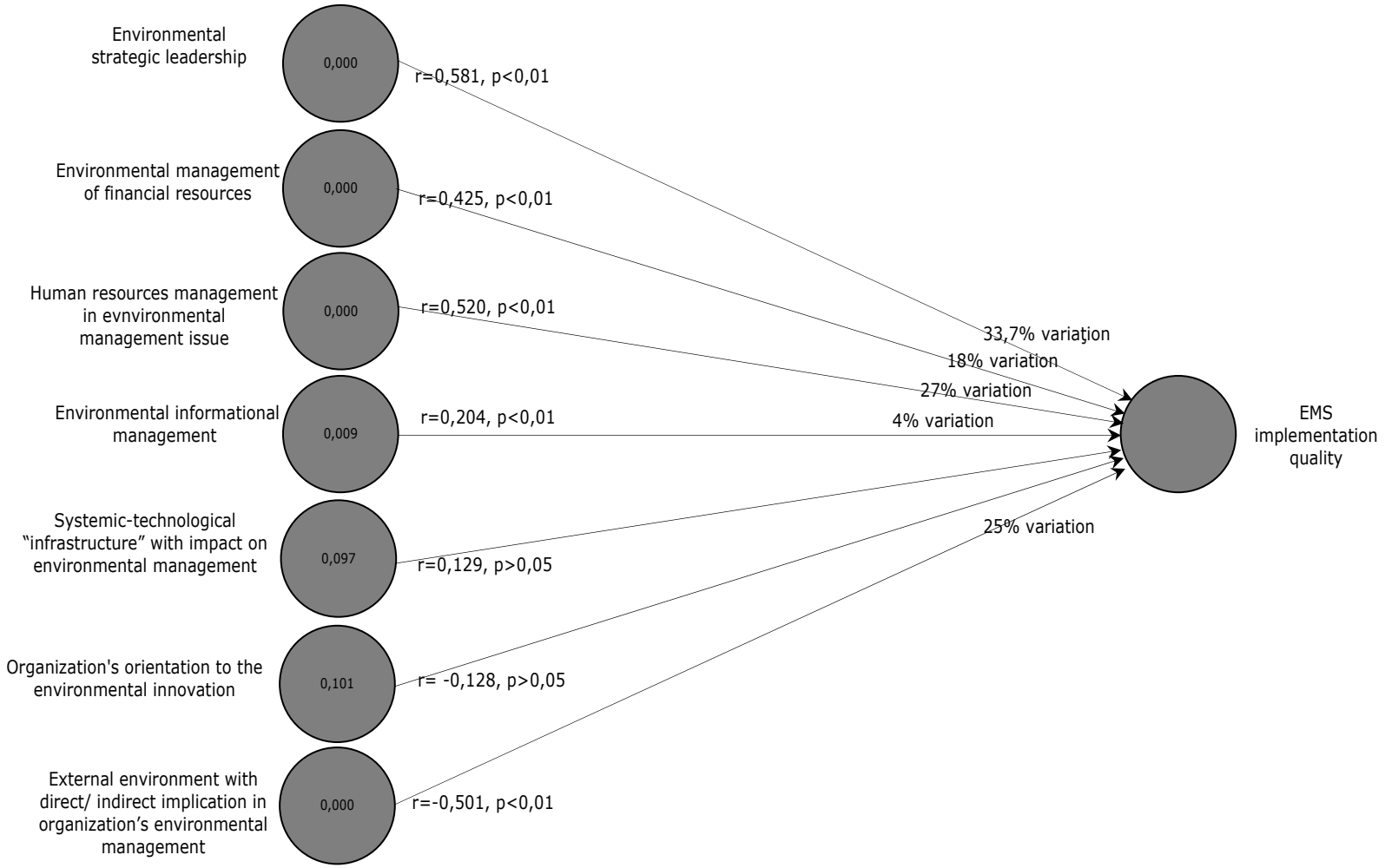


Figure 26 : Estimated structural Model II - for correlation between (a) organisation's orientations on the environmental issue (specific factors), and synthetic/ global variable that define EMS implementation/ integrations quality

3.2.6. The regression analysis between the specific factors for the organisation's orientation on/ towards the environmental issue and the EMS implementation/ integration quality

In order to achieve the multiple regression analysis, the following have been established:

The null hypothesis

H0: The synthetic variable *The EMS implementation/ integration quality* is not directly influenced by each of the variables II.1. - II.7 (Tabel 45).

The alternative hypothesis

H1: The synthetic variable *The EMS implementation/ integration quality* is directly influenced by each of the variables II.1. - II.7 (Tabel 45).

Decision rule (Jaba and Grama, 2004)

a. The sig value associated to t-statistic, for each of the parameters of the regression model should be smaller than the chosen risk α (0.05), for these to be statistically significant.

b. If Sig. > α: H0 hypothesis is accepted, Sig. < α: H0 hypothesis is rejected.

The link between the dependent variable *The EMS implementation/ integration quality* (Y) and the independent variables X (II.1 - „Environmental strategic leadership"/ II.2 - „Environmental management of financial resources"/ II.3 - „Human resource management in environmental issue"/ II.4 - „Environmental informational management"/ II.5 - „Systemic-technological "infrastructure" with impact on environmental management"/ II.6 - „Organization's orientation to the environmental innovation"/ II.7 - „External environment with direct/ indirect implication in organization's environmental management") will be approximated using graphical representation of the simple relationship (Y, X).

Starting from the shape of the point cloud resulted from the statistical analysis we can observe that there is a linear bond ($Y = a + b * X1 + X2 + ... + c * k * Xk + \varepsilon$) between the dependent variable *The EMS implementation/ integration quality* and each of the factor variables considered. As some values for independent variables grow, an average increase in the quality aspects related to *The EMS implementation/ integration quality* occurs (Appendix 13).

The estimated value of the correlation coefficient R=0,940 indicates that between the independent and dependent variables (*The EMS implementation/ integration quality*) there is a very strong bond, the coefficient approaching +1, and the sign indicates that there is a direct connection between them, meaning that the variables change takes place in the same direction (in a proportion of 88% by simultaneous changes in factor variables).

Table 47: Simple regression models for the dependent variable –
The EMS implementation/ integration quality
(Backward method)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.940[a]	.884	.879	.18499
2	.939[b]	.882	.878	.18595

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.4

After applying ANOVA for the resulted models, we observed that they are are statistically significant (sig = 0.000 <sig = 0.05), and considering that the probability is below 5%, we can reject the null hypothesis, which says that the factor variables do not influence the variable dependent on the implementation quality of an EMS.

After analysing the regression model parameters, we can say that there is a connection between the dependent variable and the independent variables; the estimated equation is:

Y =1.661 + 0.285 * II.1. + 0.080 * II.2. + 0.186 * II.3. + 0.100 * II.4. + 0.090 * II.5. – 0.192 * II.7.

Some estimations of the regression parameters are positive (II.1., II.2., II.3, II.4., II.5), therefore the relationship between the dependent variable and the independent variables is straightforward, while the relationship between the dependent variable and predictor II.7. is reversed, this variable being accompanied by negative regression coefficients.

Concluding the analysis of specific factors of "organisation's oriantation on the environmental issue" and the variable that defines the "implementation/ integration quality of EMS" - *The implementation /integration quality of the EMS*, it is necessary to specify the folowing according to the equation:

a. the medium level of the quality aspect of *The implementation/ integration quality of the EMS* when no factor is active is 1.661 (parameter β0);

b. the medium level of the quality aspect of *The implementation/ integration quality of the EMS* will increase by an average of 0.285 units if „Environmental strategic leadership" factors improve by one unit while the other variables remain unchanged (parameter β1);

c. the medium level of the quality aspect of *The implementation/ integration quality of the EMS* will increase by an average of 0.080 units if the „Environmental management of financial resources" factor improves by one unit while the other variables remain unchanged (parameter β2);

d. the medium level of the quality aspect of *The implementation/ integration quality of the EMS* will increase by an average of 0.186 units if the factor „Human resource management in environmental management" improves by one unit while the other variables remain unchanged (parameter β3);

e. the medium level of the quality aspect of *The implementation/ integration quality of the EMS* will decrease by an average of 0.100 units if the „Environmental informational management" improves by one unit while the other variables remain unchanged (parameter β4);

f. the medium level of the quality aspect of *The implementation/ integration quality of the EMS* will increase by an average of 0.090 units if the „Systemic-technological "infrastructure" with impact on environmental management" improves by one unit while the other variables remain unchanged (parameter β5);

g. the medium level of the quality aspect of *The implementation/ integration quality of the EMS* will decrease by an average of 0.192 units if the „External environment with direct/ indirect implication in organization's environmental management" factor improves by one unit while the other variables remain unchanged (parameter β7).

3.2.7. The multivariate analysis of the variance between the dependent variables that define the EMS implementation/ integration quality and the independent variables that characterise the organisation's orientation on the environmental issue

The Environmental management system is characterised as being a complex process determined by certain factors specific to the organisation's orientation to the environmental issue, and at the same time this factors can act as "barriers" in the implementing/ integration process of this type of system (Stone, 2000; Tinsley and Pillai, 2006).

The statistical analysis (correlation and regression – under certain conditions) performed in the previous subchapters confirm this determination connection between these factors grouped in an original manner on the level of the independent variable set – "organisation's orientation to the environmental issue" and the dependent variables considered as a group, variables that characterise the implementation/ integration quality of an Environmental management system.

In order to **test again and to certify the stability of these evaluated and analysed connections,** it was considered suitable to carry out a multivariate analysis of the effect variance of one or several independent variables upon the dependent variables at the same time – by utilising four different statistical tests: Pillai's Trace/ Wilks' Lambda/ Hotelling's Trace/ Roy's Largest Root (MANOVA/ MANCOVA) (Annex no. 17). The carrying out of the multivariate analysis aimed at identifying the sig. level (<0.05) corresponding to the relationship between the independent variables and the dependent variables under certain conditions (Table 45). Thus the validation condition is represented by the value limit of the sig. associated to each of

the parameters of the evaluated model, which must be <0.05 so that they should be statistically significant (Cook, 2013).

After the analysis of the values on the trustworthy levels connected to the multivariate tests (sig.), the following aspects can be observed:

1a. The sig. values attained for each of the 4 multivariate tests (Pillai's Trace/ Wilks' Lambda/ Hotelling's Trace/ Roy's Largest Root) are statistically significant (<0.05), so that it can be mentioned that the independent variable "Environmental strategical leadership" - II.1 had a significant effect upon all the variables of the quality implementation/ integration of an EMS (Annex no.17: Table 1/ Table 2);

1b. The effects of the variable "Environmental strategical leadership" upon each variable that composes the quality of an EMS remain significant even after the effects of the other independent variables upon the aspects of the implementation/integration quality of an EMS are maintained constantly – the sig. value is equal to zero and inferior to the sig. level =0.05 (Annex no.17: Table 3);

2a. The sig. values attained for each of the 4 multivariate tests (Pillai's Trace/ Wilks' Lambda/ Hotelling's Trace/ Roy's Largest Root) are statistically significant (<0.05), so that it can be mentioned that the independent variable „Environmental management of financial resources" – II.2 had a significant effect upon all the variables of the implementation/ integration quality of an EMS (Annex no.17: Table 4/ Table 5);

2b. The effects of the variable „Environmental management of financial resources" upon each variable that composes the quality of an EMS remain significant even after the effects of the other independent variables upon the aspects of the implementation/ integration quality of an EMS are maintained constantly – the sig. value is equal to zero and inferior to the sig. level =0.05 (Annex no.17: Table 6);

3a. The sig. values attained for each of the 4 multivariate tests (Pillai's Trace/ Wilks' Lambda/ Hotelling's Trace/ Roy's Largest Root) are statistically significant (<0.05), so that it can be mentioned that the independent variable „Human resource management in environmental management" – II.3 had a significant effect upon all the variables of the implementation/ integration quality of an EMS (Annex no.17: Table 7/ Table 8);

3b. The effects of the variable „Human resource management in environmental management" upon each variable that composes the quality of an EMS remain significant even after the effects of the other independent variables upon the aspects of the implementation / integration quality of an EMS are maintained constantly – the sig. value is equal to zero and inferior to the sig. level = 0.05 (Annex no.17: Table 9);

4a. The sig. values attained for each of the 4 multivariate tests (Pillai's Trace/ Wilks' Lambda/ Hotelling's Trace/ Roy's Largest Root) are statistically significant (<0.05), so that it can be mentioned that the independent variable "Environmental informational management" – II.4 had a significant effect upon all the variables of the implementation/ integration quality of an EMS (Annex no.17: Table 10/ Table 11);

4b. The effects of the variable "Environmental informational management" upon each variable that composes the quality of an EMS remain significant even after the effects of the other independent variables upon the aspects of the implementation/ integration quality of an EMS are maintained constantly – the sig. value is equal to zero, inferior to the sig. level=0.05 (Annex no.17: Table 12);

5a. The sig. values attained for each of the 4 multivariate tests (Pillai's Trace/ Wilks' Lambda/ Hotelling's Trace/ Roy's Largest Root) are statistically significant (<0.05), so that it can be mentioned that the independent variable „Systemic-technological "infrastructure" with impact on environmental" – II.5 had a significant effect upon all the variables of the implementation/ integration quality of an EMS (Annex no.17: Table 13/ Table 14);

5b. The effects of the variable „Systemic-technological "infrastructure" with impact on environmental" upon each variable that composes the quality of an EMS remain significant even after the effects of the other independent variables upon the aspects of the implementation/ integration quality of an EMS are maintained constantly – the sig. value is equal to zero, inferior to the sig. value =0.05 (Annex no.17: Table 15);

6a. The sig. values attained for each of the 4 multivariate tests (Pillai's Trace/ Wilks' Lambda/ Hotelling's Trace/ Roy's Largest Root) are statistically significant (<0.05), so that it can be mentioned that the independent variable „Organization's orientation to the environmental innovation" - II.6 had a significant effect upon all the variables of the implementation/ integration quality of an EMS (Annex no.17: Table 16/ Table 17);

6b. The effects of the variable „Organization's orientation to the environmental innovation" upon each variable that composes the quality of an EMS remain significant even after the effects of the other independent variables upon the aspects of the implementation/ integration quality of an EMS are maintained constantly – the sig. value is equal to zero, inferior to the sig. value =0.05 (Annex no.17: Table 18);

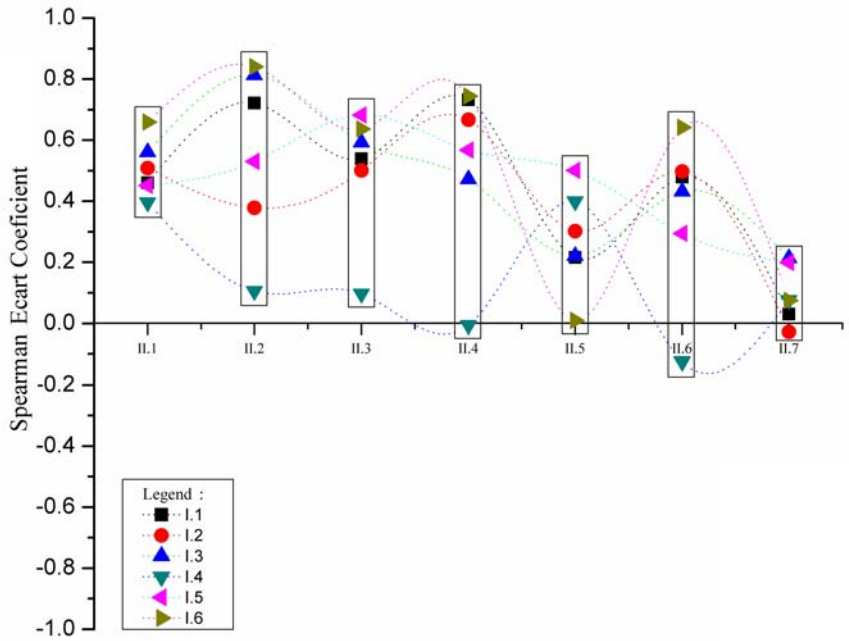
7a. The sig. values attained for each of the 4 multivariate tests (Pillai's Trace/ Wilks' Lambda/ Hotelling's Trace/ Roy's Largest Root) are statistically significant (<0.05), so that it can be mentioned that the independent variable „External environment with direct/ indirect implication in organization's environmental management" – II.7 had a significant effect upon all the variables of the implementation/ integration quality of an EMS (Annex no.17: Table 19/ Table 20);

7b. The effects of the variable „External environment with direct/ indirect implication in organization's environmental management" upon each variable that composes the quality of an EMS remain significant even after the effects of the other independent variables upon the aspects of the implementation/ integration quality of an EMS are maintained constantly – the sig. value is equal to zero, inferior to the sig. value =0.05 (Annex no.17: Table 21);

Conclusions

The Environmental management system is the formal manner with background effects which in time changes the way of how the organisations manage the relationship between them and the environment, thus changing the way of doing business.

The implementation and integration quality of an Environmental management system, characterised by the sum of its characteristics, fall into a complex subject, and it is the one that indicates directly (a) the effectiveness and functionality of the integration system (considering the environmental management integrated in the organisation), and (b) indirectly the various features of the organisations that implement such a system (the intensity level of some existing links/ dynamics of various relationships between different influencing factors and their issues, and so on).



Legend:
Influenced variables (dependent variables):
I.1 „Implementation of environmental policies and programs"**/ I.2** „Compliance with environmental regulations"**/**
I.3 „Environmental financial performance"**/ I.4** „Environmental operational performance"**/ I.5** „The relationship with various external entities"**/**
I.6 „The relationship between organizational activities and state of the environment"
Variable (factors) that exerts an influence on variables that characterize the EMS implementation/ integrations quality :
II.1 „Environmental strategic leadership"**/ II.2** „Environmental management of financial resources"**/**
II.3 „Human resource management in environmental issue"**/ II.4** „Environmental informational management"**/**
II.5 „Systemic-technological "infrastructure" with impact on environmental management"**/ II.6** „Organization's orientation to the environmental innovation"**/ II.7** „External environment with direct/ indirect implication in organization's environmental management"

Figure 27: Distribution of correlations between variables of model I
Source: Figure 25/ 26

Table 48 : Legend of remarks (Nt) for the variables used

N_t	**Consequences of the Environmental management system implementation/ integration at the organisation level** (dependent variables)	N_t	**Organizations orientation to environmental issues and implicitly in the EMS implementation and integration** (independent variables)
I.1	Implementation of environmental policies and programs	**II.1.**	Environmental strategic leadership
I.2	Compliance with environmental regulations	**II.2.**	Environmental management of financial resources
I.3	Financial performance environment	**II.3.**	Human resource management in environmental management (of issue)
I.4	Environmental operational performance	**II.4.**	Environmental informational management
I.5	Relationship with various external entities	**II.5.**	Systemic-technological "infrastructure" with impact on environmental management
I.6	Relationship between the activities of the organisation and the state of the environment	**II.6.**	Organization's orientation to the environmental innovation
		II.7.	External environment with direct/ indirect implication in organization's environmental management

By analysing logically the aspects that characterise the implementation and integration quality of the Environmental management system, we can say the following:

1. For the qualitative aspect related to the *Implementation of environmental policies and programmes* (3.104), which is in a direct, linear and positive relation (r = 0,479) with the „Organization's orientation to the environmental innovation" factor that determins it, at a rate of 23% (Figure 27, Annex no.5), and it's characterized by the following equation: Y1 = 3,104 + 0,097 * II.2. + 0,478 * II.4. - 0,203 * II.7 (subchapter 3.2.4 – doctoral thesis), we can anticipate that if:

a. the process of budget allocation from the organisation improves through the quantification of the real necessary in an objective manner, by allocating sufficient resources for environmental action and also for the environmental objectives and targets, and by raising funds through various environmental projects[25] („Environmental management of financial resources"),

[25] Improving the quality of „Environmental management of financial resources"variable even by one unit would lead to an average of 0.097 improvement of the qualitative aspect related to the "Implementation of environmental policies and programmes".

b. the environmental decision making improves (increase of efficiency and effectiveness of environmental decision-agent/ clarifying the main purpose of the made environmental decisions/ decentralisation of the environmental decision), the management credibility increases, the management system of environmental knowledge improves, the quality of environmental information system functioning of the organisation (informational necessary/ information processing degree/ data efficacy/ the ability to process information/ the type of information distribution/ the speed of information), the understanding of environmental duties increases, different aspects of practice monitoring and specific document-management activities improve[26] („Environmental informational management"),

c. implementing an Environmental management system and ISO 14001 certification is the result of the organisation's environmental awareness and not a consequence of the ISO 14001 certification of the competing companies, or as a result of the massive existence of the Common Market ISO 14001 certified companies, or as the effect of the development directions (national/ European), or the social acceptance level of the organisation's activities increased, or because different stakeholders exert pressure for environmental certification[27] („External environment with direct/ indirect implication in organization's environmental management"),

then as an effect, the quality of the synthetic variable *The Implementation and environmental policies and programes*, as a constitutive aspect of the EMS implementation/ integration quality, would increase;

2. For the qualitative aspect of *Compliance with environmental regulations* (2,296) which is in a direct, linear and positive relation (r=0,498/ r=0,667) with the factors that determins it, repectively with the "Organization's orientation to the environmental innovation" (at a rate of 24,8%), and with the „Environmental informational management" (at a rate of 44,4%), and also it's characterized by the following equation: Y2 = 2,296 – 0,121 * II.2. - 0,168 * II.3. + 0,840 * II.4. + 0,175 * II.5. + 0,123 * II.6. – 0,342 * II.7 (subchapter 3.2.4 – doctoral thesis), we can predict that if:

[26] Improving the quality of „Environmental informational management" variable even by one unit would lead to an average of 0.478 improvement of the quality aspect related to the "Implementation of environmental policies and programmes".

[27] Otherwise, the improvement of the variable „External environment with direct/ indirect implication in organization's environmental management" - based on considerations opposed to those mentioned in the text, even by one unit would lead to an average decrease by 0.203 of the qualitative aspect related to the "Implementation of environmental policies and programmes".

a. „Environmental management of financial resources" (as in the previous paragraph - 1.a) but provided that the characteristics of the environmental management of financial resources are directly related to environmental regulations[28],
b. specialisations/ environmental training sessions (opportunities offered by the organisation), the environmental knowledge management (ethical principles), the staff's committment to environmental issues, general attitude of the organisation's management towards environmental responsibilities, the relationship reward system - environmental performance, level for fairness of the environmental activities and work, the relationship between the employees' motivation - environmental performance, and so on - as a condition, these issues must be addressed and managed through the environmental regulations[29] („Human resource management in environmental management"),
c. „Environmental informational management" (as in the previous paragraph - 1.b)[30],
d. the production process management in the organisation should also consider its secondary outcome (amount of waste/ the emissions' quantitative level) - that is an extremely important aspect, the organisation's oriantation towards clean technology (non polluting) increases, the usage level of the information obtained from the implementation process of the Environmental management system, would increase[31] („Systemic-technological "infrastructure" with impact on environmental").
e. the increasing frequency of using techniques to find new ideas to improve processes (e.g. brainstorming), the increased frequency of meetings/ working groups which aim to improve the environmental procedures, changing the improving process of environmental performance by increasing the level of the importance given to the suggestions of the employees/ managers[32] („Organization's orientation to the environmental innovation"),

[28] Otherwise, the improvement of the variable „Environmental management of financial resources"- based on considerations opposed to those mentioned in the text, even by one unit, would lead to an average decrease of 0.121 for the qualitative aspect of "Compliance with environmental regulations".
[29] Otherwise, the improvement of the quality of „Human resource management in environmental management" variable - based on considerations opposed to those mentioned in the text, even by one unit, would lead to an average decrease of 0.168 for the qualitative aspect of "Compliance with environmental regulations"
[30] Improving the quality of „Environmental informational management" variable, even by one unit, would lead to an average improvement by 0.840 of the quality aspect of "Compliance with environmental regulations"
[31] Improving the quality of the variable „Systemic-technological "infrastructure" with impact on environmental" at least by one unit would lead to an improvement in average of 0,175 for the qualitative aspect of "Compliance with environmental regulations"
[32] Improving the quality of „Organization's orientation to the environmental innovation" by at least one unit would lead to an improvement in average by 0,123 for the qualitative aspect of "Compliance with environmental regulations"

f. „External environment with direct/ indirect implication in organization's environmental management" - but provided that the characteristics of this variable should be addressed through the environmental regulations (as in the previous paragraph - 1.c)[33],

then the quality of the variable *Compliance with environmental regulations*, as constitutive aspect of the EMS implementation quality, would increase;

3. For the qualitative aspect related to *Environmental financial performance* (2,228), which is in direct, positive, linear relation (r=0,813/ r=0,593) with the factors that determine it: „Environmental management of financial resources" variable and „Human resource management in environmental management" variable, in proportions of 66% and respectively 35%, and also it's characterized by the following equation: Y3 = 2,228 + 0,315 * II.1. + 0,343 * II.2. + 0,468 * II.3. – 0,454 * II.4. + 0,231 * II.5. – 0,514 * II.7 (subchapter 3.2.4 – doctoral thesis), we can predict that if:

1. the establishment and expression of the organization's environmental vision would improve, the flexibility of the organizational structure change would increase, the internal regulations of the organization would be more flexible, the process of development/ communication and integration of environmental objectives and targets would improve, the organization would increase the frequency regarding the audits of all internal systems, the relationship between the information from the audit of the Environmental system management and their use in improving its operation would improve, the frequency of assessments and analyzes of environmental performance would increase[34] („Environmental strategic leadership"),
2. „Environmental management of financial resources" (as in the previous paragraph - 1.a, 2.a)[35],
3. „Human resource management in environmental management" (as in the previous paragraph - 2.b)[36],
4. „Environmental informational management" (as in the previous paragraph - 1.b, 2.c) - but with the condition to take into account the environmental and financial performance[37],

[33] Otherwise, the variable improvement „External environment with direct/ indirect implication in organization's environmental management"- based on considerations opposed to those mentioned in the text, even by one unit, would lead to a decrease in average by 0,342 for the qualitative aspect of "Compliance with environmental regulations"

[34] The quality improvement of „Environmental strategic leadership" variable by at least one unit would lead to an average improvement by 0,315 o f the quality aspect of "Environmental financial performance".

[35] Improving the quality of „Environmental management of financial resources" variable even by one unit would lead to an average improvement by 0,343 of the qualitative aspect of the "Environmental financial performance"

[36] Improving the quality of „Human resource management in environmental management" variable by at least one unit would lead to an improvement in average by 0.468 of the qualitative aspect of the "Environmental financial performance".

[37] Otherwise the improvement of the „Environmental informational management" - based on considerations opposed to those mentioned in the text, even by one unit , would lead to a decrease in average by 0,454 of the qualitative aspect of the "Environmental financial performance".

5. „Systemic-technological "infrastructure" with impact on environmental management" (as in the previous point - 2.d)[38].
6. „External environment with direct/ indirect implication in organization's environmental management" - but provided that the characteristics of this variable should be addressed through the environmental regulations (as in the previous point - 1.c,2.f)[39],

then the quality of the variable Environmental financial performance, as constitutive aspect of the quality of the implementation of an EMS, would increase;

4. For the qualitative aspect related to *Environmental operational performance* (1,529), which is direct, positive, linear relation (r=0,396/ r=0,399) with the factors that determine it: „Environmental strategic leadership" and „Systemic-technological "infrastructure" with impact on environmental", in proportions of 15,6% and 16%, and also it's characterized by the following equation: Y4 = 1,529 + 0,650 * II.1. + 0,160 * II.3. – 0,405 * II.4. + 0,164 * II.5. – 0,144 * II.6.+ 0,105 * II.7 (subchapter 3.2.4 – doctoral thesis), it can be predicting that if:

a. „Environmental strategic leadership" (as in the previous point - 3.a)[40] ,
b. „Human resource management in environmental management" (as in the previous point - 2.b, 3.c)[41],
c. „Environmental informational management" - but on condition that takes into account for the specific aspects of the environmental information management also by the environmental financial performance (as in the previous point - 1.b; 2.c; 3.d)[42],
d. „Systemic-technological "infrastructure" with impact on environmental management" (as in the previous point - 2.d; 3.e)[43],
e. „Organization's orientation to the environmental innovation" - but taking into account in the its specific characteristics by the environmental performance (as in the previous point - 2.e)[44],

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[38] Improving the quality of „Systemic-technological "infrastructure" with impact on environmental management" variable by at least one unit, would lead to an improvement in average by 0,231 of the qualitative aspect of "Environmental financial performance".
[39] Otherwise, the variable improvement „External environment with direct/ indirect implication in organization's environmental management" - based on considerations opposed to those mentioned in the text, even by one unit ,would lead to a decrease in average by 0,514 for the qualitative aspect of "Environmental financial performance".
[40] The quality improvement of „Environmental strategic leadership" by at least one unit would lead to an average improvement by 0,650 of the quality aspect of "Environmental operational performance".
[41] The quality improvement of „Human resource management in environmental management" variable by at least one unit would lead to an average improvement by 0,160 of the quality aspect of "Environmental operational performance".
[42] Otherwise the improvement of the „Environmental informational management" variable - based on considerations opposed to those mentioned in the text, even by one unit, would lead to a decrease in average by 0,405 of the qualitative aspect of the "Environmental operational performance".
[43] The quality improvement of „Systemic-technological "infrastructure" with impact on environmental management" by at least one unit would lead to an average improvement by 0,164 of the quality aspect of "Environmental operational performance".

f. „External environment with direct/ indirect implication in organization's environmental management" (as in the previous point - 1.c; 2.f; 3.f)[45],

then the quality of the variable *Environmental operational performance*, as constitutive aspect of the quality of the implementation of an EMS, would increase;

5. For the qualitative aspect related to *The relationship with various external entities* (1,057), which is direct, positive, linear relation (r=0,682/ r=0,501) with the factors that determine it: „Human resource management in environmental management" variable and „Systemic-technological "infrastructure" with impact on environmental management" variable*,* in proportions of 46,5% and respectively 21,1%, and also it's characterized by the following equation: Y5 = 1,057 + 0,430 * II.1. - 0,062 * II.2. + 0,781 * II.3. – 0,576 * II.4. + 0,217 * II.5. – 0,105 * II.6 (subchapter 3.2.4 – doctoral thesis), we can predict that if:

a. „Environmental strategic leadership" (as in the previous point - 3.a; 4.a)[46],
b. „Environmental management of financial resources" (as in the previous point - 1.a; 2.a; 3.b)[47] but on condition that it takes into account the specific aspects of the relationship with various external entities*,*
c. „Human resource management in environmental management" – (as in the previous point - 2.b; 3.c; 4.b)[48],
d. „Environmental informational management" (as in the previous point - 1.b; 2.c; 3d; 4c)- but on condition that it takes into account the specific aspects of the relationship with various external entities[49],
e. „Systemic-technological "infrastructure" with impact on environmental management" (as in the previous point - 2.d; 3.e; 4.d)[50]

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[44] Otherwise, the variable improvement „Organization's orientation to the environmental innovation" - based on considerations opposed to those mentioned in the text, even by one unit ,would lead to a decrease in average by 0,144 for the qualitative aspect of "Environmental operational performance".

[45] The quality improvement of „External environment with direct/ indirect implication in organization's environmental management" variable by at least one unit would lead to an average improvement by 0,105 of the quality aspect of "Environmental operational performance".

[46] The quality improvement of „Environmental strategic leadership" variable by at least one unit would lead to an average improvement by 0,430 of the quality aspect of "Relationship with various external entities"

[47] Otherwise, the variable improvement „Environmental management of financial resources" - based on considerations opposed to those mentioned in the text, even by one unit, would lead to a decrease in average by 0,062 for the qualitative aspect of "Relationship with various external entities"

[48] The quality improvement of „Human resource management in environmental management" by at least one unit would lead to an average improvement by 0,781 of the quality aspect of "Relationship with various external entities"

[49] Otherwise, the variable improvement „Environmental informational management" - based on considerations opposed to those mentioned in the text, even by one unit, would lead to a decrease in average by 0,576 for the qualitative aspect of „Relationship with various external entities".

[50] The quality improvement of „Systemic-technological "infrastructure" with impact on environmental management" variable by at least one unit would lead to an average improvement of the quality aspect of "Relationship with various external entities".

f. „Organization's orientation to the environmental innovation" (as in the previous point – 2.e; 4.e)[51] but with the condition that it takes into account the specific aspects of the relationship with various external entities,

then the quality of *Environmental operational performance*, as constitutive aspect of the quality of the implementation of an EMS, would increase.

6. For the qualitative aspect related to *The relationship between organizational activities and state of the environment* variable (0,245), which is direct, positive, linear relation (r=0,659/ r=0,841/ r=0,636/ r=0,774/ r=0,642) with the factors that determine it: „Environmental strategic leadership", „Environmental management of financial resources", „Environmental informational management", „Human resource management in environmental management" and „Organization's orientation to the environmental innovation" in proportions of 43,49%, 70,7%, 40,4%, 55,3%, and respectively 41,2%, and also it's characterized by the following equation: Y6 = -0,254 + 0,493 * II.1. + 0,236 * II.2. + 0,746 * II.4. - 0,531 * II.5. – 0,091 * II.7 (subchapter 3.2.4 – doctoral thesis), we can predict that if:

a. „Environmental strategic leadership" (as in the previous point - 3.a; 4.a; 5.a)[52]
b. „Environmental management of financial resources" (as in the previous point – 1.a; 2.a; 3.b; 5.b)[53],
c. „Environmental informational management" (as in the previous point – 1.b; 2.c; 3d; 4c; 5.c)[54],
d. „Systemic-technological "infrastructure" with impact on environmental management" – but with the condition that it takes into account the specific aspects of the relation between the organisation's activities and the state of the environment (as in the previous point – 2.d; 3.e; 4.d; 5.e)[55],
e. „External environment with direct/ indirect implication in organization's environmental management" – but takes into account also the specific aspects of the relation between the

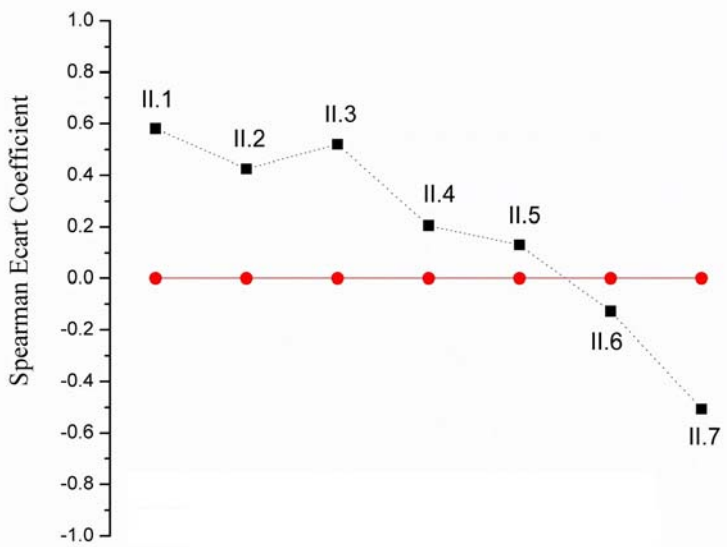
[51] Otherwise ,the variable improvement „Organization's orientation to the environmental innovation" - based on considerations opposed to those mentioned in the text, even by one unit ,would lead to a decrease in average by 0,105 for the qualitative aspect of "Relationship with various external entities".
[52] The quality improvement of „Environmental strategic leadership" variable by at least one unit would lead to an average improvement by 0,493 of the quality aspect of "Relationship between the organisation's activities and the state of the environment".
[53] The quality improvement of „Environmental management of financial resources" variable by at least one unit would lead to an average improvement by 0,236 of the quality aspect of "Relationship between the organisation's activities and the state of the environment".
[54] The quality improvement of „Environmental informational management" variable by at least one unit would lead to an average improvement by 0,746 of the quality aspect of "Relationship between the organisation's activities and the state of the environment".
[55] Otherwise, the variable improvement „Systemic-technological "infrastructure" with impact on environmental management" - based on considerations opposed to those mentioned in the text, even by one unit ,would lead to a decrease in average by 0,531 for the qualitative aspect of "Relationship between the organisation's activities and the state of the environment".

organisation's activities and the state of the environment (as in the previous point – 1.c; 2.f; 3.f; 4.f)[56],

then the quality of the variable *The The relationship between organizational activities and state of the environment*, as constitutive aspect of the quality of the implementation of an EMS, would increase;

In conclusion, we can say that the sum of these constituent aspects (1-6) contributes substantially to the overall improvement of the quality of the implementation and integration of an Environmental management system in organizations.

In another train of thoughts regardingt the correlations between (a) factors specific to the organisation's orientation on the environmental issue (independent variables) and (b) the synthetic/ global variable which defines the EMS implementation/ integration quality, the resulting distribution of the coefficients can be observed Figure 28.



Legend:

independent variable : **II.1** „Environmental strategic leadership"**/ II.2** „Environmental management of financial resources"**/ II.3** „Human resource management in environmental issue"**/ II.4** „Environmental informational management"**/ II.5** „Systemic-technological "infrastructure" with impact on environmental management"**/ II.6** „Organization's orientation to the environmental innovation"**/ II.7** „External environment with direct/ indirect implication in organization's environmental management"

level 0 of influence regarding the EMS implementation/ integration quality

Figure 28 : Distribution of correlations between specific factors of the organisation's orientation towards environmental issue and the synthetic/ global variable which defines the EMS implementation/ integration quality - structural estimation Model II

[56] Otherwise, the variable improvement „External environment with direct/ indirect implication in organization's environmental management" - based on considerations opposed to those mentioned in the text, even by one unit, would lead to a decrease in average by 0,091 for the qualitative aspect of "Relationship between the organisation's activities and the state of the environment".

For the quality aspect related to – The quality of EMS implementation (1,661), based on the estimated regression equation (Y =1.661 + 0.285 * II.1. + 0.080 * II.2. + 0.186 * II.3. + 0.100 * II.4. + 0.090 * II.5. – 0.192 * II.7. – subchapter 3.2.6 of the doctoral thesis) it can be said that if:

1. the average quality of the factor „Environmental strategic leadership" would improve;
2. the average quality of the factor „Environmental management of financial resources" would increase;
3. the average quality of the factor „Human resource management in environmental management" would increase by one unit;
4. the average quality of the factor „Environmental informational management" would increase by one unit;
5. the average quality of the factor „Systemic-technological "infrastructure" with impact on environmental management" would increase by one unit;
6. implementing an Environmental management system and ISO 14001 certification is the result of the organisation's environmental awareness and not a consequence of the ISO 14001 certification of the competing companies, or as a result of the massive existence of the Common Market ISO 14001 certified companies, or as the effect of the development directions (national/ European), or the social acceptance level of the organisation's activities increased, or because different stakeholders exert pressure for environmental certification („External environment with direct/ indirect implication in organization's environmental management"),

<u>then as an effect, the *Environmental management system* synthetic variable quality, would increase; and so would increase the quality of the EMS implementation/ integration process.</u>

Models obtained and explained, that describe the architecture of the influences between the variables of *organization's orientation on the environmental issue* (the determinant/ influence factors) and the aspects that describe the SMM implementation and integration quality/ overall quality of the EMS implementation, present essentially **what**? and **in what extent/ level?** the considerated factors/ barriers influence the quality of the implementation and integration of an Environmental management system (Figure 25/ Figure 26).

3.3. Proposed solutions to improve the Environmental management system implementation and integration quality

Improving the implementation and integration of Environmental management system should be a priority for the managers of organisations, given that this process brings benefits to the organization.

Given the results of quantitative and qualitative analysis of the relationship between: (a) the organization's orientation on the environmental issue and (b) the Environmental management system implementation quality, we tried to develop in the following a number of practical and theoretical proposals/ solutions. These proposals could be considered as starting points for environmental managers in an organization, and a process of the transformation and the improvement of the Environmental management system, sometimes considered "leverage advantage" over competitors.

3.3.1. Proposed solutions to improve the quality of the implementation and integration of Environmental management system

3.3.1.1. Proposed solutions to improve the „Implementation of environmental policies and programs" aspect

Variable: **"Implementation of environmental policies and programs"**
Relation: direct linear positive (r=0,479) with **„**Organization's orientation to the environmental innovation**"** variable that determines it, in a proportion of 23% (Figure 26, Appendix.5)
Estimated equation for the regression model:
Y1 = 3,104 + 0,097 * II.2. + 0,478 * II.4. - 0,203 * II.7
Y1 = 3,104 + (**0,097** * **„**Environmental management of financial resources**"** variable) **+** (**0,478** * **„**Environmental informational management**"** variable) – (**0,203** * **„**External environment with direct/ indirect implication in organization's environmental management**"** variable)

To improve the quality process of "Implementation of environmental policies and programs", that can be considered the most important aspect (3104) of the Environmental management system at the organizations level, a number of measures can be taken, as follows (Table 49):

Table 49 : Possible solutions to improve the "implementation of environmental policies and programs" aspect

Nr.Crt	Variable	Possible measures/ solutions
1.	**„**Environmental management of financial resources**"** (+)	a. increasing the financial resources of the organization's budget allocation for conducting various environmental activities; b. reassessment of the relationship between the allocation of environmental financial resources and real needs: b1. assessing the efficiency and effectiveness of the procedures used in the organization;

		b2. the use of new techniques and methods to quantify the necessary financial resources allocated to various environmental actions; c. increased absorption of various funds (national or European) for various environmental projects: c1. increasing the skills of human resources; c2. employing specialized/ experienced human resource in developing environmental projects; d. rethinking the organization's priorities.
2.	**„**Environmental informational management**"** (+)	a. improve the environmental decision making process through: a1. increasing the environmental knowledge level of the organizational human resource through different environmental trainings programs; a2. empower the organization employee at the level of various environmental activities; a3. clarifying the coordinates of environmental decision process; a4. clarify the methods used in environmental decision making process - respecting the peculiarities of the process; a5. creating and maintaining a database of all environmental decisions taken; a6. where it is possible to use custom environmental decision making– using the same solutions that have positive results for similar situations; a7.increasing the credibility of environmental decision makers managers; b. improving environmental information system by: b1. using efficient software for transmitting, recording, processing, , and so on. environmental information; b2. development of an environmental information system enabling real-time communication between the employees of the organization; b3. for the distribution of certain environmental information, different sessions are recommended at the organization departments level; b4. recording all the information of environmental expertise resulting from different environmental tasks; c. improving the knowledge management system through: c1. clarification at organization employees level, the basics notions regarding the environmental knowledge management; c2. using an electronic scoreboard for employees/ managers regarding the environmental tasks performed; c3. increase the employees/ managers access level at various electronic sources of environment knowledge/ different environment software for solving the assigned environmental tasks; c4. recording of important documents (environmental laws/ environmental education programs, , and so on.) that have been used to solve various environmental activities; c5. organizing periodic meetings with employees in order to present/ explain different methods and techniques that address environmental issues; c6. promoting the use of intranet and internal newsletters to transfer various environmental information/ knowledge; c7. encouraging employees/ managers to share environmental knowledge between them; d. improve environmental monitoring and control by: d1. establishing a clear and fair system of environmental performance indicators; d2. monitoring the level of understanding of the basic knowledge necessary to perform assigned environmental tasks (employee/ manager).
3.	**„**External environment with	a .raising the awareness of the importance regarding the environmental

direct/ indirect implication in organization's environmental management**"** (-)	protection through various trainings programs; PS.: the implementation of environmental policies and programs should be the result of environmental awareness and not a consequence of indirect reasons (reasons of competition/ pressure of various stakeholders).

3.3.1.2. Proposed solutions to improve "Compliance with environmental regulations" aspect

Variable: **"Compliance with environmental regulations"**
Relation: direct linear positive (r=0,498/ r=0,667) **„**Organization's orientation to the environmental innovation**"** variable and with **„**Environmental informational management**"** variable, that determines it, in a proportion of de 24,8% and 44,4% (Figure 26, Appendix.5)
Estimated equation for the regression model:
Y2 = 2,296 – 0,121 * II.2. - 0,168 * II.3. + 0,840 * II.4. + 0,175 * II.5. + 0,123 * II.6. – 0,342 * II.7
Y2 = 2,296 – (0,121 * „Environmental management of financial resources**"** variable**) – (0,168 * „**Human resource management in environmental management**"** variable**) + (0,840 * „**Environmental informational management**"** variable**) + (0,175 * „**Systemic-technological "infrastructure" with impact on environmental management**"** variable**) + (0,123 * „**Organization's orientation to the environmental innovation**"** variable**) – (0,342 * „**External environment with direct/ indirect implication in organization's environmental management**"** variable**)**

To improve the quality process of "Compliance with environmental regulations", that can be considered an important aspect (2,296) of the Environmental management system, at the organizations level, a number of measures can be taken, as follows:

Table 50 : Possible solutions to improve the "compliance with environmental regulations" aspect

Nr.Crt	Variable	Possible measures/ solutions
1.	**„**Environmental management of financial resources**"** (-)	a. increasing the financial resources of the organization's budget allocation for deployment of different environmental activities; b. reassessment of the relationship between the allocation of financial resources for environment and real needs: b1. assessing the efficiency and effectiveness of the procedures used at the organization level; b2. the use of new techniques and methods to quantify the necessary financial resources allocated to various environmental actions;; c. increased absorption of various funds (national or European) for various environmental projects: c1. increasing the skills of human resources; c2. employing specialized/ experienced human resource in developing environmental projects; d. rethinking the organization's priorities; * applying the measures through the following: **-** compliance with applicable national regulations in financial management and accounting;

		- compliance with national environmental regulations; - avoid legal fines from competent organizations in the financial audit and the issue of the environment (court of auditors, the financial guard, environmental protection agency/ environmental guard); - include in internal regulations of organization articles on environmental compliance for all employees; - regular monitoring of all transactions that include environmental funds.
2.	**„**Human resource management in environmental management**"** (-)	a. providing by the organisation the opportunity to attend at different environmental educational programs (trainings) only for employees/ managers who are interested, are regularly integrated in environmental activities and have achieved good results in past environmental trainings activities; b. environmental trainings should aim the transmission of information/ knowledge about the use of best environmental practices, with the condition to be applicable at the organization level; c. developping and setting clear environmental responsibilities; d. rethinking the evaluatin system of rewarding employees given the environmental performance; d. rethinking the reward system of employees considering also the environmental performance.
3.	**„**Environmental informational management**"** (+)	a.applying the proposed measures from the Table 49 - **„**Environmental informational management**"** (+).
4.	**„**Systemic-technological "infrastructure" with impact on environmental management**"** (+)	a. organization's orientation towards clean technology (non-polluting) b. improving production through process optimization, taking into account the overall environmental impact; c. reducing as much as possible the amount of waste and emissions generated by organization activities; d. the gathered experience within the organization as a result of the implementation of Quality management system (ISO 9001), to be used in the management of environmental assets.
5.	**„**Organization's orientation to the environmental innovation**"** (+)	a. increasing the frequency of use of brainstorming technique in the organization to find new ideas to improve processes; b. increasing the regularity of working groups which discuss the possibility of improving environmental procedures; c. using the employees/ managers's suggestions in improving environmental innovation; d. improve current business activities considering various suggestions of employees/ managers.
6.	**„**External environment with direct/ indirect implication in organization's environmental management**"** (-)	a. raising awareness of the importance of environmental protection through various trainings programs; PS.: the implementation of environmental policies and programs should be the result of environmental awareness and NOT a consequence of indirect reasons (reasons of competition/ pressure of various stakeholders).

3.3.1.3. Proposed solutions to improve „Environmental financial performance" aspect

Variable: **"Environmental financial performance"**
Relation: direct linear positive (r=0,813/ r=0,593) with **„**Environmental management of financial resources**"** variable and with **„**Human resource management in environmental management**"** variable that determines it, in a proportion of de 66% and 35% (Figure 26, Appendix.5)
Estimated equation for the regression model:
Y3 = 2,228 + 0,315 * II.1. + 0,343 * II.2. + 0,468 * II.3. – 0,454 * II.4. + 0,231 * II.5. – 0,514 * II.7
Y3 = 2,228 + (0,315 * „Environmental strategic leadership**"** variable**) + (0,343 * „**Environmental management of financial resources**"** variable**) + (0,468 * „**Human resource management in environmental management**"** variable**) – (0,454 * „**Environmental informational management**"** variable**) + (0,231 * „**Systemic-technological "infrastructure" with impact on environmental management**"** variable**) – (0,514 * „**External environment with direct/ indirect implication in organization's environmental management**"** variable)

To improve the quality process of "Environmental financial performance", that can be considered an important aspect (2,228) of the Environmental Management System, at the organizations level, a number of measures can be taken, as follows:

Table 51 : Possible solutions to improve the "environmental financial performance" aspect

Nr.Crt	Variable	Possible measures/ solutions
1.	**„**Environmental strategic leadership**"** (+)	a. improving the establishment and comunication process of the organization's environmental vision; b. improving the flexibility of changing process of the organizational structure (duration/ establishment or dissolution of departments); c. increase the flexibility of the internal regulations of the organization; d. improving the development/ communication and integration process of organization environmental objectives and targets; d. increasing the regularity of audits regarding to all organizations internal systems; e. use of information obtained from the Environmental management system audit in improving its operation; f. increase periodicity of environmental performance evaluation/ analysis.
2.	**„**Environmental management of financial resources**"** (+)	a. increasing the financial resources of the organization's budget allocation for deployment of environmental activities; b. reassessment of the relationship between the allocation of financial resources for environment and real needs: b1. assessing the efficiency and effectiveness of the environmental procedures used in the organization; b2. use of new techniques and methods to quantify the financial resources necessary to various environmental actions; c. increased absorption of various funds (national or European) for various environmental projects: c1. increasing the skills of human resources; c2. employing specialized/ experienced human resource in developing environmental projects; d. rethinking the organization's priorities; e. aiming in all organizations actions undertaken to increase environmental operational performance.

3.	„Human resource management in environmental management**"** (+)	a. increasing the number of environmental educational programs (trainings) for employees/ managers who are interested/ are regularly integrated in environmental activities/ and obtained good results in the last environmental trainings activities; b. increasing the number of environmental trainings that should aim at the transmission of information/ knowledge about the use of best practice in environmental tasks (condition: the real applicability of these practices); c. developing and establishing clear environmental responsibilities; d. rethinking the evaluation system of rewarding employees given the organization's environmental performance; d. rethinking the system of promotion of employees considering the environmental performance.
4.	„Environmental informational management**"** (-)	Applying measures from the Table 49 - **„**Environmental informational management**"** (+) with the following specifications: - increase the level of empowement of employees in environmental activities, with condition that they are supported and monitored by managers; - where it is possible, to use custom environmental decision, only if the situations are similar; - the use of different environmental software to assist environmental decision; - in the case of environmental information sharing, the meetings organized in departments of the organization will not interrupt the current activities and will not be purely formal; - the environmental information system, that allows real-time communication between the employees of the organization, is used only by authorized personnel and strictly for organizations business; - the recording process of all environmental information resulted from environmental undertaken tasks, need to be done by competent personnel; - using an electronic scoreboard for environmental tasks of employees/ managers, with the condition that it is continuously updated and checked by competent managers; - use of intranet and internal newsletters to transfer-various environmental information/ knowledge, with the condition that are filtered by competent managers; - environmental monitoring and control to be carried out according to the procedures and by competent staff; - the use of reliable environmental performance indicators; - moderate monitoring of the level of understanding the basic knowledge that are required to perform different assigned environmental tasks (employee/ manager); - assessment of the information management needs, taking into account the environmental and financial performance.
5.	**„**Systemic-technological "infrastructure" with impact on environmental management**"** (+)	a. organization's orientation towards clean technology (non-polluting technology); b. improving production through process optimization, taking into account the overall environmental impact; c. reducing as much as possible the amount of waste and emissions generated by organizations activities; d. the gathered experience within the organization as a result of the implementation of quality management system (ISO 9001) to be used in the environmental management.
6.	**„**External environment with direct/ indirect implication in	a. applying the measures in Table 49 - **„**External environment with direct/ indirect implication in organization's environmental management**"** taking

	organization's environmental management" (-)	into account the Environmental financial performance.

3.3.1.4. Proposed solutions for improving „Environmental operational performance" aspect

Variable: **"Environmental operational performance"**
Relation: direct linear positive (r=0,396/ r=0,399) with „Environmental strategic leadership" variable and **with** „Systemic-technological "infrastructure" with impact on environmental variable" that determines it, in a proportion of de 15,6% and 16% (Figure 26, Appendix.5)
Estimated equation for the regression model:
Y4 = 1,529 + 0,650 * II.1. + 0,160 * II.3. – 0,405 * II.4. + 0,164 * II.5. – 0,144 * II.6. + 0,105 * II.7
Y4 = 1,529 + (0,650 * „Environmental strategic leadership" variable**) + (0,160 *** „Human resource management in environmental management" variable**) – (0,405 *** „Environmental informational management" variable**) + (0,164 *** „Systemic-technological "infrastructure" with impact on environmental management" variable**) – (0,144 *** „Organization's orientation to the environmental innovation" variable**) + (0,105 *** „External environment with direct/ indirect implication in organization's environmental management" variable**)**

To improve the quality process "Environmental operational performance", that can be considered an important aspect (1,529) of the Environmental Management System, at the organizations level, a number of measures can be taken, as follows:

Table 52 : Possible solutions to improve the "environmental operational performance" aspect

Nr.Crt	Variable	Possible measures/ solutions
1.	„Environmental strategic leadership" (+)	a. improving the establishment and comunication process of the organization's environmental vision; b. improving the flexibility of changing process of the organizational structure (duration/ establishment or dissolution of departments); c. increase the flexibility of the internal regulations of the organization; d. improving the development/ communication and integration process of organization environmental objectives and targets; d. increasing the regularity of audits regarding to all organizations internal systems; e. use of information obtained from the Environmental management system audit in improving its operation; f. increase the periodicity level of environmental performance evaluation/ analysis.
2.	„Human resource management in environmental management" (+)	a. increasing the number of environmental educational programs (trainings) for employees/ managers who are interested/ are regularly integrated in environmental activities/ and obtained good results in the last environmental trainings activities; b. increasing the number of environmental trainings that should aim at the transmission of information/ knowledge about the use of best practice in environmental tasks (condition: the real applicability of these practices); c. developing and establishing clear environmental responsibilities; d. rethinking the evaluation system of rewarding employees given the organization's environmental performance;

		d. rethinking the system of promotion of employees considering the environmental performance.
3.	**„**Environmental informational management**"** (-)	a.applying measures in Table 49 – "Environmental information management" (+) with the following specifications: - increase the level of empowement of employees in environmental activities, with condition that they are supported and monitored by managers; - where it is possible, to use custom environmental decision, only if the situations are similar; - the use of different environmental software to assist environmental decision; - in the case of environmental information sharing, the meetings organized in departments of the organization will not interrupt the current activities and will not be purely formal; - the environmental information system, that allows real-time communication between the employees of the organization, is used only by authorized personnel and strictly for organizations business; - the recording process of all environmental information resulted from environmental undertaken tasks, need to be done by competent personnel; - using an electronic scoreboard for environmental tasks of employees/ managers, with the condition that it is continuously updated and checked by competent managers; - use of intranet and internal newsletters to transfer-various environmental information/ knowledge, with the condition that are filtered by competent managers; - environmental monitoring and control to be carried out according to the procedures and by competent staff; - the use of reliable environmental performance indicators; - moderate monitoring of the level of understanding the basic knowledge that are required to perform different assigned environmental tasks (employee/ manager); - assessment of the information management needs, taking into account the environmental and financial performance.
4.	**„**Systemic-technological "infrastructure" with impact on environmental management**"** (+)	a. organization's orientation towards clean technology (with minimum environmental impact) b. improving production process through process optimization, taking into account the overall environmental impact; c. reducing as much as possible the quantity of waste and emissions generated by organization activities; d. the gathered experience within the organization as a result of the implementation of Quality management system (ISO 9001) to be used in the EMS implementation and integrations process.
5.	**„**Organization's orientation to the environmental innovation**"** (-)	a. increasing the frequency of use of brainstorming technique in the organization to find new ideas to improve processes; b. increasing the regularity of working groups which discuss the possibility of improving environmental procedures; c. using the employees / managers's suggestions in improving environmental innovation; d. improve current business activities considering various suggestions of employees/ managers.
6.	**„**External environment with direct/ indirect implication in organization's environmental management**"**	a. increase the environmental awareness level; b. compliance with environmental regulations; c. use of benchmarking in environmental management issues; d. increase the organization orientation to access funds through various

(+)	priority axes of development (national/ EU), for various environmental projects; e. improving the relations with the local community; f. use in environmental analyzes of the feedback from the external environment.

3.3.1.5. Proposed solutions for improving „Relationship with various external entities" aspect

Variable: **"Relationship with various external entities"**
Relation: direct linear positive (r=0,682/ r=0,501) with **„**Human resource management in environmental management**"** variable and with **„**Systemic-technological "infrastructure" with impact on environmental**"** variable that determines it, in a proportion of de 46,5% and 21,1% (Figure 26, Appendix.5)
Estimated equation for the regression model:
Y5 = 1,057 + 0,430 * II.1. - 0,062 * II.2. + 0,781 * II.3. – 0,576 * II.4. + 0,217 * II.5. – 0,105 * II.6
Y5 = 1,057 + (0,430 * „Environmental strategic leadership**"** variable**) – (0,062 * „**Environmental management of financial resources**"** variable**) + (0,781 * „**Human resource management in environmental management**"** variable**) – (0,576 * „**Environmental informational management**"** variable**) + (0,217 * „**Systemic-technological "infrastructure" with impact on environmental management**"** variable**) – (0,105 * „**Organization's orientation to the environmental innovation**"** variable**)**

To improve the quality process "Relationship with various external entities", that can be considered an important aspect (1,057) of the Environmental management system, at the organizations level, a number of measures can be taken, as follows:

Table 53 : Possible solutions to improve "the relationship with various external entities" aspect

Nr. Crt	Variable	Possible measures/ solutions
1.	**„**Environmental strategic leadership**"** (+)	a. improving the establishment and comunication process of the organization's environmental vision; b. improving the flexibility of changing process of the organizational structure (duration/ establishment or dissolution of departments); c. increase the flexibility of the internal regulations of the organization; d. improving the development/ communication and integration process of organization environmental objectives and targets; d. increasing the regularity of audits regarding to all organizations internal systems; e. use of information obtained from the Environmental management system audit in improving its operation; f. increase the periodicity level of environmental performance evaluation/ analysis.
2.	**„**Environmental management of financial resources**"** (+)	a. increasing the financial resources of the organization's budget allocation for deployment of environmental activities but without neglecting other current activities; b. reassessment of the relationship between the allocation of financial resources for environment and real needs; c. the use of new techniques and methods to quantify the financial resources necessary for various environmental actions;;

		d increased absorption of various funds (national or European) for various environmental projects; e. increasing the human resources competency level; f. employing specialized/ experienced human resource in developing environmental projects; g. aiming in all organizations actions undertaken to increase global organizational performance.
3.	**„**Human resource management in environmental management**"** (+)	a. increasing the number of environmental educational programs (trainings) for employees/ managers who are interested/ are regularly integrated in environmental activities/ and obtained good results in the last environmental trainings activities; b. increasing the number of environmental trainings that should aim at the transmission of information/ knowledge about the use of best practice in environmental tasks (condition: the real applicability of these practices); c. developing and establishing clear environmental responsibilities; d. rethinking the evaluation system of rewarding employees given the organization's environmental performance; d. rethinking the system of promotion of employees considering the environmental performance (and through the organization's relationships with various external entities).
4.	**„**Environmental informational management**"** (-)	a.applying measures in Table 49 – "Environmental information management" (+) with the following specifications – taking into account the organization's relationships with various external entities: - increase the level of empowement of employees in environmental activities, with condition that they are supported and monitored by managers; - where it is possible, to use custom environmental decision, only if the situations are similar; - the use of different environmental software to assist environmental decision and to communicate with the organization's various external entities; - in the case of environmental information sharing, the meetings organized in departments of the organization will not interrupt the current activities and will not be purely formal; - the environmental information system, that allows real-time communication between the employees of the organization, is used only by authorized personnel and strictly for organizations business; - the recording process of all environmental information resulted from environmental undertaken tasks, need to be done by competent personnel; - using an electronic scoreboard for environmental tasks of employees/ managers, with the condition that it is continuously updated and checked by competent managers; - use of intranet and internal newsletters to transfer-various environmental information/ knowledge, with the condition that are filtered by competent managers; - environmental monitoring and control to be carried out according to the procedures and by competent staff; - the use of reliable environmental performance indicators; - moderate monitoring of the level of understanding the basic knowledge that are required to perform different assigned environmental tasks (employee/ manager); - assessment of the information management needs, taking into account the environmental and financial performance and the organization's relationships with various external entities.
5.	**„**Systemic-technological	a. organization's orientation towards clean technology;

	"infrastructure" with impact on environmental management**"** (+)	b. improving production through process optimization, taking into account the overall environmental impact and the organization's relationships with various external entities; c. reducing as much as possible the amount of waste and emissions generated by activities, in order also to do not exert a negative influence on the organization's relationships with various external entities;
6.	**„**Organization's orientation to the environmental innovation**"** (-)	a. increasing the frequency of use of brainstorming technique in the organization to find new ideas to improve processes and also to improve the organization's relationships with various external entities; b. increasing the regularity of working groups which discuss the possibility of improving environmental procedures; c. using the employees/ managers's suggestions in improving environmental innovation and organization's relationships with various external entities; d. improve current business activities considering various suggestions of employees/ managers.

3.3.1.6. Proposed solutions for improving „The relationship between organizational activities and state of the environment" aspect

Variable: **„The relationship between organizational activities and state of the environment"**
Relation: direct linear positive (r=0,659/ r=0,841/ r=0,636/ r=0,774/ r=0,642) with **„**Environmental strategic leadership**"** variable, **„**Environmental management of financial resources**"** variable**, „**Human resource management in environmental management**"** variable**, „**Environmental informational management**"** variable and with **„**Organization's orientation to the environmental innovation**"** variable that determines it, in a proportion of de 43,49%, 70,7%, 40,4%, 55,3%, and 41,2% (Figure 26, Appendix.5)
Estimated equation for the regression model:
Y6 = -0,254 + 0,493 * II.1. + 0,236 * II.2. + 0,746 * II.4. - 0,531 * II.5. – 0,091 * II.7
Y6 = -0,254 + (0,493 * „Environmental strategic leadership**"** variable**) + (0,236 *** Environmental Financial Resources Management variable**) + (0,746 * „**Environmental informational management**"** variable**) – (0,531 * „**Systemic-technological "infrastructure" with impact on environmental management**"** variable**) – (0,091 * „**External environment with direct/ indirect implication in organization's environmental management**"** variable**)**

To improve the quality process „The relationship between organizational activities and state of the environment", that can be considered an important aspect (1,254) of the Environmental Management System, at the organizations level, a number of measures can be taken, as follows:

Table 54 : Possible solutions to improve „the relationship between organizational activities and state of the environment" aspect

Nr.Crt	Variable	Possible measures/ solutions
1.	**„**Environmental strategic leadership**"** (+)	a. improving the establishment and comunication process of the organization's environmental vision, in order to improve (indirectly) the relationship between organizational activities and state of the environment; b. improving the flexibility of changing process of the organizational structure (duration/ establishment or dissolution of departments); c. increase the flexibility of the internal regulations of the organization; d. improving the development/ communication and integration process of

		organization environmental objectives and targets; d. increasing the regularity of audits regarding to all organizations internal systems in order to improve the state of the environment; e. use of information obtained from the Environmental management system audit in improving its operation; f. increase the periodicity level of environmental performance evaluation/ analysis.
2.	„Environmental management of financial resources" (+)	a. increasing the financial resources of the organization's budget allocation for deployment of environmental activities but without neglecting other current activities – with the main purpose to improve the relationship between organizational activities and state of the environment; b. reassessment of the relationship between the allocation of financial resources for environment and real needs; c. the use of new techniques and methods to quantify the financial resources necessary for various environmental actions/ projects; d increased absorption of various funds (national or European) for various environmental projects; e. increasing the human resources competency level; f. employing specialized/ experienced human resource in developing environmental projects; g. aiming in all organizations actions undertaken to increase the relationship between organizational activities and state of the environment (in order to reduce the negative environmental impact); h.assessing the efficiency and effectiveness of the environmental procedures used in the organization.
3.	„Environmental informational management" (-)	Applying measures in Table 49 - „Environmental informational management" (+) with the following specifications: - increase the level of empowement of employees in environmental activities, with condition that they are supported and monitored by managers; - where it is possible, to use custom environmental decision, only if the situations are similar; - the use of different environmental software to assist environmental decision and to communicate with the organization's various external entities; - in the case of environmental information sharing, the meetings organized in departments of the organization will not interrupt the current activities and will not be purely formal; - the environmental information system, that allows real-time communication between the employees of the organization, is used only by authorized personnel and strictly for organizations business; - the recording process of all environmental information resulted from environmental undertaken tasks, need to be done by competent personnel; - using an electronic scoreboard for environmental tasks of employees/ managers, with the condition that it is continuously updated and checked by competent managers; - use of intranet and internal newsletters to transfer-various environmental information/ knowledge, with the condition that are filtered by competent managers; - environmental monitoring and control to be carried out according to the procedures and by competent staff; - the use of reliable environmental performance indicators; - moderate monitoring of the level of understanding the basic knowledge that are required to perform different assigned environmental tasks (employee/ manager); - assessment of the information management needs, taking into account

		mainly the environmental performance – reducing as much as possible the environmental negative impact.
4.	„Systemic-technological "infrastructure" with impact on environmental**"** (+)	a. organization's orientation towards clean technology; b. improving production through process optimization, taking into account the overall environmental impact; c. reducing as much as possible the amount of waste and emissions generated by activities; d. the gathered experience within the organization as a result of the implementation of Quality management system (ISO 9001) to be used in the EMS implementation/ integration process;
5.	„External environment with direct/ indirect implication in organization's environmental management**"** (-)	a.applying the measures in Table 49 - External environment with direct/ indirect effects on the organization's environmental managementalso taking into account mainly the relationship between organizational activities and state of the environment.

3.3.1.7. Proposed solutions for improving „The Environmental management system implementation quality" (synthetic aspect of EMS implementation/ integration quality)

Synthetic variable: **"The Environmental management system implementation quality"**
Relations:
*direct linear positive with „Environmental strategic leadership" variable, „Environmental management of financial resources" variable, „Human resource management in environmental management" variable, „Environmental informational management" variable and with, that determine it,
*extremely low with **„**Systemic-technological "infrastructure" with impact on environmental management" variable, and with **„**Organization's orientation to the environmental innovation**"** variable,
*direct linear but reverse (negative regression coefficien) with the factor **„**External environment with direct/ indirect implication in organization's environmental management**"** variable;
Estimated equation for the regression model:
Y =1,661 + 0,285 * II.1. + 0,080 * II.2. + 0,186 * II.3. + 0,100 * II.4. + 0,090 * II.5. – 0,192 * II.7.
Y =1,661 + (0,285 * „Environmental strategic leadership**"** variable**) + (0,080 * „**Environmental management of financial resources**"** variable**) + (0,186 * „**Human resource management in environmental management**"** variable**) + (0,100 * „**Environmental informational management**"** variable**) + (0,090 * „**Systemic-technological "infrastructure" with impact on environmental management**"** variable**) – (0,192 * „**External environment with direct/ indirect implication in organization's environmental management**"** variable**)**

Table 55 **:** Proposed solutions for improving „the Environmental management system implementation quality" aspect

Nr.Crt	Variable	Possible measures/ solutions
1.	„Environmental strategic leadership**"** (+)	a. improving the establishment and comunication process of the organization's environmental vision, in order to improve the EMS implementation/ integration quality; b. improving the flexibility of changing process of the organizational structure (duration/ establishment or dissolution of departments); c. increase the flexibility of the internal regulations of the organization; d. improving the development/ communication and integration process of organization environmental objectives and targets; d. increasing the regularity of audits regarding to all organizations internal

		systems in order to improve the state of the environment; e. use of information obtained from the Environmental management system audit in improving its operation; f. increase the periodicity level of environmental performance evaluation/ analysis.
2.	„Environmental management of financial resources**"** (+)	a. increasing the amount of financial resources of the organization's budget allocation for deployment of environmental activities/ projects; b. reassessment of the relationship between the allocation of financial resources for environmental protection and real needs: b1. assessing the efficiency and effectiveness of the current environmental procedures used at the organization level; b2. the use of new techniques and methods to quantify the financial resources necessary to various environmental actions/ projects; c. increased the absorption level of various funds (national or European) for various environmental projects: c1. increasing the skills of human resources; c2. employing specialized/experienced human resource in developing environmental projects; d. rethinking the organization's priorities; e. improve environmental innovation process (investments/ fostering human resources in coming up with new ideas constantly/ developing procedures addressing environmental innovation, , and so on.) f. increasing the allocation level of financial resources (internal budget of the organization/ attracting investors/ national funds or European funds) for improving the technologies owned by the organization.
3.	„Human resource management in environmental management**"** (+)	a. increasing the number of environmental educational programs (trainings) for employees/ managers who are interested/ are regularly integrated in environmental activities/ and obtained good results in the last environmental trainings activities; b. increasing the number of environmental trainings that should aim at the transmission of information/ knowledge about the use of best practice in environmental tasks (condition: the real applicability of these practices); c. developing and establishing clear environmental responsibilities; d. rethinking the evaluation system of rewarding employees given the organization's environmental performance; d. rethinking the system of promotion of employees considering the environmental performance
4.	„Environmental informational management**"** (+)	a. improve the environmental decision making process through: a1. increasing the environmental knowledge level of the organizational human resource through different environmental trainings programs; a2. empower the organization employee at the level of various environmental activities; a3. clarifying the coordinates of environmental decision process; a4. clarify the methods used in environmental decision making process - respecting the peculiarities of the process; a5. creating and maintaining a database of all environmental decisions taken; a6. where it is possible to use custom environmental decision making – using the same solutions that have positive results for similar situations; a7.increasing the credibility of environmental decision makers managers; b. improving environmental information system by: b1. using efficient software for transmitting, recording, processing, , and so on. environmental information; b2. development of an environmental information system enabling real-time

		communication between the employees of the organization; b3. for the distribution of certain environmental information, different sessions are recommended at the organization departments level; b4. recording all the information of environmental expertise resulting from different environmental tasks; c. improving the knowledge management system through: c1. clarification at organization employees level, the basics notions regarding the environmental knowledge management; c2. using an electronic scoreboard for employees/ managers regarding the environmental tasks performed; c3. increase the employees/ managers access level at various electronic sources of environment knowledge/ different environment software for solving the assigned environmental tasks; c4. recording of important documents (environmental laws/ environmental education programs, , and so on.) that have been used to solve various environmental activities; c5. organizing periodic meetings with employees in order to present/ explain different methods and techniques that address environmental issues; c6. promoting the use of intranet and internal newsletters to transfer various environmental information/ knowledge; c7. encouraging employees/ managers to share environmental knowledge between them; d. improve environmental monitoring and control by: d1. establishing a clear and fair system of environmental performance indicators; d2. monitoring the level of understanding of the basic knowledge necessary to perform assigned environmental tasks (employee/ manager).
5.	**„**Systemic-technological "infrastructure" with impact on environmental management**"** (+)	a. organization's orientation towards clean technology (non-polluting) b. improving production through process optimization ,taking into account the overall environmental impact;; c. reducing as much as possible the amount of waste and emissions generated by activities;; d. the gathered experience within the organization as a result of the implementation of Quality management system (ISO 9001) is used in the management of environmental assets.
6.	**„**External environment with direct/ indirect implication in organization's environmental management**"** (-)	a. raising awareness of the importance of environmental protection through various trainings and training programs; PS.: the implementation of a EMS should be the result of environmental awareness and not a consequence of indirect reasons (reasons of competition/ pressure of various stakeholders).

3.3.2. Theoretical proposals to improve the Environmental management system implementation and integration quality

3.3.2.1. Sistematic model to improve environmental decision-making process

Any environmental problem that occurs during the carrying out activities of an industrial organization, after collecting and analyzing relevant information, has as a consequence on environmental decision, followed by an action.

From these environmental decisions taken, of course in different conditions, it's believed that is possible to learn active. Therefore the systematic model developed (Figure 29) - model that follows the fundamental elements of environmental decision - propose the use of typified (standardized) environmental decision (Herghiligiu *et al*., 2012b; Herghiligiu and Lupu, 2012a).

This subchapter comes with these proposals, found in the model in Figure 1, as it fallows:

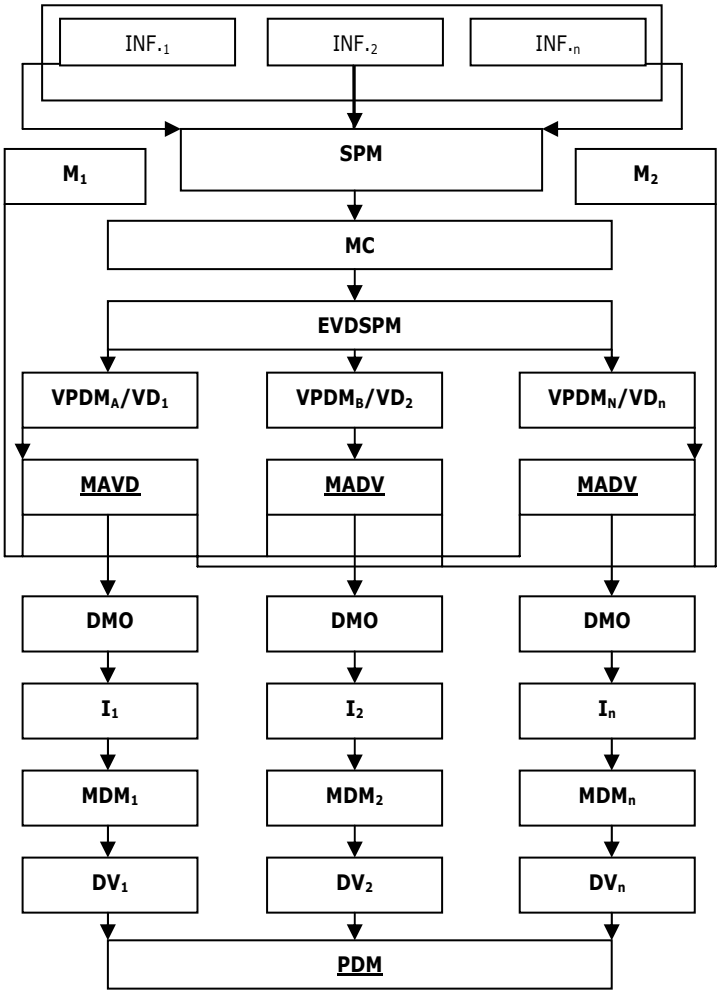
a. based on information gathered from past environmental problems and the actions taken, it can simulate different environmental decision-making option (MC => EVDSPM, Figure 29);

b. an environmental decision-making option requires a comparative analysis by two submodels proposed to reach the optimal decision;

b.1.first submodel, which analyzes decision-making option, quantifies the impact of decisional option effects on the environment by comparing results from different methods used to quantify the impact;

b.2.second submodel, which analysis environmental decision-making option, check the according of alternative decision-making and proposed environmental objectives and targets of organization;

c. based on the concept of adaptive management (Hax and Wilde, 1999) is proposed to consider the system of Figure 29, as an active adaptive circuit (Wilhelm, 2002), which continuously monitors each step, and final portfolio of environmental decision to be that step which gives the most important information for future decision-making options.



Legend:
INF. (INF.$_1$, INF.$_2$ ..... INF.$_n$) – environmental information; CIM – collection of environmental information; SPM – finding of environmental problems; MC – conceptual management; EVDSPM - developing decision-making options for solving environmental problems (where{VD_1, VD_2 ...VD_n} $\epsilon\Sigma$EVDSPM); VD – decision-making option; VPDM (where{$VPDM_A/VD_1$, $VPDM_B/VD_2$, ... $VPDM_N/VD_n$}$\epsilon\Sigma$ VPDM) – various environmental problems with decision-making options for solving these problems; MADV – analysis sub-models (M_1 and M_2) of decision-making option; DMO – optimal environmental decision; I (where {I_1, I_2...I_n}$\epsilon\Sigma$I) – implementation environmental decision-making option; MDM (where {MDM_1, MDM_2...MDM_n}$\epsilon\Sigma$MDM) – monitoring environmental decision; DV(where {DV_1, DV_2...DV_n}$\epsilon\Sigma$DV) – validation environmental decision; PDM – portfolio of validated environmental decisions.

Figure 29 : Systematic model for environmental decision
Source: Herghiligiu *et.al.*, 2012b

In most cases of environmental decision taken at organizations level it is necessary a model, fact that indirectly shows the necessity of this systematically proposed model. This proposed model essentially tries to give a factual and logical basis of any environmental decision options.

1. Environmental action

Environmental actions can be characterized as being those real actions occurred following an environment decision-making. This decision is grounded by collecting environmental information, analyzed and processed, taking into account different relevant criteria, due to the occurrence of environmental problems.

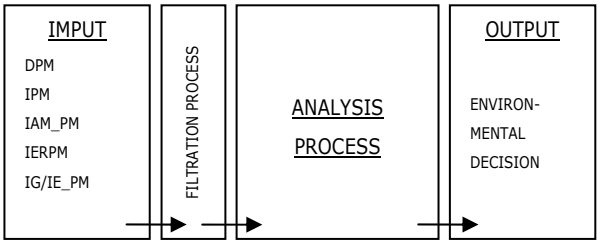
Environmental actions can be divided, taking into account the obligatory criteria in two categories (Figure 30): a. regulated, and therefore mandatory for the organization; b.voluntary (ISO 14001).

Environmental Actions	
Regulated environmental actions	Voluntary environmental action
Environmental advice	Continuously improving the relationship with the community
Various reports	Environmental monitoring/ testing
Various monitoring	Environmental trainings
Various studies	Environmental audits
Various records	management report
Planning	Environmental reporting
Trainings	Environmental insurance
Inspections	Environmental planning
Eco labeling	Feasibility studies
Action due to various overflows (accidental or not)	Cost-benefit analysis
Various insurance	Environmental impact studies
Pollution management	Environmental remediation
Waste management	Recycling actions
	Habitats and landscapes protection
	Various environmental projects
	ONGs and research in this area

Figure 30 : Regulated and voluntary environmental action
Source: Herghiligiu *et.al.*, 2012b

Analyzing in reverse, environmental action undertaken by an organization, it is possible to clamed that they are assembly through actions and improvements of environmental protection, protection and judicious management of natural resources, including air, water, soil, flora, fauna and representative samples (Lupu, 2011).

It's considered the following general structure of a process of solving various environmental problems (Figure 31):



Legend:
DPM - data about environmental issues; IPM - information on environmental issues; IAM_PM - information about environmental actions that solved environmental problems; IERPM - information resulted from direct or indirect experience resulting from the appearance and solving of different environmental problems; IG / IE_PM - information about mistakes or errors that led to various environmental problems.

Figure 31 : The process of solving environmental problems
Source: Herghiligiu *et.al.*, 2012b

An important role in the process of solving environmental problems, will consist in information about the Environmental Action (IAM_PM, with IPM) that solves environmental problems identified, which were held in the past or are ongoing, as they provide criteria in developing of decision-making options in the proposed model (Figure 29). This information result from analysis of environmental actions past or ongoing could be called: *early investigative sources* (Herghiligiu *et.al.*, 2012b).

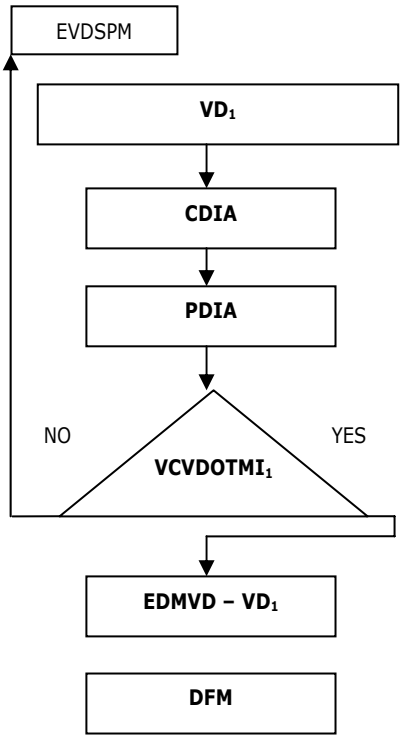
2. Submodels of environmental decision - systematic model

These two submodels which will be presented next, are integrated in MADV stage (M_1 and M_2), Figure 29; these submodels consider a variant of decision-making, and finally compares the results for choosing the optimal environmental decision.

A. Submodel M_1

The first submodel proposed - M1 (Figure 32), consider the concordance between the proposed environmental objectives and targets in the suggested at organization level and environmental decision-making options. The model goes on the principle of equivalence, it checks the importance of environmental decision-making options according to integration level of the environmental objectives and targets in the organization's goals level.

M1 submodel attempts to measure the degree of integration and assimilation of environmental objectives and targets at top management level of the organization (thus, is trying to determinate the efficiency of decisional options by the top management analyses, in the approach of the environment issues).



Legend:
VD1 – an environmental decision-making option 1; CDIA – collecting additional data and information (integration / implementation level of environmental objectives and targets in the top management of organization); PDIA – processing of additional data and information; VCVDOTM – checking of concordance for decisional options with environmental objectives and targets of organization; EDMVD – developing environmental decision for decisional option VD_1; DFM – the final environmental decision.

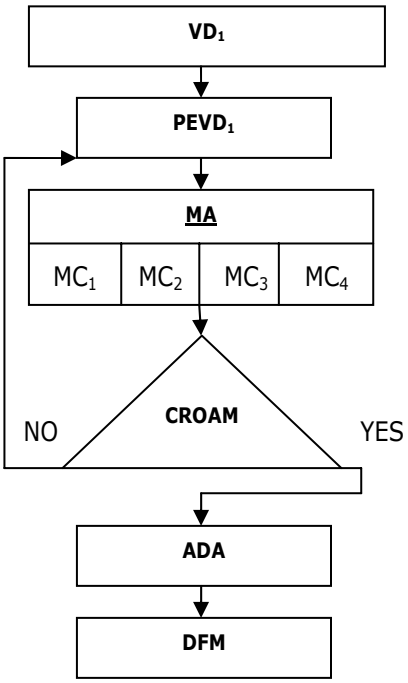
Figure 32 : Submodel $\mathbf{M_1}$
Source: Herghiligiu *et.al.*, 2012b

B. Submodel M2

The submodel M2 (Figure 33) proposed performs an analysis of the effects of the decisional option using four methods (Macoveanu, 2006) to quantify the environmental impact induced by industrial activity. Then compare the results obtained by choosing the most optimal method for proposed environmental decision-making option.

Any activity of any organization has an environmental impact, and the difference in measurement of this impact may be on the method used (Lupu and Herghiligiu, 2012b).

Efficiency of activity consists in an opportune environmental decision option; based exactly according with the facts (what impact has the decision-making option on the environment).



Legend:
VD1 – an environmental decision-making option 1; PEVD – design of environmental decision-making option 1 effects; MA - using an analysis method of induced impacts of different environmental decision-making option; MC1 - quantification method 1: Index method of global pollution; MC2 - quantification method 2: Evaluation charts method; MC3 - quantification method 3: Simple matrix method of interaction (Leopold matrix); MC4 - quantification method 4: Rapid evaluation matrix method of environmental impact; CROAM - comparing the results obtained after applying the four methods for quantifying the environmental impact; ADA - alternative data analysis; DFM - the final environmental decision

Figure 33 : Submodel $\mathbf{M_2}$
Source: Herghiligiu *et.al.*, 2012b

Conclusions

The environmental decision is the essential component of an environmental process that requires a logic judgment, requires an efficient model and an efficient corroboration between the facts (and of all environmental actions) in order to obtain an final environmental decision based on reality.

For an efficient environmental decision, it is necessary to know the environmental impact induced by the organization (which is achieved by applying an efficient method for impact quantification), and by analyzing the relationship between the environmental decision and environmental objectives (general and specific).

The advantages of using this systematic environmental decision model are:

a. more accurate environmental decision-making options as a result of performing various simulation;

b. each environmental decisional option pass through the process of two sub-models M_1 and M_2 from which is obtain a final decisional result;

c. the systematic environmental decision model compares the results obtained for each proposed decisional option and thus achieve optimal decisional option;

d. is proposed the use of standardized environmental decision.

In fact is intended to increase the level of efficiency regarding the environmental decision; this result can be achieved by using the proposed systematic model that analyze the environmental decision-making options (Figura 29), and finaly leading to environmental decision results with minimum risk and maximum environmental benefits.

3.3.2.2. Methodology for analyzing the importance of environmental knowledge management system due to its influence on the quality of environmental decision

Environmental knowledge management - explicitly, it can be seen as an environmental knowledge management system - (EKMS) and it can be defined as that system which links environmental data/information, analysis methods, human resources, and thus it's created the premise of integrating environmental principles at organizational level (Herghiligiu and Lupu, 2012a; Wernicke, 2003).

The literature presents quite explicit that environmental management and knowledge management are studied for a long time, and for achieving environmental performance it's necessary to use an effective environmental knowledge system.

Each entity at the organization level (it's consider an organizational entity: employees, departments, operational sections, or even a part of employee-oriented work, for achieve a specific environmental goal), must receive effective environmental data, environmental information, environmental knowledge, at a level which allows responsible environmental decisions, that have a minor negative impact on the environment (Figura 34) (Herghiligiu and Lupu, 2012a).

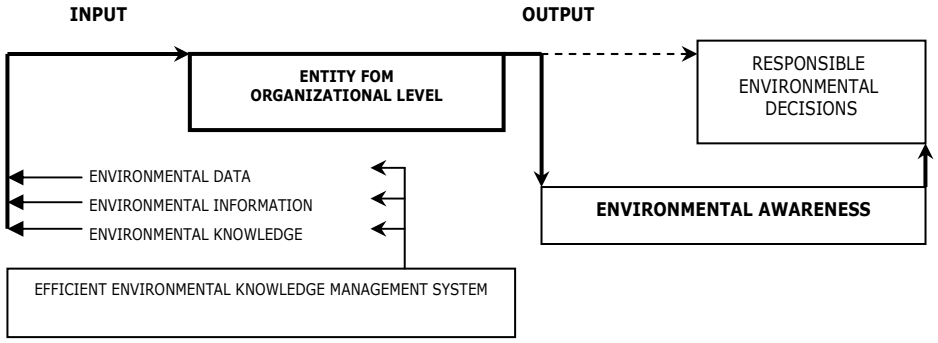


Figure 34 : Environmental knowledge management (EKMS) as a process
Source: Herghiligiu and Lupu, 2012a

1. Knowledge Management

For centuries philosophers have tried to define the term "knowledge" and explain specifically what it means (Alavi and Leidner, 2001; Tsoukas and Vladimirou, 2001). Interest in the source and nature of knowledge exists since Socrates, Plato, and Aristotle, interest that continues even today (Gu, 2004).

The term *knowledge management*, although it is quite new, has attracted attention in the academic as well as private management, because in this environment that is constantly changing, knowledge is the highest source of power (Toffler, 1990). Knowledge has become successful factor for an organization - a major advantage, internally and externally; because internal leads to responsible decisions at any organizational level, and external because it provides to organization a surplus in the competitive environment (Herghiligiu and Lupu, 2012a).

There are many definitions of syntagma knowledge, but most relevant is that they are "justified belief" (Nonaka and Parker, 2009) or "justified belief that increases an entity's ability to take effective action" (Alavi and Leidner, 2001).

Knowledge management can be generally defined as all methods, mechanisms, processes, structures, policies, strategies, people, data and information that have the ability to create, capture, collect, store, query, use and transfer knowledge, with the main objective that the organization work more efficiently. It can be considered that knowledge management summarizes all processes at organization level regarding the knowledge creation, storage of knowledge, transfer of knowledge and use of knowledge, with the purpose to provide accessible, reusable and transferable knowledge (Herghiligiu and Lupu, 2012a).

Environmental knowledge management

To respect the idea of sustainable development, is required a combination of knowledge management with environmental management, especially in this turbulent economic environment in which the organizations coexist.

Starting from the premise that environmental knowledge management (EKM), at organization level, can be viewed as a stand-alone, it is possible to give the following definition: environment knowledge management system is all methods, mechanisms, processes, structures, policies, strategies, people, data and information that have the ability to create, capture, collect, store, query, use and transfer environmental knowledge with the main goal to improve the environmental impact of the organization (adapted after Finster); and environmental knowledge as including data, information and knowledge, which have been accumulated by linking to environmental problems of an organization since it was founded (Herghiligiu and Lupu, 2012a).

Environmental knowledge management must effectively combine, at organization level, explicit and tacit knowledge, and control environmental impact through the creation, storage, transfer and use of environmental knowledge.

Environmental knowledge is knowledge that includes practical ideas and concepts of environmental protection (minimizing the negative impact of organization on the environment, sustainable development, unpolluted environment for employees, continuous improvement, , and so on); what stakeholders of organization know about environmental protection and sustainable development. The environmental knowledge management system (EKMS) must effectively manage the environmental information in order to solve environmental problems through responsible environmental decisions, presenting in a real manner the environmental benefits.

EKMS integrate environmental issues in the routine operations carried out in the businesses to reduce pollution and increase their environmental responsibility (Frick *et al*., 2004; Herghiligiu and Lupu, 2012a).

Given that environmental EKMS combines tacit knowledge (gained by human experience of time - experience) with explicit knowledge (arising from solving various environmental tasks), authors say that it is possible to prevent environmental problems and not just solving them.

Regarding the relationship between information system of organization (ISO) and EKMS, it is possible to say that is integration - EKMS is integrated in ISO. EKMS uses all available resources of ISO to assist environmental managers to perform their environmental tasks and solve environmental problems.

2. Methodology for investigating the EKMS importance as a consequence of its direct influence on environmental decision

This subchapter propose a research methodology (with an adapted method of analysis), which is based on literature review, different specialists opinion, and different research in environmental management area for doctoral thesis. So this subchapter has the following goals:

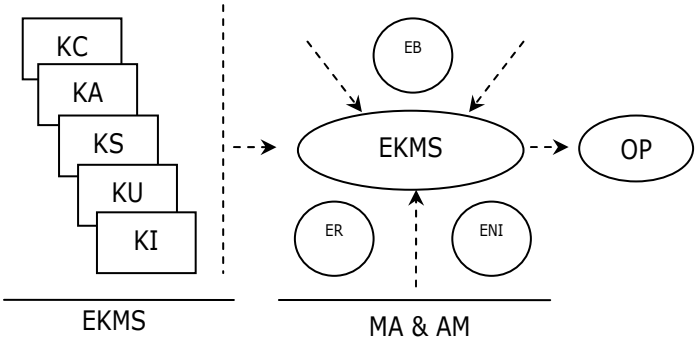
a. to provide a pertinent methodology for investigating the importance of EKMS (as a system) at organizations level, essentially starting from: (1) environmental knowledge creation, (2) storage of environmental knowledge, (3) transfer/sharing of environmental knowledge and (4) use of environmental knowledge (1-4: environmental knowledge circulation);

b. to adapt and develop a simple method of analysis (as a simple tool for environmental managers) - which identifies the importance of SMCM.

Romania's economic development and adherence to the EU opened the doors to the community market which has certain legal requirements and voluntary standards. Romanian organizations must adapt to the "criteria" and the requirements imposed in terms of environmental protection in order to become competitive. One of the key elements of Romanian organizations success is to develop substantial the

environmental knowledge management at the organizations level to increase their environmental performance (and as a whole).

Therefore Romanian environmental managers, and not only, need a simple and efficient tools (methodologies/ methods) to quantify the performance of environmental knowledge management system.



Legend:
KC – Knowledge creation; KA – Knowledge accumulation; KS – Knowledge sharing; KU – Knowledge utilization; KI – Knowledge internalization; EKMS - environmental knowledge management system; EB – environmental benefits (direct and indirect); ER – environmental risk (for the employees/ ambient environment/ community); ENI – environmental negative impact; EKMSP - environmental knowledge management system performance; OP – organizational performance

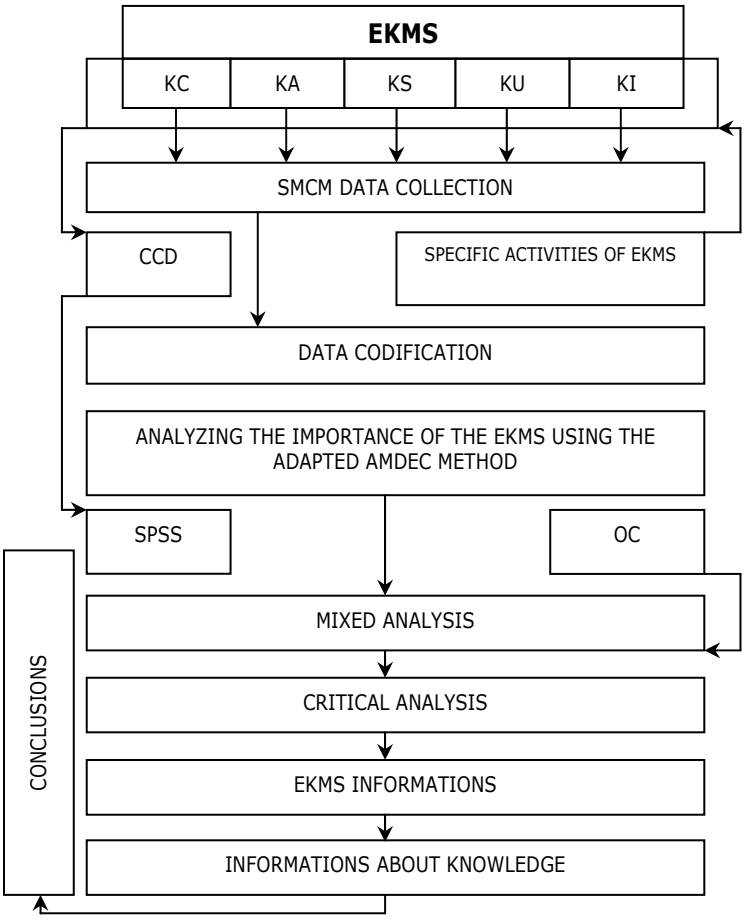
Figure 35 : General environmental knowledge management system research model
Source: Herghiligiu and Lupu, 2012a

The proposed research methodology regarding EKMS

This subchapter proposes to establish the importance of EKMS using a *mixed analysis*; combining a method who quantifies the environmental impact (adapted AMDEC method) with the classical method that evaluates the importance of some considerate aspects, using the questionnaire and SPSS (Figure 36).

For each *factor* of EKMS is observed the level of use, regarding specific activities (Table 56).

For classical analysis, each specific activity SMCM can be adapted and considered to be an item, to collect data by questionnaire.



Legend:
KC – Knowledge creation; KA – Knowledge accumulation; KS – Knowledge sharing; KU – Knowledge utilization; KI – Knowledge internalization; CCD – classic collecting data through questionnaire; OC – organizational characteristics (organizational structure, organization size, type of activity); EKMS - environmental knowledge management system

Figure 36 : Mixed analisys regarding the importance of EKMS
Source: Herghiligiu and Lupu, 2012a

It is considered that these assessments can be made periodically in the organization, with the purpose to follow the progress of EKMS, and the influence of voluntary or involuntary changes.

This theoretical framework (who is proposed) studies the importance of EKMS and considers that through this mixed analysis (using an industrial method and investigation through questionnaire) it is possible to make a positive contribution in obtaining information about EKMS (about "knowledge").

Regarding the characteristics of organizations authors can say that they can directly influence specific activities EKMS; such as the level of dissemination of knowledge in a large organization is higher than in a

small organization, or an organization with industrial profile will have a higher level of environmental knowledge creation than one in service sector, , and so on.

Naturally an environmental manager can use this methodology proposed separately - not using a mixed analysis to obtain a situation report: (1) using first the factors (Table 56) - collecting data from the documents/records of organization (transforming it in indicators) and then using the proposed method, or (2) using proposed factors with proposed specific activities (Table 56) as items for a questionnaire survey (proposed questionnaire – Annex no.11) - and then analyzing data using statistic program SPSS.

Table 56 : Specific activities of EKMS
Source: Herghiligiu and Lupu, 2012a - adapted from Lee *et.alt.* 2004

No.	FACTOR	SPECIFIC ACTIVITY OF EKMS
1.	Knowledge creation (KC) a. the understanding level of environmental task b. the level of understanding the environmental information	1.a.1.Using an electronic dashboard for environmental tasks 1.a.2.Correct explaining of environmental task by environmental manager 1.a.3.Proper understanding of the most important knowledge for environmental tasks 1.b.1.The use of brainstorming sessions to share environmental information 1.b.2.The use of different electronic sources of knowledge from organization level for carrying out environmental tasks 1.b.3.Optimum use of different environmental software 1.b.4.The use of alternative knowledge for solving environmental tasks
2.	Knowledge accumulation (KA)	2.a. Use of organization's databases to store environmental tasks 2.b.Storing information regarding assessment from fulfillment of environmental tasks 2.c.Storage of environmental legislation who was useful for solving environmental tasks 2.d.Store's feedback from the external environment of the organization's environment 2.e.Storing documents who were used to solve various environmental activities 2.f.Storing all environmental education programs 2.g.Storing the results of environmental education programs
3.	Knowledge sharing (KS)	3.a.Distribution/ transfer/ sharing of environmental information/ knowledge by different methods (meetings followed by regular evaluations , and so on.) 3.b.Using the results from the transfer of environmental information 3.c.Using the intranet and internal electronic bulletin – regarding environmental issues 3.d.Transfer of environmental information/ knowledge between different teams/departments of the organization
4.	Knowledge utilization (KU)	4.a.Using environmental education programs for stakeholders of the organization 4.b.Environmental research 4.c.Use of environmental knowledge from external database 4.d.Use internal policies to stimulate new ideas on the use of environmental knowledge 4.e.The existence of an organizational culture that encourages environmental knowledge sharing
5.	Knowledge internalization (KI) a. opportunity for environmental education b. knowledge from environmental tasks	5.a.1.Opportunity to follow environmental education programs for employees 5.a.2.Opportunity to follow environmental academic programs 5.b.1.The learning level though new environment tasks 5.b.2.Using best practices in environmental tasks

Proposed FMECA Method

The subchapter, in addition to the data processing and data/ information evaluation using the statistical program SPSS, suggests an adapted method of analysis - FMECA.

The proposed method for quantifying the importance level of EKMS is based on the method called FMEC (in fr.: Analyse des Modes of Defaillance the effects et de leur leur Criticites) applied for the first time to the aircraft industry and later extended to their sectors.

This method allows prioritization of environmental issues by identifying important impacts, based on the following criteria: the importance of the impact/ production frequency or probability of occurrence/ persistence / other criteria (Lupu and Herghiligiu, 2011; Herghiligiu and Lupu, 2012a).

In the case of EKMS, the method of quotation/ measurement regarding the identified impacts consider the following criteria (Herghiligiu and Lupu, 2012a):

a.the importance of the impact (I) - if the activities SMCM (KC+KA+KS+KS+KU) bring a positive contribution on the following: a_1.reducing negative impact on human; a_2.reducing negative environmental impact; a_3. environmental benefits (direct or indirect);

b.impact frequency (F) - EKMS if activities are carried: b_1. daily = significant frequency; b_2.2-4 times / week = average frequency; b_3.1-4 times / month = frequency low / occasional;

c.impact magnitude (M) - if EKMS activities are carried: c_1.significant = of / with more than 50% of people directly interested/involved; c_2. medium = approximately 50% of staff interested/involved; c_3. minor = more than 50% of staff interested/involved;

d.user activity opinion (O) - if the activities of EKMS are evaluated by the staff which is directly involved and interested (through periodic surveys) as: d_1. as a significant positive activities for the organization and employees = significant; d_2. as activities with a positive impact on the organization = average opinion; d_3.does not exist an opinion.

For these criteria there is set a scale (Table 57), each criterion taking positive values and having a weight coefficient, depending on its importance in the process of quantification.

Table 57 : Cotation grid regarding specific activities impact of EKMS
Source: Herghiligiu and Lupu, 2012a

Criteria	Weight coefficient	10 points	5 points	1 point
I	7	(a_1+a_2+ a_3) major	(a_2+a_3) medium	(a_3) minor
F	4	(b_1) daiy	(b_2) medium	(b_3) occasional
M	5	(c_1) significantly	(c_2) medium	(c_3) minor
O	2	(d_1) significantly positive	(d_2) medium	(d_3) no opinion

It gives to each criterion values for each specific activities impact and finally get an average score (for the importance of each specific activity of EKMS) calculated using the following formula:

Score: F×4+I×7+M×5+O×2

It is proposed a scale of impacts achieved (Herghiligiu and Lupu, 2012a):

P <30 - insignificant impact of specific activities

30> P <45 - a medium impact of specific activities

P> 45 - significant impact of specific activities

For analysis of specific activities will be retain only those significant impacts that have higher values than 45 points.

The impact of a factor of EKMS to which has been associated *n* number of specific activities is calculated as follows:

$$IFa_i = \frac{\sum_{i=1}^{n} IF_i}{n}$$

where:

IFa_i – impact of factors/indicators of EKMS ($IFa_i \in \{ KC,KA,KS,KS,KU \}$)

n – number of specific activities of factors/indicators of EKMS

The overall impact (performance) regarding the SMCM, where is developing a_n factors (with specific activities), are calculated as follows:

$$IF_{global} = \frac{\sum_{a_i=1}^{a_n} IFa_i}{a_n}$$

where:

IF_{global} – impact of all factors of EKMS

a_n – number of factors - EKMS

Conclusions

At the organizational level, environmental knowledge management system is one of the most important systems, which can lead to performance; and, development of this system can lead to minimizing the environmental negative effect induced by organizations and even to obtain benefits in the short, medium and long term (Herghiligiu and Lupu, 2012a).

This subchapter considers the EKMS as being a part of General Information System (as an integrated system in general informational system).

This theoretical framework that identifies the importance of EKMS at organizations level, propos:

a. a analysis methodology for EKMS using in parallel the classical investigation (through questionnaire) and an adapted method (FMECA) from industry.

b.considered as semi indicators for EKMS the specific activities of this system (Table 56)

c.adapts and uses a method from industry to measure the quantitative level of different specific activities of EKMS

d.for classical evaluation suggests using the same items as the specific activities of EKMS

e.considers that any specific activity of EKMS can be analyzed using qualitative investigation; following a critically analysis of the relationship between quantitative and qualitative assessment

f.considering effective the earlier idea, when the EKMS increase (quantitative level) the environmental performance (of the organization) enlarges

As a final concussion, this subchapter aims to provide an efficient and pertinent way for analyzing the environmental knowledge system of organizations, aiming to emphasize its value and importance.

Conclusions and contributions

1. Conclusions

The undertaken research is original and singular on the organisations' level in the North-East of Romania as (a) it presents concretely their specific features by describing the factual state, and (b) it clarifies what factors influence the implementation quality of an Environmental management system, the influence degree and the nuance of this influence (positive/ negative). The originality of the research also results from the methodology conception, the performed statistical analysis, from the attained results, from the solutions proposed to the managers on the organisations' level in order to improve the implementation quality of the EMS.

The following aspects were observed during the research:

1. Although the practical reality and the specialty literature mention that informational system management play a defining role in the organisations, it has been noticed after the undertaken research that *the Environmental informational management* determines only a very low percentage (of 4%) from the variation of the implementation quality of the EMS aspect. Thus the probability of this phenomenon's existence is explained only by finding out that the organisations have not developed an efficient decisional/ informational/ knowledge environmental management system, whereas the environmental monitoring and control have a purely formal character.

2. While analysing the lack of connection between *the System-Technological Infrastructure with an impact upon the environmental management,* respectively *the Orientation to the organisation's environmental innovation*, and the implementation quality of the EMS, we notice the lack of interest that the organisations have in these aspects, probably due to the big costs related to the non pollutant technologies and to the innovation process.

3. It is extremely important to notice that while the environmental regulations requirements increase and while the pressure of the stakeholders also increases, then the EMS implementation quality decreases. This finding presents in essence the real relationship between the EMS and the organisations, characterised thus as "a necessary burden" to the organisations' interests, and not as an effect of the awareness on environmental issues. The probable causes of this "paradoxical" phenomenon may be in essence the following:

(a) excessive routinisation (considered as a negative effect) – as an effect of the integration of the EMS on the level of the general management,

(b) the excess of the tolerability limit of the expenses necessary for the implementation and function of the EMS on the organisations' level,

(c) the lack of vision on average term and on long term, and

(d) a high degree of endurance to change, and so on.

The conception and the factual achievement of the research determined the identification of solutions presented synthetically in order to improve the implementation quality of the EMS on the level of the Romanian organisations in the North-Eastern region and not only, as follows: the flexibilisation of the organisation's internal regulations, the laying out and the clear expression of an environmental vision, a clearer laying out of the environmental objectives and targets as well as theis real integration in the organisations' general objectives, the real utilisation of the results attained after the environmental audits and the increase in the monitoring level of the environmental performance; all these can improve substantially the implementation quality of the EMS.

Then the identification of the environmental knowledge level of the organisations' employees by regular evaluations, and subsequently the laying out of the objectives/ training sessions/ specialisations in environmental issues, plus the clear elaboration of the environmental responsibilities and the introduction of the environmental performance on the level of the employee rewarding/ compensating system, all these cauld improve the implementation quality of the EMS.

The conclusions extracted from the evaluation and the quantitative - qualitative analysis of the relationship between: a) the organisation's orientation in the environmental management issues and b) the implementation quality of the Environmental management system may be considered as the starting points in the development of measures with a practical character for an environmental manager on an organisation's level, which have as their main purpose the transformation of the Environmental management

system into an efficient system that functions at its best and represents "an advantage lever" at the organisation's disposal.

2. Contributions

Both theoretical and practical original contributions brought by developing this chapter, may be listed in a synthetic manner in the following:

- Development of a conceptual framework and a coherent research methodologies that allow quantitative and qualitative study of the relationship between the organization orientation in environmental management issues and EMS implementation quality;
- Development of a systematic model to improve environmental decision making process;
- Development of an investigation methodology of the environmental knowledge management system importance due to its influence on the quality of environmental decision and aso the development of a simple method to quantify the importance level of this system;
- Proposal of a definition for environmental knowledge management systems;
- Development and validation of an original research instrument (questionnaire) used in present research for evaluation/ analysis of relationship between organization orientation in environmental management issues, and Environmental management system implementation/ ntegration quality;
- Development of models showing:
    a. architecture of all influences between variables that describe the organisation's orientation on the environmental management and variables that describe EMS implementation and integration quality under certain conditions;
    b. estimation of correlations between organisation's orientation specific factors regarding environmental management and synthetic variable/ global that defines EMS implementation and integration quality;
- Application of developed research methodologies in the field research undertaken;
- Proposal and development of practical solutions to improve the quality of EMS implementation and integration at N-E Romania organizations level.

Chapter 4 : Research and contribution regarding the transformation and adaptation of the Environmental management system architecture relying on the principles of the fractal philosophy

The organisations interact among them nowadays in an environment that changes very fast, and thus, in order to be efficient, they must have knowledge about clients, market tendencies, new different technologies that might be utilised for the settlement of different issues. They must also have different management systems (for example in accordance with ISO 14001/ ISO 9001/ ISO 18001), designed and implemented so that they should be flexible, intelligent, easily configurable, and so on (Herghiligiu *et al.,* 2012; Herghiligiu *et al.*, 2013).

The consumers' demand in this modern environment became diverse, dynamic and sometimes unpredictable, whereas the organisations' need to maintain a market share and to increase fast has become harder and harder to reach (Ryu and Jung, 2003).

The flexibility need of the organisations whose main objective is to meet the consumers' demand promptly, associated with the demand's continual change and with some uncertain and unstable aspects of the characteristics of the organisations' environment may disturb fundamentally all the levels of an organisation (Deming, 1994; Herghiligiu *et al.*, 2012; Gavronski I. *et al.*, 2013) (Figure 37).

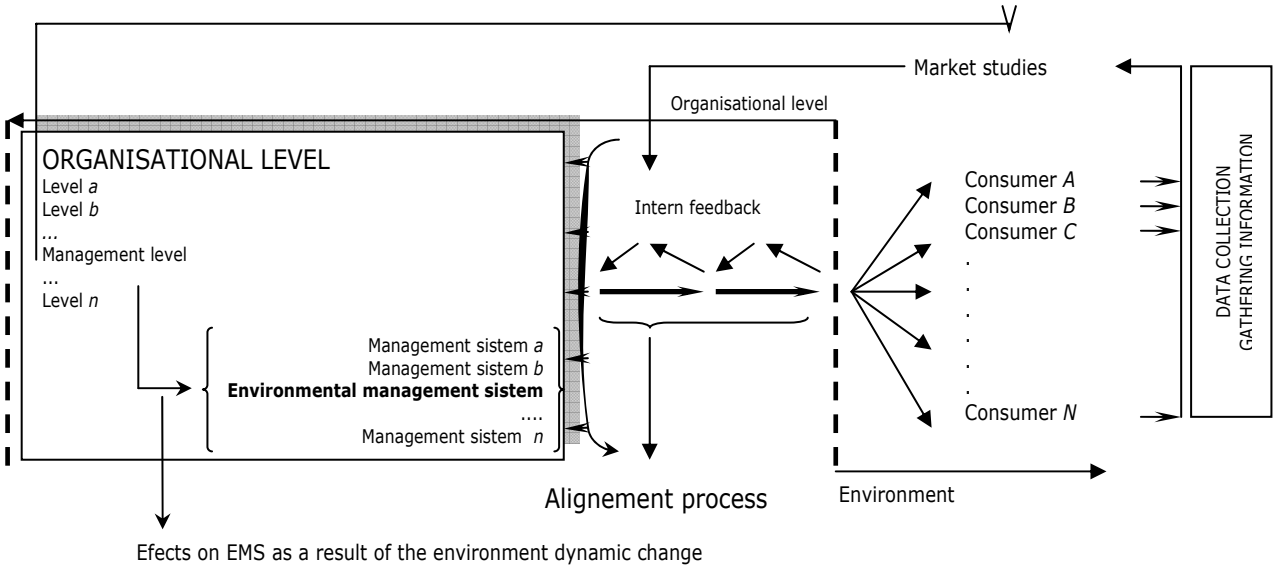


Figure 37 : The relationship organisation – consumers
Source: Herghiligiu *et al.*, 2012

4.1. The research methodology applied in the analysis of the possibility to improve the quality of the implementation and operation of the Environment management system by transforming and adapting its architecture relying on the principles of the fractal philosophy

4.1.1. Structure and general description of the research process

The main **purpose** of this chapter is to propose a quality instrument that might improve the quality of the implementation and operation (functionality) of the Environmental management system.

On the level of the designing stage, the choice of the information sources (articles and profile books/ the utilisation of the national and international databases/ existing environmental documentations on the level of the large organisations in the north-eastern area of Romania/ the specialists' opinions – regarding the quality of the implementation and operation (functionality) of the Environmental management system/ the conclusions after the analysis of the questionnaire applied to the organisations' level in the north-eastern area of Romania), and the selection of the modality to gather and systematise information represented an extremely important stage in the approach of the undertaken research.

In order to materialise **the main objective,** and namely to develop a theoretical framework based on principles of the fractal philosophy that could offer the possibility of transforming and adapting the architecture of the Environmental management system, in order to improve the quality of the implementation and operation (functionality) of this system (O_4 – Chapter 1), and of the proposed sub-objectives, the achievement stage aimed at:

a. collecting information with the purpose:

a1. of identifying and describing the main characteristics of the fractal philosophy; the exploratory research techniques consisted in the identification of the information type and source that need to be studied as follows: secondary information sources – the specialty literature;

a.2. of identifying and describing the implementation and operating stages of the Environmental management system (in accordance with ISO 14001); for the identification and description of these stages, the exploratory research techniques consisted in the identification of the information type and source that need to be studied as follows: secondary information sources – the ISO 14001 standard, the specialty literature, environmental documentations from the level of some of the largest organisations in the north-eastern development area of Romania , and so on;

a.3.of rethinking and adapting the architecture of the Environmental management system – the elaboration of the theoretical framework based on the principles of the fractal philosophy, that should allow

the improvement of the implementation and operation of the Environmental management system; for this sub-stage the exploratory research techniques consisted in the identification of the information type and source that need to be studied as follows:

- secondary information sources: the ISO 14001 standard, the specialty literature, environmental documentations on the level of some of the largest organisations in the north-eastern development area of Romania, , and so on;

- primary information sources: the investigation of different aspects [a. implementation and functionality of the Environmental management system (a1. establishing the environmental responsibilities having in view the influence factors/aspects/ a2. performing the training in the environmental management issues/ a3. environmental communication/ a4. performing the control on the level of the Environmental management system; b. the organisation's flexibility to assimilate the transformation and the adaptation of the architecture of the Environmental management system; (b1.the flexibility of the organisational structure/ the orientation of the organisations' managers towards the decentralisation of the environmental objectives and targets/ b2.decentralisation of the environmental decisional process), considered as being important for this research, using the applied questionnaire in Annex no.2., with a scale of an ordinal type[57] in seven (Likert scale), and with 179 items applied to 171 (validated final number) by managers (specialists in the environmental field (environmental manager) with/ or without experience in different environmental actions) on the level of the largest organisations in the north-eastern development area of Romania , and so on;

b. processing/codifying information:

1. the questions in the questionnaire were introduced and codified in the statistical analysis programme SPSS 16, with the purpose of obtaining statistical and graphical representations which shall allow the formulation of exact interpretations regarding the proposed "aspects" for the transformation and adaptation of the architecture of the implementation and operation of the Environmental management system on an organisation's level;
2. the information in the specialty literature were processed and adapted so that they should serve in a direct manner to the proposed objective and sub-objectives;

c. analysing and interpreting the mentioned collected information:

In order to analyse the possibility of improving the quality of the implementation and functionality of the Environmental management system, having in view the transformation and the adaptation of this system's architecture that relies on principles of fractal philosophy,

[57] The ordinal scales (ordering) involve a measuring level in which the objects from the different categories of a scale are from a certain relationship with those categories (Hutu, 2005).

(A.) The exploratory research techniques consisted in the identification of the information type and source that need to be studied, having in view:

- the secondary information sources: the specialty literature , and so on/ environmental documentations of the organisations;

- the primary information sources: the information resulted after the application of a questionnaire (annex 2)/ processing/ and the critical analysis of the collected data;

(B.) The analysis process:

1. qualitative/ quantitative analysis and the processing of data collected in the applied questionnaire were performed by using the SPSS statistical programme (testing of the internal consistency corresponding to the aimed variables/ utilised within the research instrument – the Cronbach Alpha index/ descriptive statistics (average/ standard average infringement), the analysis of the frequency);
2. the qualitative analysis of the information and knowledge in the specialty literature either aimed at processing and adapting the respective information and knowledge, either aimed only at understanding their essential aspects (points t_0 in subsequent constructs); and

(C.) The result of the research consisted in: the transformation and the adaptation of the architecture of the Environmental management system relying on principles of the fractal philosophy that should allow the improvement of the implementation and operation of the Environmental management system, having in view the frequent changes produced in the environment in which the organisations interact.

It is also necessary to mention that **on the level of the data/ information/ knowledge collection stage** – The applied research methodology in the development of the conceptual framework regarding the transformation and the adaptation of the architecture of the implementation and operation of the Environmental management system (Figure 38) has the following sub-stages: laying out the sample/ designing the constructions and instruments for the investigation/ (Annex no. 2)/ validating the investigation instruments/ **applying the investigation instruments; these were detailed in chapter 3 – The designing of the considered variables (constructs)** – doctoral thesis.

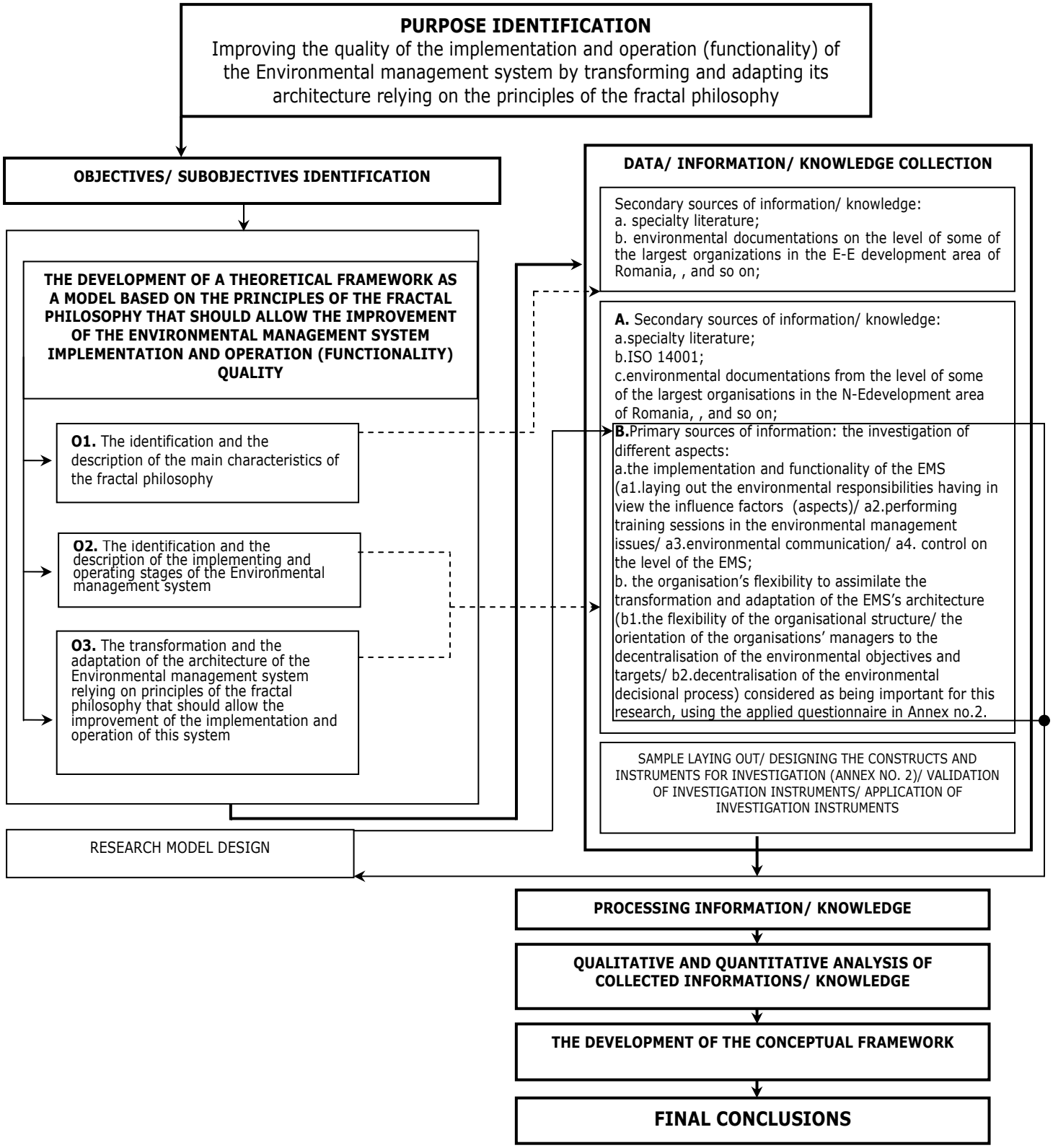


Figure 38 : The applied research methodology in the development of the conceptual framework regarding the transformation and the adaptation of the architecture of the implementation and operation of the Environmental management system

4.1.2. The designing of the research model

The main objective of the research model is the possibility of developing a flexible conceptual framework that should allow the transformation and adaptation of the current architecture of the Environmental management system on the level of the implementation and operation (functioning) stage. That is why the elaborated model (Figure 39) has three essential aspects:

a. main aspects that characterise the implementing and operating stage of the Environmental management system (laying out the environmental responsibilities/ performing the environmental training sessions/ the environmental communication/ control); their choice was made in accordance with the ISO 14001 standard and can be found explained and motivated according to the specialty literature on the level of the previous chapter (Sub-chapter: The designing of the considered variables (constructs) – Chapter 3 - doctoral thesis)

b. aspects regarding the flexibility of the organisation on the possible proposed transformations on the level of the current architecture of the Environmental Management System, such as the flexibility of the organisational structure and the orientation of the organisations' managers – decentralisation of environmental objectives and targets/ decentralisation of the environmental decisional process; these aspects can be found explained and motivated according to the specialty literature on the level of the previous chapter (Sub-chapter: The designing of the considered variables (constructs) – Chapter 3 - Doctoral thesis).

c. principles of the fractal philosophy/ paradigm – the exploratory research techniques consisted in the identification of the information type or resource that need to be studied, having in view the secondary information sources: the specialty literature (they can be noticed below).

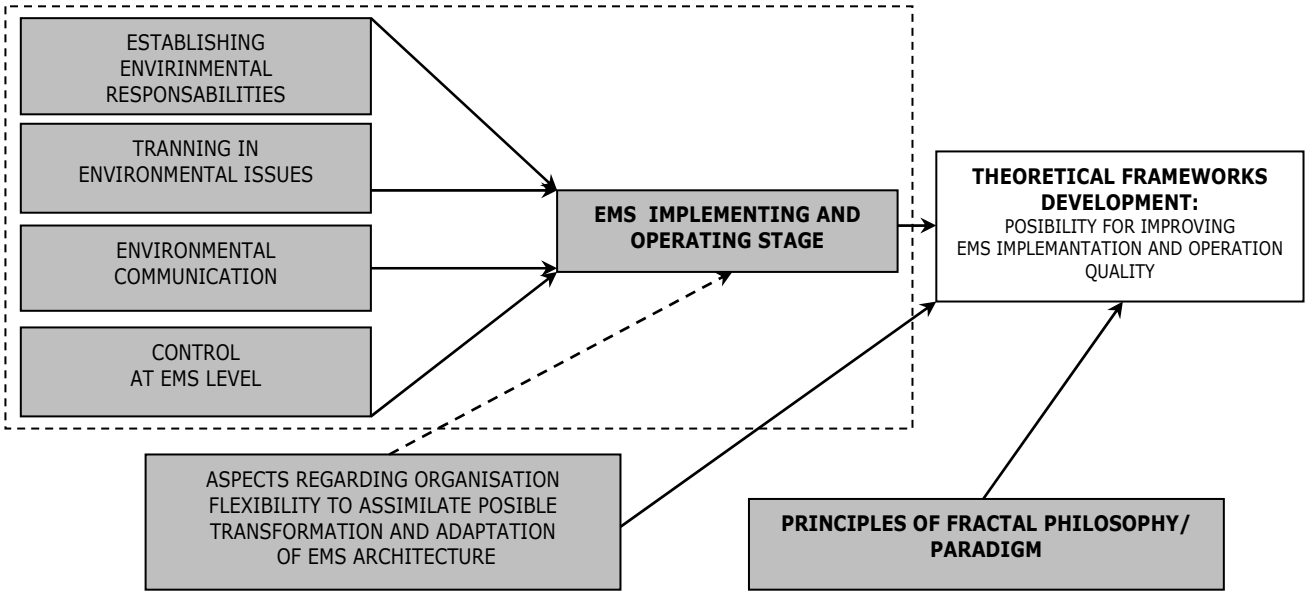


Figure 39 : General research model regarding the posibility of improving EMS implementation and operation quality

4.1.3. Testing the trust of the internal consistency related to the selected constructs in the applied questionnaire

For testing the trust of the internal consistency related to the selected constructs in the applied questionnaire, was used the SPSS version 16 software and the results can be observed in the following table (Table 58):

Table 58 : Testing the Trust of the Internal Consistency Related to the Selected Constructs
Source: statistic analysis of applied questionnaire - Annex no.15

No.	Considered variables	Utilized items (ANEX No. 1)	Descriptiv statistic (ANEX No.3)			
			N	Average	Average standard deviation	Cronbach's Alpha Index
EMS IMPLEMENTATION AND OPERATION (EMS implementation according to ISO 14001)						
A.	**SETTING ENVIRONMENTAL RESPONSABILITIES AT EMS LEVEL**					
I.	**Organizational structure through implementation of EMS environmental policies and programs** - INFLUENCING FACTORS -					
1.	Formalizing environmental activities	I.2./ I.18./ I.19./ I.20./ I.21.	171	4.5380	.75873	.630
2.	Specialization of environmental activities	I.5./ I.18./ I.19./ I.20./ I.25./ I.26./ I.27.	171	5.1178	.64883	.610
3.	Centralization of environmental activities	I.4./ I.22.	171	4.4503	1.73261	.656
4.	Decentralization of environmental activities	I.3./ I.23./ I.24./ I.28.	171	4.9450	.68291	.560
5.	Functional cooperation (departmental/ interdepartmental)	I.6./ I.7./ I.26./ I.28./ I.30./ I.31.	171	4.6374	1.04058	.599
II.	**Qualified staff in environmental management issues** - INFLUENCING FACTORS -					
1.	Environmental indoctrination	I.8./I.29/ I.30.	171	4.0390	.99201	.70
III.	**Establishing environmental responsibilities (at EMS level)**					
1.	Establishing environmental responsibilities	II.17	171	4.2807	1.56530	-
IV.	**Existence of another management system implemented at the organisational level**					
1.	Existence of quality management system	II.55./ II.56.	171	6.4386	.98848	.926
V.	**Operation of EMS internal audits** - INFLUENCING FACTOR -					

1.	EMS internal audits	II.6./ II.7	171	6.0936	.96863	.895
B.	**ENVIRONMENTAL TRAINING**					
1.	Environmental training	I.32./ I.33./ II.12./ II.13./ II.14.	171	4.6117	1.49205	.853
2.	Registration of environmental trainings results	II.43	171	5.3158	1.44089	-
3.	Registration of environmental trainings effects through performed environmental activities	II.38.	171	6.0877	1.13678	-
C.	**ENVIRONMENTAL COMMUNICATION**					
1.	External environmental communication	I.14	171	4.2632	1.92378	-
2.	Internal environmental communication					
	*at environmental information level (a)	II.30./ II.31./ II.35./ II.37.	171	5.3494	.98760	.778
	*at environmental knowledge level (b)	II.44./ II.45./ II.47.	171	5.0526	1.2932	.610
D.	**CONTROL AT EMS LEVEL**					
1	Control of environmental documents	I.9./ I.34.	171	5.8246	1.23607	.812
2.	Operational control	I.39./ I.40./ I.41./ I.60/ I.84./ I.85./ I.87./ I.89./ I.90./ I.91./ I.94./ I.96.	171	4.9873	1.14504	.886
3.	Operational control externalization	I.42.	171	5.5614	1.45138	-
ORGANISATION FLEXIBILITY TO ASSIMILATE EMS ARCHITECTURE TRANSFORMATION AND ADAPTATION						
A.	**Flexibility of organisational structure**					
1.	"Flexibility" of organisational structure	II.2./ II.3./ II.4.	171	3.2495	1.49862	.877
B.	**Orientation of organization managers – environmental decentralization objectives and targets/decentralization of decisional process**					
1.	Establishing, modifying and updating environmental objectives and targets at department level/ divisions of organisations guided by a set of environmental objectives and targets as general-directive (strategic orientation)	I.10	171	6.6959	.55406	-
2.	Decentralization of environmental decision-making process (each employee has to decide for themselves in performed environmental current activities (guided by a code of good environmental practices)	II.28	171	3.4620	2.15093	-

4.1.4. The critical analysis of the data collected by the applied questionnaire

The critical analysis of the data collected through applied questionnaire has as a derived purpose, the observation of the relationship between the (a) considered as most important aspects that characterize the EMS implementation and operation stage, (b) the hierarchical structure of organizations, and (c) the actual flexibility of the organisations to assimilate an eventual transformation and adaptation of the architecture of the EMS, seen through the resulted effects upon the EMS quality (implementation and operation stage) due to critical analysis made (Table 59).

Table 59 : The critical analysis of the collected data
Source: The statistical analysis of the applied questionnaire – based on Annex no.14/ Annex no.15

NO.	ANALYSED ASPECT	WEAK AND STRONG POINTS	CAUSES	EFFECTS UPON THE QUALITY OF THE EMS WITHIN THE ORGANISATIONS
THE IMPLEMENTATION AND THE OPERATION OF THE EMS (EMS implemented in accordance with ISO 14001)				
I.	**ESTABLISHING THE ENVIRONMENTAL RESPONSIBILITIES ON THE LEVEL OF THE EMS**			
I.1.	The organisational structure through the implementation prism of the environmental policies and programmes of the EMS (as a factor that determines the environmental responsibilities)	**I. Weak points:** 1.the existence of the environmental responsibilities only for some managers of organisations; 2. the relatively average level to verify the concordance between the environmental activities deployed and the duties in the job description; 3.half of the organisations' managers consider that the pollution prevention is the responsibility of the environmental department; 4.high centralisation degree of the environmental activities (implication in the process of laying out the environmental objectives and targets/ different environmental activities); 5.half of the organisations' managers consider as an inefficient practice the implication of all the employees in the environmental decisional process;	1.the lack of flexibility in the structural re-organisation after the implementation of the EMS; 2.the unawareness on the importance of managing the aspects and the associated impact upon the environment (on the level of all the managers in an organisation); 3.the hierarchical structure of the organisation conditions and determines the architecture of the implementation and operation of the EMS.	1.the low level of operational flexibility of the EMS/ or of the agents/ of the entities on this system's level as an effect of the absent environmental responsibilities on the level of all the managers; 2.the decrease of the functioning quality level of the EMS having in view the lack of the environmental awareness; 3.the lack of configurability of the EMS on the implementation and operation level; 4. the lack of autonomy of the EMS or of the agents/ entities of this system on the implementation and operation level; 5.the decentralisation possibility of the agents/ entities on the level of the ESM, but also on the entire organisation's level, having in view the flexibility of the job descriptions that allow the managers' implication in the establishing process of the environmental objectives and targets; + due to the high level of functional

		6.the relatively reduced level of the access to the environmental information of the organisations' managers; 7.the transfer of the environmental information in a proportion of approx. 50% has only one way: to the environmental department; **II. Strong points:** 1. the flexibility of the job descriptions belonging to the organisations' managers that should allow them to get involved in the process of laying out the environmental objectives and targets; 2.the laying out of the environmental objectives and targets strictly by a team of specialists; 3.the management of the pollution prevention by a group of specialists; 4.the environmental actions are managed according to their importance by different hierarchical levels; 5.the flexibility on the implication level in different actions regarding the pollution prevention of the managers from other departments;		cooperation among departments regarding the pollution prevention;
I.2.	Qualified staff in the environmental management issues	**I. Weak points:** 1.not all the organisations are preoccupied with having qualified staff in the environmental management issues. **II. Strong points:** 1.most of the organisations' managers claim to have the necessary information in order to participate to the process of laying out the environmental objectives and targets; 2. most of the organisations' managers have all the necessary	1.the unawareness on the importance of the environmental issues; 2.the lack of vision on average and long-term	1.major disfunctionalities on the implementing and operating level of the EMS; 2.the probable improvement of the operation quality of the EMS as an effect of the high level of having the necessary information in the process of laying out the environmental objectives and targets and in order to carry out diverse actions whose purpose is the pollution prevention on the level of the organisations' managers;

		information in order to carry out diverse actions whose purpose is the pollution prevention;		
I.3.	The laying out of the environmental responsibilities	**I. Weak points:** 1. the environmental responsibilities for current different environmental actions are set out on the spot by the responsible manager; **II.Strong points:** 1.there is a relative preoccupation for the responsibilisation of the environmental actions	1.the absence of the environmental responsibilities on the level of the ESM as an effect of ignoring the requirements ISO 14001, or of the lack of interest in the environmental issues; 2.the unawareness on the importance of correctly establishing the environmental responsibilities;	1.major disfunctionalities on the implementing and operating level of the ESM;
I.4.	The existence of another management system implemented on the organisation's level except EMS	**I.Weak points:** 1.the routinisation of the deployed activities; **II.Strong points:** 1.on most of the organisations' level, there is an implemented management system of the quality that contributed positively to the implementation of the EMS;	1.the faulty application of the continual improvement principle;	1.the possibility of improving the quality of the implementation and operation of the EMS by the transfer of the attained knowledge as a consequence of the experience of the implementation and operation of the quality management system (ISO 9001);
I.5.	An internal audit operation of the EMS	**I.Weak points:** 1.not all the firms operate internal audits; **II.Strong points:** 1.most of the information attained after the internal audits are utilised in order to improve the functioning of the EMS; 2.increased periodicity of the internal audits of the implemented management systems on an organisation's level (including an EMS);	1.the unawareness on the importance of the internal audits;	1.the possibility of improving the quality of the implementation and operation of the EMS as a consequence of using the information attained after the internal audits; 2.the high periodicity of the internal audits may lead to different delays, difficulties and disfunctionalities in the implementation and operation of the EMS;
II.	**ENVIRONMENTAL TRAINING**			
II.1.	Training sessions in the environmental issues	**I.Weak points:** 1.moderate periodicity on the training sessions' level so that the employees become aware about environmental	1.the lack of financial resources aimed at organising the environmental training sessions for the human resource on the	1.delays, difficulties and disfunctionalities in the implementation and operation of EMS; 2.the possibility of maintaining a minimum quality level of the implementation and

		protection issues; 2.few opportunities for the employees to attend environmental educational programmes (training sessions); **II.Strong points:** 1.all the employees of the organisations attended a training session on the consequences of non compliance with the environmental procedures;	organisation' level;	operation of the EMS, as an effect of attending a training session in the environmental issues by all the employees of an organisation;
II.2.	The recording of the environmental training results	**I.Weak points:** 1.possible errors on the level of the results' recording process; **II.Strong points:** 1.the employees'/ managers' results attained after the environmental educational programmes are recorded by organisations;	1.disfunctionalities on the level of the environmental informational system;	1.the possibility of carrying out analysis subsequent to the employees'/managers' results attained after the environmental educational programmes that should offer information on the important aspects that need to be followed in the future training sessions – in order to improve the quality of the operation and implementation of the EMS;
II.3.	The recording of the environmental training effects through the prism of the environmental activities deployed	**I.Weak points: -** **II.Strong points:** 1.the organisations record all the environmental information on the expertise resulted from the accomplishment of environmental tasks;		1.the possibility of improving the environmental knowledge transfer on the level of the EMS;
III.	**ENVIRONMENTAL COMMUNICATION**			
III.1	External environmental communication	**I.Weak points:** 1.the organisations carry out meetings with stakeholders (local community) on an average level, in the view of presenting different environmental reports; **II.Strong points:** 1.there is a preoccupation of communicating by means of the organisations' sites.	1.the relative lack of the organisations' environmental responsibility; 2.the lack of management transparency on the organisation's level of the EMS; 3.possible existing disfunctionalities on the level of the EMS;	1.the misrepresentation of the organisation's image in the business environment;
III.2.	Internal environmental communication *on the level of the environmental information (a)	**I.Weak points:** 1.the managers who are in decisional situations receive all the data/ information collected on the field; (the managers who are in decisional	1.disfunctionalities on the level of the organisation's informational system;	1.in some cases, the elaboration and implementation of late environmental decisions on the level of the EMS, as an effect of the big volume of environmental data and information – non synthetically elaborated and transmitted

		situations need synthetic information); **II.Strong points:** 1.high update degree of the information utilised in the communication process on the level of the informational system; 2. the information reaches the very departments where it should reach;		(decreased adaptability for the EMS to the stimuli received from the environment); 2.in other cases, the possibility of elaborating efficient environmental decisions on the level of the EMS; 3.the lack of equilibrium on the level of the environmental decisional process;
III.3	Internal environmental communication *on the level of environmental knowledge (b)	**I.Weak points:** 1.the environmental knowledge is not formulated; **II.Strong points:** 1.meetings with employees are periodically organised on the level of organisations, with the purpose of presenting/explaining different methods and approaching techniques of the environmental issues; 2.the organisations promote preponderantly the use of the intranet and of the internal electronic bulletins in order to transfer different environmental information/ knowledge; 3.the organisations should encourage the employees/managers to exchange environmental knowledge;	1.faulty management of the environmental knowledge;	1.delays, difficulties and disfunctionalities in the implementation and operation of the EMS; 2.the possibility of improving the quality of the implementation and operation of the EMS;
IV.	**PERFORMING THE CONTROL ON THE LEVEL OF THE EMS**			
IV.1.	The control of the environmental documents	**I.Weak points:** 1.the lack of the systematisation and organising the control process of the environmental documents; 2.disconcordance between the reality on the field and the environmental documents; **II.Strong points:** 1.preponderently on the organisations' level, the documents that contain the environmental objectives and targets are constantly monitored and controlled in order to be updated;	1.the unawareness on the importance of the environmental protection; 2.the lack of competence on the level of the persons who are responsible with the control of the environmental documents;	1.the possibility of improving the quality of the implementation and operation of the EMS under the conditions of the systematisation and organising the control process of the environmental documents and also the possibility of eliminating the disconcordance between the field reality and the environmental documents;

		2. on the organisations' level there is a constant elaboration, update and control of the documents that contain: (a) environmental strategies, (b) environmental objectives and targets, (c) environmental programmes, (d) emergency situations;		
IV.2.	Operational control	**I.Weak points:** 1.the level of the budget allotted for the environment is the one that determines the monitoring and analysis degree of the induced impact upon the environment by the activities carried out by the organisations; 2.the unawareness on the importance of the existence of an indicators system of the environmental performance; **II.Strong points:** 1.the organisations that monitor and control regularly the situation of the environmental aspects of the organisation's activities in order to comply with the environmental legislation; 2.on the organisations' level there are frequent measurements regarding the emissions in the air/water, respectively the dumping down into the soil by pollutants;	1.disfunctionalities on the hierarchisation level of the organisations' priorities; 2. the lack of awareness on the importance of the environmental issues – the measurements regarding the emissions in the air/water, respectively the dumping down in the soil by the pollutants are a result of the necessity to comply with the environmental legislation (avoiding the fines from the qualified bodies in the environmental issues);	1.disfunctionalities in the implementation and operation of the EMS;
IV.3.	Externalisation of the operational control	**I.Weak points:** 1.limited control; **II.Strong points:** 1.most of the organisations externalise this measuring activity (determinations of the different concentrations/ impact upon the environment) in the field; the analysis is made only in accredited laboratories;	1.a probable absence of the technical resources (possibly human) in carrying out different field measurements (determinations of different concentrations/ impact upon the environment); 2.the lack of vision on the level of the organisation's environmental management;	1.consumption of financial resources with the third parties in the detriment of utilising them on the level of the EMS; 2.disfunctionalities on the management level of the EMS;

THE FLEXIBILITY OF THE ORGANISATION TO ASSIMILATE THE TRANSFORMATION AND THE ADAPTATION OF THE ARCHITECTURE OF THE EMS				
I.	The "flexibility" of the organisational structure	**I.Weak points:** 1. disappearance/ establishment of some departments is characterised above average by the organisations' managers as having a non beneficial character; **II.Strong points:** 1.the organisations present flexibility to the length level of the organisational chart changing process;	1.a high level of endurance to changes;	1.disfunctionalities for a short period on the level of the management, implementation and operation of the EMS;
II.	**The orientation of the organisations' managers – decentralisation of environmental objectives and targets/ decentralisation of the environmental decisional process**			
II.1.	The settlement, the modification and the update of the environmental objectives and targets strictly on the level of the departments/ organisations' sections, guided by a set of environmental objectives and targets that are general-directive (of strategic orientation)	**I.Weak points:** 1.the probability that not all departments/ sections have staff who have expertise in establishing, modifying and updating the environmental objectives and targets; **II.Strong points:** 1.all the managers of the organisations consider that the settlement, the modification and the update of the environmental objectives and targets strictly on the level of the organisation's departments/ sections, guided by a set of environmental objectives and targets that are general-directive (of strategical orientation) would bring major benefits to the efficiency and the clerks of the EMS;	1.the lack of allocation of the resources necessary for the organising and performing of environmental training sessions; 2.disfunctionalities on the level of the training process in the environmental issues;	1.the necessity to decentralise the establishing/modifying/and updating process of the environmental objectives and targets on the organisation's level; Effect: the necessity of autonomy and configurability of the entities that are part of the EMS (entity = departments/ sections/ managers/ or even some of the employees);
II.2.	Decentralisation of the environmental decisional	**I.Weak points:** 1.the decentralisation of the	1.the influence of the hierarchical organisational	1.the possibility to decentralise the environmental decisional process on condition

	process (the employees should decide on their own in the current environmental activities deployed, guided by a code of environmental good practices).	environmental decisional process is a purely declarative matter; **II.Strong points:** 1. approximately half of the organisations' managers express their agreement on the decentralisation of the environmental decisional process where the employees could decide on their own in the current environmental activities deployed, guided by a code of environmental good practices).	structure; 2. limited competence on the global level of the entire human resource, in terms of the environmental decisional process;	that the employees' competence level increases (by training sessions/ environmental specialisations) Effect: the decisional decentralisation of the entities that are part of the EMS (entity = departments/ sections/ managers/ or even some of the employees);

4.1.5. Research results of the critical analysis

It is currently asserted that the Environmental management system can be seen as a system managed hierarchically, utilised by the organisations that have well-defined organisational systems (Herghiligiu *et al.,* 2012a). Taking into consideration this logical idea, the specialty literature and the research results from table 59, it could be made the following main remarks (in particular for the N-E area of Romania organizations):

- the lack of flexibility in the structural reorganisation after the implementation of the EMS;
- the unawareness on the importance of managing the aspects and the associated impact upon the environment - on the level of all the organizational managers;
- the hierarchical structure of the organisation conditions and determines the architecture of the implementation and operation stage of the EMS.
- environmental responsibilities on the level of the EMS is an is an ambiguous aspect as an effect of ignoring the requirements of ISO 14001, or of the lack of interest in the environmental issues of the organizations;
- at organizations level it could be observe a high level of unawareness on the importance of correctly establishing the environmental responsibilities;
- the continual improvement principle is incorrectly applied;
- exists different disfunctionalities on the level of the environmental informational system;
- limited competence on the global level of the entire human resource, in terms of the environmental decisional process, and so on.

Regarding to the direct effects on EMS implementation and operation stage taking into account the analized aspects (Table 59), it could be mentione the following:

- the low level of operational flexibility of the EMS/ or of the agents/ of the entities on this system's level as an effect of the absent environmental responsibilities on the level of all the managers;
- the decrease of the functioning quality level of the EMS having in view the lack of the environmental awareness;
- the lack of configurability of the EMS on the implementation and operation level;
- the lack of (relative) autonomy of the EMS or of the agents/ entities of this system on the implementation and operation level;
- the decentralisation possibility of the agents/ entities on the level of the ESM, but also on the entire organisation's level, having in view the flexibility of the job descriptions that allow the managers' implication in the establishing process of the environmental objectives and targets; plus due to the high level of functional cooperation among departments regarding the pollution prevention;
- the possibility and also the necessity to decentralise the establishing/ modifying/ and updating process of the environmental objectives and targets on the organisation's level;

- the possibility to decentralise the environmental decisional process on condition that the employees' competence level increases (by training sessions/ environmental specialisations) and so on.

Considering the main results of research undertaken at the level of the organizations from the N-E area of Romania presented above, the main arguments for this research (presented in the subchapter 1.1.1: "The Pertinence and Importance of the Research Issue" – doctoral theses), and not finally taking into account the specialty literature, we can say that certainly that the objectives of this chapter is appropriate and necessary for the improvement of the EMS implementation and operation stage.

4.2. Identification and description of the main specific features of the fractal philosophy

4.2.1. Generalities on the fractal theory/ philosophy

One of the scientists' major preoccupations consists in understanding systems (regardless of the system's type and nature). This understanding approach relies on the following idea: if there are enough data/ information/ and knowledge (if it is the case) about a system, then the system's behaviour can be forecasted.

Having in view that any kind of systems - including the natural ones are approached in order to be analysed, the introduction of the fractal geometry (of the philosophy/ of the logic/ and of its principles) represents one of the most important events in the contemporary science.

One of the first noteworthy historical personalities who tried to explain and describe the basic shapes of geometry was Euclid by introducing dots/circles/lines and many other simple shapes as well as a series of equations. Then Descartes created the system of Cartesian coordinates (the mathematical and natural objects are described in three dimensions). Isaac Newton resumed Descartes' system and developed the differential calculus system (curves having a collection of small segments that leads to the integral calculus). These three systems utilised to describe what surrounds us and to understand the functioning of the natural systems represent the three main instruments of the science's classical paradigm.

Although these instruments contributed substantially to the understanding of what surrounds us, it has been noticed that certain natural shapes, systems or subsystems cannot be fully understood by using the old paradigm, and that certain shapes in nature correspond to a multiplication pattern relying on similarities (a valid idea for the simple or complex systems).

An eloquent example of similarity is Sierpinski's gasket, also known as Sierpinski's triangle, which would be almost impossible to describe using Euclid's geometry, a triangle that is presented in the four stages in Figures 40/ 41/ 42 and 43 (Lesmoir-Gordon, 2006; Harţe, 2001; Crownover, 1995; Peitgen *et al.,* 1992).

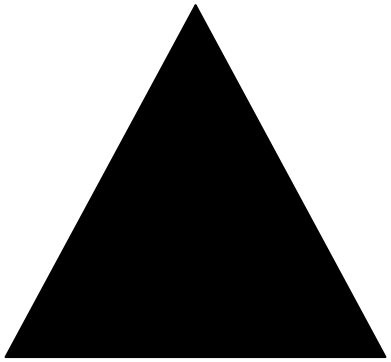


Figure 40 : Solid triangle - basic stages of the construction of the Sierpinski triangle

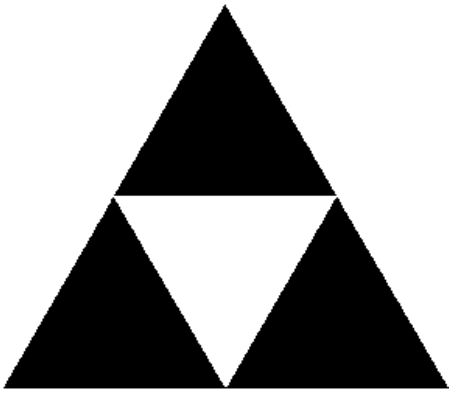


Figure 41: The first step in the construction of Sierpinski's triangle

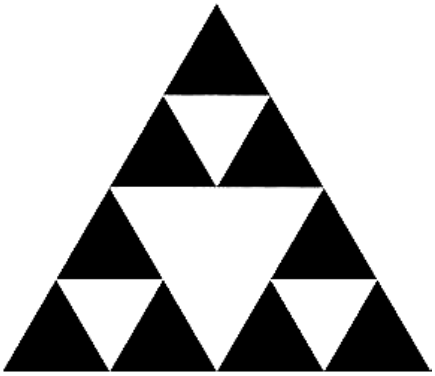


Figure 42 : The second step in the construction of Sierpinski's triangle

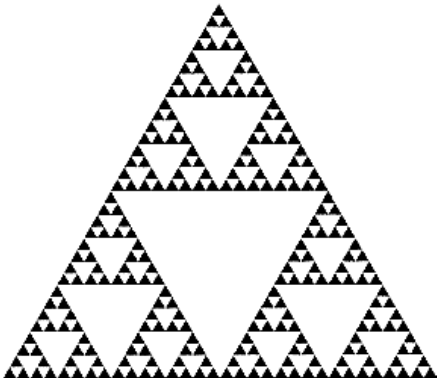


Figure 43 : The fifth step in the construction of Sierpinski's triangle

Source: Kigami, 2008; Lesmoir-Gordon, 2006; Harte, 2001; Crownover, 1995; Peitgen *et al.,* 1992

Sierpinski's gasket is essentially made up of similar triangles (only that they are on another scale) with a solid basic triangle. The process of making up Sierpinski's triangle (Figure 6.7), has as a starting point the union between the middle of the triangle's lateral basis and the extraction of the made up triangle (iterative process); this operation is repeated for each of the remaining smaller triangles to the infinity – thus a shape/or a finite object is attained (a triangle), with an infinite number of triangles/ or objects in itself.

The same general principle (as an example for the iteration) was presented by Georg Cantor – the Cantor set (Figure 44), as well as by Helge von Koch – the Koch curve (Figure 45).

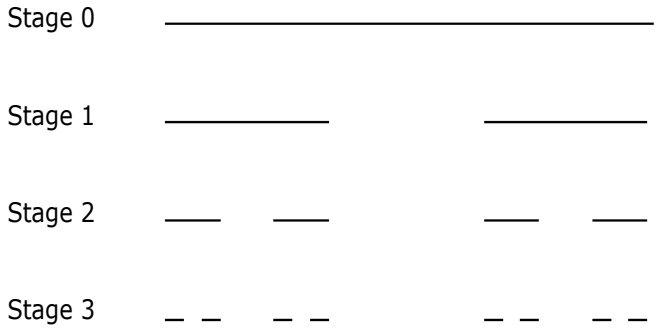


Figure 44 : Cantor set
Source: Kigami, 2008

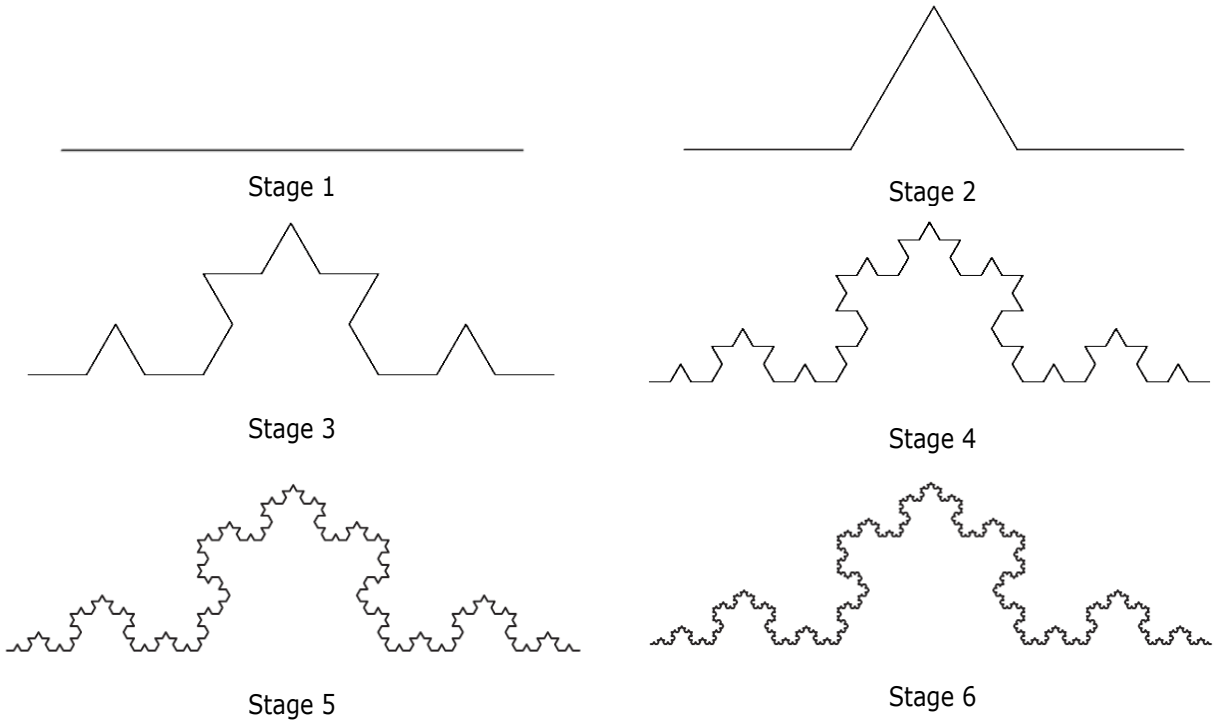


Figure 45 : Koch curve
Source: Kigami, 2008

Another substantial contribution to this paradigm (fractal) is brought along by Benoit Mandelbrot, considered to be a Euclid of the fractal geometry. His works that were published in the 1960s deny the centrality of the equations that describe nature; relying on the development approach of the primary shapes and processes constructs, Mandelbrot claimed that "the mountains are not cones, and the clouds are not spheres" – by

completely changing the perspective of looking at things and focusing on the dynamic, not on the static. This manner of focussing on the essence that composes the global may be summed up by the concept: *fractal* + iteration (Mandelbrot, 1983).

A *fractal* is characterised in essence as being "the set of reduced dimensions that generate rules when the information is randomly general" (Peters, 1996). The fractal is self-similar from the viewpoint of the smaller parts' level which are tightly connected with the integer.

There is no exact definition of the *fractal* concept and perhaps it shall never be developed having in view the complexity of the systems and shapes that it can describe (Peters, 1996). Nevertheless the fractals offer a new perspective in explaining the irregularity of the shapes, systems and processes by a simple set of rules that clarify substantially the different phenomena that make their foundation.

As a conclusion, the fractal theory created by the French professor **Benoît Mandelbrot,** who once said that his childhood ambition was to become Newton in a specific area of mathematics, proposes something creative and completely innovating. Fractal objects – geometrical figures relatively unknown with curious properties, with the intuitive meaning and simply called ***fractals*** (from an etymological point of view, it comes from the adj. *Fractus* = *fraction, break* (DEX, 2009)) are geometrical structures or natural objects which combine the following characteristics:

(a) their parts have the same shape or structure as the whole (they are self-similar), even in the case when they have different scales, being also able to be easily deformed;

(b) their shapes are either extremely irregular, or extremely interrupted or fragmented, regardless of the scale to which the examination is made, so that *it cannot be described in the language of the Euclidian geometry, neither on the local level, nor on the global level*;

(c) they contain distinctive elements whose scales may be varied and which cover a large range;

(d) in most of the cases, they can be defined by very simple rules.

4.2.2. The main specific features of the Basic Unit of the fractal philosophy – the Fractal

The fractal philosophy started to be used on the level of the organisations and systems' behaviours even in 1992; it has been trying to improve their performance by a series of scientific articles and books (Sandkuhl and Kirikova, 2011).

Table 6.6 presents some of the most representative authors who approached and developed certain "aspects" of the organisations: their architecture/ the informational system/ the quality management and control/ the knowledge management and the decisional process/ the architecture of the management systems on the organisations' level/ the logistic management/ the development of the production systems , and so on

Table 60 : Specialty literature synthesis – the application of the fractal paradigm

ANALYSED ISSUE	REFERENCE	REMARKED ASPECTS
INFORMATIONAL ORGANISATIONAL SYSTEM	Kirikova, 2009a.; Kirikova *et al.*, 2011 ; Kirikova, 2009b.; Stecjuka *et al.*, 2008; Grabis *et al.,* 2009	*the fractal theory allows the application of diverse methods of system development on different administrative levels of the organisations; it leads to the acceleration of the informational process development and the change of this system's management (informational system); *the flexibilisation of the information architecture and of the fractal informational system;
ORGANISATIONS' ARCHITECTURE	Sandkuhl and Kirikova, 2011; Kirikova *et al.*, 2011	a.the adaptation of the organisations' properties with fractal architecture in the analysis of the organisations' models; b.the identification of the opportunities and limitations of the utilisation of the organisations' characteristics with fractal architecture in the analysis of the companies' models;
	Malan and Bredemeyer, 2010	*fractal architecture;
QUALITY MANAGEMENT AND CONTROL	Strazdina and Kirikova, 2010	*the change management on the organisation's level by using the fractal philosophy;
	Qin *et al.*, 2007; Prisecaru *et al.*, 2012	*****the development of a (model) methodology of evaluation and the quality analysis relying on fractal principles; *the continual improvement process as a fractal structure for the managerial processes and for their continual improvement required by the ISO 9001 standard;
KNOWLEDGE MANAGEMENT AND DECISIONAL PROCESS	Xu and Chen, 2010, Lei *et al.*, 2000; Herghiligiu *et al.*, 2013a; Herghiligiu *et al.*, 2012c.	*the application of the fractal philosophy on the level of the knowledge management of the human resource (investigation methodology , and so on);
THE ARCHITECTURE OF THE ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)	Herghiligiu *et al*., 2012a	*the application of the fractal philosophy on the level of the environmental decisional process; *the transformation of the implementation and operation of the EMS starting with the fractal philosophy;
THE DEVELOPMENT OF THE PRODUCTION SYSTEMS	Qin *et al.*, 2007; Bin and Gangyan, 2009; Danli *et al.*, 2011	*****the development of methods/ models in order to increase the efficiency of the production systems relying on the fractal theory;
THE PRODUCTION SYSTEMS ORGANISED ACCORDING TO FRACTAL PRINCIPLES	Ryu and Jung, 2003a./b.; Ryu *et al.*, 2003.c; Ryu and Jung, 2004; Shin and Jung, 2004	*defining the fractal architecture of the production systems and of the fiscal entities; *the comparison between the hierarchical architecture and the fractal one; *the description of the fractal agents associated to each fractal module; *the description of the orientation mechanism of the fiscal entities' objectives;
LOGISTIC MANAGEMENT	Ryu *et al.*, 2003d	*the design of a representative fractal unit for the provision chain of an organisation;

In order to understand the fractal paradigm correctly, it is necessary to describe and explain the main characteristics/ or basic properties of the fractals, as follows (Sandkuhl and Kirikova, 2011; Kirikova, 2009; Herghiligiu *et al*., 2012a; Ryu and Jung, 2003a; Ryu *et al.*, 2003c; Ryu and Jung, 2004; Shin and Jung, 2004):

I. SELF-SIMILARITY – the repetition of the structural organisation on a different scale, starting with a basis to the infinity from a theoretical point of view (notice the development of Sierpinski's triangle/ Cantor's set/ Koch's curve).

This characteristic property may be deduced logically; it eliminates the informational monopoly on the level of an organisation/ system/ process, which in most of the cases describes the classical hierarchical processes.

Self-similarity does not refer only to the design characteristics, but also to the service operating manner, and equally to the level of formulating and following objectives. In order to reach the proposed objectives, there may be several solutions to the particular issues; thus there may be several system components with different structure, but with the same entrances and the same exits (Ryu and Jung, 2003b; Sandkuhl and Kirikova, 2011).

The fractals seen as a process, that do not have an identical structural organisation, are self-similar if they have the same entrances and the same exits from the resulted environment, provided they do not modify their structure on the transformation level of the process (Figure 46).

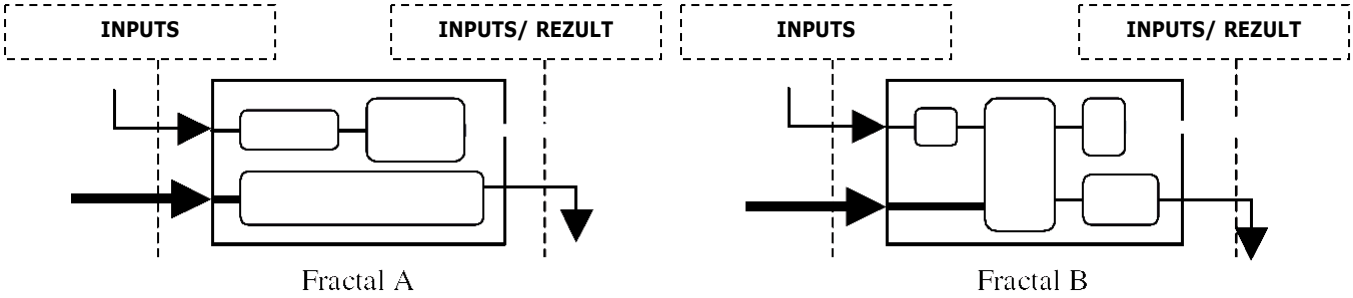


Figure 46 : Fractals self-similarity with different internal structure
Source: Ryu şi Jung, 2003b

II. SELF-ORGANISATION – the fractals' capacity to self-organise: (a) from a theoretical point of view (strategic re-organisation/ self-optimisation) and (b) from an operational point of view.

The self-organisation concept means in essence the re-organisation of the fractals/the development of new fractals/ the elimination of fractals according to the proposed purposes and developed connections.

The fractals' capacity to self-organise theoretically/ to self-optimise represents concretely the application of suitable methods in order to control the system and to optimise the fractals' component on the system's level. For example if a fractal's "work" load (the work concept is utilised with the meaning of information load/ level of operational activities , and so on) is not balanced with the others', the entire performance of the system falls down (Ryu and Jung, 2003b).

The fractals' operational self-organisation presents the fractals' dynamic re-organisation in order to become more structurally stable, according to the developed connections among them (the necessity of these developed connections/ of the interaction frequency by means of these connections) – Figure 47.

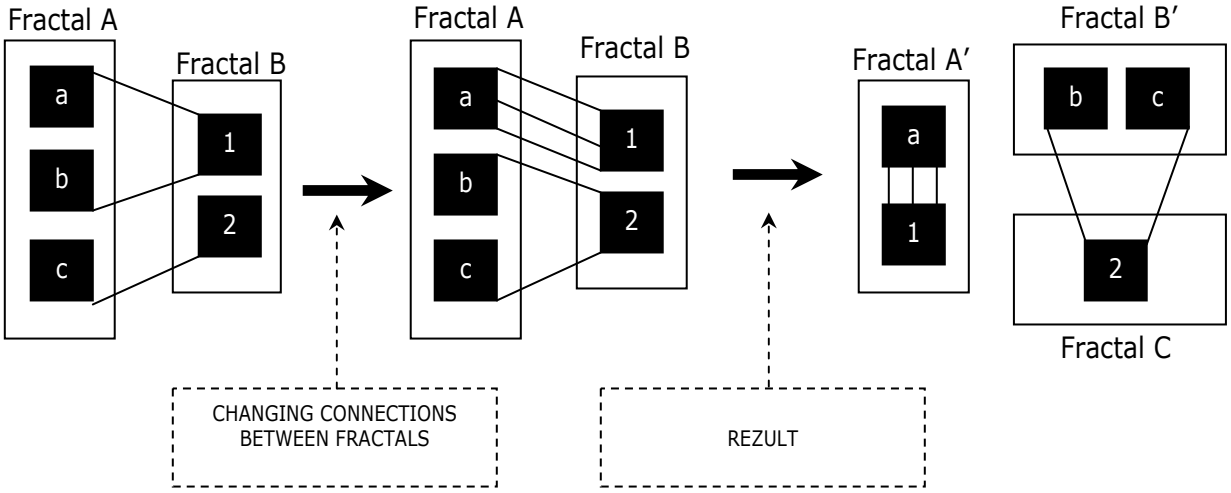


Figure 47 : Changing/ restructuring process of fractal connections
Source: Ryu and Jung, 2003b

III. THE ORIENTATION TO THE OBJECTIVE (S) – the system's objectives result from the sum of each fractal's individual objectives; each fractal has different objectives from the other fractals in the system's structure, but in order to maintain their coherence, it is necessary to develop a relative concordance among all its objectives that should eventually lead to the achievement of the organisation's objectives.

The internal process of making the fractals' objectives must be supported by a mechanism that should ensure their concordance, consistency and coherence. The individual objectives must be autonomously developed, continually coordinated and negotiated on the fractals' level in order to solve the possible conflicts – Figure 48 (Cha *et al.,* 2007).

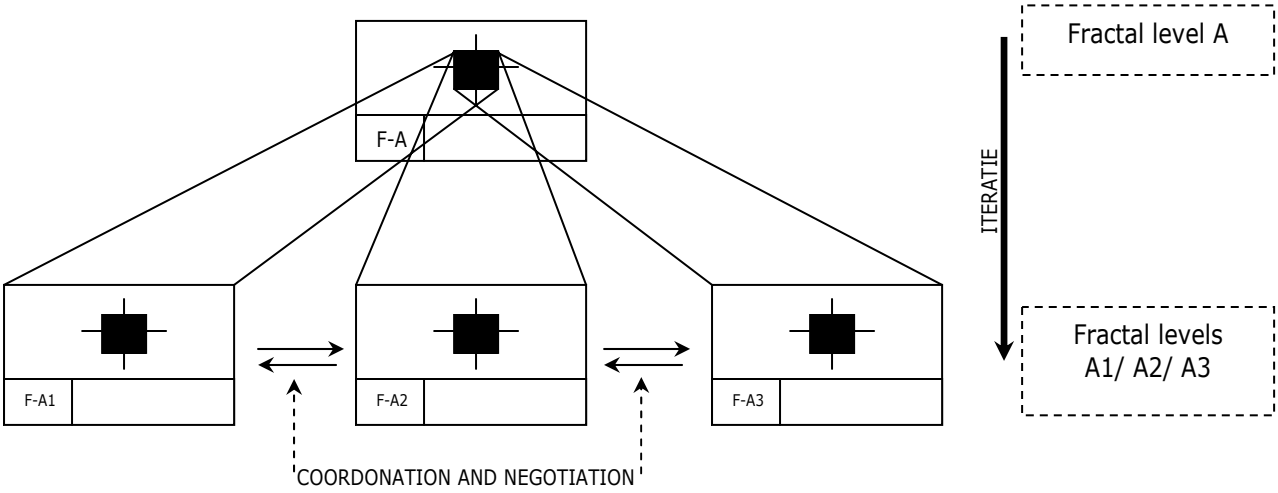


Figure 48 : Forming process of fractals objectives
Source: adaptated after Cha *et al.*, 2007

IV. DYNAMICITY AND VITALITY – due to the necessity to adapt to the environment that change in short periods of time, the cooperation and coordination among the fractals must be characterised by dynamicity; the fractals must develop among themselves a system to communicate efficiently the information and to determine the nature and the quantity of the transferred data. Having in view that the fractals must be characterised by dynamicity, they must be at the same time the subject of the analysis and continual evaluation of the achieved performances (Sandkuhl and Kirikova, 2011; Ryu and Jung, 2003b).

The fractal can be considered as being the basic unit/ the basic entity of the considered system and having the following functional modules: an observer, an analyser, a resolver, an organiser and a reporter (Ryu and Jung, 2003b).

Taxonomically[58] speaking, the functional modules that we find in the specialty literature, utilised in the development of the fractal systems[59] are the following: detection, observation, analysis, resolution, organisation, reporting and updating (1) (Stecjuka *et al.,* 2008); detection, defining and planning requirements, execution, delivery and response (2) (Ramanathan, Y., 2005; Stecjuka *et al.,* 2008); monitoring, analysis, reporting, planning and execution (3) (Canavesio and Martinez, 2007; Stecjuka *et al.,* 2008); the selection of the main objectives, coordination, the tasks execution and monitoring the progress of the proposed programme (4) (Hongzhao *et al.,* 2005; Stecjuka *et al.,* 2008).

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[58] *Taxonomical,* adj. - with a character of classification, of taxonomy; categorial. – from French *taxonomique* (DEX, 2009)
[59] A fractal system is a non-linear complex, an interactive system that has the capacity to adapt to a changeable environment. These systems are characterised by the self-organisation potential, existing in an environment of non-balance (Fryer, P., Ruis, J, http://www.fractal.org).

The fractal basic unit/ the fractal basic entity is developed and presented so that it represents the elements from any organisational level, it cooperates and interacts with the adjacent elements from these levels.
Ryu and Jang (2003) develop and explain these modules as follows:

a. the observer has the function of monitoring the current state of the fractal entity and of communicating with the other fractals (messages/ information);

b. the analyser has the function of analysing different activities, of classifying rules and of simulating the possible real-time effects;

c. the resolver is the most important module on the level of the BFE; this module is responsible with the activity elaboration, objective formation process and with the decisional process;

d.the organiser has the function of managing the current state of the fractal and of operating the re-organisation process;

e. the reporter has the main function of reporting the attained results;

In another connection, it must be mentioned that the new architectures (on the functional level) of the implemented systems and operated on the organisations' level must be made up by entities/ units/ agents that should have the following main specific features: 1. autonomy; 2. flexibility; 3. intelligence; 4. they must be made of entities/ iterated modules; 5. configurability; 6. adaptability to the environment (Herghiligiu *et al.,* 2012a).

4.3. Identification and description of the Environmental management system implementation and operation stage at the organisation's level

An environmental management system can be described as a **methodology** by which the organisations function in a structured way with the purpose of ensuring the protection of the environment. It identifies and defines the impact of the organisation's activities, and then proposes actions of reducing the level of this impact. As a consequence, the objective of an EMS is to control and to reduce continually the induced negative effects upon the environment (Rowland-Jones and Cresser, 2005).
The current architecture utilised for the implementing and operating stage of the Environmental management system is offered by the ISO 14001 and described in Table 61.

Table 61 : Environmental management system implementation and operation
Chapter 4.4 of the ISO 14001: 2005
Source : developed after ISO 14001/ ISO 14004/ Lupu *et al.* , 2006

No. of Chapter ISO 14001 standard	**Name of Chapter ISO 14001 standard**	**Description of identified aspects ISO 14001**
4.4.1.	Resources, tasks, responsibilities, authority	*the management board of an organisation must clearly decide upon tasks, responsibilities and authority level in order to be able to accomplish the general objectives, the specific ones and the laid out programmes (an efficient EMS); *the management board of an organisation must provide availability to the necessary resources at the highest level (organisational infrastructure, human resources and specialised abilities, training, information system, technology and financial resources) that shall allow the setting, the implementation, the maintenance and the improvement of the EMS; *at the level of the human resource (management level/ employees) there must be representatives who should have authority and responsibilities in order to make sure that the EMS is developed, implemented and maintained in accordance with the requirements of SR EN ISO 14001:2005, and in order to regularly report to the management the performance level of the EMS for analysis, including different recommendations for improvement; *all the managers of an organisation must have job descriptions with well laid out environmental responsibilities and must comply with the specific regulations regarding the environmental aspects; *in order to emphasise the environmental responsibilities, the organisation uses a common organisational chart or a matrix of the environmental responsibilities for the purpose of deciding the implication of the relevant functions at all the hierarchical levels;
4.4.2.	Abilities, training and awareness	*the management board at the highest level must make the commitment of supporting the organisation's orientation towards the environmental protection by supporting the environmental policy and its communication at the level of the entire organisation; *the organisation's management board must actively contribute to the awareness process of the environmental values and to motivate the employees towards the environmental protection; *everybody at the organisation's level must be aware about the importance of a) the compliance with the adopted environmental policy, current procedures and requirements specific to the Environmental management system, b) the significant environmental aspects (positive and negative), c) the attainment of the proposed environmental objectives and targets or of the elaborated environmental programmes; *the organisation's management board must make sure that the human resource that performs different specific environmental activities have the necessary abilities and were trained accordingly; *the training of the human resource must take place: a) for all the new employees, b) when different modifications occur at the level of the job descriptions, c) when different current working procedures are modified; d) when different modifications occur at the level of the elaborated environmental objectives/ programmes, of the environmental legislation or of other regulations specific to the environmental management; e) when they reach the conclusion that the level of the environmental performance level of the human resource is unsatisfying. *the development of the human resource abilities must rely on different training programmes, aptitudes and/or experience corresponding to the environmental management; *all the environmental training programmes/ all the environmental instruction programmes must be followed by a regular evaluation of the quality and quantity of the transmitted environmental information from a theoretical point of view as well as from an operational point of view;

4.4.3.	Communication	*the ISO 14001 standard stipulates that the organisation must elaborate, implement and maintain a procedure regarding the environmental aspects of the Environmental management system. At the same time, an efficient and efficacious communication process at all hierarchical levels contributes positively to the attainment of the proposed environmental objectives and targets by satisfying the environmental informational necessary under quality conditions (this informational necessary that contributes to the attainment by the human resource of the environmental responsibilities /obligations from the job description); *in the communication process it is necessary to emphasise the importance of utilising modern communication methods and techniques; *the different examples of environmental communication at an organisation's level may include: internal reunions, different meetings that also aim at the environmental management issues, different minutes of the organised reunions, internal informative bulletins, informative panels, , and so on; *the organisation must pay attention to the communication with different interested parties (stakeholders), such as: employees, clients, environmental NGOs, neighbours of the organisation's location, investors, shareholders, environmental regulatory authorities , and so on *at the organisations' level it is necessary to elaborate, implement and maintain different procedures that aim at the environmental communication; *the transmitted environmental information must be easy to understand and to explain; they must also contribute positively to the correct presentation of the organisation in terms of environmental performance; *the communication environmental process should have the following general steps in accordance with the ISO 14004: a) collecting environmental information from stakeholders, b) deciding upon the target group and the specific informational necessities; c) the choice of the environmental information considered relevant at the level of the communication process; d) the choice of a decisional solution regarding the environmental information that should be communicated, e) identification of all the methods considered corresponding to the environmental communication; f) evaluation and regular analysis of how efficacious the environmental communication process is; .
4.4.4.	Documentation	*an adequate documentation at the organisation's level shall contribute positively to the provision of environmental information necessary for the attainment of the proposed environmental objectives and targets under efficacy conditions. In the same connection, an organisation must elaborate and maintain an adequate documentation that should aim at the environmental policy/ environmental objectives and targets/ environmental management programme and environmental responsibilities/ environmental procedures/ emergency plans/ organisational chart/ in essence the description of all the elements of the Environmental management system and of the developed connections among them, including different documents and recordings required by the standard (it aims at planning/ implementing/ operating/ controlling the EMS) , and so on;
4.4.5.	Document control	*at the organisation's level it is necessary to elaborate a procedure regarding the approval of the specific environmental documents before they are submitted to the public; this procedure must present the documents' update and revision of the Environmental management system, respectively the identification of the modifications occurred in time; *the documents specific to the Environmental management system must be available to the employees who are qualified to utilise them; they must be readable and able to be interpreted easily; *the organisation's external documents must be able to be identified and distributed in a controlled manner;
4.4.6.	Operational control	*the ISO 14001 standard stipulates the elaboration of operating procedures because it is only by means of these procedures that the different activities specific to the Environmental management system can be carried out under efficiency and efficacy conditions; these procedures must identify both the necessities for the operational controls and

		elaborate the operating criteria (the operational control method/ adequate operational criteria/ the documentation of the elaborated operational procedures/ the inclusion, if it is the case, of different provisions for the measurement, evaluation for the purpose of determining the manner in which the operating criteria are reached). *the operational controls implemented at the organisational level must aim at a wide range of activities such as: research, technological development, supplies, the operation and the storage of the raw materials, the building and the modification of services in the relationship with the stakeholders, the production process, the storage and the shipping of the finite products, the processes that include the different utilities; *at an organisation's level the operational controls may include the management of the significant environmental aspects, the management of the compliance with the environment-related requirements, the management of the environmental objectives and targets under efficiency and efficacy conditions, the management of the environmental risk, providing the environmental training of the human resource so that it should utilise adequately the different procedures elaborated for the above mentioned aspects; *in case of utilising different dangerous materials at the organisation's level, then specific procedures and instructions can be elaborated.
4.4.7.	Preparations for emergency situations and response capacity	*at the level of an organisation's current activities, there is a probability that some emergency situations may occur and can determine a negative effect upon the environment (accidental emissions, accidental evacuations in the water and in the soil , and so on) As an effect of this previously mentioned possibility, it is necessary to elaborate different procedures that should identify the emergency situations and that should decide upon the response way in these situations; *the ISO 14001 standard recommends the organisation to develop an action plan that should aim at diminishing the possible negative consequences occurred in the case of a situation without a prognosis, that have a negative impact upon the environment; *the procedures specific to emergency situations must be regularly revised, especially after some accidents take place; *the planning of the emergency situations should include: the evaluation of the specific emergency situation/ different preventive measures/ different specific responsibilities/ the persons who shall be involved in an emergency situation/ the elaboration of the necessary abilities for intervention in emergency situations/ the elaboration of communication manners/ instructions for emergency situations, , and so on/ the different specific actions that should be undertaken in emergency situations/ the elaboration of a list with dangerous materials at the organisation's level/ the training of the human resource who is about to intervene/ the after-accident elaboration for the purpose of elaborating specific actions (corrective and preventive).

4.4. Development of the theoretical framework regarding the transformation and the adaptation of the architecture of the Environmental management system relying on principles of the fractal philosophy, that should allow the improvement of this system's implementation and operation

The complexity of the activities deployed by an organisation and the complexity of the relationship consumer – producer (regardless of the "production" nature; either products/ services) have determined in the latest decade, and not only, the increase of the negative impact which it had upon the environment.

The process by which the consumers' demand is met has a direct effect on the organisation's level which becomes dynamic, or at least it should do that in order to still exist on the market.

In a logical order of things, any modification of the consumer's demand has effects upon the organisation, upon the management level and indirectly upon all the existing levels on the organisational level.

Unfortunately this haste of the organisations to meet the consumers' demands has some negative effects upon the environment. The dynamic change of the organisation's adaptation to the market has an accelerated level which, combined with the hierarchical structure of the management systems on the internal level, leads to a late response to the different environmental issues, and undoubtedly to a negative effect upon the environment. (Herghiligiu *et al.,* 2012a).

That is why it was and it is absolutely necessary for an organisation to manage efficiently its relationship with the external environment (we refer directly to the environment), and this can be achieved only by means of the Environmental management system.

This complex system, but also simple at the same time (similar to a paradox), is dimensioned, evaluated and audited having in view the recommended architecture of ISO 14001 standard, standard which was designed in order to offer an international acknowledged framework (Robert, 2000; Glavic and Lukman, 2007) .

The management system of an organisation is an ensemble of elements by means of which is ensured the exercise of the management process with the purpose of reaching the proposed objectives and targets (for the management by objectives – in the case of the environmental management system).

We are thus approaching this definition of the management system because it describes accurately (for a general definition) the Environmental management system (in order to send to the particular).

It is currently asserted that the Environmental management system can be seen as a system managed hierarchically, utilised by the organisations that have well-defined organisational systems – and that have a general "production" process in a stable state (Herghiligiu *et al.,* 2012a).

The hierarchical management system is suitable for organisations that "produce" in a stable environment, and not for modern organisations that are in an environment which changes dynamically in short periods of time (Ryu and Jung, 2003a/b).

The classical hierarchical management systems are easy to understand and have a low degree of redundancy, but:
(1) these do not have the capacity of being flexible to the inputs from the exterior (beneficial for the organisation),
(2) these have a major difficulty in observing the negative aspects and the inefficiency ones on all the hierarchical levels, and not lastly,
(3) these cannot change their pattern with which they were designed (the designed structure) (Herghiligiu *et al.,* 2012a).
That is why in this environment which is in a dynamic change, it is necessary for the Environmental management system, and not only that, to have the following essential/specific features (Figure 49) (Herghiligiu *et al.,* 2012a).: 1.autonomy, 2.flexibility, 3.intelligence, 4.being made up of iterated functional modules (or entities), 5.configurability, 6.adaptability to the environment.

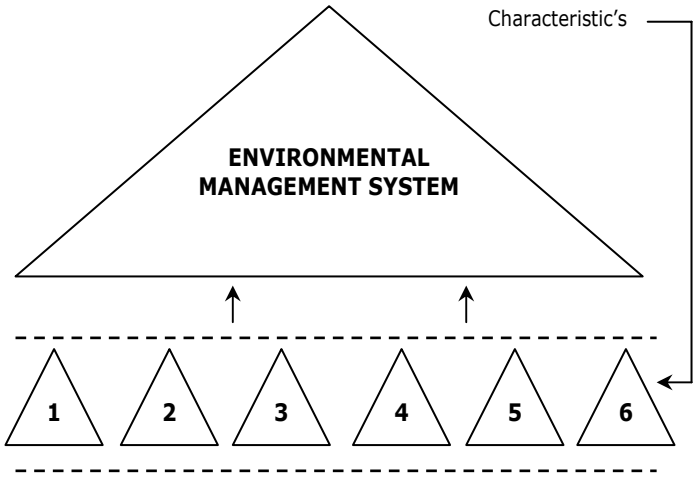


Figure 49 : EMS necessary characteristics

Having in view **the results attained in Table 59**, the specialty literature and at the same time the urgent need of the organisations to answer as flexibly as possible to the changes of the environment, it can be noticed that it is necessary to approach this complex system in a pertinent manner (the Environmental management system), that should offer the premises to improve the quality of the implementation and operation of the Environmental management system, and that can be done only by a fractal approach (Figure 50).

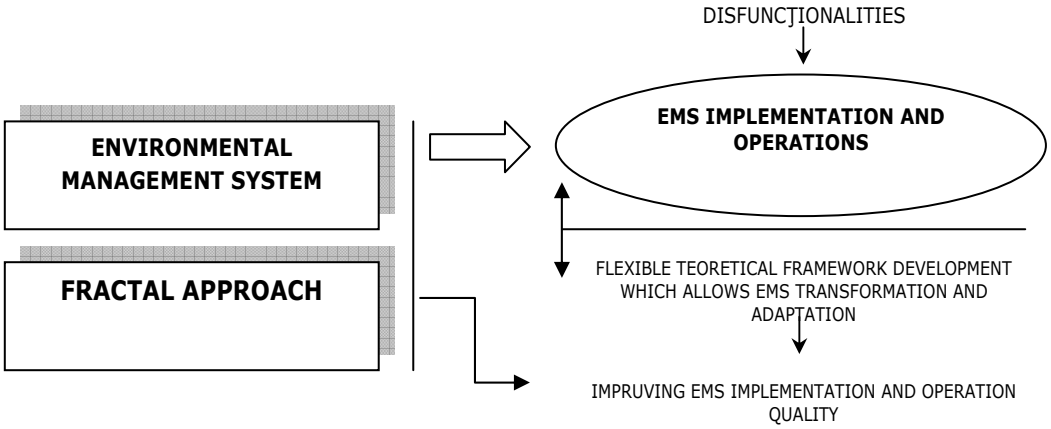


Figure 50 : The need for new EMS approaches

Thus the Environmental management system (EMS) shall be considered as being a system analysed through the prism of the approach to which it has been subscribed.

The fractal basic entity (unit) – the initiator shall be considered as the main component of the EMS and as having the following functional units which sum up the entity's functionality (the mechanism by which it functions), starting from and adapting from the definition itself given to the EMS by the ISO 14001: 2004[60] Standard (Figure 51) (Herghiligiu *et al.,* 2012a.):

1. monitoriser (the analyser that observes);
2. analyser;
3. resolver;
4. implementer;
5. reporter (that verifies).

[60] Environmental management system in accordance with the ISO 14001 standard is: "a component of the general management system that includes the organisational structure, planning activities, responsibilities, practices, procedures, processes and human resources for the elaboration, implementation, performance, analysis and maintenance of the environmental policy".

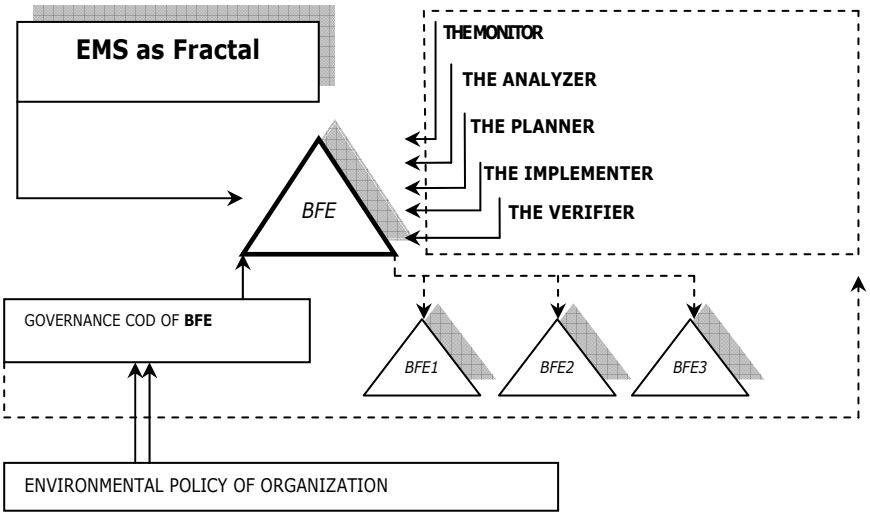


Figure 51 : The general functionality of the basic fractal entity (unit) (BFE) – the initiator for SFMM

Starting from the elaboration requirements of the environmental policy (ISO 14001 – chapter 4.2), it is necessary to mention that the governing code of the Fractal basic entity must present a series of principles that should be observed on the level of the functioning mechanism of the BFE; there must be a concrete compliance with the correspondence between the specific activities developed on the level of the logical modules and:

1. the nature, the dimensions, respectively the environmental impact of the activities, products or services of the organisation;
2. the principle of the continual improvement;
3. the continual prevention of pollution;
4. the compliance with the applicable environmental regulations, as well as with other requirements which the organisation adopted;
5. the general objectives of the organisation/ the proposed environmental general objectives/ the proposed environmental objectives on the level of the fractal entity;
6. the necessary framework for the establishment and analysis of the proposed environmental objectives and targets on the level of each fractal;
7. the possibility of documentation, implementation and consistency for each proposed specific activity;
8. the compliance with the transparency principle.

The following definition of the **Environmental management system** is proposed through the prism of the **fractal approach: the Environmental management system** is a set of iterated individual and autonomous entities that develop relationships and fairly distribute environmental knowledge and resources in order to fulfil efficiently the purpose for which it has been designed and implemented (Figure 52).

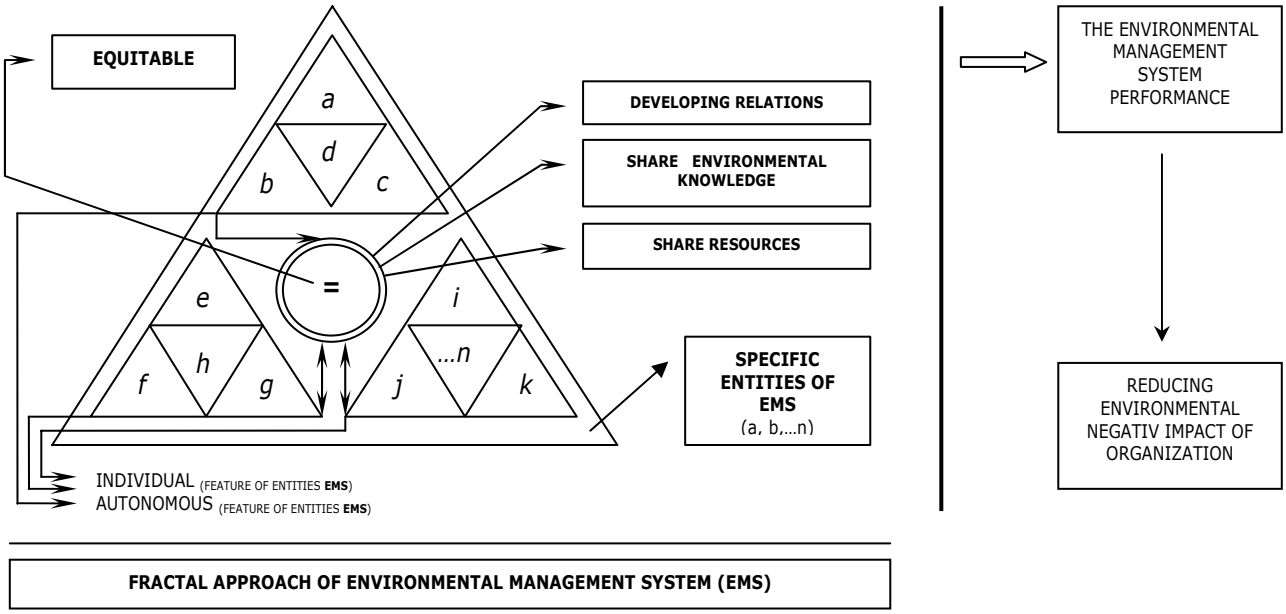


Figure 52 : Fractal approach of the EMS components entities

Each fractal component entity is dynamic, independent, inter-operable, taking action in order to reach the main purpose (just as the basic fractal system – EMS as a whole).

The following can be considered as being **fractal entities of the EMS**: a person, a department, a section, a production line, a part of a person's effective working time, or any combination of the aforementioned previously (Herghiligiu *et al.,* 2012a/c; Herghiligiu *et al.,* 2013a).

The purpose of improving the implementation and operation of the system (EMS) can be characterised thus: the optimisation of the organisation's internal activity in order to reduce the impact upon the environment (negative impact).

This process that is developed on the level of the Environmental management system must be carried out so that it maximises the continual capability and it allows each component entity to reach its specific objective, in order to offer integrated solutions that should reduce the organisation's negative impact upon the environment.

By resuming, the fractal approach of the Environmental management system relies on the following idea: this complex but simple system (EMS) **iterates** (it is multiplied with the same shape and the same defining specific features) **from the macro level to the micro level**. It gets thus to a simplification of each process carried out on the level of the entire environmental management system by each component entity.

In order to emphasise the conceptual structure of the EMS, there shall be a graphic start-up by parallelism from Sierpinski's triangle, by iterating the basic fractal entity (BFE) (Figure 53).

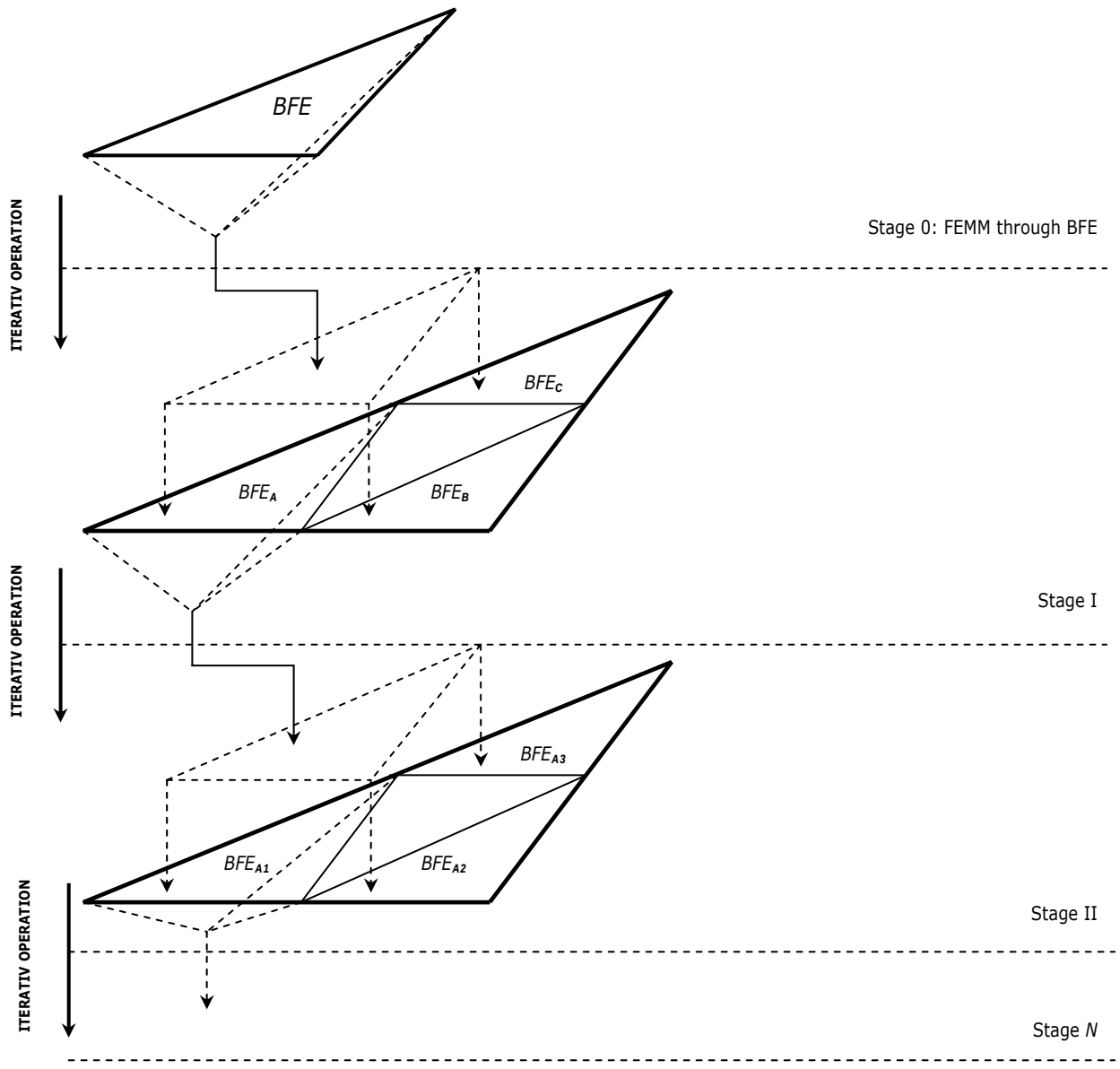


Figure 53 : Conceptual structure/architecture of FEMM

This process is presented in the following way (an iteration process that belongs to the specific mechanism of the environmental fractal entity):

a. the start-up is at the triangle mentioned in Figure 53 – that is made up of Coordinator(C) - Controller(C) - Executer(E); it is considered to be an equilateral triangle by definition. In its case: (1) the triangle is divided into four equal parts (and thus four other equilateral triangles are made up, identical as the first one, but different as a scale); (2) a part of the centre is eliminated – namely the central equilateral triangle; (3) the three remaining equilateral triangles are considered to be made up of the three logical sub-divisions: one has the Coordinator, the other one the Controller, and the third one the Executer.

b. according to the principle mentioned previously in *a,* it is proceeded to the iteration *a* to the following *levels/stages* BFE (Level 2, Level *n* , and so on – Figure 53).

The Fractal (F) is considered to represent the total of the subdivisions BFE, which comply with the whole on the scale (namely the architecture of the functionality).

In the present case, the fractals' specific features that comply with the integer, but in the subdivision, are the following:

a. similarity/ resemblance: (1) the way in which the fractals are designed – similar, (2) the way in which they accomplish their environmental tasks, and (3) the way in which they follow the environmental objectives , and so on;

b. self-organisation/ self-optimisation: relying on a governing mechanism, each fractal can carry out its activity in the accord, and with the purpose of successfully accomplishing the proposed environmental objective (s);

c. the orientation to the environmental objectives: each fractal (F) is considered to have individual objectives because the given sub-issue that is attempted to be solved is a particular one; nevertheless a process of communication among the fractals is necessary with the purpose of negotiating and coordinating the objectives (adapted after Ryu and Jung, 2003a/b.);

d. dynamicity and vitality **–** due to the necessity to adapt to the environment that changes in short periods of time, the cooperation and coordination among the fractals must be characterised by dynamicity; the fractals must develop among them a system to communicate the environmental information efficiently and they must also determine the nature and the quantity of the transferred data. Having in view that the fractals must be characterised by dynamicity, at the same time, they must also be the subject of the analysis and continual evaluation of the achieved environmental performances.

In the same connection, we consider that it is necessary to have an identical process of negotiation and coordination – related to the environmental objectives – between BFE and the other entities (departments, sectors, persons , and so on) that are to be found on the organisation's level. It is only in this way that the proposed environmental objectives can be achieved under efficacy conditions.

4.4.1. The mechanism of the Basic Fractal Entity (BFE)

For the graphical simplification and conceptual approach, by subscribing to the logic of Sierpinski's triangle, it shall be considered that the mechanism of the Basic Fractal Entity contains the following units:

1. Coordinator which in its turn contains the following modules: "monitor (the analyser that observes)"/ "analyser"/ and "resolver";
2. Executor which contains the "implementer" module;
3. Controller which contains the "reporter (which also verifies)" module;

In terms of the existing modules on the units' level of the Basic Fractal Entity (BFE), it can be considered that their development took into account the Deming principle regarding the continual improvement and the possibility of including all the present levels in a hierarchical structure.

In terms of the informational relationships that are established among the logical modules of the architecture developed for the mechanism of the BFE (Figure 54), it is necessary to mention that the loop (1) in the previously mentioned figure supposes the existence of a sub-process of environmental data/ information collection which are absolutely necessary for the function accomplishment of the "monitor" ("M") unit (and not only); the other relationships established among the units can be followed in Figure 54.

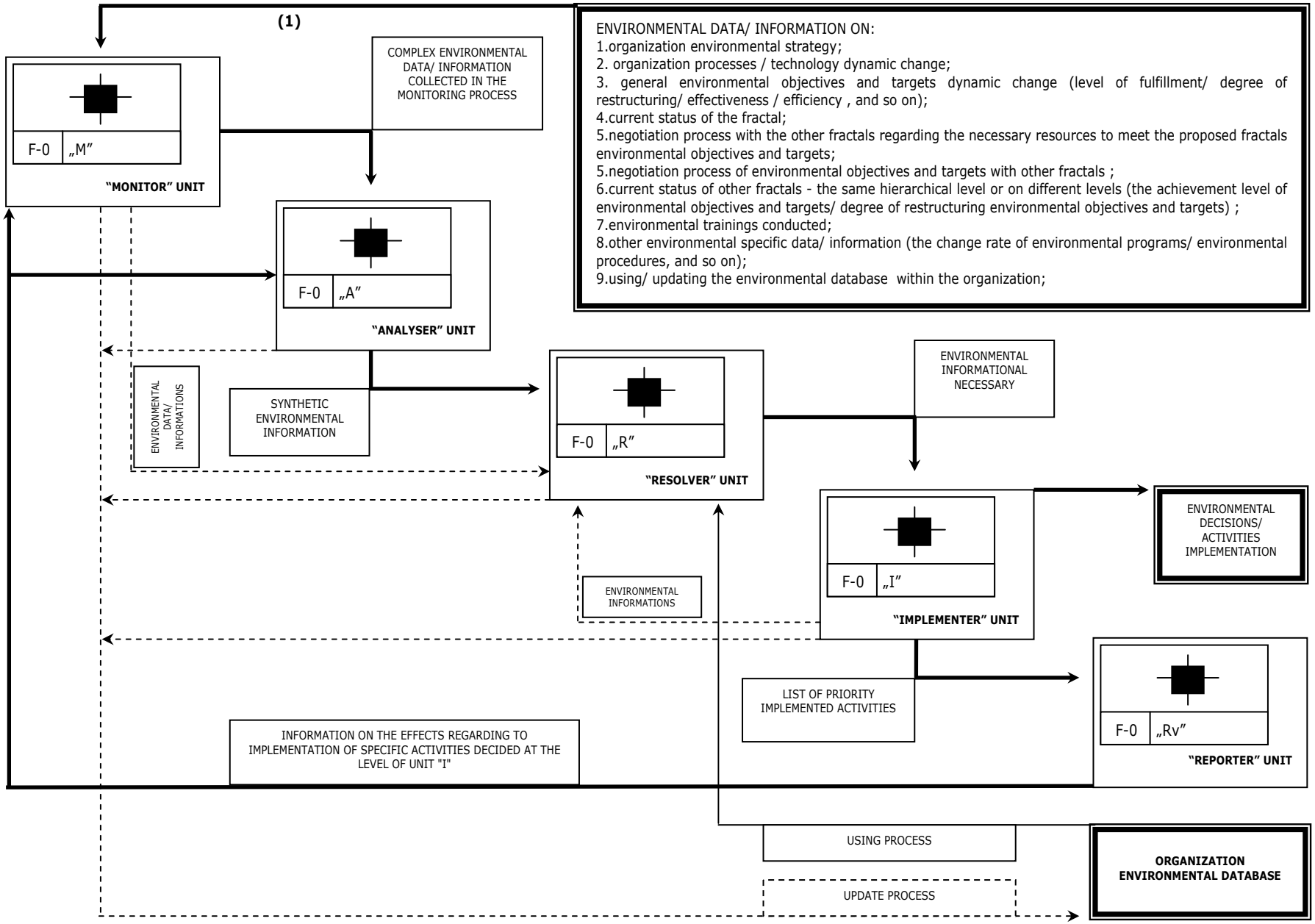
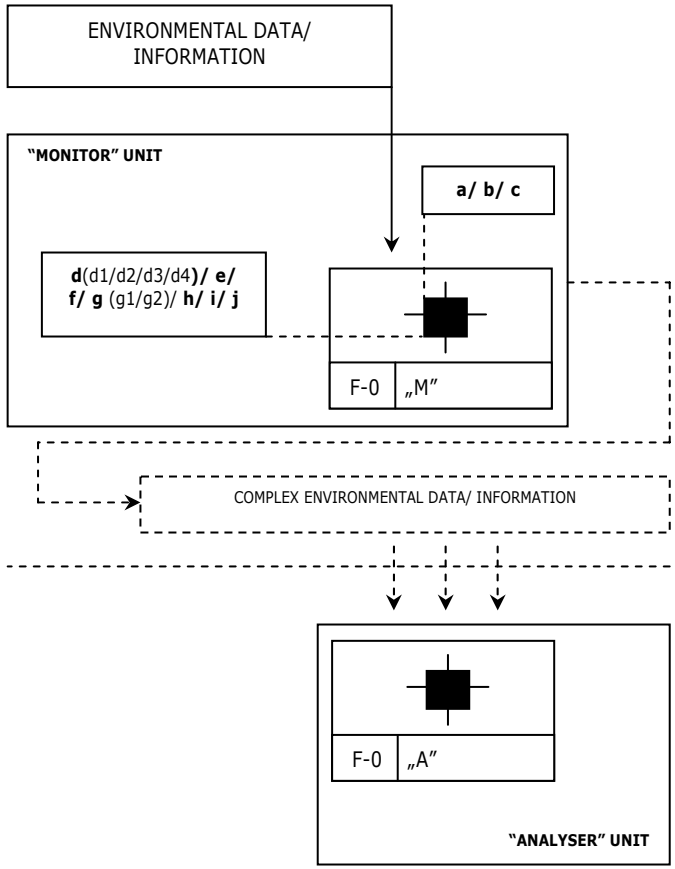


Figure 54 : Global architecture developed for the BFE mechanism

1. MONITOR (THE ANALYSER THAT OBSERVES) – "M"

The main function of this module consists first of all in monitoring the own current state of the fractal, and then in collecting/ receiving specific information from the organisational environment and from the other fractals/ respectively in transmitting to the Analyser Unit ("A"), or as it is the case to the other fractals, different complex environmental informational answers.

Table 62 : "Specific Activities"- Monitor Unit

"SPECIFIC ACTIVITIES" - MONITOR UNIT	
a.monitoring the possible changes produced on the level of the organisation's environmental strategy; **b.**observing the changes produced from a technological point of view on the organisation's level; **c.**monitoring the possible changes on the level of the organisation's environmental general objectives and targets; **d.**monitoring the fractal's current state: d1.the accomplishment level of the proposed environmental objectives and targets on the fractal's level; (implicitly of the programme (s) and of the utilised environmental procedures); d2.the reorganisation degree of the proposed environmental objectives and targets on the fractal's level, having in view the available resources (financial/ human) allotted and/or negotiated with the other fractals; d3.the reorganisation degree of the proposed environmental objectives and targets on the fractal's level, having in view the changes produced on the level of the organisation's environmental strategy; d4.the reorganisation degree of the proposed environmental objectives and targets on the fractal's level having in view the changes produced on the level of the organisation's utilised technology; **e.**observing the process of negotiation with the other fractals of the resources necessary for the accomplishment of the proposed environmental objectives and targets; **f.**monitoring the process of negotiation of the environmental objectives and targets with the other fractals; **g.**monitoring the current state of the other fractals (on the same hierarchical level or on different levels): g1.the reach level of the environmental targets and objectives; g2.the reorganisation degree of the environmental objectives and targets; **h.**monitoring the performed environmental training sessions; **i.**other specific observing and monitoring activities; **j.**the update of the environmental database/ information/ knowledge on the organisation's level;	

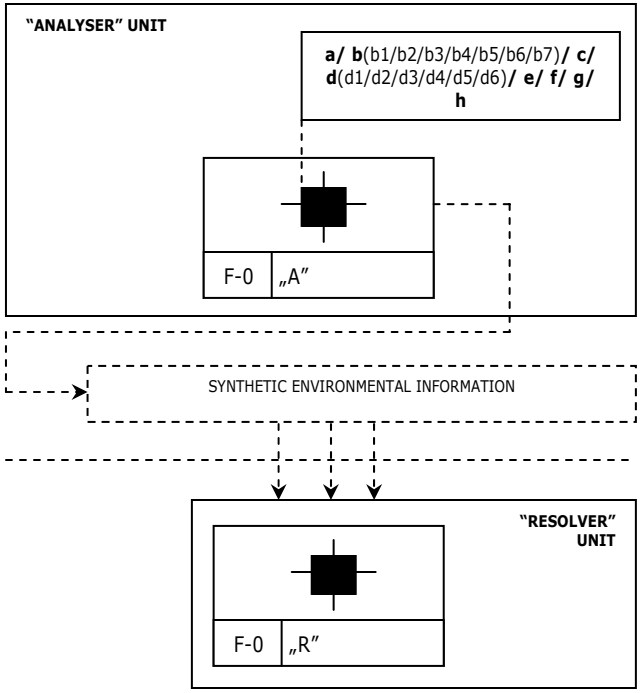
2. ANALYSER – "A"

The main function of this module consists in analysing the current state of the fractal – the current analysis of the environmental activities carried out on the fractal's level. Concretely: on the level of the analysis unit there is an analysis of the efficiency and efficacy of the elaboration and hierarchisation process of the environmental activities carried out on the fractal's level – taking into account: (a) the proposed environmental performance (ISO 14031), (b) the environmental objectives and targets on the fractal's level and (c) the simulations performed in order to quantify the possible effects of the environmental activities deployed.

Table 63 : "Specific activities" - Analyser Unit

"SPECIFIC ACTIVITIES"- ANALYSER UNIT

a.the analysis of different alternative environmental activities carried out currently;
b.the analysis of the methods and techniques utilised on the level of:
b1.the design/ implementation of the environmental objectives and targets of the fractal;
b2.the quantification of the induced impact upon the environment as an effect to the deployed activities;
b3.the simulation of the possible effects of the deployed activities;
b4.the negotiations carried out among the fractals which aim at diverse environmental objectives and targets, and the resources necessary for their implementation;
b5.the collection of environmental data/ information/ knowledge;
b6.the process of choosing and hierarchising the environmental performance indicators;
b7.the process of quantifying the environmental performance (according to ISO 14031);
c.the analysis of environmental information/ knowledge that exist on the fractal's level;
d.the analysis of environmental objectives and targets on the fractal's level, considering:
d1.the environmental general objectives/targets established on the organisation's level;
d2.the accomplishment level of the proposed environmental objectives and targets on the fractal's level;
d3.the reorganisation degree of the proposed environmental objectives and targets on the fractal's level having in view the available resources (financial/ human) allotted and/or negotiated with other fractals;
d4.the reorganisation degree of the proposed environmental objectives and targets on the fractal's level having in view the changes produced on the level of the organisation's environmental strategy;
d5.the reorganisation degree of the proposed environmental objectives and targets on the fractal's level having in view the changes produced on the level of the technology utilised on the organisation's level;
d6.the environmental policy on the organisation's level;
e. the analysis of all the environmental activities carried out currently (on the level of the environmental programme (s) , and so on);
f.the analysis of the existing environmental procedures;
g.the analysis of the results of the environmental training sessions deployed;
h.other specific analysis activities (update of environmental database , and so on);



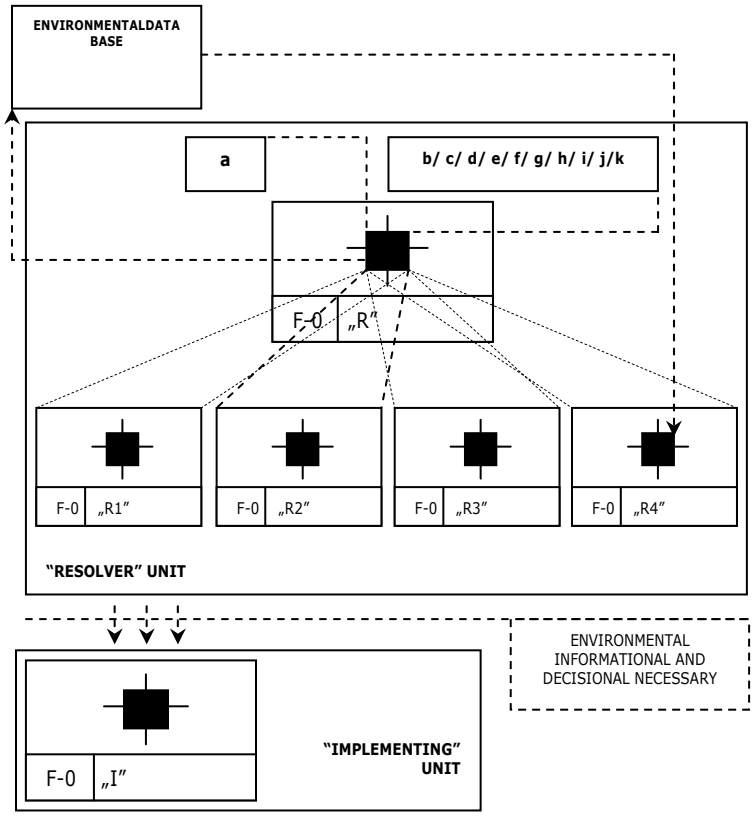
3. RESOLVER – "R"

The module called "resolver" represents the most important module on a fractal's level; this module in essence (a) elaborates the environmental activities (on the level of the environmental programme) (R1), (b) designs and reorganises the environmental responsibilities necessary for the deployment of the planned environmental activities (R2) (if it is the case), (c) elaborates the environmental objectives and targets of the fractal (R3), (d) leads the environmental decisional process on the fractal's level (R4), , and so on

Table 64 : "Specific activities" - Resolver Unit

"SPECIFIC ACTIVITIES" - RESOLVER UNIT

a.it receives from the analyser module „A" the synthetic information necessary for the current carrying out of the activities specific to this unit/ or environmental data and information from the monitoring module/ or environmental information from the implementing module;
b.it elaborates/ develops the current environmental activities on the fractal's level;
c.it elaborates plans with different alternative environmental activities;
d.it designs and reorganises the environmental responsibilities necessary for the carrying out of the planned environmental activities;
(environmental responsibilities on the level of the job descriptions/ utilised procedures);
e.it elaborates the environmental objectives and targets of the fractal;
f.it elaborates the environmental programme (s) necessary for the accomplishment of the proposed environmental objectives and targets;
g.it elaborates the operational and system procedures necessary for the carrying out of the current environmental activities;
h.it leads the negotiation process of the resources necessary for the accomplishment of the proposed environmental objectives and targets in relationship with the other fractals;
(it leads implicitly the negotiation process of the environmental objectives and targets with the other fractals);
i.it leads the environmental decisional process on the fractal's level;
j.it utilises and updates the environmental database/ information/ knowledge on the organisation's level;
k.other activities specific to the resolution unit;



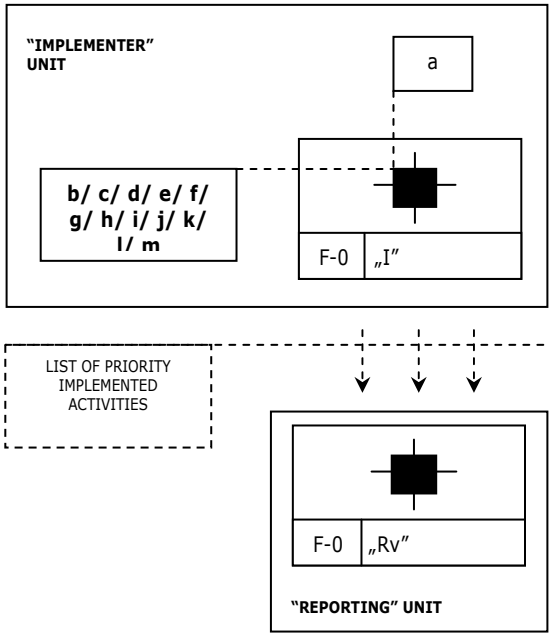
4. IMPLEMENTER – "I"

The main function of this module consists in implementing the environmental decisions elaborated on the resolution level; and secondly it has the organising function of the fractal's current situation to stabilise dynamically the reorganisation process that intervenes (a) once the proposed environmental objectives/targets are accomplished on the fractals' level, and (b) as an effect of the lack of equilibrium produced on the level of the negotiation process of the necessary resources.

Table 65 : "Specific activities" - Implementer Unit

"SPECIFIC ACTIVITIES" - IMPLEMENTER UNIT

a.it receives from the resolution module "R" the list with the priority action activities (as it is the case – "the environmental informational necessary") in order to deploy the activities specific to this unit;
b.it clearly defines tasks, responsibilities and the authority level in order to implement the environmental general objectives, targets and programme (s) established on the fractal's level;
c.it establishes a matrix of the environmental responsibilities on the fractal's level;
d.it provides the availability of the necessary resources (allotted/ negotiated with the other fractals) for the implementation of the environmental general objectives, targets and programmes established;
(it provides the availability of the necessary resources for the environmental activities deployed);
e.it carries out environmental training activities in order to increase (a) the competences in the environmental issues on the fractal's level, and (b) the awareness degree on the importance of the environmental protection;
f.it collects alternative environmental information (others than the ones collected as a sub-process of the "M" module – if the situation imposes it); it establishes the target-group and the necessities of information and/or dialogue; it establishes the relevant information that are to be communicated; it determines the corresponding methods for the communication process; it evaluates periodically the efficacy of the environmental communication process;
g.it elaborates and maintains a documentation suitable to the complex process of environmental management on the fractal's level;
h.it establishes and implements environmental operational and system procedures for the different environmental activities deployed on the fractal's level;
i.it identifies the necessity for different operational controls and it establishes specific operating criteria;
j.it prepares and implements plans/actions aiming at different emergency situations;
k.it implements diverse alternative environmental activities (if it is the case);
l.it implements decisions resulted after the environmental decisional process on the fractal's level/ negotiation process with the other fractals;
m.it updates the organization environmental database;



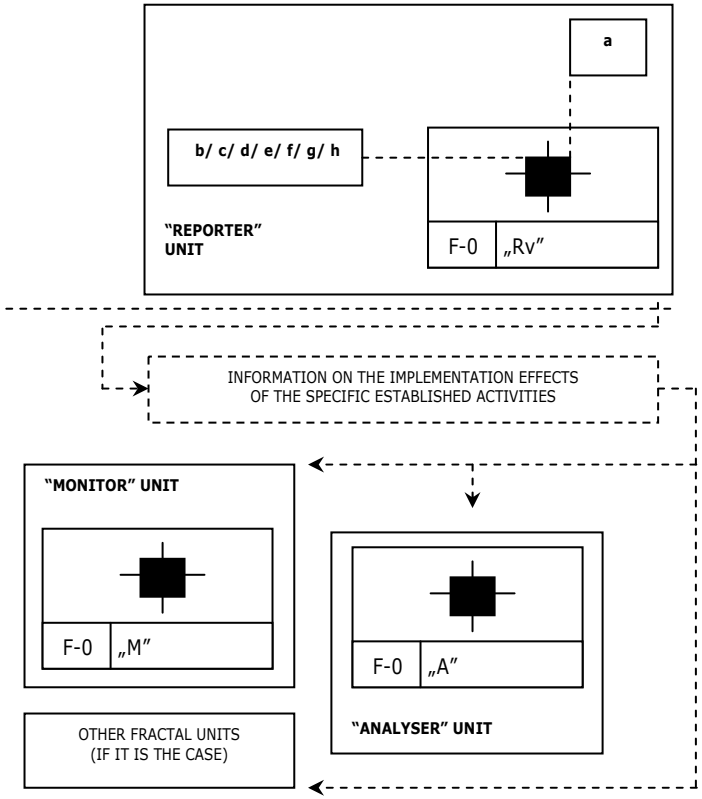
5. REPORTER (that also verifies) "Rv"

The main function of this module consists in reporting to the monitor unit "M" / respectively to the analyser unit – "A" the results attained after the implementation of all the "specific activities" developed on the level of the implementer module "I"; it fulfils indirectly the function of verifying the attained results and of the resulted effects (the reporting function satisfies/ meets the principle of the continual improvement).

Table 66 : "Specific activities" - Reporter Unit

"SPECIFIC ACTIVITIES" - REPORTER UNIT

a.it receives from the implementing module "I" the list of the priority activities implemented by this module;
b.it reports to the monitoring unit "M"/ respectively the analysis unit "A" the results/effects attained after the implementation of all the "activities specific" developed on the level of the implementing module „I";
c.it verifies the accuracy of the environmental data/ information that presents the results/effects attained after the implementation of all the "activities specific" developed on the level of the implementing module „I";
d.it communicates different current environmental data/ information/ knowledge to the derived fractals of the fractal considered as a reference ("baby" fractals) - (e.g.: the derived environmental objectives and targets);
e.it communicates different environmental data/ information/ knowledge to the fractals on the same hierarchical level/ on different superior hierarchical levels;
f.it verifies and reports the efficacy of the communication channels with the other fractals;
g.it verifies and reports the results of the negotiation process with the other fractals;
h.it updates the environmental database/ information/ knowledge on the organisation's level;



Having in view the architecture proposed in Figure 54 respectively in tables 62, 63, 64, 65, 66, by resuming synthetically, it can be said that on the level of the Basic Fractal Entity different functions are exercised on each module of each unit considered apart:

a. on the level of the "Monitor" module (the analyser that observes), the main function is to monitor the current state of the fractal, and then to collect/ receive different specific information from the organisational environment and from the other fractals/ respectively to transmit different complex environmental informational answers ("Coordinator" unit) to the Analyser Unit ("A"), or as it is the case to the other fractals;

b. on the level of the "Analyser" module, the main function is to analyse the current state of the fractal; namely it analyses the efficiency and efficacy of the elaboration and hierarchisation of the environmental activities deployed on the fractal's level – taking into account different criteria ("Coordinator" unit);

c. on the level of the "Resolver" module, considered the most important module of the BFE, the following functions are considered essential: a) the elaboration function of the environmental activities, (b) the design and reorganisation function of the environmental responsibilities necessary for the carrying out of the planned environmental activities, (c) the elaboration function of the fractal's environmental objectives and targets, (d) the leading function of the environmental decisional process on the fractal's level ("Coordinator" unit);

d. on the level of the "Implementer" module, the main function is to implement the environmental decisions elaborated on the level of the resolution unit; and secondly it exercises the organising function of the fractal's current state in order to stabilise the dynamics of the reorganising process ("Executer" unit);

e. on the level of the "Reporter" module, the main function consists in reporting to the monitoring unit "M"/ respectively to the analyser unit "A", the results attained after the implementation of all the "specific activities" developed on the level of the implementer unit "I"; secondly it also fulfils the verifying function of the attained results and of the resulted effects ("Controller" unit);

The mechanism developed for the BFE contributes substantially to the correct structuring and to the efficient and effective management of the existing informational relationships on the level of the logical subdivisions of the BFE.

It is also necessary to mention that this environmental data/ information/ knowledge managed on the level of the BFE are (a.) codified in time in a personal manner, (b.) in a direct relationship with the informally assimilated routines and practices, (c.) in a relationship with the explicit manner of communicating the environmental knowledge, and (c.) in a direct connection with the operational relevance that represents it, and that is why it is absolutely necessary to pay special attention to their decoding in an efficacious manner.

4.4.2. Environmental Informational Necessary that provides the current functioning of the Basic Fractal Entity (BFE)

The current functioning and under efficiency and efficacy conditions of the BFE is essentially provided on the level of the module called "Resolver" which is considered to represent the most important module on a fractal's level. Having in view the importance of the functions that it develops (of elaborating the environmental activities/ of designing and reorganising the environmental responsibilities necessary for the carrying out of the planned environmental activities/ of elaborating the environmental objectives and targets of the fractal/ of leading the environmental decisional process on the fractal's level), it can be said from another prism that it elaborates and reorganises the environmental informational necessary of the "Implementer" unit.

In another connection, through the fractal approach of the complex management processes, the informational flows that can be developed are: (a) the existing flows on the level of the fractal entity (within the entity), (b) flows that can be found among the fractal entities that are on identical levels, (c) flows among the fractal entities that are on different levels, (d) flows that are reported between the fractal entity and the external environment (Ryu and Jung, 2003a; Stecjuka *et al.*, 2008).

Having in view the aforementioned, it is necessary to present the correlation between different environmental activities carried out on an organisation's level and the environmental informational necessary (Table 67/ Table 68).

Table 67 : Matrix model I which shows the correlation between environmental activities and environmental informational necessity of managers (for internal organizational level)
Source: Herghiligiu *et al.*, 2013b

ENVIRONMENTAL INFORMATIONAL NECESSARY		ENVIRONMENTAL ACTIVITIES (starting from environmental responsibilities of an environmental manager) Source: Herghiligiu *et al.*, 2012.c.	THE NATURE OF ACTIVITY	ACTIVITY LEVEL
ENVIRONMENTAL INFORMATION	1.informations regarding the levels and dynamics evolution of the pollutant emissions of the organization; 2.1. informations about the number and characteristics of the developed products that have minimal environmental impact; 2.2. informations on the functioning level regarding the internal processes of the organization and the environmental efficiency level of this process; 3. informations about the number/ frequency/ content/ results obtained after performing environmental audits; 4. informations about the number and results of field inspections; 5. informations on environmental programs developed in the past, about the content and timeliness of currently environmental programs used at the level organization.	1. evaluation and/ or control of different pollutant emissions levels regarding the activities of organization (negative environmental impact); 2. research on (a) obtaining products / (b) operation of the organization's internal processes, with minimal negative impact on the environment;	**TECHNICAL**	PERFORMED ACTIVITIES - INTERNALLY

ENVIRONMENTAL KNOWLEDGE	1.knowledge about (a) the environmental legislative framework (maximum levels allowed) and (b) about the best methods and techniques for assessing and controlling the emission levels of pollutants; 2.1. theoretical knowledge regarding products and their impact on the environment/ new clean technologies for product with minimal impact on the environment; different ideas to improve/ change products; 2.2.practical and theoretical knowledge about processes and methods to improve the functioning of different process; ideas and strategies on improving processes; 3.knowledge about the internal audit mission (methodology); 4.knowledge about the use of various technical equipment used in the field inspection/ analysis and quantified the results obtained during the inspections / theoretical and practical knowledge about components of technological process; 5. knowledge on the best techniques for developing and updating the environmental management programs.	3. periodic audits and preparation of documents that contain the results; 4. periodic inspections and / or in field evaluations (at sections - inspection of various parts of the technological process); 5. design/ development of various environmental programs;		
ENVIRONMENTAL INFORMATION	1.informations about the level regarding the legal compliance of the organization/ the level regarding the fines received for failure to comply with environmental regulations; 2. informations about the existence/ non-existence of an EMS; 3. informations regarding the number and content of the various assessments made at the organization level; 4. informations about periodicity and different aspects tracked in various financial analyzes performed at of the Environmental Department level; 5. informations about the existence and content of the different measures developed for the emergency situations.	1. ongoing analysis of environmental legal compliance of the organization; 2. design and implementation (if doesn't exists, and if the organization wants to undertake such a measure) an environmental management system (EMS) / develop the existing EMS; 3. analysis and processing of environmental data and information gathered from internal organizational (mathematical and statistical standpoint to obtain synthetic reports); 4. financial analysis carried out in the environmental department of the organization; 5. planning / development / and implementation of measures to be taken to emergency situations;	**ADMINISTRATIVE**	
ENVIRONMENTAL KNOWLEDGE	1. theoretical knowledge about environmental legislation / best methods used to observe the legislative changes / the analysis of impact induced on medium activities of the organization; 2. theoretical and practical knowledge about the design / implementation / integration and function of the EMS; 3. theoretical knowledge concerning the design and application of different research methodologies (tools of investigation / sampling / technical analysis / interpretation); 4. knowledge about content and stages of financial analysis; 5. theoretical knowledge about the complexity of emergency situations and about the best techniques used in their planning / development / and implementation.			
ENVIRONMENTAL INFORMATION	1. information about the frequency / number / content and results obtained after environmental trainings for organization's staff (quantified through the evaluation and analysis of increased efficiency and effectiveness of environmental activities performed by employees / to achieve the environmental objectives and targets of the organization); 2. information about the type and frequency of interdepartmental collaborations that have as main objective the different environmental activities; 3.information about the level of internal development of environmental organisational culture; 4. information about the level of distribution and understanding by the organization's staff of environmental policy.	1. planning / development / and implement trainings that aim to inform and increase the employee awareness on environmental issues; 2. design / development / and implement various environmental initiatives that have as their primary objective the internal relations between the environmental department and other internal departments; 3. design and / or development of environment organizational culture; 4. implementing and maintaining at all levels of the organization's the environmental policy;	**SOCIAL**	
ENVIRONMENTAL KNOWLEDGE	1. knowledge regarding: (a) the best techniques and methods used in environmental trainings, (b) the real need of environmental trainings; 2. knowledge about environmental information management system, ideas and strategies about the best ways to increase the efficiency and effectiveness of inter-departmental relationships; 3. knowledge about the best techniques and modern methods used in the development of environmental organizational culture; 4. knowledge about the best methods of dissemination of environmental policy / about the way the environmental policy should be implemented and maintained at the level of an organization.			

Table 68 : Matrix model II which shows the correlation between environmental activities and environmental informational necessity of managers (for external organizational level)
Source: Herghiligiu *et al.*, 2013b

ENVIRONMENTAL INFORMATIONAL NECESSARY		ENVIRONMENTAL ACTIVITIES (starting from environmental responsibilities of an environmental manager) Source: Herghiligiu *et al.*, 2012.c.	THE NATURE OF ACTIVITY	ACTIVITY LEVEL
ENVIRONMENTAL INFORMATION	1. information about: (a) previous simulations of potential environmental impacts performed, (b) the criteria used in these simulations of environmental impact, (c) the level of use of simulations results; 2.1. information about the technological and moral wear of equipment used at organizational level; 2.2. information about the financial resources that could be used by the organization to purchase clean technologies; 3. Information about: the number / frequency / previous organization's participation to different scientific events; 4. information about (a) the level of expertise of potential external partners of the organizations, (b) previous inspections performed at the level of different components of the technological process; 5.idem point 4.	1. potential environmental impacts simulation based on assessments and / or control current levels of emissions regarding the pollutants from the organization; 2. research on the possibility of implementing at the organization level of new technologies with minimum impact on the environment; 3. representing the organization on different environmental scientific manifestations (congresses / conferences - discussions on various clean technologies and so on); 4. partnerships and collaborations with various external partners (external experts) on various measurements / inspections regarding the different parts of the technological process; 5. partnerships and collaborations with different external partners (external experts) on various environmental programs - design / development at the organization level;	**TECHNICAL**	PERFORMED ACTIVITIES – EXTERNAL PURPOSE
ENVIRONMENTAL KNOWLEDGE	1.1. theoretical knowledge about software programs that can be used in making simulations of the induced impact on the environment organization's activities; 1.2. knowledge of techniques used to evaluate the relationship between pollutant emissions and the best methods / simulation programs of the induced impact on the environment; 2.1. technical knowledge about the machinery and equipment used by the organization; 2.2. knowledge about environmental operational performance evaluation of the equipment used in the activities of the organization; 2.3. theoretical knowledge about clean technologies; 3.knowledge about the best communication techniques at scientific events; clear knowledge about environmental objectives and targets of the organization; 4. knowledge about the best ways to evaluate the technological process; 5. knowledge about design / development / implementation / functioning of environment programs;			
ENVIRONMENTAL INFORMATION	1. information about any fines received by the organization from different qualified agencies in environmental issues; 2. information about (a) the content and form of environmental reporting regarding environmental issues managed, (b) previous reports made regarding various environmental problems occur; 3. information about the existing environmental authorizations for various activities of the organization; 4. information about the content and results of previous and in progress environmental projects at organizational level; 5. information about current environmental regulations required and about the type of the link between the organization and external stakeholders;	1. managing the relationship between the organization and various public institutions - ability in environmental issues (environmental agencies, environment ministry, and so on); 2. performing of different environmental reports (on various current environmental actions or extraordinary) regarding the management of environmental issues; 3.o obtaining of different environmental permits from the institutions that have the ability to provide it for the organization; 4. managing environmental projects undertaken by the organization (funded national or international); 5. management of the relationship between organization and environmental guidelines set by state and the management of the relationship between the organization and external stakeholders (customers / suppliers / community and so on);	**ADMINISTRATIVE**	
ENVIRONMENTAL KNOWLEDGE	1.ideas (or even medium and long term strategies) to improve the relationship between the organization and institutions environmental issues; 2.knowledge about the form / content / complexity of environmental reporting; 3. knowledge of the procedure to obtain various environmental authorizations from the qualified agencies; 4. theoretical and practical knowledge of environmental project management and cost benefit analysis; 5. knowledge of the regulations established by the state and about stakeholder theory;			
ENVIRONMENTAL INFORMATION	1. information about the number of partnerships and previous / current collaborations with various external partners concerning various environmental initiatives; 2. and 3. information about community notification actions / ONG at local level about activities carried out by the organization, information about informational satisfaction level of the community regarding the activities carried out by organization (activities that have an impact on the environment);	1. partnerships and collaborations with various external partners on various environmental initiatives; 2. management of the relationship between organization and environmental NGOs.	**SOCIAL**	

ENVIRONMENTAL KNOWLEDGE	1.communication and negotiation knowledge that have as main goal partnerships completion and collaborations with various external partners concerning various environmental initiatives; 2. and 3. knowledge of the best techniques of communication and negotiation / regarding to evaluation methods of individuals perception;	3. management of the relationship between the organization and the public;		

The purpose of these two models presented in the previous tables is to contribute to the clear understanding of the functional informational relationships carried out by the BFE and at the same time to serve as a model in the real elaboration of the mentioned relationships.

4.4.3. Conceptual framework regarding the Environmental Decisional Process based on Fractal Philosophy

4.4.3.1. Environmental decisional process based on fractal philosophy

Herbert Simon, the father of the canonical model of decision making, presents the fact that any issue generates sub-issues which in turn resume the cycle of investigation, conception and selection "wheels of wheels" (Figure 55); thus we can conclude that the decision making process is not sequential, but iterative – a valid idea for any type of decision (Herghiligiu *et al.*, 2012c).

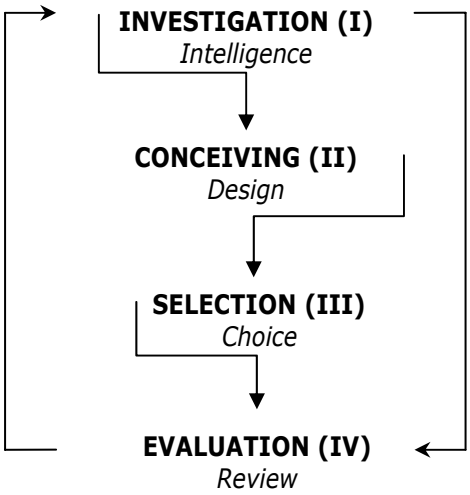


Figure 55 : Canonic model for any organizational decision
Source: Herghiligiu *et al.,* 2012c

In terms of the environmental decisional process on the level of Romanian organisation, it is suitable to mention that there are clear major incoherencies generated by a series of aspects, among which the

following can be enumerated: a1.decisional incoherence – as the environmental decisional process; a2. the incorrect delimitation of the environmental responsibilities; a3. the absence of environmental responsibilities; a4. the use of analysis methods of the environmental decisions that have not been adapted correctly to the specific features of the environmental decisions; a5. the superficial quantification of the effects of the made environmental decisions (the concrete environmental impact)/ or the inexistent quantification of this evaluation type , and so on (Herghiligiu *et al.*, 2012c).

Having in view that each fractal entity existing on the organisations' level, such as managers, employees, departments, sections or even a part of an employee's work aimed at reaching an environmental specific objective, must manage efficiently and effectively environmental data, information and knowledge to a corresponding level that leads to the making of environmental responsible decisions (Herghiligiu *et al.,* 2012a/c; Herghiligiu *et al.,* 2013a), it is considered suitable to develop and present a theoretical framework regarding the environmental decisional process through the prism of the fractal philosophy.

In another connection, the use of fractal approaches in the systems' development was applied in a number of different contexts. Theoretically, the fractals' systems are self-organised, independently similar on the different levels of processes, which can be adapted to the change of objectives and environment, favourable specific features to the environmental decisional process (Fryer and Ruis, 2006).

Thus, having in view the specialty literature presented previously and which presents the main specific features of the fractal philosophy, we can define the environmental decision as being **"the process of an autonomous entity, inter-operable and independent called fractal entity, that develops endogenous and exogenous connections, divides collaboratively environmental knowledge and resources in order to accomplish the environmental objectives of the fractal and eventually of the organisation"** (Herghiligiu *et al.*, 2012c).

Thus the environmental decision is described – starting from the fractal paradigm, since any environmental issue generates sub-issues, which in their turn resume the cycle of investigation, conception and selection – "wheels of wheels" (Figure 6.19).

In order to present as simply as possible *the environmental decisional fractal process* from the level of the "Resolver" unit (Table 64), we shall use the model of Sierpinski's[61] triangle, by presenting an equilateral triangle, with other three equilateral triangles iterated within it (Figure 56):

[61] The representation with the help of Sierpinski's triangle is also arbitrary for the presentation of this concept – the environmental informational fractal process, and there shall be no appeal to any legity that derives from the use of Sierpinski's triangle.

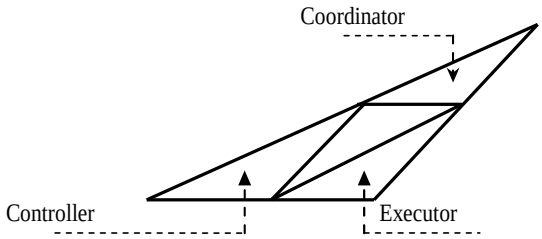
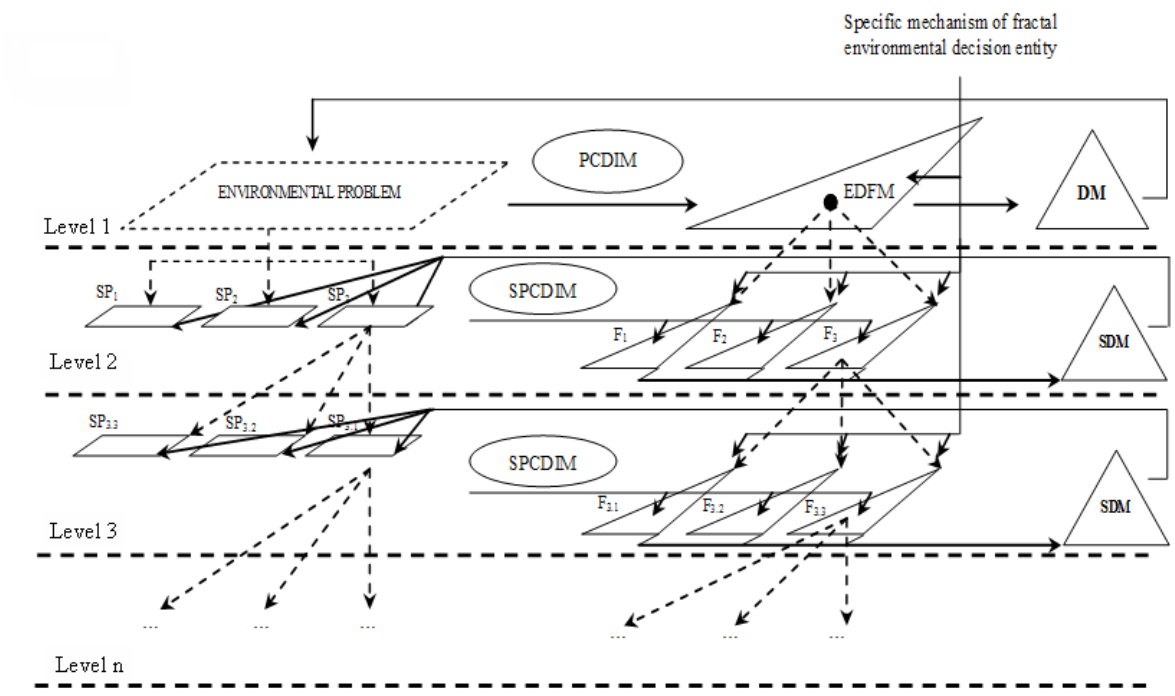


Figure 56 : Logical structure of EDFM

Each fractal entity has the following general specific features: dynamicity, inter-operability and independence, starting from only one person and reaching an entire process or even the entire organisation (Herghiligiu *et al.*, 2012c).

As it can be noticed in Figure 57 (that has the iteration as the basic principle – the principle of Sierpinski's triangle), each issue generates other sub-issues (notice the cyclicity on the given levels – Level 1, Level 2, ... Level *n*), that require the resumption of the cycle of environmental decisional investigation, conception and selection. In order to simplify, to order, to increase the quality and to understand easily the *environmental decisional process and the environmental decisional concept*, there shall be an appeal to the fractal philosophy of approach, considering this process as being carried out on the level of a basic fractal entity that leads the environmental decisional process (Herghiligiu *et al.*, 2012c).

The PCDIM/ SPCDIM/ or the entries (the input) – are considered to represent the total of the informational necessary (Table 67/ Table 68) for making environmental successful decisions, in case of environmental issues at a given moment. We consider synthetic to include here: (a.) the total of the data and information about the environmental issue considered to be settled, that leads to an environmental decision, (b.) the total of the "aspects" specific to the considered environmental decision that influence directly the quality of this decision type (c.) the decoding having in view the operational relevance and (d.) other endogenous and exogenous factors, determined or unquantifiable , and so on (Herghiligiu *et al.*, 2012c).



Legend:
EDFM – fractal environmental decision entity; SP (SP_1, SP_2, SP_3, ...$SP_{.n}$.) – environmental subproblems; F (F_1, F_2, F_3, ...$F_{m.n}$, and so on) – fractal ϵ EDFM; PCDIM – collecting environmental data/ information process, related to the environmental issue analyzed; SPCDIM – collecting environmental data/ information subprocess, related to the environmental issue analyzed; DM – environmental decision; SDM – environmental subdecision

Figure 57 : Conceptual structure of the relationship between environmental problems and fractal environmental decision entity (EFDM)
Source: Herghiligiu *et al.*, 2012c

The DM/ SDM/ or the exits (the output) are considered to be the result of the environmental decisional fractal process – the final environmental decision, that settles the given environmental problems (and implicitly the sub-problems of the problem) in a successful manner (Herghiligiu *et al.*, 2012c).

4.4.3.2. The Mechanism of the Fractal Environmental Decision Entity (FEDE)

The following shall be considered in relation to the *Mechanism* that is proposed to be the basis of the environmental decisional fractal process– the basic fractal entity on the internal level:

The Fractal Environmental Decision Entity (FEDE) is made up of the following logical sub-divisions that provide its good functioning (sub-divisions adapted for the exemplification of FEDE according to Walsh *et.al.* 2003; Herghiligiu *et al.*, 2012c):

a. Coordinator
b. Executer

c. Controller

Coordinator: it is responsible with the necessity of interacting with the fractal entities (F) created to settle the sub-issues of an environmental issue (EI). It provided essentially the organisation and the coordination of the process's stages. Additionally: (a) it provides collaboration with the other entities from the organisation's level in order to establish connections that have as the main purpose the accomplishment of the proposed environmental objectives which are necessary to be achieved by the environmental decision that can be found working on the level of the environmental decisional fractal entity (on the level of this process), and (b) it provides collaboration with the sub-created fractal entities (F) – aiming at the efficient management of the environmental sub-objectives derived from the sub-issues arisen from the given environmental issue, in a negotiating manner (Herghiligiu *et al.*, 2012c).

We consider that Coordinator represents "the intelligence" of the entire environmental decisional process and of the FEDE consequently. By taking valid for the environmental decision as a basis the model of a canonical decision presented by Simon, it includes in essence all the stages of the decisional process, but especially on the level of Conception II and Selection III (Figure 55) (Herghiligiu *et al.*, 2012c).

Executer: this sub-division of the FEDE is responsible with the implementation of activities and the use of the necessary resources in order to accomplish the proposed environmental objectives by that considered environmental decision (what is analysed and decided on Coordinator's level) - (Herghiligiu *et al.*, 2012c).

Controller: it fulfils the role of measuring the performances of the environmental decision, established on the Coordinator's level. Besides measuring these performances, it receives the Evaluating task IV of the decision (starting again from the stages of Simon - Figure 55) - (Herghiligiu *et al.*, 2012c).

The conceptual framework proposed for the environmental decision hoped to clarify, to order and to explain efficiently the environmental decisional process carried out on the organisations' level, and thus to become a simple and successful model for the environmental decisional agents who are invested with the authority necessary to make this type of decisions. Not lastly did it hope to emphasise the importance of the environmental responsibilities and the necessity of a clear and objective methodology for the environmental decision, which should eliminate the current existing chaos on the level of firms that carry out activities which have a negative impact upon the environment (Herghiligiu *et al.*, 2012c).

While following the same logics elaborated and proposed for the Mechanism of the Basic Fractal Entity (BFE) - it is also necessary to mention synthetically for the environmental decisional fractal process (Herghiligiu *et al.*, 2012c):

A. Coordinator can be broken down into 3 logical sub-units that operate the following functions:

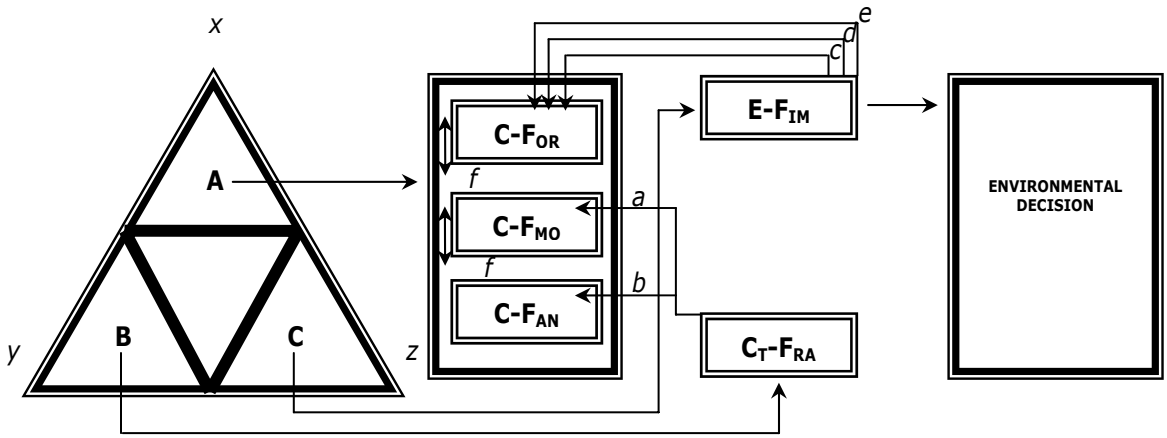
A1. the organising/ solving function ($C\text{-}F_{OR}$),

A2. the monitoring and observation function ($C\text{-}F_{MO}$), and

A3. the analysing function ($C\text{-}F_{AN}$);

B. the Controller's – the reporting function (C_T-F_{RA});

C. the Executer's – the implementing function (E-F_{IM}).



Legend:
Equilateral triangle *x-y-z*: the representation of the existing mechanism on the level of the environmental decisional fractal process. The A, B, C triangles represent the logical sub-divisions of FEDE. C-F_{OR}: the organising/ solving function; C-F_{MO}: the monitoring and observing function; C-F_{AN}: the analysing function; C_T-F_{RA}: the reporting function; E-F_{IM} : the implementing function.

Figure 58 : Functions of actual mechanism at Fractal Environmental Decision Entity level
Source: Herghiligiu *et al.*, 2012c

In terms of the informational relationships that are established among the logical subdivisions, we can describe them in the following way (Figure 58): (Herghiligiu *et al.*, 2012c):

1. the relationship/ connection *"a"* indicates: (a) the information flow related to the resolution degree of the environmental sub-issues on the level of the inferior fractals, (b.) the information flow that contains data about the changes in the external environment;

2. the relationship/ connection *"b"* emphasises: (a) the information flow (sometimes bi-directional) related to the alternative environmental variants, (b.) information on the attained results after the application of the environmental decisions;

3. the relationship/ connection *"c"* indicates the data and information flow related to the changes occurred in the environmental decisional process – on the level of the fractals that are situated on an inferior hierarchical level;

4. the relationship/ connection *"d"* indicates the data and information related to the modifications of the different parameters utilised in the environmental decisional process;

5. the relationship/ connection *"f"* indicates a continual exchange of environmental information (in both ways);

6. the relationship *"e"* emphasises the connection that transmits environmental information related to the future environmental decisions.

It is also necessary to remind that these environmental data/ information/ knowledge, managed on the level of the environmental deciding entity are: (a) codified in time in a personal manner, (b) in a direct relationship with the informally assimilated routines and practices, (c) in a relationship with the explicit manner of communicating the environmental knowledge, and (c) in a direct connection with the operational relevant that represents it, and that is the reason why it is absolutely necessary to pay special attention to their decoding in an efficient manner.

Conclusions

"Today" more than ever complex environmental decision process should maximize more the performance to ensure organizations a competitive market advantage. Therefore is needed due to the fast changes of the environment of a new functionality architecture philosophy of this process (a new conceptual framework for understanding and approach) that provide flexibility, dynamicity, durability, quick adaptability to the environment and a decentralization of environmental decision-making objectives.

Proposed conceptual framework for environmental decision making process, built after fractal philosophy principles offers besides the advantages mentioned above, a number of specific tangible benefits, which is a leverage with managerial value for entity/ environmental decision making agent from organisation level; among the most important are:

(a) environmental decisions can be generated by a small series (even standardized decision) of aspects that are considered relevant for this process (environmental data/ environmental information/ methods/ techniques and so on);

(b) eliminates environmental data/ environmental information redundancy and so on;

(c) can reduce environmental data storage and environmental information (environmental reports) revealed by their analysis (resulting reduced costs from these specific actions);

(d) simplifies the analysis/ data codification/ environment information processes;

(e) can reduce the response time materialized by an environment decision (distance between an occurring event - effect of the organization activities and the answer to that environmental problem – concrete by an environment decision);

(f) can reduce the established connections number at this environmental decision-making level process, and

(g) may develop environmental particular decision-making methodologies (depending on the particular organizations) to streamline this process.

Conclusions and contributions

1. Conclusions

The flexibility need of the organizations whose main objective is to meet the consumers' demand promptly, associated with the demand's continual change and with some uncertain and unstable aspects of the characteristics of the organizations' environment may disturb fundamentally all the levels of an organization. Regarding to the Environmental management system it is currently asserted that the can be seen as a system managed hierarchically, utilized by the organizations that have well-defined organizational systems, fact resulted from research undertaken and supported by specialty literature. At the same time, taking in view this important aspect mention previously, it is necessary to underline the following:

- the traditional production systems managed through hierarchical management (and through decisional methods based on hierarchical control) are no longer able to meet the actual needs, having in view the complexity of the environment;
- even if the hierarchical control is easy to understand and has a low redundancy level, it has a major disadvantage: the reduced capacity to register all modifications produced at all the hierarchical levels;
- according to the Laws and Axioms of the Needed Variety (Ashby, 1964)[62], a structure that is referred to as being hierarchically managed (a hierarchical authority) does not have the necessary variety in order to provide the adaptation of their own systems in their niche;
- resuming the idea that the environment in which the organizations coexist is extremely complex and dynamic because of the changes produced in short periods of time, and that the features defining the traditional hierarchical patterns, usually present at the level of these organizations, is extremely limited, sometimes leading to inefficiency and to lack of effectiveness, we may conclude that this "limited perspective" also characterizes the environmental decisional process.

Having in view the main ideas previously exposed, we can state that the research we carried out is of maximum importance; in other words, we can see that the adaptation and transformation of the Environmental management system implementation and operation (functioning) process at the organizational level is of crucial importance; also, this type of system should have the following attributes:

[62] This law was promulgated for the first time by Ross Ashby (1964). It is characteristic to cybernetic systems and it refers to the fact that the output diversity of a system can be modified only through a sufficient input diversity of the same system [explained by analogy to the variety – constraint report; the constraint represents a relation existing between two elements (subsystems) that determines the maintenance of the variety at a constant level (the reduction of the variety that describes an element through the variation of the other element)].

flexibility/ "intelligence"/ configurability/ fast adaptability to the environment/ it should also include entities characterized by the attributes previously mentioned/ and autonomy, in order to really become an "advantage lever" in this strong competitive environment. Therefore the undertaken research hopes to solve some of the organizational manager's problems providing a useful "calitative tools" – through the developed EMS theoretical framework presented in this chapter.

The undertaken research is original and unique and had as main objective the development of a theoretical framework based on fractal philosophy principles that could provide improvement of Environmental management system implementation and operation quality through transformation and adaptation of this kind of architecture system.

To underline the importance of this developed flexible theoretical framework for improving EMS implementation and operation quality, it will be highlight and synthetic present the difference between the essential characteristics of the new theoretical framework developed for EMS and general characteristics of hierarchical management systems (Table 69 / Table 70), as it follows:

Table 69 : Hierarchically management system characteristics

Source: Herghiligiu *et al.*, 2012a (developed after Ryu and Jung, 2003a/b)

Structured at a specific point in time Active higher units and passive lower units	**Hierarchy** **Relationship between units**
According to specified objectives Similar units at the same management levels have similar internal management	**Job processing** **Unit function**
Suitable for a stable environment Not flexible	**Adaptability** **Flexibility**

Table 70 : General characteristics of the developed EMS theoretical framework

Source: Herghiligiu *et al.*, 2012a (developed after Ryu and Jung, 2003a/b)

Dynamic structuring Active lower fractal and coordinative higher units (fractal units/ entity)	**Hierarchy** **Relationship between units**
According through environmental goal-formation process Every units (fractal units/ entity) have the same functional modules	**Job processing** **Unit function**
Suitable for a turbulent environment Flexible	**Adaptability** **Flexibility**

Therefore, as can be seen from this above tables (Table 69/ 70) the developed EMS theoretical framework characteristics are diametrically different in comparison with hierarchically management system characteristics that in certain proportions characterized the current overview of the implemented EMS at the level of the organizations from the N-E area of Romania.

In another train of thoughts, among the concrete implications of EMS architecture transformation and adaptation, from the theoretical framework developed, it could be synthetic mentione the following:

- transformation of environmental policy into a governance code of the entire system and hence of each fractal entities;
- general objectives have only an advisory role and set the direction on environmental policy explicit: minimizing or no negative environmental impacts existence/ creating an optimal working environment for employees and so on;
- objectives (specific) from each fractal entity level has to have a key role in the new system ("decentralization of environmental objectives");
- creating the possibility to modify the government code system, depending on the external dynamic change of the organization environment;
- creating the premise (possibility in terms of system functionality) that BFE's could negotiate between them the environmental objectives;
- constant auditing of all specific BFE objectives coherency and unity (towards direction of the governance code).

Regarding the proposed conceptual framework for environmental decision making, built on the fractal philosophy principles, it is necessary to underline that it offers some tangible benefits, that represent a leverage with managerial value for environmental decision making entitys/ agents at the organization level.

Concluding it is necessary to mention that the proposed theoretical framework wich presents the adaptation and transformation of the EMS implementation and operation on the basis of fractal philosophy principles, subscribe to the purpose of the doctoral theses, wich is to elaborate various quantitative and qualitative methodologies, methods and work tools to improve implementation, integration and functioning process that define the Environmental management system at the organisational level.

2. Contributions

The elaboration of this chapter, that had as main objective the original development of a theoretical framework for EMS architecture through transformation and adaptation, **theoretical framework that could be a qualitative tool of great value for an organizational manager**, bring the following main contributions:

- Identification of the best research methods and techniques to achieve the objectives of proposed research;
- Application of developed research methodologies in the undertaken research field;
- Identification and presentation of the most important environmental responsabilities for a manager which is involved in various environmental activities;
- Development of a conceptual framework and a coherent research methodology, that allow to evaluate the possibility to improve the EMS implementation and operation quality by transforming and adapting its architecture based on fractal philosophy principles;
- Development of a theoretical and synthetical framework model based on fractal philosophy principles that could allow the improvement of Environmental management system implementation and operation quality.
- Matrix development wich summarizes the environmental informational necessary – as active tools in the proposed conceptual framework that could allow the improvement of Environmental management system implementation and operation quality (and also for any organizational manager which is involved in various environmental activities).

Chapter 5 : Pilot testing regarding the aplicability of the conceptual framework developed according to the fractal philosophy principles at the level of the Quality-Environment-Laboratories Department at S.C. ApaVital S.A. Iaşi, Romania

Environmental management system (EMS) is a set of iterated individual and autonomous entities/ units that develop relationships and fairly distribute environmental knowledge and resources in order to fulfil efficiently the purpose for which it has been designed and implemented (original proposed definition mention in previous chapter – doctoral thesis).

Starting from this definition it must be added that each iterated individual and autonomous entities/ units develop and conduct different specific activities directly related to the Basic Fractal Entity (BFE) of the EMS, that in our case of pilot testing the aplicability of the conceptual framework developed according to the fractal philosophy principles, is the Quality-Environment-Laboratories Department at S.C. ApaVital S.A. Iaşi, Romania.

This scientific approach has mainly relied on two types of data/ informations/ knowledge (Figure 59):

A. secondary data / information/ knowledge sources:

1. the theoretical framework based on the principles of fractal psilosophy that allows transforming and adapting the EMS architecture in order to improve the system implementation and operation (developed in previous chapter – doctoral thesis);

2. internal documents S.C.Apavital S.A. Iaşi, Romania: such as regulation of organization and operation, organization internal regulation, integrated management manual, system/ work procedures, the training program for 2013, organizational chart, and so on;

B. main data/ information/ kniowledge sources:

1. survey at the level of the Quality-Environment-Laboratories Department within the company S.C. Apavital S.A. Iaşi, Romania, based on free unstructured interview method.

Also it is necessary also to mention that the main objective of this chapter is to develop a theoretical and functional framework based on the principles of the fractal paradigm for the specific activities of the EMS at the level of the Quality - Environment - Laboratories Department within the company S.C. Apavital S.A. Iaşi.

5.1. Methodology used in the pilot testing the aplicability of the fractal paradigm at the level of the QUALITY - ENVIRONMENT - LABORATORIES DEPARTMENT within the company S.C. APAVITAL S.A. Iaşi, Romania

The methodology used in the pilot application of the fractal paradigm at the level of the Quality-Environment-Laboratories Department within the company S.C. APAVITAL S.A. Iaşi, Romania, can synthetically be observed in the following figure (Figure 59):

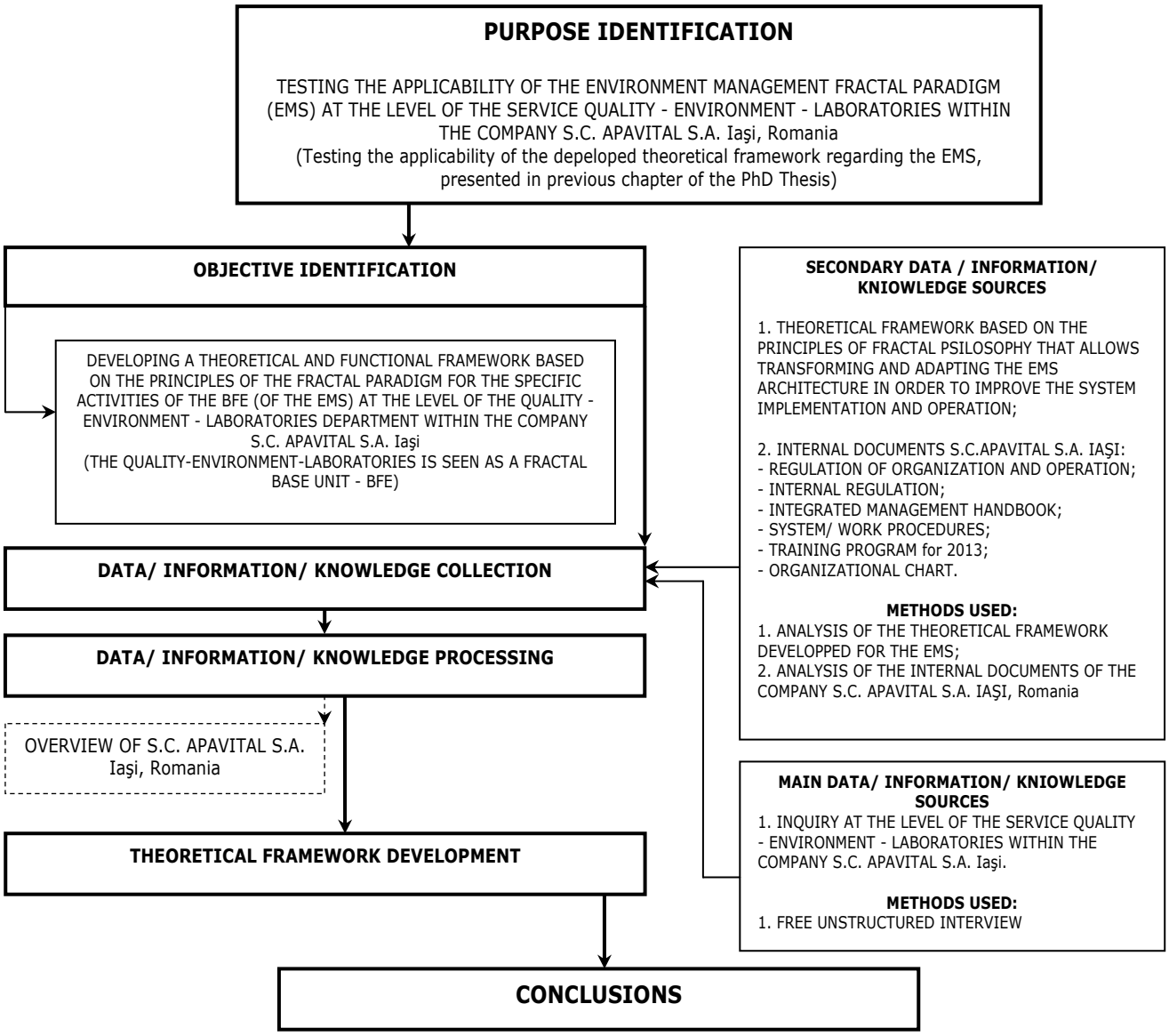


Figure 59 : Methodology used in the pilot application of the fractal paradigm at the level of the QUALITY-ENVIRONMENT-LABORATORIES DEPARTMENT within the company S.C. APAVITAL S.A. Iaşi, Romania

5.2. Overview S.C. APAVITAL S.A. Iaşi, Romania

5.2.1. Short History of the Company S.C. APAVITAL S.A. Iaşi

The company "APAVITAL" - S.A. was set up as a joint stock company based on the Decision of the Local County of Iaşi No. 89/ 21.03.2008, by taking over the entire RAJAC Iaşi patrimony, and it has functioned based on Law 31/ 1990 regarding joint-stock companies as subsequently amended and supplemented and the company's articles of incorporation. At the same time, S.C. "APAVITAL"– S.A is characterised as a regional[63] water supply and sewerage operator, head-quartered in the city of Iaşi, 6 Costăchescu Street, incorporated as a *Romanian legal entity*, registered with the Trade Register Office under no. J.22-1-1991, CIF RO1959768; the company holds a bank account and it has a management and financial autonomy (ROF, 2013)

The company "APAVITAL"– S.A runs its activity in various buildings, structures or emplacements within the surroundings of the city of Iaşi, and the towns Targu Frumos and Hârlau and in the facilities located in the city of Iaşi and its surroundings registered with the Trade Register Office, and it is a well-established entity within its activity field, as it also attested by the history of the water supply and sewerage public services in the county of Iaşi (Table 71/ ROF, 2013).

Table 71 : Documents attesting the history of the water supply and sewerage public services in the county of Iaşi

Source: ROF, 2013 – article no.14.

REFERENCE YEAR	**IMPORTANT ASPECT NOTICED**
1395	The first documented mention of the city of Iaşi on a stone encryption, situated within the precincts of the Armenian church Saint Mary.
1408	The first documented mention of the city of Iaşi in a document issued at the Court of Alexandru cel Bun [Alexander the Good-Hearted]. At the time, the water supply was carried out from natural springs or grooves, vessels or fountains.
1654	In Iaşi there were underground water drainage infrastructures, as well as a bathhouse, the first of this kind in the country.
1774-1777	Prince Grigore Alexandru Ghica built a series of public fountains and increased the flow rate of the old springs.
1853	The Ministry of Home Affairs is established, followed by the establishment of the Ministry of Public Works.
1865-1872	The Waters Service is taken over from the Ministry of public Works, under the supervision of the City Hall. At the same time, the first attempts to supply the city from more distant sources are made.
1878-1884	Together with the expansion of the first water supply works the first sewerage works are also undergone.
1898-1911	Engineer W. H. Lindley carries out hydro-geological studies and suggests supplying the city of Iaşi from sources near the village Timişeşti, at the confluence of the rivers Nemţişor and Moldova, originating from the Ozana river. Water collection consists in a drain pipe approximately 14 meters deep, where water is piped through a cast-iron pipe, the second of its kind in Europe at that time,

[63] Operator which ensures water supply services and sewerage services at least on two administrative units level

	both in terms of flow-rate and length, ensuring an average of 10.000-30.000 m3 water/day. This work constitutes the first step towards the modernization of the water supply system in the municipality of Iaşi.
1943	The Drinking Water Communal Society of Iaşi is set up.
1942	The Drinking Water Communal Society of Iaşi turns into the Communal Public Administration.
1948	The Electricity, Tramways, Water-Sewerage and Sanitation Company of Iaşi [Intreprinderea de Electricitate, Tramvaie, Apă-Canal, Salubritate - IETACS] is set up.
1955-1957	As a consequence of the insufficient flow rate provided by the source Timişeşti, the surface source Prut is designed and operated to supply the city of Iaşi.
1973	The Services of the Communal Company Water - Sewerage - Baths [Întreprinderea Comunală Apă Canal Băi] of Iaşi are taken over by the GIGCL, the Group of Communal and Local Household Companies.
1991	The Autonomous Public Entity for Water and Sewerage Iaşi (RAJAC) is established based on Decision no. 92/1991 of the Prefecture of Iaşi, an autonomous entity with integrated state-owned capital, subordinated to the County Council of Iaşi;
2008	S. C. APAVITAL – S.A. Iaşi is established based on Decision no. 89/21.03.2008 regarding the restructuring of RAJAC Iaşi.

5.2.2. Mission and objectives S.C. APAVITAL S.A. Iaşi, Romania

The Mission of S.C. APAVITAL - S.A. Iaşi consists in the continuous provision of water supply, sewerage and treatment services to all consumers in the municipality of Iaşi, the towns of: Târgu Frumos, Hârlău, Podu Iloaiei, and a number of 48 communes, rigorously respecting the quality and efficiency standards (ROF, 2013: article 15).

The most important strategic objectives pursued by S.C. APAVITAL - S.A. are the following (Table 72):

Table 72 : Strategic objectives pursued by S.C. APAVITAL - S.A - Romania
Source: ROF, 2013 – article no.16./ www.apavital.ro

No.crt.	Strategic Objectives
1.	Ongoing maintenance and careful monitoring of the drinking water supply system, the waste water collection system and the water treatment system, with rapid intervention teams that are always prepared.
2.	Supplying potable water to the parameters imposed by the regulations in force.
3.	Collecting waste water through the sewerage system, treating the water and the mud by complying to the national and European quality standards.
4.	Permanent monitoring of the operation costs and cost reduction by means of applied innovation. Obtaining an optimal profit margin that allows for both the ongoing development of the Company and repayment of the loans and staff boosting.
5.	Extension in the region Moldova of the services provided by the company.
6.	Developing human resources through ongoing training and careful assessment of the employees.
7.	Development and implementation of social responsibility policies.
8.	Ensuring security and health among the ApaVital staff members.
9.	Applying sustainable management policies for monitoring resources and assessing environmental risks.

5.2.3. Scope of activity - S.C. APAVITAL S.A. Iaşi

The scope of activity of the company S.C. APAVITAL - S.A. Iaşi consists in providing sewerage public services of water supply. The company's main activity is defined by the CAEN (NACE) code 3600 - *The collection, purification and distribution of water and any industrial, commercial, financial, security or property activity that is directly or indirectly related with the main activity or which may facilitate its realization, as well as participation in entities having the same scope of activity* (ROF, 2013: Articles 17/19). Besides the main scope of activity, the Articles of Incorporation of the Company also provide for a series of secondary activities that are constantly updated, depending on the specificity of the activity and the applicable legislation, such as those provided in Table 73 (ROF, 2013; Article 20 and Annex 1).

Table 73 : List of secondary activities underwent within S.C. APAVITAL - S.A. Iaşi, Romania (Source: ROF, 2013: Annex no.1)

No.crt.	Indicative	Secondary activities S.C. APAVITAL - S.A. Iaşi
1.	1812	Other printing activities.
2.	1813	Pre-printing training services.
3.	3319	Fixing other equipment.
4.	3320	Industrial machines and equipment installation.
5.	3512	Electric energy transportation.
6.	3514	Electric energy marketing.
7.	3700	Waste water collection and treatment.
8.	3811	Collecting non-threatening waste.
9.	3812	Treating and disposing non-threatening waste.
10.	4221	Construction works involved in fluid utilitarian projects.
11.	4291	Hydro-technical constructions.
12.	4299	Construction works of other engineering works.
13.	4311	Building demolition works.
14.	4312	Land preparation works.
15.	4321	Electrical fittings works.
16.	4322	Plumbing, heating and air conditioning works.
17.	4329	Other construction installation works.
18.	4333	Floor and walls covering works.
19.	4334	Painting, whitewashing and window fitting works.
20.	4339	Other finishing works.
21.	4391	Covering, framework and terrace building works.
22.	4399	Other special construction works.
23.	4520	Vehicle maintenance and repairing.
24.	4649	Wholesale of other household goods.
25.	4711	Retail sale in non-specialized stores with predominant sale of food, beverages and tobacco.
26.	4799	Retail sale outside stores, counters, stands and markets.
27.	4941	Freight transport by road.
28.	4950	Transport via pipelines.
29.	5210	Warehousing and storage.
30.	5629	Other food services.
31.	6820	Renting and subletting owned or leased real estate.
32.	6832	Managing real estate on a fee or contract base.
33.	7022	Business and management consultancy activities.
34.	7111	Architecture works.
35.	7112	Engineering activities and related technical consultancy activities.

36.	7120	Testing and technical analysis activities.
37.	7219	Research-development in other national sciences and engineering.
38.	7729	Renting and leasing of other personal and household goods.
39.	8110	Combined support service activities.
40.	8299	Other support services activities for undertakings.
41.	8559	Other education forms.

5.2.4. Management of the Company APAVITAL S.A. Iaşi

The company management is structured as follows (ROF, 2013; Articles 21/ 22/ 23/ 24):

A. The Shareholders General Assembly (SGA): this is the participative leading body of the company and it can be Ordinary or Extraordinary;

B. The Board of Directors (BD): has unlimited power regarding the company management and administration, complying to the limits set by the scope of activity and the duties as provided by law as regards the Shareholders General Assembly.

The BD is composed of three to seven non-executive administrators, appointed and / or removed exclusively by a decision of the Shareholders General Assembly; the non-executive administrators are appointed for a mandate of 4 years.

The Chairman of the Board of Administration is elected among the administrators by the Shareholders General Assembly for a mandate that does not exceed his/her Administrator mandate.

C. Director General (DG): is responsible with managing the Company's activity, mainly acting to this purpose.

5.2.5. Organizational Chart of Company S.C. APAVITAL S.A. Iaşi - Subordination of the functional and production departments.

The Company APAVITAL – S.A. Iaşi is structured on three directions (global departments) and two exploitations, each having under their subordination a varied number of functional and production departments, sectors and production teams - Table 74 (ROF, 2013; chapter 9).

The three directions are:

- The General Directorate;
- The Economical Department;
- The Technical Department.

The two exploitations are:

- The Exploitation - Iaşi Metropolitan Area;
- The Exploitation - Iaşi County Area;

Table 74 : Structure of APAVITAL S.A. Iaşi

Source: ROF, 2013; Organizational Chart S.C.ApaVital S.A – Annex no.16; www.apavital.ro

	DEPARTMENTS			EXPLOITATIONS	
	THE DIRECTORATE GENERAL	**THE ECONOMICAL DEPARTMENT**	**THE TECHNICAL DEPARTMENT**	**THE EXPLOITATION IAŞI**	**THE EXPLOITATION IAŞI COUNTY AREA**

No.crt.				METROPOLITAN AREA	
1.	Expert Team	Financial Department - Economic Analyses	Technical Department: *Production Office; *Topography Office - Approvals.	Water Collection - Treatment Department: *Timişeşti Operational Sector; *Adducts Exploitation - Maintenance Sector; *Iaşi – Prut Operational Sector.	Communal Centers Department: *Vlădeni Sector; *Răducăneni Sector; *Ţibăneşti Sector; *Communal Microsector Installations Sector.
2.	Legal Department - Shareholders	Billing Customer Service: *Iaşi Commercial Department; *Târgu – Frumos Commercial Department; *Communal Centres Commercial Department; *Counters Repair and Replacement Department.	A.T.A. Department.	Distribution Department: *South Distribution Operational Sector; *North Distribution Operational Sector;	*Târgu – Frumos Department; *Belceşti Sector; *Podul Iloaei Sector; *Târgu Frumos Sector and Micro-sectors; *Water Exploitation and Water Treatment Sector.
3.	Human Resources Department: *Occupational Health and Safety Department (OHS).	Accounting Department.	L.T.E. Department.	Sewerage Networks Department: *South Sewerage Operational Sector; *North Sewerage Operational Sector;	
4.	Public Relations Department	Acquisitions Department: *Cafeteria – Buffet	Electromechanical Department	Water Treatment Department: *Water Treatment Exploitation Sector *Energetic and Water Treatment Sector	
5.	Dispatch Office	Administrative Office	Design Workshop		
6.	Operational Control Office	CFG Office	Investment Department: *Investment Follow-up Office; *Cohesion Funds Office.		
7.	**Quality - Environment - Laboratory Department:** *Drinking Water Analysis Laboratory; *Waste Water Analysis Laboratory;		Computerization Department: *Hardware Infrastructure Department.		

*Metrological Laboratory.

8. Internal Audit Department

5.2.6. QUALITY–ENVIRONMENT–LABORATORIES Service S.C. APAVITAL S.A. Iaşi

The Quality-Environment-Laboratories Department is directly subordinated to the GENERAL DIRECTORATE, more precisely subordinated to the general director, and it is in its turn in charge of three laboratories: 1. Waste Water Analysis Laboratory, 2. Drinking Water Analysis Laboratory, and 3. Meteorological Checks Laboratory - as it can also be noticed from the Figure below.

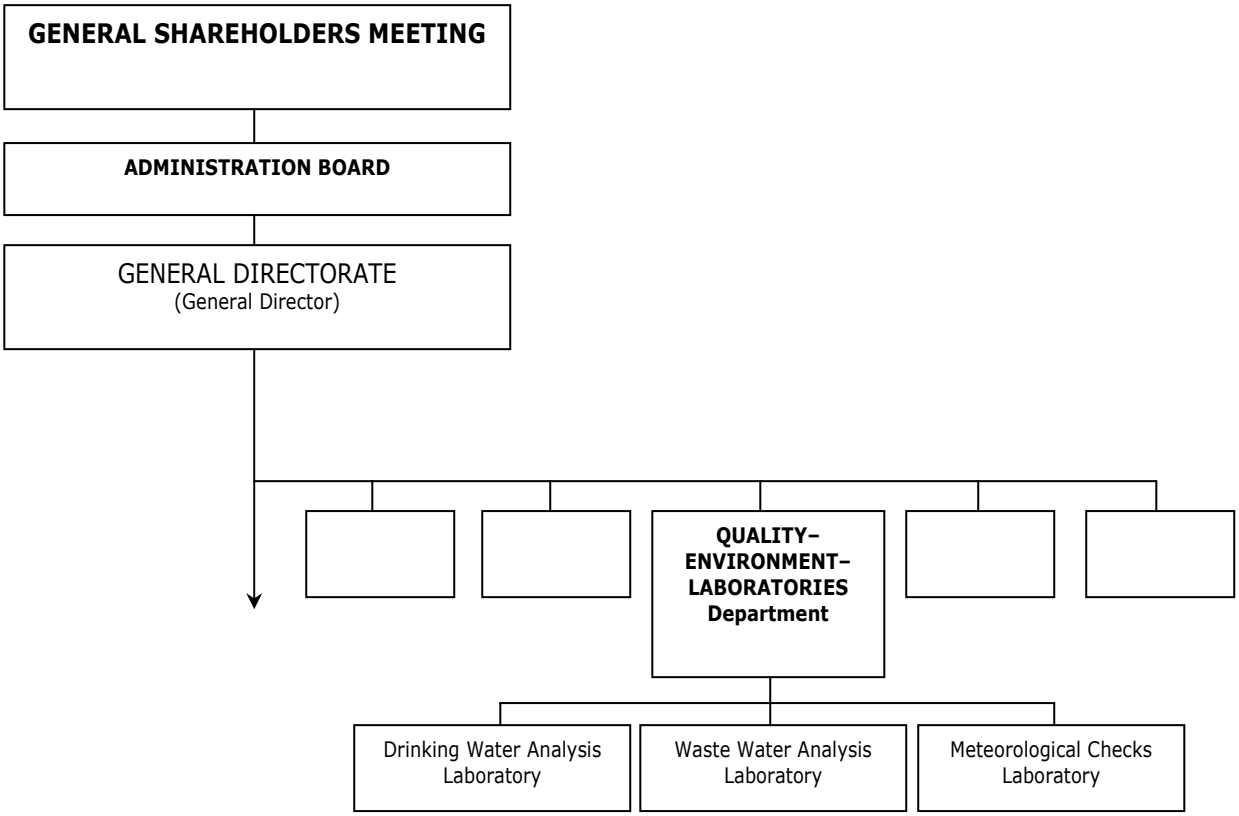


Figure 60 : Extract from the Organizational Chart of S.C. APAVITAL S.A. - QUALITY–ENVIRONMENT–LABORATORIES Department
Source: Organizational Chart S.C. APAVITAL S.A./ www.apavital.ro (Annex no.16)

The Quality-Environment-Laboratories Department undergoes in particular the following **specific activities** as it is further presented in Table 75 (ROF, 2013; chapter 9.17):

Table 75 : Specific activities of the Quality - Environment - Laboratories Department
Source: ROF, 2013

No.crt.	SPECIFIC ACTIVITIES
1.	Ensure the implementation and compliance of the Integrated Management System (Quality - Environment - Occupational Safety - Computerized Safety) by observing the reference standards and quality policies of the company.
2.	Establish and develop the Quality Management System, the responsibility and authority levels, as well as and interface relations in the field of quality.
3.	Constantly update the documentation required to maintain and continuously improve the Integrated Management System implemented in compliance with national and international standards in force.
4.	Develop and maintain relationships with certification companies and companies specialised in auditors and experts training in the field of quality management, environmental management, information security management and the management of occupational safety).
5.	Ensure communication between different levels and functions within the company regarding the application and compliance with the provisions of the Integrated Management System implemented at company level.
6.	Develop and update the Quality and Environment Handbooks.
7.	Develop work procedures and operational flows compulsory for the Integrated Management System.
8.	Develop and monitor the organization's processes chart and its distribution in all departments.
9.	Develop and update policies in the fields of quality, environment, information security and occupational health and safety.
10.	Designate the staff in charge with quality issues at organization level.
11.	Designate internal auditors in accordance with the ISO standards requirements.
12.	Periodic update and review of documentation confirming the society's concerns in the fields of quality management, environmental management, information security and occupational safety.
13.	Develop the annual quality assurance and control program and submitting it for analysis and approval upon the Director General.
14.	Drafting and negotiating with environmental authorities, water management and public health authorities regarding the compliance programs required to frame the objectives and activities of the company within the legal provisions.
15.	Analysis of incidents related to the quality of the activities carried out or the environmental incidents in order to draw corrective actions designed to prevent the occurrence of such incidents in the future, by means of evaluating the actions, taking into account the normal and abnormal operating conditions as well as the possible emergency situations encountered in the event of environmental accidents.
16.	Establish a corrective and preventive action plan in the field of quality, environment, information and occupational safety.
17.	Analysis of the changed circumstances in which the unit is required to operate in conjunction with environmental conditions imposed on the unit by the legal authorities in the area.
18.	Draw up, coordinating and updating the documentation required to obtain environmental/ water management agreements and permits for all the organization's objectives.
19.	Identify sources of pollution arising from the activities of the organization that may have immediate or prospective impacts on environmental quality.
20.	Identify sources causing qualitative malfunctions within the activities and processes undertaken at organization level, directly affecting their quality.
21.	Identify sources causing information and occupational insecurity within the organization.
22.	Development of measures to respond to any situation that may affect the performance and functionality of the organization, originating in the field of quality management, environmental management, information and occupational security.
23.	Maintain and update the database of businesses that are potential polluters, as well as the operators which exceeded the value of quality indicators of the waste water discharged into the public sewerage system (name of the company, address, indicators exceeded, the penalty imposed, notifications, , and so on).
24.	Develop periodic reports that the organization has an obligation to deliver to the stakeholders in terms of environmental protection (Environmental Protection Agency, Environmental Squad, National Administration "Romanian Waters", international bodies financing environmental investment projects, , and so on).
25.	Organise continuous informing for employees regarding environmental legal obligations.
26.	Pursue tax payments to the Environment Fund.
27.	Working with functional and operational departments within the company with a view to drawing up

procedures and work instructions.

28. Working with the Operations Control Department to monitor the implementation and enforcement of the provisions and requirements of the Integrated Management System working across the organization.

29. Establishing distribution lists of the documents within the Integrated Management System working across the organization.

30. Develop annual audit plans corresponding to the Integrated Management System and submitting it for approval to the Director General.

31. Perform system and process audits, and draw up non-compliance and audit reports, together with the internal auditors appointed.

32. Follow the observance of the corrective actions deadlines provided in the non-compliance reports.

33. Establish the annual training plan for the staff in the field of Integrated Management System.

34. Provide internal consultancy on matters pertaining to the Integrated Management System.

35. Develop the annual evaluation report of the quality assurance program.

36. Coordinate the impact studies assessment, the environmental audit, and specific work procedures and so on in agreement with the regulations in force.

37. Participate in drawing up the documentation corresponding to the operation of production units.

38. Participate, along with other hierarchical units and the Contracting Authority, in developing and implementing a Management Plan in the field of management and exploitation of potential natural resources for the production of drinking water.

39. Establish, together with the competent authorities, the protection perimeters of the water system facilities to be used for drinking water and sewerage.

40. Coordinate activities specific to the Drinking Water Analysis Laboratory, the Waste Water Analysis Laboratory and the Metrological Checks laboratory.

41. Collaboration with similar (domestic and foreign) units and the participation, with the management's approval, in various trainings, seminars and the development of joint programs in the field.

42. Participation in quality audits performed on companies operating in the areas administered by S.C. Apavital - SA, in order to comply with the quality requirements for drinking water and waste water.

43. Checking, ascertaining and applying sanctions in its capacity of body authorized by the President of Iaşi County Council in agreement with the Government Decision no. 472/2000, GEO 73/2005 and with Article 38-39 of Law no. 241/2006.

44. Working, alongside other hierarchical units, with ARSACIS to study new rules and standards in order to agree upon the financial and technical consequences on services provision, prior to their implementation.

45. Ensure compliance with the applicable laws on the protection of sites and the environment, by taking the necessary measures with a view to restore and rehabilitate sites and land where the works and the equipment used have an impact on the environment.

46. The assessment of the degree of achievement of the annual targets set in the field of quality and environmental protection.

47. Obtain the operation license and other permits required for functioning.

48. Periodical reporting to ANRSC.

49. Fulfilment of specific performance indicators set by the senior management in accordance with the Performance Assessment Handbook applicable to the Company, namely:

1. Coverage of the performance assessment system;
2. Average compliance index against the quality management system;
3. The annual training rate of the staff in charge with quality;
4. Settlement rate of non-compliances;
5. Average improvement index of the Integrated Management System;
6. The average level of standardization of the processes;
7. Index of compliance with the drinking water quality;
8. Index of compliance with the quality of treated waste water;
9. Complaints on water quality;
10. Average response time to complaints on water quality;
11. Effectiveness of the metrological checks activity;
12. Effectiveness of regulations related activities.

5.3. Development of the theoretical - functional real framework based on the principles of the fractal paradigm for the EMS management at the level of the Department Quality - Environment - Laboratories within the S.C. APAVITAL S.A. Iaşi

Given the general architecture proposed for the Fractal Base Unit[64] - Figure 54/ 61 it is necessary to point out that the loop (1) of the above mentioned figure implies the existence of a sub-process of environment data/ information collection that is essential to perform the functions of the unit "MONITOR" ("M"). Thus, taking into account the data, information and knowledge gathered from direct or indirect sources at the level of S.C. APAVITAL S.A. (as also presented in the methodology used in this research action - Figure 59) we suggest the following list of environment data/ information necessary to the fractal submitted for analysis - DEPARTMENT QUALITY-ENVIRONMENT-LABORATORIES, as results from Table 76.

[64] The Department Quality-Environment-Laboratories seen as a **Fractal Base Unit** - EBF

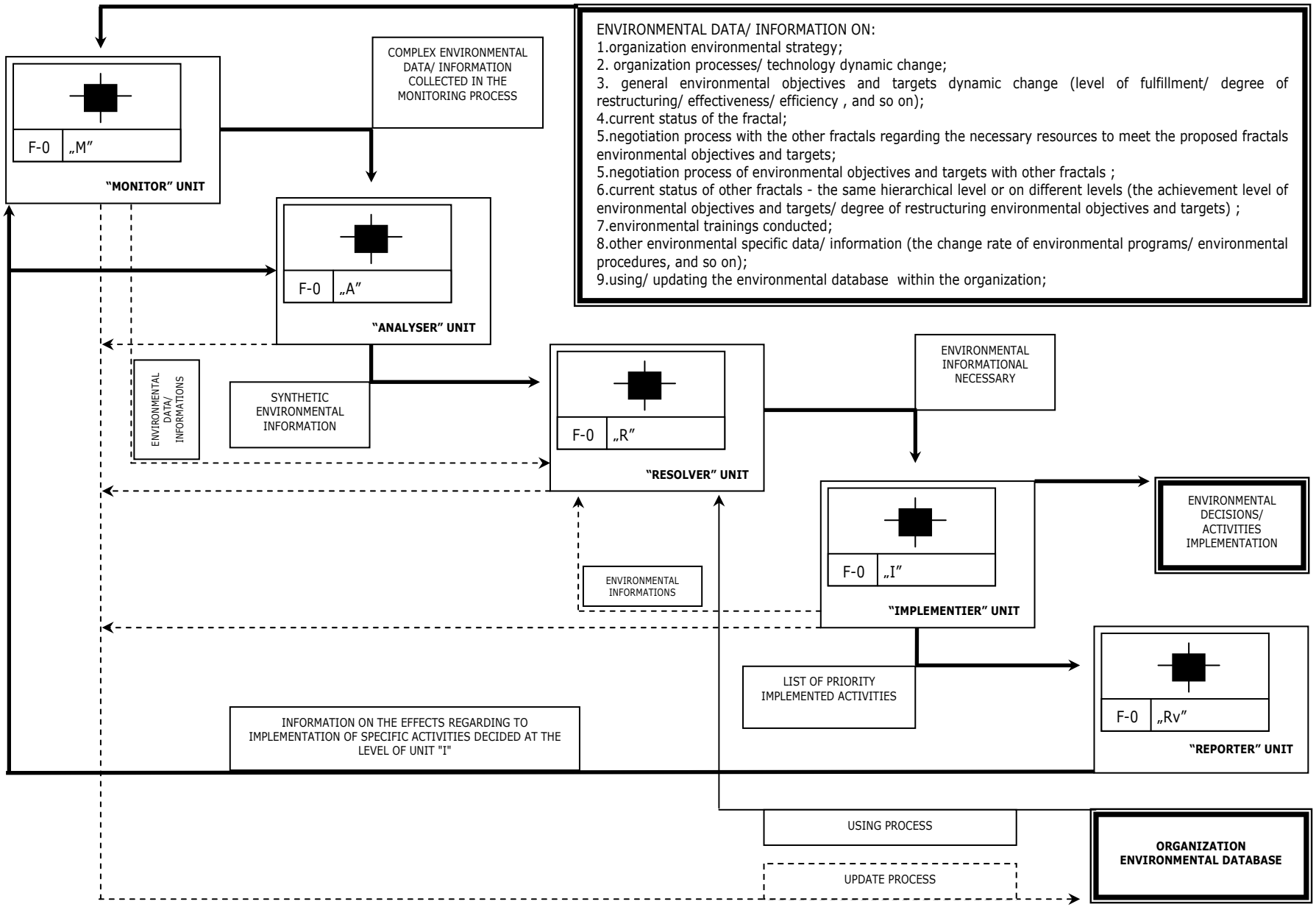


Figure 61 : Global architecture developed for the BFE mechanism

Table 76 : Sub-process of data/ information collection coordinated by Unit "M": Quality-Environment–Laboratories Department

Source: original elaboration

No. crt.	ENVIRONMENT DATA/ INFORMATION
1.	Strategy of the organization S.C. APAVITAL S.A. Iaşi concerning: the Environment;
2.	Processes/ technologies ("clean" technologies) used at the level of S.C. APAVITAL S.A. Iaşi;
3.	General environmental objectives and targets of the organization (level of accomplishment/ degree of restructuring/ effectiveness/ efficiency , and so on).
4.	Documentation necessary to maintain and continuously improve the EMS, in accordance with the national and international standards in force;
5.	Relations developed with accreditation companies and corporations aimed at the training of auditors and specialists in the field of environmental management;
6.	Different aspects considered as relevant to the process of communication between the DEPARTMENT QUALITY - ENVIRONMENT - LABORATORIES (seen as the **Fractal Base Unit** - BFE) and other fractals of the EMS at the level of the S.C. APAVITAL S.A. Iaşi given hierarchical levels and functions within the company - regarding the implementation and enforcement of the EMS provisions;
7.	Environmental Handbook for the S.C. APAVITAL S.A. Iaşi;
8.	Work procedures and operational flows required for EMS ;
9.	Environmental policy at the level of the S.C. APAVITAL S.A. Iaşi;
10.	Different aspects considered relevant to the appointment of internal auditors on environmental issues, according to the ISO standards requirements;
11.	Various documents used at EMS level within the S.C. APAVITAL S.A. Iaşi certifying environmental management concerns;
12.	Various reports showing the analysis of incidents related to the quality of the (environment) activities conducted or the environmental incidents, in order to draw corrective actions designed to prevent the occurrence of such incidents in the future (activities or incidents performed/ occurred at the level of the DEPARTMENT QUALITY ENVIRONMENT - LABORRATORIES, as well as at the level of the other fractals);
13.	Different aspects considered relevant to the process of allocating fractal objectives and activities within the legal provisions (e.g. negotiating with environmental authorities, water management and public health);
14.	The organization's current plan that includes preventive and corrective measures regarding the environment;
15.	Existing documentation at organization level regarding environmental agreements and authorizations for all the organization's objectives;
16.	Documents presenting the sources of pollution arising from the activities carried out by the organization, which may have an immediate or prospective impact on the quality of the environment;
17.	Measures developed within the organization to any potential situation that may affect the performance and functionality of the organization; arising from the field of environmental management;
18.	Businesses that are potential polluters, as well as businesses which exceeded the value of quality indicators of the waste waters discharged into the public sewerage system (from the organization existing database, , and so on);
19.	Periodic reports that the organization is compelled to deliver to the stakeholders as regards environmental protection (Environmental Protection Agency, Environmental Squad, National Administration "Romanian Waters", international bodies financing environmental investment projects, , and so on);
20.	Different aspects considered relevant to the ongoing process of informing the employees on the legal obligations regarding environmental protection;
21.	Observe the deadlines set up for the corrective actions provided in the non-compliance reports;
22.	Annual plan for training the staff working in the field of environment;
23.	Audit plan established at organization level (system audit/ process audit);
24.	Methods and techniques used in impact studies, environmental audits, specific work procedures, and so on, in agreement with the legislation in force;
25.	Different aspects considered relevant to the participation in drawing up the documentation authorizing the operation of units within the organization (e.g. production units, , and so on);
26.	Participation, along with other hierarchical units and the contracting authority, in developing and implementing a Management Plan in the field of management and exploitation of natural resources for the production of drinking water;

27. Different aspects considered relevant to setting, together with the competent authorities, of protection perimeters for the water systems, to be later used for drinking water and sewerage;
28. Specific activities at the level of the (1) Drinking Water Analysis Laboratory , the (2) Laboratory Water Waste Analysis and (3) The Metrological Checks Laboratory ("children" fractals of the QUALITY - ENVIRONMENT - LABORATORIES DEPARTMENT);
29. Different aspects considered relevant to the process of collaboration with similar institutions (domestic and foreign) and participation, with the company management's approval, in various trainings, seminars or in the development of joint programs in the field;
30. Obtain the operation license and the other permits required for functioning;
31. Aspects related to the periodical reporting to the ANRSC;
32. Specific performance indicators established by the senior management in accordance with the Performance Assessment Handbook applicable within the Company (the coverage of the performance evaluation system/ the conformity environment index against the environmental management system/ the annual rate of environmental training/ the settlement rate of non-compliances/ the average level of standardization of the processes/ the index of compliance with drinking water quality/ the rate of compliance with the quality of the treated waste water/ the complaints regarding water quality/ the average response time to complaints regarding water quality/ the effectiveness of the metrological activity/ the effectiveness of activities related to regulations);
33. Different aspects considered relevant to the fractals negotiation of the resources necessary to meet the established environmental targets and objectives;
34. Different aspects considered relevant in the process of negotiating the fractals' objectives and targets;
35. Different aspects considered relevant to the other fractals (current status) - on the same hierarchical level or on different levels;
36. Other data / specific environmental information (current environmental programs/ environmental procedures used, , and so on);
37. Using / updating the environment database within the organization;

1. MONITOR MODULE/ UNIT – "M"

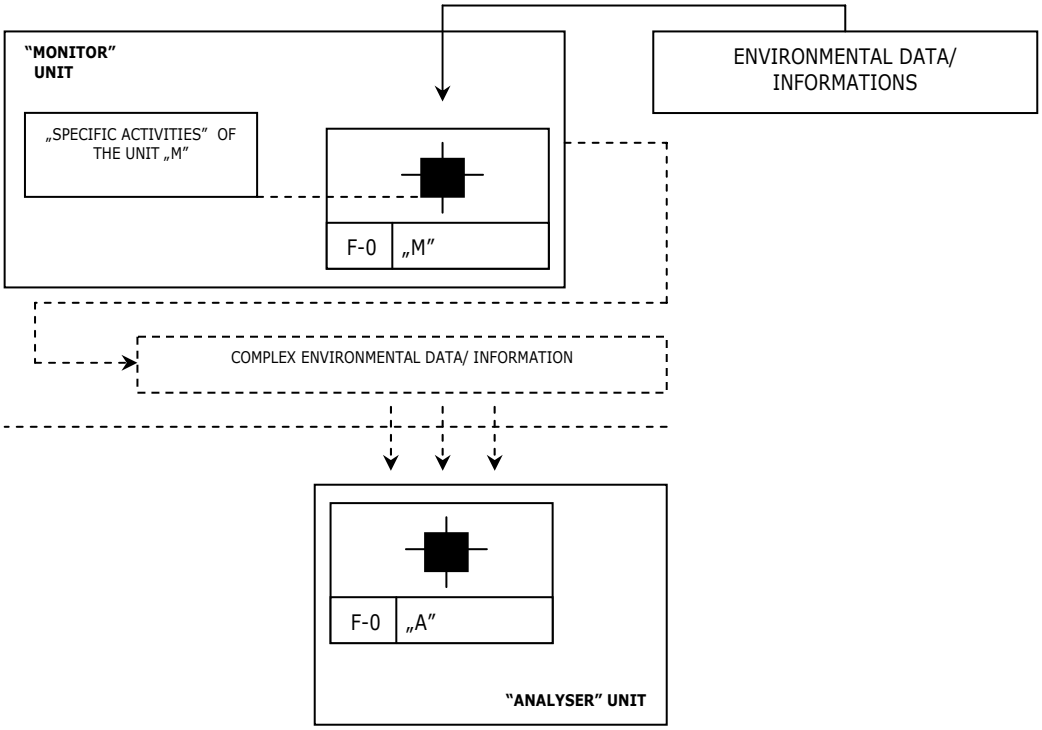


Figure 62 : Monitor unit ("M") architecture

The main function of this module consists primarily in monitoring their current state of the fractal - QUALITY-ENVIRONMENT-LABORATORIES DEPARTMENT, and then in collecting/ receiving specific information from the organizational environment and from the other fractals/ respectively sending to the Analyser Unit ("A"), or, where appropriate, to the other fractals, various complex environmental informative responses (Figure 62). Thus, the specific activities developed to achieve the goal to which this module/ unit ("M") was designed, are presented in Table 77.

Table 77 : "Specific activities" - Monitor Unit ("M") for Quality-Environment-Laboratories Department
Source: original elaboration

No. crt.	"**SPECIFIC ACTIVITIES"**
1.	It monitors the various changes occured at strategy level within the S.C. APAVITAL S.A. Iaşi concerning: the Environment;
2.	It monitors: (1) the dynamics of the changes occurring at the level of processes/ technologies ("clean" technologies used - where appropriate) - S.C. APAVITAL S.A. Iaşi/ (2) the dynamics of changes occurring at the level of the processes/ technologies used at fractal level - QUALITY-ENVIRONMENT-LABORATORIES DEPARTMENT;
3.	It monitors: (1) the dynamics of changing the general environmental objectives and targets of the organization/ (2) the dynamics of changing the environmental objectives and targets of the fractal QUALITY - ENVIRONMENT - LABORATORIES DEPARTMENT;
4.	It monitors: (1) the global updating level, sourced at the level of the entire organization, the documentation necessary to maintain and continuously improve the EMS, in agreement with national and international regulations in force/ (2) the updating level of the documentation necessary to maintain and improve the EMS from the fractal level - QUALITY - ENVIRONMENT - LABORATORIES DEPARTMENT;
5.	It monitors the development and maintenance of the relationships with accreditation companies as well as the companies having as activity object the training of auditors and specialists in environmental management;
6.	It monitors the communication between the DEPARTMENT QUALITY - ENVIRONMENT - LABORATORIES (seen as the **Fractal Base Unit** - FBU) and the other fractals of the EMS within the S.C. APAVITAL S.A. Iaşi given the hierarchical levels and functions within the company - regarding the implementation and enforcement of the EMS provisions;
7.	It monitors the development and update of the Environmental Handbook both globally, drawing its source at the level of the entire organization, and also particularly, at fractal level (degree of restructuring , and so on);
8.	It monitors the development of work procedures and operational flows required for EMS used by other fractals of the organization, but also by the fractal (degree of restructuring effectiveness/ efficiency - where applicable, , and so on);
9.	It monitors various aspects of the development and updating of the environmental policy (degree of restructuring, , and so on);
10.	It monitors the appointment of internal auditors on environmental issues, in agreement with the ISO requirements;
11.	It monitors various aspects considered relevant in the process of updating and periodically reviewing the documentation certifying environmental management concerns - both globally and in particular at fractal level;
12.	It monitors the drawing up of reports on the analysis of incidents involving the quality of the activities conducted (in terms of the environment), or environmental incidents in order to draw corrective actions designed to prevent the occurrence of such incidents in the future (activities or incidents are carried out/ occurred at the level of the DEPARTMENT QUALITY - ENVIRONMENT - LABORATORIES, but also at the level of the other fractals);
13.	It monitors the process of framing the fractal objectives and activities within the law (e.g. negotiations with environmental authorities, water management and public health authorities);
14.	It monitors the current plan of the organization that includes corrective and preventive measures on the environment;
15.	It monitors: (1) the existing documentation on the organization's environmental agreements and authorizations for all the objectives of the organization/ (2) existing documentation on the fractal agreements and environmental permits for its environmental objectives;

16. It monitors: (1) the documents presenting the sources of pollution arising from the activities of the organization, which can have an immediate or a long term impact on the quality of the environment/ (2) the documents presenting the sources of pollution arising from the activities of the fractal;

17. It monitors the measures developed both at the organization and at the fractal level, for any potential situation that may affect the performance and functionality of the organization, as a result of the environmental management;

18. It monitors the process of updating the list of businesses that may constitute sources of pollution, as well as the businesses which exceeded the value of the quality indicators for the waste water discharged into the public sewerage system (from the existing database at the level of the organization, , and so on);

19. It monitors the periodicity of the reports that the organization is required to deliver to the stakeholders on environmental protection grounds (Environmental Protection Agency, Environmental Squad, Romanian Waters National Administration, international bodies financing environmental investment projects , , and so on);

20. It monitors the ongoing briefing of the staff as regards their environmental protection legal responsibilities;

21. it monitors the deadlines set up for the corrective actions provided in the non-compliance reports;

22. Iit monitors the changes occurred at the level of the annual plan for training the staff working in the field of environment;

23. It monitors the changes occurred at the level of the audit plan established at organization level (system audit/ process audit);

24. It monitors the methods and techniques used in impact studies, environmental audits, specific work procedures, and so on, in agreement with the legislation in force;

25. It monitors participation in drawing up the documentation corresponding to the operation authorisation of the production units at organization level;

26. It monitors participation, along with other hierarchical units and the contracting authority, in developing and implementing a Management Plan in the field of management and exploitation of natural resources for the production of drinking water;

27. It monitors the establishment, together with the competent authorities, the protection perimeters of the water system facilities to be used for drinking water and sewerage.

28. It monitors the current state of the specific activities at the level of the Drinking Water Analysis Laboratory, the Water Waste Analysis Laboratory and the Metrological Checks Laboratory ("children" fractals of the QUALITY-ENVIRONMENT-LABORATORIES DEPARTMENT);

29. It monitors collaboration with similar (domestic and foreign) units and the participation, with the management's approval, in various trainings, seminars or in the development of joint programs in the field;

30. It monitors the process of obtaining the operation license and the other permits required for functioning;

31. It monitors the periodical reporting to the ANRSC;

32. It monitors specific performance indicators established and used by the senior management in accordance with the Performance Assessment Handbook applicable within the Company (the coverage of the performance evaluation system/ the conformity environment index against the environmental management system/ the annual rate of environmental training/ the settlement rate of non-compliances/ the average level of standardization of the processes/ the index of compliance with drinking water quality/ the rate of compliance with the quality of the treated waste water/ the complaints regarding water quality/ the average response time to complaints regarding water quality/ the effectiveness of the metrological activity/ the effectiveness of activities related to regulations);

33. It monitors negotiations with the other fractals regarding the resources necessary to meet the proposed environmental targets and objectives;

34. It monitors the negotiation of the environmental goals and targets with the other fractals;

35. It monitors the current status of the other fractals - the same hierarchical level or on different levels (level of achievement of the environmental goals and objectives/ degree of restructuring of environmental targets and objectives);

36. It monitors various other specific environmental data/ information that are considered to be relevant (dynamics of the environmental programs/ dynamics of the environmental procedures, , and so on);

37. It monitors the level of environment data/ information/ knowledge base use/ update within the organization;

2. ANALYSER MODULE/ UNIT - "A"

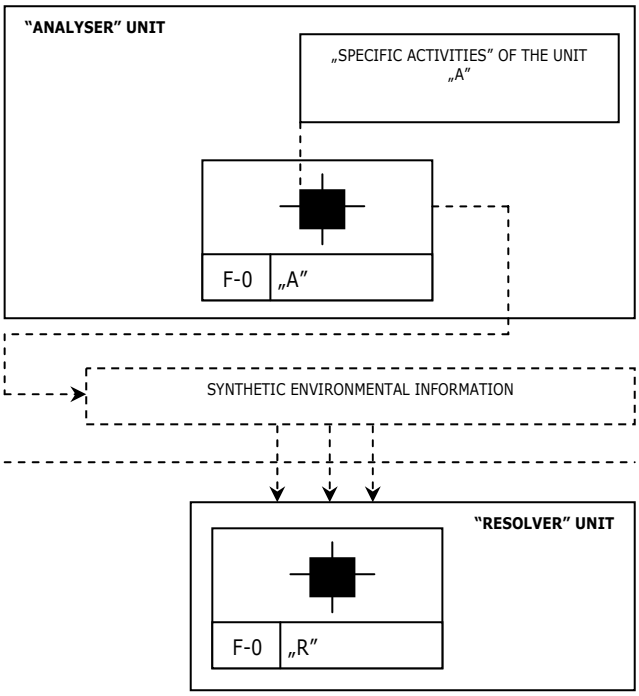


Figure 63 : Analyser unit ("A") architecture

The main function of this module consists in analysing the current status of the fractal - current analysis of the environmental activities carried out within the fractal. Specifically, at the level of the unit of analysis, environmental activities carried out in the fractal are developed and ranked - taking into account: (a) the environmental performance (ISO 14031), (b) the environmental objectives and goals proposed at fractal level, and (c) simulation performed to quantify the potential environmental effects of the environmental activities carried out (Figure 63). Thus, the specific activities developed to achieve the goal to which this module/ unit ("A") was designed, are presented in Table 78.

Table 78 : "Specific activities" - Analysis Unit ("A") - Quality-Environment-Laboratories Department
Source: original elaboration

No. crt.	"SPECIFIC ACTIVITIES"
1.	It analyses the correlation between the environmental objectives and goals of the fractal and the strategy of the organization S.C. APAVITAL S.A. Iaşi concerning: the Environment;
2.	It analyses the performance level of the processes/ technologies existing at the level of the fractal, considering the environmental protection;
3.	It analyses the level of compliance/ the degree of restructuring/ the effectiveness/ the efficiency, and so on, of the the environmental objectives and goals proposed at the fractal level, taking into account (a) the overall environmental objectives of the organization/ (b) the changes in the environmental strategy of the organization/ (c) the changes in the technology/ processes used within the organization, respectively within the fractal/ (d) the

environmental policy within the organization;

4. It analyses the performance of the updating process as regards the documentation necessary to maintain and continuously improve the EMS;
5. It analyses the effective and efficient development and maintenance of the relationships with accreditation companies as well as the companies having as activity scope the training of auditors and specialists in environmental management;
6. It analyses the effectiveness and efficiency of the communication between the DEPARTMENT QUALITY - ENVIRONMENT - LABORATORIES (seen as the **Fractal Base Unit** - FBU) and the other fractals of the EMS within the S.C. APAVITAL S.A. Iaşi given the hierarchical levels and functions within the company - regarding the implementation and enforcement of the EMS provisions;
7. It analyses the degree of restructuring/ the effectiveness/ the efficiency of the development and update of the Environmental Handbook given the "contribution" of the fractal to this process;
8. It analyses the degree of restructuring/ the effectiveness/ the efficiency , and so on of the work procedures and operational flows development required for EMS;
9. It analyses the degree of restructuring/ the effectiveness/ the efficiency , and so on of the environmental policy development and updating (the "contribution" of the fractal to this process);
10. It analyses the relationship between the state of affairs in the field and the internal audit reports developed - regarding environmental issues, in agreement with the ISO requirements;
11. It analyses the performance of the periodical update and review of the documentation certifying the environmental management concerns;
12. It analyses the usefulness of various reports showing the analysis of incidents related to the quality of the (environmental) activities conducted or the environmental incidents, in order to draw corrective actions designed to prevent the occurrence of such incidents in the future (activities or incidents performed/ occurred at the level of the DEPARTMENT QUALITY ENVIRONMENT - LABORRATORIES, as well as at the level of the other fractals);
13. It analyses various aspects of the process of framing the fractal objectives and activities within the law (e.g. negotiations with environmental authorities, water management and public health authorities);
14. it analyses the correlation between the internal list of the fractal comprising various environmental corrective and preventive measures and the current plan at organizational level - from the ESM level (where applicable);
15. It analyses all existing environmental agreements and permits within the organization and the current/ estimated necessary;
16. it analyses the documents presenting the sources of pollution arising from the activities carried out by the organization at global level, respectively at the level of the fractal, which may have an immediate or prospective impact on the quality of the environment, and the reality in the field;
17. It analyses the effectiveness and the efficiency of the measures taken at fractal level for any potential situation that may affect the performance and functionality of the organization; arising from the field of environmental management;
18. It analyses the value of the relationship between the businesses that are potential polluters, as well as businesses which exceeded the value of quality indicators of the waste waters discharged into the public sewerage system (source: the organization existing database, , and so on), and the activities carried out at the level of the fractal;
19. It analyses the "contribution" of the fractal in developing periodical reports that the organization has an obligation to deliver to the stakeholders as regards environmental protection (Environmental Protection Agency, Environmental Squad, National Administration "Romanian Waters", international bodies financing environmental investment projects, , and so on).
20. It analyses the effectiveness and efficiency of the ongoing briefing of the staff as regards their environmental protection legal responsibilities;
21. It analyses the correlation between the correction deadlines established for the actions provided in the non-compliance reports and their observance at the level of the fractal;
22. it analyses the degree of accomplishment, at fractal level, of the annual plan regarding the staff environmental training established at ESM level;
23. It analyses the compliance of the audit plan established at organization level (system audit/ process audit) by the fractal;
24. It analyses the effectiveness and efficiency of the methods and techniques used in impact studies, environmental audits, specific work procedures, and so on, in agreement with the legislation in force;
25. It analyses the effectiveness of the fractal participation in drawing up the documentation corresponding to the operation authorisation of the production units at organization level;
26. It analyses the effectiveness of the fractal participation, along with other hierarchical units and the contracting

authority, in developing and implementing a Management Plan in the field of management and exploitation of natural resources for the production of drinking water;

27. It analyses the effectiveness of the fractal involvement in the establishment, together with the competent authorities, of the protection perimeters of the water system facilities to be used for drinking water and sewerage.

28. It analyses the general effectiveness of all specific activities at the level of the Drinking Water Analysis Laboratory, the Water Waste Analysis Laboratory and the Metrological Checks Laboratory ("children" fractals of the QUALITY - ENVIRONMENT - LABORATORIES DEPARTMENT);

29. It analyses the effectiveness and efficacy of the fractal collaboration with similar (domestic and foreign) units and the participation, with the management's approval, in various trainings, seminars or in the development of joint programs in the field;

30. It analyses the effectiveness and efficacy of the process of obtaining the operation license and the other permits required for the fractal functioning (where applicable);

31. It analyses the performance level of the periodical reporting to ANRSC - "contribution" of the fractal to this process;

32. It analyses the selection and assessment of specific performance indicators established and used by the senior management in accordance with the Performance Assessment Handbook applicable within the Company (the coverage of the performance evaluation system/ the conformity environment index against the environmental management system/ the annual rate of environmental training/ the settlement rate of non-compliances/ the average level of standardization of the processes/ the index of compliance with drinking water quality/ the rate of compliance with the quality of the treated waste water/ the complaints regarding water quality/ the average response time to complaints regarding water quality/ the effectiveness of the metrological activity/ the effectiveness of activities related to regulations);

33. It analyses the effectiveness of the negotiations with the other fractals regarding the resources necessary to reach the proposed environmental goals and objectives;

34. It analyses the effectiveness of the negotiation of the environmental goals and targets with the other fractals;

35. It analyses the general effectiveness of the other fractals' activity - the same hierarchical level or on different levels (level of achievement of the environmental goals and objectives/ degree of restructuring of environmental targets and objectives);

36. It analyses the effectiveness and efficiency of other environmental data/ information necessary to the fractal (dynamics of the environmental programs/ dynamics of the environmental procedures, , and so on);

37. it analyses the effectiveness of using/ updating the organization's environmental data/ information/ knowledge base with environmental data/ information/ knowledge from the fractal;

38. It analyses the potential impact of the various alternative environmental activities on the current activities;

3. RESOLVER MODULE/ UNIT - "R"

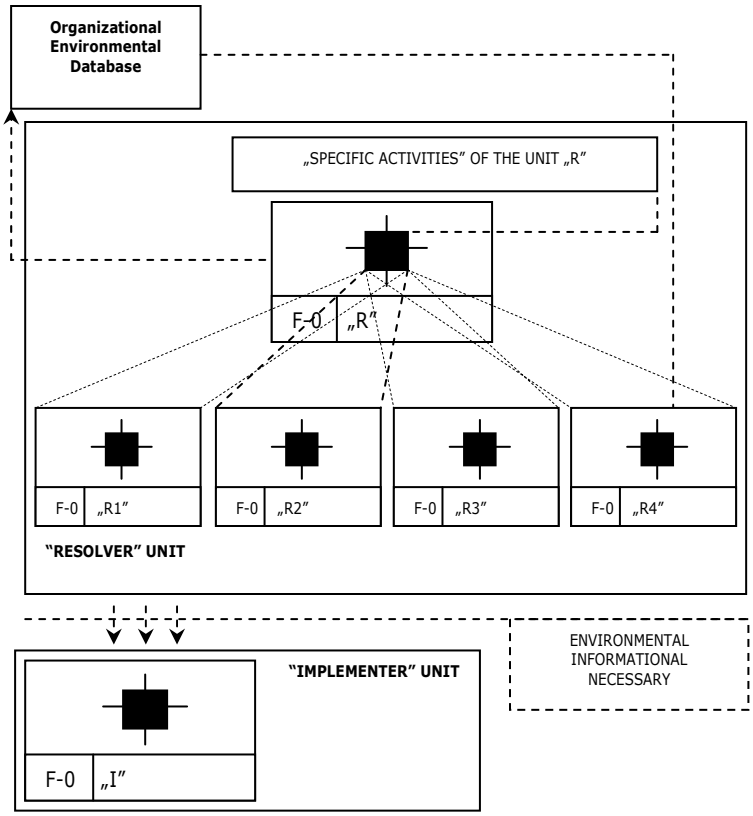


Figure 64 : Rezolver unit ("R") architecture

The module called "resolver" represents the most important module at the level of a fractal; essentially, this module (a) develops environmental activities (at the level of the environmental program) (S1), (b) projects and restructures the environmental responsibilities required for carrying out the planned environmental activities (S2) (where applicable), (c) develops the environmental objectives and goals of the fractal (S3), (d) leads the environmental decision-making process at the level of the fractal (S4), , and so on (Figure 64). Thus, the specific activities developed to achieve the goal to which this module/ unit ("S") was designed, are presented in Table 79.

Table 79 : "Specific Activities" - Resolver Unit ("R") of Quality-Environment-Laboratories Department
Source: original elaboration

No. crt.	"SPECIFIC ACTIVITIES"
1.	It receives, from the analysis module - "A"synthetic information necessary to conduct activities specific to this unit/ or environmental data and information from the monitoring module/ or environmental information from the module implementation;
2.	It develops the environmental objectives and goals of the fractal;
3.	It develops the necessary measures to transform and adapt the processes/ technologies existing at the level of the fractal, considering the environmental performance;
4.	It decides upon all the parameters of the selection and operation of the environment indicators, considering the particularities of the activities carried out both at the fractal level, and from a consultative viewpoint, at the level of the whole organization (the coverage of the performance evaluation system/ the conformity environment index against the environmental management system/ the annual rate of environmental training/ the settlement rate of non-compliances/ the average level of standardization of the processes/ the index of compliance with drinking water quality/ the rate of compliance with the quality of the treated waste water/ the complaints regarding water quality/ the average response time to complaints regarding water quality/ the effectiveness of the metrological activity/ the effectiveness of activities related to regulations);
5.	It chooses the best techniques and methods to be used for improving the quality of the process of updating the documentation required for maintaining and continuously improving the EMS;
6.	It decides upon the measures to be taken for improving the development and maintenance of the relationships with accreditation companies as well as the companies having as activity scope the training of auditors and specialists in environmental management;
7.	It decides upon the different measures to be taken for improving the communication between the DEPARTMENT QUALITY - ENVIRONMENT - LABORATORIES (seen as the **Fractal Base Unit** - BFE) and other fractals of the EMS at the level of the S.C. APAVITAL S.A. Iaşi given the hierarchical levels and functions within the company - regarding the implementation and enforcement of the EMS provisions;
8.	It decides upon all parameters involved in the development and updating of the Environment Handbook, considering the "contribution" of the fractal to this process;
9.	It decides upon the measures to be taken in order to increase the effectiveness of the development of the work procedures and operational flows compulsory for the EMS;
10.	It decides the degree of the fractal participation in the development and updating of the environmental policies;
11.	It decides upon the measures necessary to improve the relationship between the internal audit reports developed - regarding environmental issues and the state of affairs in the field (in agreement with the ISO requirements);
12.	it decides what data/ information will be introduced for the periodical update and review of the documentation certifying the environmental management concerns;
13.	It analyses the usefulness of the reports on the analysis of incidents involving the quality of the activities conducted (in terms of the environment), or the environmental incidents in order to draw corrective actions designed to prevent the occurrence of such incidents in the future (activities or incidents are carried out/ occurred at the level of the DEPARTMENT QUALITY - ENVIRONMENT - LABORATORIES, but also at the level of the other fractals);
14.	It decides upon the internal list of the fractal comprising various corrective and preventive environmental measures;
15.	It decides upon the environmental agreements and permits necessary for the activities carried out at the level of the fractal;
16.	It elaborates the list of pollution sources arising from the activities carried out at fractal level, that may have immediate or prospective impacts on the quality of the environment;
17.	It elaborates and decides upon the list of the measures required for any potential situation that may affect the performance and functionality of the organization, as a result of the environmental management;
18.	It decides upon the current and future state of the relationship between the businesses that are potential polluters, as well as businesses which exceeded the value of quality indicators of the waste waters discharged into the public sewerage system (source: the organization existing database, , and so on), and the activities carried out at the level of the fractal;
19.	It decides upon the degree of involvement of the fractal in developing periodic reports that the organization has an obligation to deliver to the stakeholders in terms of environmental protection (Environmental Protection

Agency, Environmental Squad, National Administration "Romanian Waters", international bodies financing environmental investment projects, , and so on).

20. It decides upon the best techniques and methods to be used at the level of the fractal (and in conditions of cooperation/ collaboration within the entire organization - where applicable) to increase the effectiveness/ efficiency of the ongoing information of the staff as regards their legal environmental protection responsibilities;

21. It establishes the corrective deadlines of the actions specified in the non-compliance reports and their compliance at the level of the fractal;

22. It establishes all the defining aspects of the staff training process on environmental issues, decided at the level of the ESM (deadlines/ subject area / real needs/ criteria of the review process, , and so on).

23. It decides upon the measures required at the level of the fractal for fulfilling the audit plan established at organization level (system audit/ process audit);

24. It decides upon the methods and techniques used in impact studies, environmental audits, specific work procedures, and so on, in agreement with the legislation in force;

25. It decides upon the degree of participation of the fractal in drawing up the documentation corresponding to the operation permit of the units at the level of the organization (implicitly at the level of the fractal);

26. It decides upon the degree of participation of the fractal, along with other hierarchical units and the Contracting Authority, in developing and implementing a Management Plan in the field of management and exploitation of potential natural resources for the production of drinking water;

27. It decides upon the degree of participation of the fractal in establishing, together with the competent authority, of protection perimeters for the water systems, to be later used for drinking water and sewerage;

28. It suggests various cooperation measures to increase the overall effectiveness of all activities specific to the Drinking Water Analysis Laboratory, the Waste Water Analysis Laboratory and the Metrological Checks Laboratory ("children" fractals of the QUALITY - ENVIRONMENT - LABORATORIES DEPARTMENT);

29. It decides upon the degree of participation of the fractal to the process of collaboration with similar institutions (domestic and foreign) and participation, with the company management's approval, in various trainings, seminars or in the development of joint programs in the field;

30. It decides upon all the parameters involved in the process of obtaining the operation license and the other permits required for the fractal functioning (where applicable);

31. It decides, at fractal level, what information is required to be included in the organization's periodical reports to the ANRSC;

32. It develops plans for alternative environmental activities;

33. It projects and restructures environmental responsibilities necessary to conduct the environmental activities planned; (environmental responsibilities for the job descriptions/ procedures used);

34. It develops the environmental program/ programs necessary to achieve the objectives and goals established;

35. it develops operational and system procedures necessary to conduct current environment activities;

36. It leads the negotiation of the resources necessary to achieve the established environmental objectives and targets in relation to other fractals
(implicitly, it leads the negotiation of the environmental goals and objectives with the other fractals);

37. If actually leads the decision-making process and updates the environmental data/ information/ knowledge base within the organization;

38. It uses/ updates the the environmental data/ information/ knowledge base within the organization;

39. It decides upon other activities specific to the solving unit;

4. IMPLEMENTER MODULE/ UNIT - "I"

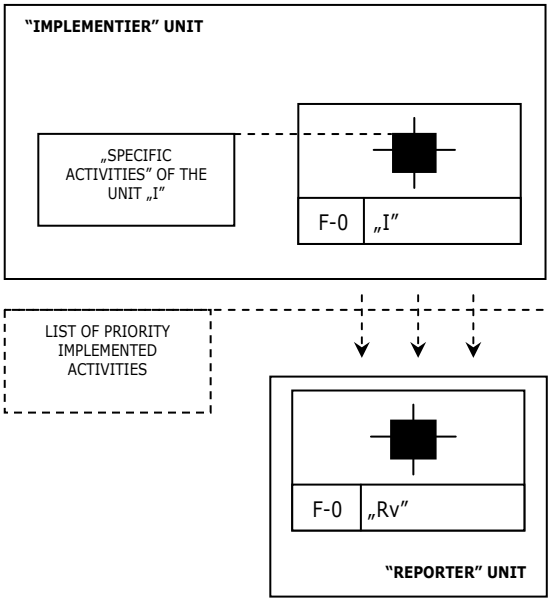


Figure 65 : Implementer unit ("I") architecture

The main function of this module consists in implementing the environmental decisions developed at the level of the solving unit; secondly, it undertakes the organization function of the current situation of the fractal in order to stabilise the dynamics of the restructuring process that emerges (a) with reaching the environmental objectives and targets proposed at fractal level, and (b) as a consequence of the imbalances occurring at the level of the negotiation of the resources necessary and the environmental objectives and goals (Figure 65). Thus, the specific activities developed to achieve the goal to which this module/ unit ("I") was designed, are presented in Table 80.

Table 80 : "Specific activities" - Implementer Unit ("I") of Quality-Environment-Laboratories Department
Source: original elaboration

No. crt	"SPECIFIC ACTIVITIES"
1.	It receives from the solving module - "S", the list of priority action activities (where applicable - "the environmental information necessary") to carry out activities specific to this unit; [List of priority action activities: (*) the objectives and targets of the fractal/ (*) the measures necessary for the transformation and adaptation processes/ technologies at the level of the fractal/ (*) the parameters of the selection and operation process of the environmental indicators/ (*) the techniques and methods to be used in order to improve the process of updating the documentation necessary to maintain and continuously improve the EMS/ (*) the measures drawn to improve the process of developing and maintaining the relationships with certification companies and corporations which have as activity scope the training of auditors and specialists in environmental management/ (*) the measures taken for improving the communication between the QUALITY - ENVIRONMENT - LABORATORIES Department and the other fractals of the EMS at the level of the S.C. APAVITAL S.A. Iaşi/ (*) the measures taken in order to streamline the process of developing work procedures

and operational flows required for the EMS/ (*) the measures needed to improve the relationship between internal audit reports prepared - in terms of environmental issues and the state of affairs in the field/ (*) the data / information to be introduced in regularly updating and reviewing the documentation certifying environmental management concerns/ (*) the reports deemed useful that present an analysis of the incidents related to the quality of the activities conducted (in terms environment), or environmental incidents, in order to draw corrective actions designed to prevent the occurrence of such incidents in the future (activities or incidents carried out/ occurred at the level of the QUALITY - ENVIRONMENT - LABORATORIES Department, but also at the level of the other fractals) / (*) the fractal internal list that includes different corrective and preventive measures on the environment / (*) the list of sources of pollution arising from the activities of the fractal, which can have immediate or prospective impact on the quality of the environment/ (*) the deadlines for correcting the actions provided in the non-compliance reports at the level of the fractal/ (*) the terms/ the subject area/ the actual requirements/ the criteria for the evaluation of personnel from the environmental fractal/ (*) the methods and techniques used in the impact studies, the environmental audit, the specific work procedures, , and so on / (*) the environmental responsibilities necessary to conduct planned environmental activities/ (*) the environment program/ programs necessary to achieve the established environmental objectives and targets/ (*) the operational and system procedures necessary to conduct current environment activities/ and so on.];

2. It implements the attributes, responsibilities and the authority level required to implement the general objectives and targets as well as the environmental program/ programs established at the level of the fractal;
3. It develops and implements the matrix of the environmental responsibilities at fractal level;
4. It ensures the availability of the necessary resources (allotted/ negotiated with the other fractals) to implement the environmental general objectives/ targets and programs established;(it ensures the availability of the ressources necessary for the environmental activities carried out);
5. It ensures the deployment under the best conditions of the environmental training activities to increase (a) the environmental skills at the fractal level, and (b) the awareness on the importance of environmental protection;
6. It gathers alternative environmental information (other than those collected as sub-process of the module "M" - if the situation requires it)/ setting the target group and the information requirements and/ or the dialogue/ establishing relevant information to be transmitted/ determining adequate methods for the communication/ periodical assessment of the effectiveness of the environmental communication process;
7. It ensures the provision of a documentation adequate of the complex process of environmental management at the level of the fractal;
8. The implementation of operational and system environmental procedures for the various environmental activities carried out at the fractal level;
9. Identifying the need for different operational controls and the establishment of specific operation criteria;
10. It ensures the implementation of plans and actions aimed at various emergency situations;
11. The implementation of various alternative environment activities (if any);
12. The implementation of decisions arising from the environmental decision-making process at the level of the fractal/ the negotiation process with other fractals;
13. It updates the environment data/ information/ knowledge base within the organization;

NB.: it essentially implements all the specific activities/ measures described at the level of the resolver module - "R"

5. REPORTER MODULE/ UNIT - "Rv"

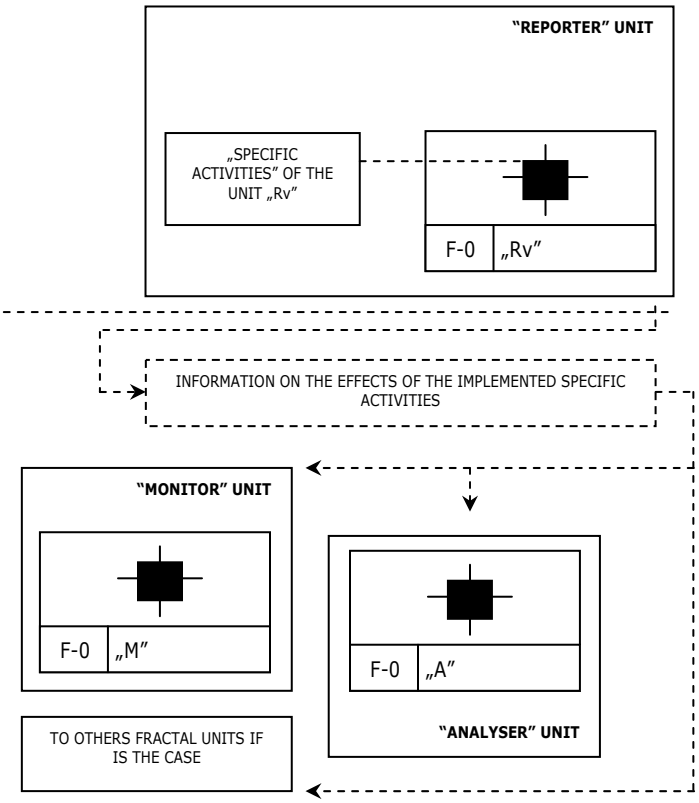


Figure 66 : Reporter unit ("Rv") architecture

The main function of this module/ unit consists in reporting to the Monitor unit "M"/ respectively the Analyser unit "A", the results obtained following the implementation of all the "specific activities" developed at the level of the Implementer "I" module; it indirectly fulfils the checking function of the results obtained and the resulting effects (the reporting function also satisfies the continuous improvement principle) (Figure 66). Thus, the specific activities developed to achieve the goal to which this module/ unit ("Rc") was designed, are presented in Table 81.

Table 81 : "Specific activities" – Reporter Unit (Rv) of Quality-Environment-Laboratories Department
Source: original elaboration

No. crt	"SPECIFIC ACTIVITIES"
1.	it receives from the implementation unit - "I", the list of priority activities implemented by this module;
2.	it reports to the monitoring unit "M"/ respectively to the analyser unit - "A" the results / effects obtained from implementing all the "specific activities" developed in the module implementation - "I";
3.	it checks the accuracy of the environmental data/ information presenting the results/ effects obtained following the implementation of all "specific activities" developed in the implementation module - "I";

4. it communicates the fractals derived from the reference fractal ("children" fractals) various environmental data/ information/ knowledge (e.g. environmental objectives and derived targets);
5. it communicates the fractals on the same hierarchical level/ on different higher hierarchical levels environmental data/ information/ knowledge;
6. it checks and reports the effectiveness of the communication channels with other fractals;
7. it checks and reports the results of the negotiation process with the other fractals
8. it updates the environment data/ information/ knowledge base within the organization;

Conclusions and contributions

1. Conclusions

The commercial company (S.C.) ApaVital S.A. Iaşi – Romania, is the only organization that provides public services of water supply for the Iasi Metropolitan area, for some small towns nearby, and also for 48 localities in Iasi County. This organization has an Environmental management system implemented at its level, system which is mainly managed from the level of the Quality-Environment-Laboratories Department. Therefore in the approach of this chapter this department was considered to be the Basic Fractal Entity (BFE), subscribing to the logical principles of fractal philosophy.

The purpose of this chapter was to observe the possibility of applying the fractal philosophy principles on Quality-Environment-Laboratories Department at S.C. ApaVital S.A. Iaşi, Romania, at the level of the EMS. Concretely was aimed to observe if the theoretical framework based on the principles of the fractal paradigm developed for the transformation and adaptation of EMS architecture (theoretical framework - presented and described in the previous chapter – doctoral thesis), it could be apply with success on an EMS of a large organization.

To simplify the research approach from this chapter, its objective was only to develop real specific activities for the functional modules of the Basic Fractal Entity (BFE) of the EMS. This approach was achieved using several important methods:

1. document analysis of the S.C. ApaVital S.A. Iaşi, Romania;

2. evaluation and analysis the possibility of applying the theoretical framework based on the principles of the fractal paradigm developed for the transformation and adaptation of EMS architecture (presented and described in the previous chapter – doctoral thesis);

and also an very important method:

3. investigation an the level of Quality-Environment-Laboratories Department at S.C. ApaVital S.A. Iaşi, Romania, using free unstructured interview with the director of this department, with the employees of this department, and also with several managers and employees of the organization ApaVital S.A..

As it can be seen from the contents of this chapter, the theoretical framework developed to improve the quality of the implementation and operation of the Environment management system by transforming and adapting its architecture relying on the principles of the fractal philosophy, at the level of the most important components – the specific activities of the functional units/ modules, it is possible to apply with success al the level of an Environmental management system (seen as fractal system).

Once again this chapter confirms the purpose of the doctoral theses, wich is to elaborate various quantitative and qualitative methodologies, methods and work tools to improve implementation, integration and functioning process that define the Environmental management system at the organisational level.

2. Contributions

The original way for developing this chapter, mainly aimed to achieve the objective: "pilot testing of the applicability of the conceptual framework developed according to the fractal philosophy principles at the level of the Department Quality-Environment-Laboratories of the company S.C. APAVITAL S.A. Iaşi" (O_5), and it's represents a practical continuation of the previous chapter.

Through main contributions brought on the level of this chapter, it can be mention the following:

- Development of a coherent research methodology that allow to test the applicability of the conceptual framework developed according to the fractal philosophy principles at the level of the Department Quality-Environment-Laboratories of the company S.C. APAVITAL S.A. Iaşi;
- Development of real specific activities for the functional modules of the developed conceptual framework that aimes to improve the quality of the implementation and operation of the Environment management system by transforming and adapting its architecture relying on the principles of the fractal philosophy;

Chapter 6 : Final conclusions, Theoretical and practical contributions, Limitations of the research and Future research directions

6.1. Final conclusions

The progress of the contemporary society characterized by the expansive development of the different industrial activities determined a negative impact upon the environment as well as the introduction of environmental legislative regulations.

The effect after the introduction of these environmental regulations stimulated the organisations to search for modalities of minimizing the induced impact upon the environment as an effect of the performed activities. Thus the development of a system that should minimize at the level of the organizations' activities the environmental risk which should also utilize the resources efficiently and develop, respectively implement different environmental responsibilities was considered the most viable solution for the efficient management of the environmental issues.

In terms of the "Environmental management system" (EMS) concept, it could be sad the following:

- The Environmental management systems have their origins in the necessity of integrating the environmental management – the environmental protection issues, at the level of the organizations' general management;
- The purpose of implementing the EMS consists in the continual improvement of the environmental performances – and thus the creation of a positive image and competitive advantages for the organisations;
- It is characterized as being "a component of the general management system that includes the organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for the elaboration, implementation, achievement, analysis and maintenance of the environmental policy" (ISO 14001);
- It represents an instrument that identifies issues, but also an instrument that settles them relying on the continual improvement concept; this principle can be implemented on an organization's level by taking into account the way it is perceived by the management and having in view the companies' activity sector;
- By designing and implementing the EMS, two essential requirements must be met: (a) the compliance with the implementing stages (the elaboration of the environmental policy and the commitment of the organization's management related to its compliance and real adoption/ the elaboration and the implementation of the environmental general objectives/ the elaboration and

the implementation of the specific environmental objectives (targets) / the elaboration and the implementation of the environmental management programme/ the monitoring process/ the management analysis), (b) compliance with the vision of ISO 14001 which mentions that the EMS is not an addition to the organization's management, but an integral part;

- The implementation of the EMS develops the different practices specific to the environmental management which are in a direct relationship with the planning and organizing at an organization's level, and it aims at different aspects such as: (a) the environmental policy, (b) the environmental objectives and targets (c) the environmental responsibilities, (d) the information, formation and implication of the human resources in the environmental management, (e) the analysis of the environmental performances, (f) plans for emergency situations;
- The implementation and the integration of an EMS at the organizations' level involves the development of different practices specific to the environmental management, which may have multiple beneficial results for the companies over the years;
- The implementation of an EMS and the certification with ISO 14001 generates benefits at the organisations' level, benefits that express the tangible result of the EMS's integration;
- The success of the EMS's implementation, in accordance with the specialty literature, is determined by certain factors with a general character unanimously valid for any organization – "organisational barriers".

The specialty literature mentions that the correct identification of these influence factors, respectively the determination of the correct influence level induced by each factor upon the implementing process of the EMS may determine an increase in the efficient utilization of the available resources, an increase in the efficacy degree on the level of the proposed environmental objectives and targets of the EMS, an increase in the global level of the attained environmental benefits.

The necessity to identify and to evaluate the relationship between these organisational barriers (influential factors) – barriers that in essence characterize the organizations' orientation in the environmental management issues and the implementation of the EMS, might help the managers take the necessary corrective measures, and at the right time, in order to improve the quality of the implementing process of this system.

A systematic review of the scientific papers presented that are several research priority directions/ areas addressed by most authors as a consequence of the importance of these directions in the development of environmental management system, among which it coud be mentioned the following:

(a) general description regarding the environmental certification process (ISO 14001) of organizations and their adoption of the Environmental Management System;

(b) the international level regarding the environmental certification of various organizations;

(c) the impact of environmental certification organizations on environmental performance.

The bibliographic research undertaken identified very few papers that analyze the relationship between specific organizational factors that characterize organization's orientation towards environmental management issues, and Environmental management system implementation/ integration quality.

In order to perform a global analysis of the important papers from the specialize literature, it was developed a series of clarifications presented in the following:

(a) a part of the international papers included quantitative methods in the analysis of the collected secondary data in order to analyze different aspects concerning the complex process of implementing an Environmental management system.

(b) nn the other hand, in other scientific papers are preferred the use of primary data in their research.

(c) other researchers chose to use the case study technique at the objectives level, proposed for the approach of the Environmental management system.

According to some authors from the literature, if the organisations are certified with standards from the ISO 14000 series, this brings major benefits to the managerial system, benefits that go far beyond the management of the impact that the organization has on the environment. Taking into account also the complexity and the organisational profile, it can certainly be state that the synergic relation between an organization and the Environmental management system will be a crucial element in the organisations development and achievement.

Every organization is a complex entity and all sometimes substantial differences between organizations, characterize the difficulty of Environmental management system implementation and integration, and justify the complexity of this type of system. Therefore an organization can be seen as a complex entity that has on its base, a process of continuous interconnected systems (designed, implemented, integrated, monitored, audited and adapted to the different levels) that use the organization's resources to achieve the proposed objectives and targets.

The main purpose of Environmental management system is to identify, to evaluate, to analyze and to solve the environmental problems and thus to improve the organization environmental performance. On the same judgment, the managers and other organizational stakeholders perceive this system as a complex process which practically demonstrates the existence of many very complex issues that occur at the level of implementation and integration.

From theoretical point of view a process is generally defined as a group of activities that transform inputs (human resources, equipment, materials, logistics resources, financial resources, and so on) in a product or service - a value result to organization stakeholders.

Related to Environmental management system (EMS) as a complex process, it could be said that:

- The literature presents that the process approach is a more efficient way of achieving the desired result (this statement is applies to any process);
- Continuous improvement of the organization environmental performance is a complex process because it is an direct effect of environmental practices development, that results from the implementation/ integration of the Environmental management system at the organizational level;
- One of the essential characteristics of the Environmental Management System is complexity. The need for complexity is a practical feature because EMS has to "cover" all activities and all staff. Essentially EMS must balance and be "synergistic match" to existing policy, operational and economic needs (and so on) of each organization;
- Main reason that underlines decision of aggregating/ assembling Environmental Management System activities in a process it is of managerial nature. Therefore the identification of a series of activities in order to emphasize the transformation of the existing subsystems is mainly focused on monitoring, evaluation and improvement of operation method;
- Complexity of Environmental Management System itself (in addition to matching and adaptation to the organizational structure, the level of integration and organizational culture) determine the success of implementing this type of system.

Given all the information and knowledge obtained from specialized literature analysis the following definition is proposed for specific Environmental Management System as a complex process at organizations level as follows: "EMS can be considered to be a complex process composed from a system of activities/ practices identified in a holistic and systematic manner so that it can be monitored, evaluated and analyzed continuously to improve the organization environmental performances". In the same context, this complex process that mediates the transformation of inputs (human resources, equipment, materials, logistics resources, financial resources, and so on) into outputs (improved environmental performances) is determined by the specific organizational barriers that influence transformations at the existing subsystems levels.

The undertaken research is original and singular on the organizations' level in the North-East of Romania as (a) it presents concretely their specific features by describing the factual state, and (b) it clarifies what factors influence the implementation quality of an Environmental management system, the influence degree and the nuance of this influence (positive/ negative). The originality of the research also results from the methodology conception, the performed statistical analysis, from the attained results, from the solutions proposed to the managers on the organizations' level in order to improve the implementation quality of the EMS.

The following aspects were observed during the research:

I. Although the practical reality and the specialty literature mention that informational system management play a defining role in the organisations, it has been noticed after the undertaken research that the Environmental informational management determines only a very low percentage (of 4%) from the variant of the implementation quality of the EMS. Thus the probability of this phenomenon's existence is explained only by finding out that the organisations have not developed an efficient decisional/ informational/management system of the environmental knowledge, whereas the environmental monitoring and control have a purely formal character;

II. While analyzing the lack of connection between "*the System-Technological Infrastructure with an impact upon the environmental management"* aspects*,* respectively "*the Orientation to the organization's environmental innovation"* aspect, and the implementation/ integration quality of the EMS, we notice the lack of interest that the organisations have in these aspects, probably due to the big costs related to the non pollutant technologies and to the innovation process.

III. It is extremely important to notice that the requirements of the environmental regulations increase and the pressure of the stakeholders also increases, then the implementation quality decreases. This finding presents in essence the relationship between the EMS and the organisations, characterized thus as "a necessary burden" to the organizations' interests, and not as an effect of the awareness on environmental issues. The probable causes of this "paradoxical" phenomenon may be in essence the following:

(a) excessive routinisation (considered as a negative effect) – as an effect of the integration of the EMS on the level of the general management,

(b) the excess of the tolerability limit of the expenses necessary for the implementation and function of the EMS on the organizations' level,

(c) the lack of vision on average term and on long term, (d) a high degree of endurance to change and so on.

The conception and the factual achievement of the research determined the identification of solutions presented synthetically in order to improve the implementation quality of the EMS on the level of the Romanian organisations in the North-Eastern region and not only, as follows: the flexibilisation of the organization's internal regulations, the laying out and the clear expression of an environmental vision, a clearer laying out of the environmental objectives and targets as well as their real interaction with the organizations' general objectives, the real utilization of the results attained after the environmental audits and the increase in the monitoring level of the environmental performance; all these can improve substantially the implementation quality of the EMS.

Then the identification of the environmental knowledge level of the organizations' employees by regular evaluations, and subsequently the laying out of the objectives/ training sessions/ specialisations in environmental issues, plus the clear laying out of the environmental responsibilities and the introduction of the environmental performance on the level of the employee rewarding/ compensating system, all these improve the implementation quality of the EMS.

It should be mention also that the environmental decision is the essential component of an environmental process that requires a logic judgment, requires an efficient model and an efficient corroboration between the facts (and of all environmental actions) in order to obtain an final environmental decision based on reality; and at the organizational level, environmental knowledge management system is one of the most important systems, which can lead to performance - and, development of this system can lead to minimizing the environmental negative effect induced by organizations and even to obtain benefits in the short, medium and long term.

The conclusions extracted from the evaluation and the quantitative - qualitative analysis of the relationship between: a) the organization's orientation in the environmental management issues and b) the implementation quality of the Environmental management system may be considered as the starting points in the development of measures with a practical character for an environmental manager on an organization's level, which have as their main purpose the transformation of the Environmental management system into an efficient system that functions at its best and represents "an advantage leverage" at the organization's disposal.

The flexibility need of the organizations whose main objective is to meet the consumers' demand promptly, associated with the demand's continual change and with some uncertain and unstable aspects of the characteristics of the organizations' environment may disturb fundamentally all the levels of an organization. Regarding to the Environmental management system it is currently asserted that the can be seen as a system managed hierarchically, utilized by the organizations that have well-defined organizational systems, fact resulted from research undertaken and supported by specialty literature. So it is necessary to underline the following:

- the traditional production systems managed through hierarchical management (and through decisional methods based on hierarchical control) are no longer able to meet the actual needs, having in view the complexity of the environment;
- even if the hierarchical control is easy to understand and has a low redundancy level, it has a major disadvantage: the reduced capacity to register all modifications produced at all the hierarchical levels;

- according to the Laws and Axioms of the Needed Variety (Ashby, 1964), a structure that is referred to as being hierarchically managed (a hierarchical authority) does not have the necessary variety in order to provide the adaptation of their own systems in their niche;
- resuming the idea that the environment in which the organizations coexist is extremely complex and dynamic because of the changes produced in short periods of time, and that the features defining the traditional hierarchical patterns, usually present at the level of these organizations, is extremely limited, sometimes leading to inefficiency and to lack of effectiveness, we may conclude that this "limited perspective" also characterizes the environmental decisional process.

Environmental management system so it can be seen as a system managed hierarchically, utilized by the organisations that have well-defined organisational systems. Taking into consideration this logical idea, the specialty literature and the research results from table 59, it could be made the following main remarks (regarding to the direct effects on EMS implementation and operation stage):

- the low level of operational flexibility of the EMS/ or of the agents/ of the entities on this system's level as an effect of the absent environmental responsibilities on the level of all the managers;
- the decrease of the functioning quality level of the EMS having in view the lack of the environmental awareness;
- the lack of configurability of the EMS on the implementation and operation level;
- the lack of (relative) autonomy of the EMS or of the agents/ entities of this system on the implementation and operation level;
- the decentralization possibility of the agents/ entities on the level of the ESM, but also on the entire organization's level, having in view the flexibility of the job descriptions that allow the managers' implication in the establishing process of the environmental objectives and targets; plus due to the high level of functional cooperation among departments regarding the pollution prevention;
- the possibility and also the necessity to decentralize the establishing/ modifying/ and updating process of the environmental objectives and targets on the organization's level;
- the possibility to decentralize the environmental decisional process on condition that the employees' competence level increases (by training sessions/ environmental specializations) and so on.

Considering the main results of research undertaken at the level of the organizations from the N-E area of Romania presented in doctoral theses, and taking into account the specialty literature, we can say that certainly that this research is appropriate and necessary for the improvement of the EMS implementation and operation stage.

Having in view the main ideas previously exposed, we can state that the research we carried out is of maximum importance; in other words, we can see that the adaptation and transformation of the Environmental management system implementation and operation (functioning) process at the

organizational level is of crucial importance; in other words, this type of system should have the following attributes: flexibility/ "intelligence"/ configurability/ fast adaptability to the environment/ it should also include entities characterized by the attributes previously mentioned/ and autonomy, in order to really become an "advantage lever" in this strong competitive environment. Therefore the undertaken research hopes to solve some of the organizational manager's problems providing a useful "qualitative tools" – through the developed EMS theoretical framework.

The undertaken research is original and unique and and has among its main objectives the development of a theoretical framework based on fractal philosophy principles that could provide improvement of Environmental management system implementation and operation quality through transformation and adaptation of this kind of architecture system.

In another train of thoughts, among the concrete implications of EMS architecture transformation and adaptation, from the theoretical framework developed, it could be synthetic mentions the following:

- transformation of environmental policy into a governance code of the entire system and hence of each fractal entities;
- general objectives have only an advisory role and set the direction on environmental policy explicit: minimizing or no negative environmental impacts existence/ creating an optimal working environment for employees and so on;
- objectives (specific) from each fractal entity level has to have a key role in the new system ("decentralization of environmental objectives");
- creating the possibility to modify the government code system, depending on the external dynamic change of the organization environment;
- creating the premise (possibility in terms of system functionality) that BFE's could negotiate between them the environmental objectives;
- constant auditing of all specific BFE objectives coherency and unity (towards direction of the governance code).

Regarding the proposed conceptual framework for environmental decision making, built on the fractal philosophy principles, it is necessary to underline that it offers some tangible benefits, that represent a leverage with managerial value for environmental decision making entity's/ agents at the organization level.

Concluding it is necessary to mention that the proposed theoretical framework which presents the adaptation and transformation of the EMS implementation and operation on the basis of fractal philosophy principles, subscribe to the purpose of the doctoral theses, which is to elaborate various quantitative and qualitative methodologies, methods and work tools to improve implementation, integration and functioning process that define the Environmental management system at the organisational level.

And as final conclusions it should be mention also that the theoretical framework developed to improve the quality of the implementation and operation of the Environment management system by transforming and adapting its architecture relying on the principles of the fractal philosophy, at the level of the most important components – the specific activities of the functional units/ modules, it could be apply with success at the level of an Environmental management system (seen as fractal system) - aspect tested in the last chapter of doctoral thesis.

Also it could be confirmed that the purpose of the doctoral theses was achived, namely the elaboration of various quantitative and qualitative methodologies, methods and work tools to improve implementation, integration and functioning process that define the Environmental management system at the organisational level, was reached

6.2. Theoretical and practical contributions

The original organisation of the material in the doctoral theses, the original objectives of the undertaken research, the original conclusions obtained, essentially the entire doctoral thesis as a unit parte brought along the following theoretical and practical contributions, as follows:

- The clarification and the systematization of the basic terminology utilized at the level of the Environmental management systems;
- The clarification and the synthetic presentation of the environmental practices developed at the organizations' level as an implementing effect of an Environmental management system;
- The identification in the specialty literature of the most important benefits resulted from the implementation of an Environmental management system;
- The clarification and the synthesis of the most important potential factors that have a general character unanimously valid for any organization, factors that may act as "barriers" in the implementing process of an Environmental management system.
- Identification of the important research directions addressed by most authors in the consulted literature, as a consequence of the importance of these directions in the development area of Environmental management system;
- Synthetic presentation of the most important environmental practices developed in organizations as a result of implementing an environmental management system;
- Identification and systematic presentation of the articles in the literature that presents the factors that determine/ influence the complex process of implementation and integration of an environmental management system;

- Group into categories of articles from the scientific literature that addresses the issue of environmental management system depending on the research methods/ type of data, or preferred information;
- Environmental management system implementation and integration definition and characterization as complex process;
- Development and proposal of EMS theoretical model - in accordance with ISO 14001, as a complex process; this scientific approach is unique and original in the specialized literature level consulted;
- Clarify and detailed developed model (EMS as complex process) by presenting each stage synthetic tabulated (development of environmental policy stage/ planning stage/ implementation and operation stage/ measurements stage, corrective measures, analysis;
- Proposal of Environmental Management Systems definition (according to ISO 14001) as a complex process;
- Development of a conceptual framework and a coherent research methodologies that allow quantitative and qualitative study of the relationship between the organization orientation in environmental management issues and EMS implementation quality;
- Development of a systematic model to improve environmental decision making process;
- Development of an investigation methodology of the environmental knowledge management system importance due to its influence on the quality of environmental decision and aso the development of a simple method to quantify the importance level of this system;
- Proposal of a definition for environmental knowledge management systems;
- Development and validation of an original research instrument (questionnaire) used in present research for evaluation/ analysis of relationship between organization orientation in environmental management issues, and Environmental Management System implementation/ ntegration quality;
- Development of models showing:
    c. architecture of all influences between variables that describe the organisation's orientation on the environmental management and variables that describe EMS implementation and integration quality under certain conditions;
    d. estimation of correlations between organisation's orientation specific factors regarding environmental management and synthetic variable/ global that defines EMS implementation and integration quality;
- Application of developed research methodologies in the field research undertaken;
- Proposal and development of practical solutions to improve the quality of EMS implementation and integration at N-E Romania organizations level;

- Identification of the best research methods and techniques to achieve the objectives of proposed research;
- Application of developed research methodologies in the undertaken research field;
- Identification and presentation of the most important environmental responsibilities for a manager which is involved in various environmental activities;
- Development of a conceptual framework and a coherent research methodology, that allow to evaluate the possibility to improve the EMS implementation and operation quality by transforming and adapting its architecture based on fractal philosophy principles;
- Development of a theoretical and synthetically framework model based on fractal philosophy principles that could allow the improvement of Environmental management system implementation and operation quality.
- Matrix development wich summarizes the environmental informational necessary – as active tools in the proposed conceptual framework that could allow the improvement of Environmental management system implementation and operation quality (and also for any organizational manager which is involved in various environmental activities);
- Development of a coherent research methodology that allow to test the applicability of the conceptual framework developed according to the fractal philosophy principles at the level of the Department Quality-Environment-Laboratories of the company S.C. APAVITAL S.A. Iaşi;
- Development of real specific activities for the functional modules of the developed conceptual framework that aimes to improve the quality of the implementation and operation of the Environment management system by transforming and adapting its architecture relying on the principles of the fractal philosophy.

6.3. Limitations of the research

Research topics are a vast subject of analysis and investigation. As a consequence to some reason related to the proper development of the research process, the research was strictly oriented towards the fulfillment of proposed objectives thus leading inevitably to some limitations of the research:

- Original models developed that describe the current state of the EMS implementation/ integration quality at the level of the organizations from N-E are of Romania, the practical and theoretical solutions proposed to improve the EMS implementation/ integration quality, as well as the teoretical framework for the improvement of the EMS implementation and operation stage (and not only), and so on, for higher accuracy it's recommended to be customized for each organization, depending on their specifications;

- Sample size used in the applied research, as well as geographical location restriction of the organizations (N-E area of Romania) involve some caution in generalizing the results to other types of businesses in other areas of Romania;
- Refusal or indifference of some potential respondents to participate in undertaken research;
- Any tendency to conceal and desirability of the respondents in relation to certain aspects of the research, it was inevitable.

6.4. Future research directions

Emphasizing the limits of the research reveals the importance of continuing and expanding it's, and also represents at the current level of this research a highly promising starting point.

Among the most important future research directions, it could be mention the following:

- The results presented in this doctoral thesis can represent a reference point for latter particular and extensive researches in the field of Environmental management system and the factors that determine it;
- Generalization of research methodologies in other types of organizations and in other areas of Romania, and not only;
- Testing and implementation of the developed methodology of investigation regarding the environmental knowledge management system importance due to its influence on the quality of environmental decision and aso testing the method developed that quantify the importance level of this system;
- Implementation of the systematic fractal model that aim to improve environmental decision making process;
- Development of the experimental studies in which through controlled variation of the research variables to be able to highlight exactly the influences and interdeterminations regarding the components in the original methodological model developed in the present doctoral thesis;
- The development of a software program that will allow the evaluation and continuous analysis of the EMS implementation and integration quality on the organizational level; this software program should be able to gather, classify and report that important information which will allow a possible improvement of EMS implementation and integration quality in an organization, will eliminate the manual collection and processing of environmental data/ information collected, and also will synthetic present the current situation of a company regarding the EMS implementation and integration quality (considering a classical approach);
- The development of a software program that will allow the implementation of the developed conceptual framework that will allow to evaluate the possibility to improve the EMS implementation

and operation stage quality by transforming and adapting its architecture based on fractal philosophy principles;

References

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ANNEX No.1: "Variables and dimensions - research instrument projection: < consequences of implementation/ integration of the Environment management system at organizations level" (centralizer)

Source: ©Herghiligiu Ionut Viorel & Lupu Mihaela Luminita

SETS OF VARIABLES MONITORED	**VARIABLES/ DIMENSIONS FOLLOWED**		**ITEMS PROPOSED FOR THE INTERVIEWED SUBJEC SCALE 1-7**
I. Variables for the **"consequences of the Environmental management system implementation/ integration at the organisation level" (ITEMS: I.1 – I.96)** **->** characterise the Environment managemen system implementation/ integration quality	I.1. Implementation of environmental policies and programs **(ITEMS: I.1 – I.34)**	I.1.1. General environmental objectives and targets **(ITEMS: I.1 – I.10)**	**I.1**At organizational level, the environmental objectives and targets established are clearly defined **I.2**.*The job description does not allow me to get involved in the process of establishing the environmental objectives and targets* (Formalization) **I.3**.*Not all the managers within the organization are involved in the process of establishing the environmental objectives and targets* (Decentralization) **I.4.**.*In order to get involved in the process of establishing the environmental objectives and targets I need the consent of my superior* (Centralization) **I.5**.*The environmental objectives and targets are strictly established by a team of specialists* (Specialization) **I.6**.*The development of environmental objectives and targets is the strict responsibility of the environmental department* (Functional cooperation (departmental / interdepartmental) / knowledge sharing (KS)) **I.7**.*In the process of establishing the environmental objectives and targets, collaboration (team work) is highly encouraged* (Functional cooperation (departmental / interdepartmental)) **I.8**.*I do not hold all the information necessary to participate in the process of establishing the environmental objectives and targets* (Indoctrination) **I.9**.*The documents containing the environmental objectives and targets are constantly monitored and controlled in order to be updated* (Environmental planning and control) **I.10**.The establishment, modification and updating of the environmental objectives and targets strictly at the level of the organization's departments/ units, guided by a general-directive set of environmental objectives and targets (strategic orienting), would bring in major benefits to the EMS effectiveness and functioning.
		I.1.2. The environmental policy **(ITEM: I.11)**	**I.11**The organization has a clearly and explicitly established environmental policy
		I.1.3.The opinions and suggestions of the employees/ the management. shareholders/ suppliers/ clients/	**I.12**.*My suggestions for improving the various environmental practices or procedures are taken into consideration* (Knowledge utilization (KU) / innovation)

		representatives teams of the various public institutions with which the organization interacts/ NGO representatives concerning the improvement of the environment quality **(ITEMS: I.12 – I.14)**	**I.13**.The organization takes into considerations the clients' suggestions concerning the environmental practices (various environmental procedures/ various environmental processes, , and so on) **I.14**.The organization carries out frequent meetings with the local community with a view to present various environmental reports (public information activities regarding the activities carried out)
		I.1.4.The actions implemented regarding the prevention of environmental pollution **(ITEMS: I.15 – I.34)**	**I.15**.The organization that I belong has a long-term environment program **I.16.** At the level of my organization there are multiple actions concerning the prevention of pollution **I.17**.I participate actively in the decision-making process regarding the various measures on pollution prevention **I.18**.*With the environmental certification obtained by my organization, in my job description were added new environmental responsibilities and activities* (Formalization (the activity behaviour) / Specialisation) **I.19**.*The implementation of the Environment Management System led to adding new responsibilities and activities regarding the environmental protection only to some of the managers of the organization* (Formalization (the activity behaviour) / Specialisation) **I.20**.*The description of the new activities required by pollution prevention were mentioned in all the job descriptions of all employees* (Formalization (the activity behaviour) / Horizontal specialisation) **I.21**.*I am often checked with regards to the consistency of the environmental activities carried out and the duties provided in the job description* (Formalization (the activity behaviour)) **I.22**.*In order to be able to participate in various actions regarding pollution prevention I need the consent of my superior* (Centralization) **I.23**.*The organization considers that the involvement of all employees in the environmental decision-making process constitutes an inefficient practice* (Horizontal decentralization) **I.24**.*The environmental decision making process at the level of the organization allows for involving the managers at different hierarchical levels* (Vertical decentralization) **I.25**.*Pollution prevention at organization level is managed by a group of specialists* (Specialization) **I.26**.*The pollution prevention actions are the strict responsibility of the environmental department (in case such a department does not exist, it is the responsibility of the environment representative)* (Functional cooperation (departmental / interdepartmental)/ Specialization)/ knowledge sharing (KS)) **I.27**.*Depending on the hierarchical level, the managers within the organization coordinate the different environmental activities* (Vertical specialization) **I.28**.*I am involved, together with my colleagues from various departments, in different actions regarding pollution prevention* (Functional cooperation (departmental / interdepartmental) / knowledge sharing

			(KS)/ Decentralization) **I.29**.*I hold all the information necessary for carrying out the various actions aimed at preventing pollution* (Indoctrination) **I.30**.*Only the staff at the level of the environmental management department has access to all the information regarding: environmental issues of the organization / the environmental risk associated to the activity carried out/ the (procedural/ legal) non-compliance reports/ improvements achieved , and so on* (Indoctrination/ Functional cooperation (departmental / interdepartmental)) **I.31**.*The transfer of environmental information among the various departments of the organization is directed in a single direction: the environment department* (Functional cooperation (departmental / interdepartmental) -> it reveals the level of the environmental decision-making - operational power pole: "Functional centralized-systemic cooperation"/ knowledge sharing (KS)) **I.32**.*Periodically, at the level of the organization, there are trainings aimed at raising the employees' awareness regarding environmental protection issues* (Training environmental issues) **I.33**.*All the employees of the organization have undergone a training session on the consequences of non-compliance with the environmental procedures* (Training environmental issues) **I.34**.*At the level of my organization, documents regarding the following issues are constantly developed and updated:* *a. environment strategies;* *b. environmental objectives and targets* *c. environment programs* *d. emergency situations* (Planning and control)
	I.2. Compliance with environmental regulations **(ITEMS: I.35 – 42)**	I.2.1.Compliance with environmental regulations (at national/ European/ world level to which the organization has adhered) **(ITEMS: I.35 – I.36)**	**I.35**.Compliance with the national environmental regulations in force represents a priority for the organization. **I.36**.The organization has a history of fines from the competent bodies in environmental issues (The Environmental Protection Agency/ The Environmental Guard)
		I.2.2.Legal responsibility regarding compliance with environmental regulations **(ITEMS: I.37 – 38)**	**I.37**. Compliance with the environmental legislation is one of the priority objectives of the environmental department (in case there is no environmental department: the environment rep.) **I.38**.*The internal rules of organization and functioning provides that compliance with the environment legislation is the responsibility of all employees* (Decentralization)
		I.2.3.The internal findings regarding environmental aspects (their periodicity) **(ITEM: I.39)**	**I.39**.*The organization constantly monitors the environment aspects of the activities carried out in order to comply with the legislation in force* (Planning and control)
		I.2.4.The analyses concerning the	**I.40**.*Annually, measurements are performed to determine the concentrations of the*

		environmental impact induced by the specific activities carried out at organizations level (their frequency) **(ITEMS: I.40 – 42)**	*polluters resulting from the activities carried out* (Planning and control) **I.41**.*The environmental impact induced by the activities carried out by the organization is monitored and analysed depending on the budget allotted for the environment* (Planning and control) **I.42**.*The measurements in the field are performed through various specialised companies (third parties)* (Planning and control)
	I.3. Environmental financial performance **(ITEMS: I.43 – I.51)**	I.3.1.The (a.operational and b. capital) costs associated with environmental aspects related to the activities carried out (their level) **(ITEMS: I.43 – I.45)**	**I.43**.If the legislation in force regarding environmental issues were more permissive, the management costs associated to environmental issues resulting from the activities carried out would drop significantly **I.44**.The high costs associated with the management of environmental issues are a consequence of the EMS implementation at organization level **I.45**.The organization has and uses a system of environmental financial performance indicators
		I.3.2.The research and development funds associated with environmental management (for various environment projects) **(ITEMS: I.46 – I.48)**	**I.46**.*The organization carries out research/ development activities in environmental issues* (Knowledge utilization (KU) / innovation) **I.47**. The organization is among the organizations adopting new clean processes/ technologies (to minimize the pollution of the environment) **I.48**.The organization has carried out environmental projects financed from own/ governmental/ European funds
		I.3.3.The legal responsibility associated to the financial management associated with the environmental management (for various environmental projects) **(ITEM: I.49)**	**I.49**.Non-compliance with the environmental responsibilities of the employees as regards the adequate financial management of the budgets distributed to the environmental programs/ projects has legally regulated effects
		I.3.4.Environmental benefits (direct and indirect) **(ITEMS: I.50 – I.51)**	**I.50**.*The activities carried out at the level of the organization have in view solely financial benefits* (Process orienting) **I.51**.*Pursuing the environmental benefits is a negative consequence of the implementation of a EMS at the level of the organization* (Process orienting)
	I.4.Environmental operational performance **(ITEMS: I.52 – I.78)**	I.4.1.reported to the materials **(ITEMS: I.52 –** Materials used/ processed to be recycled/ reused	**I.52**.*In the production process, the organization uses recycled/ reused materials* (Process orienting) **I.53**.The organization has and uses a system of environmental operational

		I.56)	(quantitative level)	performance indicators
			The water used per product unit (quantitative level)	**I.54**.The organization received fines for exceeding the maximum allowable rates (MAR) of waste water discharged into the natural environment **I.55**.The recirculation of the waste water at the level of the organization constitutes a priority in reducing the water consumption
			The raw materials reused in the production process (quantitative level)	**I.56**.The reintroduction of various raw materials in the production process is considered to be a deviation from the quality of the end product
		I.4.2. reported to services (provided by the third parties) that supports the activity of the organization **(ITEMS: I.57 – 59)**	Recycled/ reused materials used in the production process by the service providers (third party organizations)	**I.57**.The organization has concluded contracts with raw materials suppliers who use recycled/ reused materials in the process of production
			The waste generated by the service suppliers (third party organizations) (type of waste)	**I.58**.In choosing the business partners, the organization takes into account the type of waste these organizations generate **I.59**.The organization pays particular attention to dangerous waste (provedures/ systems for dangerous waste)
		I.4.3. reported to energy used **(ITEMS: I.60 – I.62)**	The energy used for a particular amount of time (ex. per an / per trimester/ per month)	**I.60**.*The organization monitors and analyses periodically the reports concerning the energy used per month/ per trimester/ per year* (Planning and control)
			Quantitative level of the energy used (per each type of energy used)	**I.61**.In the production process, the organization uses high quantities of electrical/ thermal energy
			Quantitative level of the energy used (per activity/ product/ service/ client)	**I.62**.It is highly important that the organization reduces the consumption of energy used per activity/ product/ service for financial reasons
		I.4.4. reported to fixed assets and equipments **(ITEMS: I.63 – I.66)**	Equipment functioning (the level of the direct/ indirect impact induced on the environment)	**I.63**.The equipment used at the level of the organization has a negative impact on the environment **I.64**.The machines used by the organization is older than 15 years

			The organization's location (e.g. field used for production purposes)	**I.65**.In order to carry out its production activity in optimal conditions, the activity makes use of a large surface of land
			Preventive maintenance of the equipment	**I.66**.The equipment used in the activity of the organization is fixed in case of major faults
		I.4.5. reported to provision **(ITEMS: I.67 – I.68)**	Fuel used at the level of the organization in order to provide the clients with products and services (consumption level/ type of fuel)	**I.67** The age and consumption of the vehicles in the fleet are not important as long as they are working properly **I.68**.The vehicle fleet used in the activity of product/ service provision can be considered old
		I.4.6. reported to products **(ITEMS: I.69 – I.71)**	Recycled products	**I.69**.Within the production process, the organization does not use recycled products as raw materials
			The life cycle of a product (the level of designed/ realised period)	**I.70**.*Within the design and realization of the products, the organization takes into consideration their life cycle* (Process orienting)
			Reused products	**I.71**.The faulty products resulted from the production process are reused to the extent to which the technological process allows it
		I.4.7. reported to waste **(ITEMS: I.72 – I.74)**	Environmental permits for waste (the ratio between the quantity of waste per environmental permit)	**I.72**.The organization holds environmental permits only for the activities that involve the use of dangerous substances
			The waste per product unit obtained	**I.73**.After having obtained a single product unit, it results a considerable quantity of waste
			The waste level for all the activities of the organization (total quantity of waste)	**I.74**.Following the production process, it results a considerable quantity of waste per organization
		I.4.8. reported to emissions **(ITEMS: I.75 – I.78)**	The measurements carried out for the noise at the level of the organization	**I.75**.Given the location, the noise does not constitute a problem **I.76**. The organization received warnings from competent bodies due to the systematic environmental complaints from the neighbouring community

			emplacement	
			The emissions of pollutants (in the AIR/ WATER/ SOIL) specific to the activities carried out at the level of the organization (quantity of emissions)	**I.77**.At organization level is required the modernization/ upgrading of some of the existing equipment since it produces appreciable amounts of pollutant emissions (in the AIR/ WATER/ SOIL)
			Emissions per product unit/ service resulted (quantity of emissions)	**I.78**.The ratio between the quantity of pollutant emissions and the end product unit obtained is considered to be optimal, given the legislation in force
	I.5.Relationship with various external entities **(ITEMS: I.79 – I.83)**	I.5.1.The relationship with the state institutions that monitor the compliance with the environmental regulations **(ITEM: I.79)**		**I.79**.The controls carried out by the competent bodies in environmental issues (The Environmental Protection Agency / The Environmental Guard) often resulted in the application of fines
		I.5.2.The relationship between the organization and the local community **(ITEMS: I.80 – I.82)**		**I.80**.The organization is actively involved in various projects of the local community (community solidarity) **I.81**.Many of the organization employees were recruited from the local community **I.82**.The organization allows carrying out the post-secondary/ undergraduate students' practical training (where possible).
		I.5.3. The relationship of the organization with the stakeholders (internal/ external stakeholders) **(ITEM: I.83)**		**I.83**.Only the organization's decision-makers/ top management decide upon all the aspects involved in the environmental issue
	I.6. The relationship between the organization's activity and the state of the environment **(ITEMS: I.84 -**	I.6.1.The quality (state) of the environmental factor - AIR **(ITEMI: I.84 – I.86)**	The noise measurements at the level of the organization emplacement	**I.84**.Frequent measurements are carried out at the level of the noise caused by the emplacement of the organization
			Air-emissions monitoring activities (p.s.: the dispersion-emissions can also be take into consideration)	**I.85**.Frequently, measurements are carried out regarding air polluting emissions polluters at the level of the organization **I.86**.The modernization/ re-technologization of some facilities could improve substantially the relationship with the state environment authority
		I.6.1.The quality (state) of the environmental factor - WATER	Monitoring the various polluters reaching in the underground or	**I.87**.Frequently, measurements are carried out regarding the water polluting emissions at the level of the organization **I.88**.The competent environment bodies have fined several times the organization for exceeding the maximum allowable rates of polluting substances in the waste

		(ITEMI: I.87 – I.89)	surface waters as a consequence of the activities carried out	water reaching the groundwater
			Monitoring carried out for different water specific variables with environmental impact (i.e. the temperature of the water discharged into the environment)	**I.89**.Frequently, all the variables of the water discharged into the environment are monitored (e.g. temperature)
		I.6.1.The quality (state) of the environmental factor - SOIL **(ITEMI: I.90 – I.91)**	Monitoring the various polluters reaching in the soil as a consequence of the activities carried out	**I.90**.Frequently, measurements are carried out regarding the soil polluting emissions at the level of the organization
			Monitoring carried out for different soil specific variables with environmental impact (e.g. the level of corrosion of the surface soil in a particular area)	**I.91**.Periodically, all the variables of the soil resulting from the activities carried out by the organization are monitored (e.g. the erosion of the surface soil on the organization emplacement)
		I.6.4.Relationship organization - population **(ITEM: I.92)**	Population growth rate in the local area or the region adjacent to the organization	**I.92**.The organization's emplacement in the vicinity of the local community favoured population growth in the area

		Relationship organization - flora **(ITEMI: I.93 – I.94)**	Specific measurements of the different variables for the specific species in the local area defined near the organization (habitat quality/ quantity of vegetation/ no and variety of species, , and so on).	**I.93**.The organization's activities caused in time the extinction of species belonging to the local flora **I.94**.It monitors periodically all the variables of the flora in the area neighbouring the organization (e.g. vegetation quality)
		Relationship organization - fauna **(ITEMI: I.95 – 96)**	Specific measurements of the different variables for the specific species in the local area defined near the organization (habitat quality/ no and variety of species, , and so on).	**I.95**.The organization's activities caused in time the extinction of species belonging to the local fauna **I.96**.It monitors periodically all the variables of the fauna in the area neighbouring the organization (e.g. the habitat quality)
II.Variables for **„Organizations orientation to environmental issues and implicitly in the EMS implementation and integration" (ITEMI: II.1 – II.74)**	II.1. Environmental strategic leadership (SL: SL.1+SL.2+SL.3+SL.4) **(ITEMS: II.1 – II.8)**	II.1.1.The organization vision (SL.1) **(ITEM: II.1)**	Environmental vision of the organization	**II.1**.The organization has established a clearly environmental vision
		II.1.2.The "flexibility"of the organizational structure (LS.2) **(ITEMS: II.2 – II.4)**		**II.2**. Changing the organizational structure of the company is an extremely difficult and time consuming process **II.3**.The dissolution/ establishment of departments does not constitute a process considered as beneficial to the organization process **II.4**.The regulations of our organization (e.g. ROF, ROI, , and so on) hardly allow the modification of the activities and responsibilities of managers / employees
		II.1.3.Objectives and targets of the organization (SL.3) **(ITEM: II.5)**	Environmental objectives and targets of the organization	**II.5**.The objectives and goals of the organization are clearly defined and should not be confused with the objectives and targets of the different management systems implemented
		II.1.4.Analysis and Assessment (SL.4) **(ITEMS: II.6 –**		**II.6**.All management systems implemented in the organization's are periodically subject to internal audits (internal audits) **II.7**.The information gained from internal audits of the environmental management system is used to improve its functioning

		II.8)		**II.8**.Periodically, environmental performance analyses and assessments are conducted at the level of the organization
	II.2. Environmental management of financial resource (FRM: FRM.1+FRM.2) **(ITEMS: II.9 – II.11)**	II.2.1.Budget allocation (FRM.1) **(ITEMS: II.9 – II.10)**	Environment budget allocation	**II.9**.The process of budget allocation at the level of the organization also include the environmental issues **II.10**.The level of financial resources allocated for the environment is enough only to solve current environmental problems
		II.2.2.Fund-raising (FRM.2) **(ITEM: II.11)**	Environmental projects of the organization	**II.11**.The organization has accessed (national/ European/ international , and so on) funds for various environmental projects
	II.3. Human resource management in environmental management (HRM: HRM.1+HRM.2+HRM.3+HRM.4) **(ITEMS: II.12 – II.20)**	II.3.1.Personnel (HRM.1) **(ITEMS: II.12 – II.16)**	Environmental specializations/ trainings , and so on	**II.12**.*The organization provides the employees the opportunity to attend environmental educational programs (trainings)* (knowledge internalization (KI) - environmental education opportunity) **II.13**.*The organization provides the managers the opportunity to attend university programs in the field of environment* (knowledge internalization (KI) - environmental education opportunity) **II.14**.*Environment trainings are aimed at using the best practice in environment tasks* (knowledge internalization (KI) - knowledge from environmental tasks **II.15**.The employees can trust one another at any time (level of trust)
			The engagement of the staff in the environment issues	**II.16**.The engagement of the staff in issues of environment management is active and real
		II.3.2.Responsibilities (HRM.2) **(ITEM: II.17)**	I.3.4.Environment responsibilities	**II.17**.The environmental responsibilities for various current actions are set on the spot by the responsible manager
		II.3.3.Reward system (HRM.3) **(ITEMS: II.18 – II.19)**	Relationship reward system - environment performance	**II.18**.Environmental performance is taken into consideration when computing the rewarding system of the employees **II.19**.The employees of the organization consider the reward to be even for their work (fair reward)
		II.3.4.Motivation (HRM.4) **(ITEM: II.20)**	Relationship employees' motivation - environment performance	**II.20**.Environmental performance is taken into consideration when deciding upon the employee's promotion
	II.4. Environmental informational management (IM: IM.1+IM.2+IM.3+IM.4) **(ITEMS: II.21 – II.50)**	II.4.1.Environmental decision-making system (IM.1) **(ITEMS: II.21 – II.29)**	I.3.4.Environmental decisions Decision methods used in the environmental decision-making (in terms of certainty /	**II.21**.The architect of all environmental decisions at the level of the organization is the environmental manager **II.22**.All environmental decisions taken at the level of the organization have as main objective compliance with environmental legal regulations **II.23**.The decisions regarding environmental protection are mainly based on the decision making agent's intuition

		uncertainty) (e.g. management decision-making methods: ELECTRE I, II, III, other methods) B. Quantification of the effect (environmental impact induced) of the decision-making variants (e.g. 1. methods: global pollution index, assessment charts; simple interaction matrix (Leopold's matrix); matrix method for the rapid assessment of environmental impact (MREA); the AMDEC method, other methods. 2.simulations of the alternative decisions' effects. 3. environmental decision databases. 4.environmental decision common practice	**II.24**.The most important coordinates of the environmental decision making process consists in the resources allocated by the organization (financial and human) **II.25**.The methods and techniques used in environmental decision-making are the same as in any decision made at the level of the organization **II.26**.*The existence of a database for any environmental decision made at the level of the organization would be a major advantage in the environmental decision making process* (Knowledge accumulation (KA)) **II.27**.The common practice in environmental decision-making can be considered a practice with positive effects in the environmental decision-making process **II.28**.The decentralization of environmental decision-making process would bring major benefits to the organization (each employee decides alone in the current environmental activities carried out, guided by an Environmental Code of Practice) **II.29**.The employees deem the organization management trustworthy (Leaders' trustworthiness)
	Environmental organizational informational system (IM.2) **(ITEMS: II.30 – II.38)**	I.3.4.Environmental information	**II.30**.The Information System (IS) of the organization allows awareness of everything that happens **II.31**.The information always reaches the departments it should reach **II.32**.The information received by the IS allows to identify all the factors that led to the emergence of an environmental issue **II.33**.All the environmental information transmitted by means of the IS reaches all the employees **II.34**.The documents specific to the environmental management and transmitted by means of the IS are drawn up by competent persons **II.35**.A manager involved in an environmental decision-making situation receives absolutely all the data and information collected in the field **II.36**.The environmental IS allows real-time communication between the employees/ managers of the organization **II.37**.*Brainstorming sessions are used at the level of the organization to distribute environmental information* (knowledge creation (KC) - the level of understanding the environmental task/ innovation (indirectly)) **II.38**.*The organization stores all the environmental information on the expertise resulting from the fulfilment of environmental tasks* (Knowledge accumulation (KA))
	II.4.3.The environmental knowledge management system (IM.3)	I.3.4.Environmental knowledge	**II.39**.The term "(environmental) knowledge management" is clearly understood by the organization managers **II.40**.The organization has an electronic board used to achieve the employees / managers environmental tasks (knowledge creation (KC) - the level of understanding the environmental task)

	(ITEMS: II.39 – II.47)		**II.41**.The employees/ managers of the organization have access to various electronic sources of environmental knowledge/ different environment software programs for solving the environmental tasks assigned (knowledge creation (KC) - the level of understanding the environmental task) **II.42**.The organization stores all the important documents (environmental laws/ environmental educational programs, , and so on.) that have been used to solve various environmental activities (knowledge accumulation (KA)) **II.43**.The employees/ managers' results obtained from environmental educational programs are stored by the organization (knowledge accumulation (KA)) **II.44**.Periodically, the organizations sets up meetings with the employees in order to present/ explain various methods and techniques for approaching the environmental issues (knowledge sharing (KS)) **II.45**.The organization promotes the use of internet and internal electronic bulletins to transfer various environmental information/ knowledge (knowledge sharing (KS)) **II.46**.In the efficient solving of the environmental tasks assigned to the employees/ managers, the organization has aceess to external databases (knowledge utilization (KU)) **II.47**.The organization encourages employees/ managers to participate in environmental knowledge exchanges (knowledge utilization (KU))
	Environmental monitoring and control (IM.4) **(ITEMS: II.48 – II.50)**	Monitoring the quality if the environmental management processes/ systems (a. Monitoring environmental practices / b. Monitoring environmental performance / c. Monitoring specific documents)	**I.48**.The organization has a system of environmental performance indicators **II.49**.*The organization monitors the degree to which the employee/ manager understood correctly the necessary basic knowledge to carry out the environmental tasks assigned* (knowledge creation (KC) - the level of understanding the environmental task) **II.50**.*The organization checks whether the manager explained correctly to the employees the environmental tasks assigned* (knowledge creation (KC) - the level of understanding the environmental task)
II.5. Systemic-technological "infrastructure" with impact on environmental management (ISTech.: ISTech.1+ ISTech.2) **(ITEMS: II.51 – II.56)**	II.5.1.Technological level (ISTech.1) **(ITEMS: II.51 – II.54)**	Clean technologies (technologies with a minimum negative impact on the environment)	**II.51**.The production process at the level of the organization makes intensive use of the natural resources **II.52**.The production process at the level of the organization produces (secondarily) a large quantity of waste **II.53**.The production process generates a considerable amount of emissions **II.54**.The orientation towards clean (non-polluting) technologies generates is an effect of the EMS implementation

		II.5.2.The existence of other management systems (ISTech.2) **(ITEMS: II.55 – II.56)**	The existence of the Quality Management System	**II.55**.A quality management system is implemented at the level of the organization (ISO 9001) **II.56**.The existence of the quality management system (ISO 9001) contributed positively to the implementation of the environmental management system (ISO 14001)
	II.6. Organization's orientation to the environmental innovation (CO: CO.1) **(ITEMI: II.57 – II.59)**	II.6.1.Innovation (CO.1) **(ITEMI: II.57 – II.59)**	Innovation at the level of the environmental processes/ environmental management system	**II.57**.The brainstorming technique is widely used by the organization in finding new ideas for improving the processes **II.58**.Working groups are periodically organized to discuss the possibility of improving the environmental procedures **II.59**.The employees/ managers' suggestions for improving the environmental activities carried out are always taken into consideration
	II.7. External environment with direct/ indirect implication in organization's environmental management (EE: EE.1+EE.2+EE.3) **(ITEMI: II.60 – II.74)**	II.7.1.Environmental regulations (EE.1) **(ITEM: II.60)**	Compliance with environmental regulations	**II.60**.The environmental regulations in force determined directly the organization's ISO 14001 certification
		II.7.2.Socio-economic context EE.2) **(ITEMS: II.61 – II.65)**	The sustainable context of the society economic development	**II.61**.The ISO 14001 certification of the competing companies determined the organization's certification with this standard also **II.62**.The massive existence on the common market of products from ISO 14001 certified companies determined the ISO 14001 certification of our organization **II.63**.The orientation of the financing of the priority development directions (national/ European) determined the organization's ISO 14001 certification)
			Social acceptance of the organization's activities	**II.64**.The activities carried out by the organization are accepted by the local community **II.65**.*The organization stores all feedback from the external environment* (Knowledge accumulation (KA))
		II.7.3.External stakeholders (and, indirectly, internal stakeholders) (EE.3) **(ITEMS: II.66 – II.74)**	The stakeholders' pressure in environmental issues	**II.66**.Consumers put "pressure" upon the organization, in order to raise its environmental awareness **II.67**.Suppliers put "pressure" upon the organization, in order to raise its environmental awareness **II.68**.The top management puts "pressure" upon the organization, in order to raise its environmental awareness **II.69**.The environmental management puts "pressure" upon the organization, in order to raise its environmental awareness **II.70**.The managers/ shareholders put "pressure" upon the organization, in order to raise its environmental awareness **II.71**.The employees put "pressure" upon the organization, in order to raise its environmental awareness **II.72**.The environmental state control bodies put "pressure" upon the organization, in order to raise its environmental awareness **II.73**.The environmental NGOs put "pressure" upon the organization, in order to raise its environmental awareness **II.74.**The neighbours in the close vicinity of the emplacement put "pressure" upon

			the organization, in order to raise its environmental awareness
III.General variables	III.1.Characteristics of the interview subject **(ITEMS: 1-4, 7, 8)**	III.1.1.Education level **(ITEM: 1)**	What is your education level? (options: ☐ graduate/ ☐ MA/ ☐ PhD/ ☐ post-doctoral)
		III.1.2.Age **(ITEM: 2)**	What is your age? (options: ☐ 18 – 25/ ☐ 26 – 35/ ☐ 36 – 45/ ☐ 46 – 55/ ☐ 56 – 65)
		III.1.3.Sex **(ITEM: 3)**	Sex (options: ☐ F/ ☐ M)
		III.1.4.Hierarchical level occupied within the organization **(ITEM: 4)**	The position you occupy at the level of the organization you work in (options: ☐ top management/ ☐ middle management/ ☐execution/ ☐ research/ ☐ academic)
		III.1.5.Level of the interviewee's expertise in the field of management **(ITEM: 7)**	The level of your management expertise falls within the following limits: (options: ☐ 0-5 years/ ☐ 5-10 years/ ☐ 10-15 years/ ☐ 15-20 years/ ☐ 20-25 years/ ☐ 25-30 years/ ☐ > 30 years)
		III.1.6.Level of the interviewee's expertise in the field of environmental management **(ITEM: 8)**	Please specify the level of your expertise in the field of environmental management: (options: ☐ 0-5 years/ ☐ 5-10 years/ ☐ 10-15 years/ ☐ 15-20 years/ ☐ 20-25 years/ ☐ 25-30 years/ ☐ > 30 years)
	III.2.General characteristics of the organization **(ITEMS: 5, 6, 9, I.97)**	III.2.1.The organization's field of activity **(ITEM: 5)**	What is the field of activity of your organization? (options: ☐ industrial/ ☐ agricultural/ ☐ services/ ☐ commercial/ ☐ non-profit (NGOs)/ ☐ academic)
		III.2.2.Size of the organization **(ITEM: 6)**	What is the size of your organization? (options: ☐ Small size business(1-10 employees)/ ☐Small company (11-25 employees)/ ☐ medium size company (26-50 employees)/ ☐Large company (51–250 employees)/ ☐ Very large company (>250 employees))
		III.2.3.The existence of an implemented Environmental management system at the level of the organization **(ITEM: 9)**	My organizationhas an implemented Environmental management system (EMS) (options: ☐ YES/ ☐ NO/ ☐I DO NOT KNOW)
		III.2.4. The time interval since the organization has been certified within the environmental issues area **(ITEM: I.97)**	How long has your organization been certified within the environmental issues area? (options: ☐ 0-1year /☐ 1-3 years/ ☐ 3-5 years/ ☐ 5-7 years/ ☐ 7-10 years/ ☐ > 10 years)

ANNEX No.2: Questionnaire: "researches regarding the consequences of the implementation/ integration of an EMS at organizations level"

Source: ©Herghiligiu Ionut Viorel & Lupu Mihaela Luminita

Questionnaire:
"Researches regarding the consequences of the implementation/ integration of an EMS at organization level"

This questionnaire composed only in statements was designed to be quickly and easily to fill in; supplementing it takes about 20 minutes. In this questionnaire doesn't exists good or bad answers, so please answer estimating each statement according to your knowledge and experience.
Your answers are very important for us and for this doctoral research undertaken to quantify the two major aspects:
1. "consequences of the Environmental management system implementation/ integration at the organisation level"
2. „organizations orientation to environmental issues and implicitly in the EMS implementation and integration"
The information provided by you in this questionnaire is strictly confidential; we will not make public any information, directly or indirectly, to identify your organization.
If we can assist you in completing this questionnaire please do not hesitate to contact us by e-mail: herghiligiuionut@gmail.com, or calling the phone number: 0749112567.
This investigation is a doctoral research undertaken on the Engineering and Management Department, "Gheorghe Asachi" Technical University of Iasi, Romania.

Thank you for participating!!!

I. "Consequences of the Environmental management system implementation/ integration at the organisation level"
1.Implementation of environmental policies and programs
2.Compliance with environmental regulations
3.Environmental financial performance
4.Environmental operational performance
5.The relationship with various external entities
6.The relationship between organizational activities and state of the environment

	Strongly disagree						Strongly agree
I.1. At organizational level, the environmental objectives and targets established are clearly defined	1	2	3	4	5	6	7
I.2.The job description does not allow me to get involved in the process of establishing the environmental objectives and targets	1	2	3	4	5	6	7
I.3.Not all the managers within the organization are involved in the process of establishing the environmental objectives and targets	1	2	3	4	5	6	7
I.4..In order to get involved in the process of establishing the environmental objectives and targets I need the consent of my superior	1	2	3	4	5	6	7
I.5.The environmental objectives and targets are strictly established by a team of specialists	1	2	3	4	5	6	7
I.6.The development of environmental objectives and targets is the strict responsibility of the environmental department	1	2	3	4	5	6	7
I.7.In the process of establishing the environmental objectives and targets, collaboration (team work) is highly encouraged	1	2	3	4	5	6	7

I.8.I do not hold all the information necessary to participate in the process of establishing the environmental objectives and targets	1	2	3	4	5	6	7
I.9.The documents containing the environmental objectives and targets are constantly monitored and controlled in order to be updated	1	2	3	4	5	6	7
I.10.The establishment, modification and updating of the environmental objectives and targets strictly at the level of the organization's departments/ units, guided by a general-directive set of environmental objectives and targets (strategic orienting), would bring in major benefits to the EMS effectiveness and functioning	1	2	3	4	5	6	7
I.11 The organization has a clearly and explicitly established environmental policy	1	2	3	4	5	6	7
I.12.My suggestions for improving the various environmental practices or procedures are taken into consideration	1	2	3	4	5	6	7
I.13.The organization takes into considerations the clients' suggestions concerning the environmental practices (various environmental procedures/ various environmental processes, and so on)	1	2	3	4	5	6	7
I.14.The organization carries out frequent meetings with the local community with a view to present various environmental reports (public information activities regarding the activities carried out)	1	2	3	4	5	6	7
I.15.The organization that I belong, has a long-term environment program	1	2	3	4	5	6	7
I.16. At the level of my organization there are multiple actions concerning the prevention of pollution	1	2	3	4	5	6	7
I.17. I participate actively in the decision-making process regarding the various measures on pollution prevention	1	2	3	4	5	6	7
I.18.With the environmental certification obtained by my organization, in my job description were added new environmental responsibilities and activities	1	2	3	4	5	6	7
I.19.The implementation of the Environment Management System led to adding new responsibilities and activities regarding the environmental protection only to some of the managers of the organization	1	2	3	4	5	6	7
I.20.The description of the new activities required by pollution prevention were mentioned in all the job descriptions of all employees	1	2	3	4	5	6	7
I.21.I am often checked with regards to the consistency of the environmental activities carried out and the duties provided in the job description	1	2	3	4	5	6	7
I.22.In order to be able to participate in various actions regarding pollution prevention I need the consent of my superior	1	2	3	4	5	6	7
I.23.The organization considers that the involvement of all employees in the environmental decision-making process constitutes an inefficient practice	1	2	3	4	5	6	7
I.24.The environmental decision making process at the level of the organization allows for involving the managers at different hierarchical levels	1	2	3	4	5	6	7
I.25.Pollution prevention at organization level is managed by a group of specialists)	1	2	3	4	5	6	7
I.26.The pollution prevention actions are the strict responsibility of the environmental department	1	2	3	4	5	6	7
I.27.Depending on the hierarchical level, the managers within the organization coordinate the different environmental activities	1	2	3	4	5	6	7
I.28.I am involved, together with my colleagues from various departments, in different actions regarding pollution prevention	1	2	3	4	5	6	7
I.29.I hold all the information necessary for carrying out the various actions aimed at preventing pollution	1	2	3	4	5	6	7
I.30.Only the staff at the level of the environmental management department has access to all the information regarding: environmental issues of the organization/ the environmental risk associated to the activity carried out/ the (procedural/ legal) non-compliance reports/ improvements achieved , and so on	1	2	3	4	5	6	7

I.31.The transfer of environmental information among the various departments of the organization is directed in a single direction: the environment department	1	2	3	4	5	6	7
I.32.Periodically, at the level of the organization, there are trainings aimed at raising the employees' awareness regarding environmental protection issues	1	2	3	4	5	6	7
I.33.All the employees of the organization have undergone a training session on the consequences of non-compliance with the environmental procedures	1	2	3	4	5	6	7
I.34.At the level of my organization, documents regarding the following issues are constantly developed and updated: a. environment strategies; b. environmental objectives and targets c. environment programs d. emergency situations	1	2	3	4	5	6	7
I.35.Compliance with the national environmental regulations in force represents a priority for the organization.	1	2	3	4	5	6	7
I.36.The organization has a history of fines from the competent bodies in environmental issues (The Environmental Protection Agency/ The Environmental Guard)	1	2	3	4	5	6	7
I.37. Compliance with the environmental legislation is one of the priority objectives of the environmental department (in case there is no environmental department: the environment rep.)	1	2	3	4	5	6	7
I.38.The internal rules of organization and functioning provides that compliance with the environment legislation is the responsibility of all employees	1	2	3	4	5	6	7
I.39.The organization constantly monitors the environment aspects of the activities carried out in order to comply with the legislation in force (Planning and control)	1	2	3	4	5	6	7
I.40.Annually, measurements are performed to determine the concentrations of the polluters resulting from the activities carried out	1	2	3	4	5	6	7
I.41.The environmental impact induced by the activities carried out by the organization is monitored and analysed depending on the budget allotted for the environment	1	2	3	4	5	6	7
I.42.The measurements in the field are performed through various specialised companies (third parties)	1	2	3	4	5	6	7
I.43.If the legislation in force regarding environmental issues were more permissive, the management costs associated to environmental issues resulting from the activities carried out would drop significantly	1	2	3	4	5	6	7
I.44.The high costs associated with the management of environmental issues are a consequence of the EMS implementation at organization level	1	2	3	4	5	6	7
I.45.The organization has and uses a system of environmental financial performance indicators	1	2	3	4	5	6	7
I.46.The organization carries out research/ development activities in environmental issues	1	2	3	4	5	6	7
I.47. The organization is among the organizations adopting new clean processes/ technologies	1	2	3	4	5	6	7
I.48.The organization has carried out environmental projects financed from own/ governmental/ European funds	1	2	3	4	5	6	7
I.49.Non-compliance with the environmental responsibilities of the employees as regards the adequate financial management of the budgets distributed to the environmental programs/ projects has legally regulated effects	1	2	3	4	5	6	7
I.50.The activities carried out at the level of the organization have in view solely financial benefits	1	2	3	4	5	6	7
I.51.Pursuing the environmental benefits is a negative consequence of the implementation of a EMS at the level of the organization	1	2	3	4	5	6	7
I.52.In the production process, the organization uses recycled/ reused materials	1	2	3	4	5	6	7

I.53.The organization has and uses a system of environmental operational performance indicators	1	2	3	4	5	6	7
I.54.The organization received fines for exceeding the maximum allowable rates of waste water discharged into the natural environment	1	2	3	4	5	6	7
I.55.The recirculation of the waste water at the level of the organization constitutes a priority in reducing the water consumption	1	2	3	4	5	6	7
I.56.The reintroduction of various raw materials in the production process is considered to be a deviation from the quality of the end product	1	2	3	4	5	6	7
I.57.The organization has concluded contracts with raw materials suppliers who use recycled/ reused materials in the process of production	1	2	3	4	5	6	7
I.58.In choosing the business partners, the organization takes into account the type of waste these organizations generate	1	2	3	4	5	6	7
I.59.The organization pays particular attention to dangerous waste	1	2	3	4	5	6	7
I.60.The organization monitors and analyses periodically the reports concerning the energy used per month/ per trimester/ per year	1	2	3	4	5	6	7
I.61.In the production process, the organization uses high quantities of electrical/ thermal energy	1	2	3	4	5	6	7
I.62.It is highly important that the organization reduces the consumption of energy used per activity/ product/ service for financial reasons	1	2	3	4	5	6	7
I.63.The equipment used at the level of the organization has a negative impact on the environment	1	2	3	4	5	6	7
I.64.The machines used by the organization is older than 15 years	1	2	3	4	5	6	7
I.65.In order to carry out its production activity in optimal conditions, the activity makes use of a large surface of land	1	2	3	4	5	6	7
I.66.The equipment used in the activity of the organization is fixed in case of major faults	1	2	3	4	5	6	7
I.67 The age and consumption of the vehicles in the fleet are not important as long as they are working properly	1	2	3	4	5	6	7
I.68.The vehicle fleet used in the activity of product/ service provision can be considered old	1	2	3	4	5	6	7
I.69.Within the production process, the organization does not use recycled products as raw materials	1	2	3	4	5	6	7
I.70.Within the design and realization of the products, the organization takes into consideration their life cycle	1	2	3	4	5	6	7
I.71.The faulty products resulted from the production process are reused to the extent to which the technological process allows it	1	2	3	4	5	6	7
I.72.The organization holds environmental permits only for the activities that involve the use of dangerous substances	1	2	3	4	5	6	7
I.73.After having obtained a single product unit, it results a considerable quantity of waste	1	2	3	4	5	6	7
I.74.Following the production process, it results a considerable quantity of waste per organization	1	2	3	4	5	6	7
I.75.Given the location, the noise does not constitute a problem	1	2	3	4	5	6	7
I.76. The organization received warnings from competent bodies due to the systematic environmental complaints from the neighboring	1	2	3	4	5	6	7
I.77.At organization level is required the modernization/ upgrading of some of the existing equipment since it produces appreciable amounts of pollutant emissions (in the AIR/ WATER/ SOIL)	1	2	3	4	5	6	7
I.78.The ratio between the quantity of pollutant emissions and the end product unit obtained is considered to be optimal, given the legislation in force	1	2	3	4	5	6	7
I.79.The controls carried out by the competent bodies in environmental issues (The Environmental Protection Agency / The Environmental Guard) often resulted in the application of fines	1	2	3	4	5	6	7

I.80.The organization is actively involved in various projects of the local community (community solidarity)	1	2	3	4	5	6	7
I.81.Many of the organization employees were recruited from the local community	1	2	3	4	5	6	7
I.82.The organization allows carrying out the post-secondary/ undergraduate students' practical training (where possible).	1	2	3	4	5	6	7
I.83.Only the organization's decision-makers/ top management decide upon all the aspects involved in the environmental issue	1	2	3	4	5	6	7
I.84.Frequent measurements are carried out at the level of the noise caused by the emplacement of the organization	1	2	3	4	5	6	7
I.85.Frequently, measurements are carried out regarding air polluting emissions polluters at the level of the organization	1	2	3	4	5	6	7
I.86.The modernization/ re-technologization of some facilities could improve substantially the relationship with the state environment authority	1	2	3	4	5	6	7
I.87.Frequently, measurements are carried out regarding the water polluting emissions at the level of the organization	1	2	3	4	5	6	7
I.88.The competent environment bodies have fined several times the organization for exceeding the maximum allowable rates of polluting substances in the waste water reaching the groundwater	1	2	3	4	5	6	7
I.89.Frequently, all the variables of the water discharged into the environment are monitored (e.g. temperature)	1	2	3	4	5	6	7
I.90.Frequently, measurements are carried out regarding the soil polluting emissions at the level of the organization	1	2	3	4	5	6	7
I.91.Periodically, all the variables of the soil resulting from the activities carried out by the organization are monitored (e.g. the erosion of the surface soil on the organization emplacement)	1	2	3	4	5	6	7
I.92.The organization's emplacement in the vicinity of the local community favored population growth in the area	1	2	3	4	5	6	7
I.93.The organization's activities caused in time the extinction of species belonging to the local flora	1	2	3	4	5	6	7
I.94.It monitors periodically all the variables of the flora in the area neighboring the organization (e.g. vegetation quality)	1	2	3	4	5	6	7
I.95.The organization's activities caused in time the extinction of species belonging to the local fauna	1	2	3	4	5	6	7
I.96.It monitors periodically all the variables of the fauna in the area neighbouring the organization (e.g. the habitat quality)	1	2	3	4	5	6	7
I. 97. How long is your organisation certified with ISO 14001)? ▪ 0-1ani ▪ 1-3 years ▪ 3-5 years ▪ 5-7 years ▪ 7-10 years ▪ > 10 years							

II. Organizations orientation to environmental issues and implicitly in the EMS implementation and integration"

II.1. Environmental strategic leadership
II.2. Environmental management of financial resource
II.3. Human resource management in environmental management
II.4. Environment informational management
II.5. Systemic-technological "infrastructure" with impact on environmental
II.6. Organization's orientation to the environmental innovation
II.7. External environment with direct/ indirect implication in organization's environmental management

	Strongly disagree						Strongly agree
II.1.The organization has a clearly established and expressed outlook on	1	2	3	4	5	6	7

environmental issues							
II.2. Changing the organizational structure of the company is an extremely difficult and time consuming process	1	2	3	4	5	6	7
II.3.The dissolution/ establishment of departments does not constitute a process considered as beneficial to the organization process	1	2	3	4	5	6	7
II.4.The regulations of our organization hardly allow the modification of the activities and responsibilities of managers/ employees	1	2	3	4	5	6	7
II.5.The objectives and goals of the organization are clearly defined and should not be confused with the objectives and targets of the different management systems implemented	1	2	3	4	5	6	7
II.6.All management systems implemented in the organization's are periodically subject to internal audits	1	2	3	4	5	6	7
II.7.The information gained from internal audits of the environmental management system is used to improve its functioning	1	2	3	4	5	6	7
II.8.Periodically, environmental performance analyses and assessments are conducted at the level of the organization	1	2	3	4	5	6	7
II.9.The process of budget allocation at the level of the organization also include the environmental issues	1	2	3	4	5	6	7
II.10.The level of financial resources allocated for the environment is enough only to solve current environmental problems	1	2	3	4	5	6	7
II.11.The organization has accessed (national/ European/ international , and so on) funds for various environmental projects	1	2	3	4	5	6	7
II.12.The organization provides the employees the opportunity to attend environmental educational programs	1	2	3	4	5	6	7
II.13.The organization provides the managers the opportunity to attend university programs in the field of environment	1	2	3	4	5	6	7
II.14.Environment trainings are aimed at using the best practice in environment tasks	1	2	3	4	5	6	7
II.15.The employees can trust one another at any time	1	2	3	4	5	6	7
II.16.The engagement of the staff in issues of environment management is active and real	1	2	3	4	5	6	7
II.17.The environmental responsibilities for various current actions are set on the spot by the responsible manager	1	2	3	4	5	6	7
II.18.Environmental performance is taken into consideration when computing the rewarding system of the employees	1	2	3	4	5	6	7
II.19.The employees of the organization consider the reward to be even for their work (fair reward)	1	2	3	4	5	6	7
II.20.Environmental performance is taken into consideration when deciding upon the employee's promotion	1	2	3	4	5	6	7
II.21.The architect of all environmental decisions at the level of the organization is the environmental manager	1	2	3	4	5	6	7
II.22.All environmental decisions taken at the level of the organization have as main objective compliance with environmental legal regulations	1	2	3	4	5	6	7
II.23.The decisions regarding environmental protection are mainly based on the decision making agent's intuition	1	2	3	4	5	6	7
II.24.The most important coordinates of the environmental decision making process consists in the resources allocated by the organization (financial and human)	1	2	3	4	5	6	7
II.25.The methods and techniques used in environmental decision-making are the same as in any decision made at the level of the organization	1	2	3	4	5	6	7
II.26.The existence of a database for any environmental decision made at the level of the organization would be a major advantage in the environmental decision making process	1	2	3	4	5	6	7

II.27.The common practice in environmental decision-making can be considered a practice with positive effects in the environmental decision-making process	1	2	3	4	5	6	7
II.28.The decentralization of environmental decision-making process would bring major benefits to the organization (each employee decides alone in the current environmental activities carried out, guided by an Environmental Code of Practice)	1	2	3	4	5	6	7
II.29.The employees deem the organization management trustworthy	1	2	3	4	5	6	7
II.30.The Information System (IS) of the organization allows awareness of everything that happens	1	2	3	4	5	6	7
II.31.The information always reaches the departments it should reach	1	2	3	4	5	6	7
II.32.The information received by the IS allows to identify all the factors that led to the emergence of an environmental issue	1	2	3	4	5	6	7
II.33.All the environmental information transmitted by means of the IS reaches all the employees	1	2	3	4	5	6	7
II.34.The documents specific to the environmental management and transmitted by means of the IS are drawn up by competent persons	1	2	3	4	5	6	7
II.35.A manager involved in an environmental decision-making situation receives absolutely all the data and information collected in the field	1	2	3	4	5	6	7
II.36.The environmental IS allows real-time communication between the employees/ managers of the organization	1	2	3	4	5	6	7
II.37.Brainstorming sessions are used at the level of the organization to distribute environmental information	1	2	3	4	5	6	7
II.38.The organization stores all the environmental information on the expertise resulting from the fulfillment of environmental tasks	1	2	3	4	5	6	7
II.39.The term "(environmental) knowledge management" is clearly understood by the organization managers	1	2	3	4	5	6	7
II.40.The organization has an electronic board used to achieve the employees / managers environmental tasks	1	2	3	4	5	6	7
II.41.The employees/ managers of the organization have access to various electronic sources of environmental knowledge/ different environment software	1	2	3	4	5	6	7
II.42.The organization stores all the important documents (environmental laws/ environmental educational programs, , and so on.) that have been used to solve various environmental activities	1	2	3	4	5	6	7
II.43.The employees/ managers' results obtained from environmental educational programs are stored by the organization	1	2	3	4	5	6	7
II.44.Periodically, the organizations sets up meetings with the employees in order to present/ explain various methods and techniques for approaching the environmental issues	1	2	3	4	5	6	7
II.45.The organization promotes the use of internet and internal electronic bulletins to transfer various environmental information/ knowledge	1	2	3	4	5	6	7
II.46.In the efficient solving of the environmental tasks assigned to the employees/ managers, the organization has access to external databases	1	2	3	4	5	6	7
II.47.The organization encourages employees/ managers to participate in environmental knowledge exchanges	1	2	3	4	5	6	7
II.48.The organization has a system of environmental performance indicators	1	2	3	4	5	6	7
II.49.The organization monitors the degree to which the employee/ manager understood correctly the necessary basic knowledge to carry out the environmental tasks assigned	1	2	3	4	5	6	7
II.50.The organization checks whether the manager explained correctly to the employees the environmental tasks assigned	1	2	3	4	5	6	7
II.51.The production process at the level of the organization makes intensive use of the natural resources	1	2	3	4	5	6	7

II.52.The production process at the level of the organization produces (secondarily) a large quantity of waste	1	2	3	4	5	6	7
II.53.The production process generates a considerable amount of emissions	1	2	3	4	5	6	7
II.54.The orientation towards clean (non-polluting) technologies generates is an effect of the EMS implementation	1	2	3	4	5	6	7
II.55.A quality management system is implemented at the level of the organization (ISO 9001)	1	2	3	4	5	6	7
II.56.The existence of the quality management system (ISO 9001) contributed positively to the implementation of the environmental management system (ISO 14001)	1	2	3	4	5	6	7
II.57.The brainstorming technique is widely used by the organization in finding new ideas for improving the processes	1	2	3	4	5	6	7
II.58.Working groups are periodically organized to discuss the possibility of improving the environmental procedures	1	2	3	4	5	6	7
II.59.The employees/ managers' suggestions for improving the environmental activities carried out are always taken into consideration	1	2	3	4	5	6	7
II.60.The environmental regulations in force determined directly the organization's ISO 14001 certification	1	2	3	4	5	6	7
II.61.The ISO 14001 certification of the competing companies determined the organization's certification with this standard also	1	2	3	4	5	6	7
II.62.The massive existence on the common market of products from ISO 14001 certified companies determined the ISO 14001 certification of our organization	1	2	3	4	5	6	7
II.63.The orientation of the financing of the priority development directions (national/ European) determined the organization's ISO 14001 certification)	1	2	3	4	5	6	7
II.64.The activities carried out by the organization are accepted by the local community	1	2	3	4	5	6	7
II.65.The organization stores all feedback from the external environment	1	2	3	4	5	6	7
II.66.Consumers put "pressure" upon the organization, in order to raise its environmental awareness	1	2	3	4	5	6	7
II.67.Suppliers put "pressure" upon the organization, in order to raise its environmental awareness	1	2	3	4	5	6	7
II.68.The top management puts "pressure" upon the organization, in order to raise its environmental awareness	1	2	3	4	5	6	7
II.69.The environmental management puts "pressure" upon the organization, in order to raise its environmental awareness	1	2	3	4	5	6	7
II.70.The managers/ shareholders put "pressure" upon the organization, in order to raise its environmental awareness	1	2	3	4	5	6	7
II.71.The employees put "pressure" upon the organization, in order to raise its environmental awareness	1	2	3	4	5	6	7
II.72.The environmental state control bodies put "pressure" upon the organization, in order to raise its environmental awareness	1	2	3	4	5	6	7
II.73.The environmental NGOs put "pressure" upon the organization, in order to raise its environmental awareness	1	2	3	4	5	6	7
II.74. The neighbors in the close vicinity of the emplacement put "pressure" upon the organization, in order to raise its environmental awareness	1	2	3	4	5	6	7

III. Characteristics of the interview person

1. What is the level of your studies?
   - graduate
   - MA

2. Your age is?
   - 18 – 25
   - 26 - 35

▪ PhD ▪ post-doctoral)	▪ 36 – 45 ▪ 46 – 55 ▪ 56 – 65
3. Sex: ▪ F ▪ M	4. Hierarchical level occupied within the organization: ▪ top management ▪ middle management ▪ execution management ▪ research ▪ academic
5. What is the level of the organization's field of activity? ▪ industrial ▪ agricultural ▪ services ▪ commercial ▪ nonprofit (ONG'uri) ▪ academic	6. What is the size of the organization? ▪ Small size business(1-10 employees) ▪ Small company (11-25 employees) ▪ medium size company (26-50 employees) ▪ Large company (51–250 employees) ▪ Very large company (>250 employees)
7. What is your level of expertise in the field of management: ▪ 0-5 years ▪ 5-10 years ▪ 10-15 years ▪ 15-20 years ▪ 20-25 years ▪ 25-30 years ▪ > 30 years	8. What is your level of expertise in the field of environmental management (as environmental manager/ or as manager involved in various environmental activities) ▪ 0-5 years ▪ 5-10 years ▪ 10-15 years ▪ 15-20 years ▪ 20-25 years ▪ 25-30 years ▪ > 30 years
9. My organizations has implemented an Environmental management system ▪ Yes ▪ No ▪ I do not know	

ANNEX No.3: Testing the internal consistency of the research variables and their associated descriptive values

1.Testing the internal consistency of the variable „Implementation of environmental policies and programs"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	176	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,734	34

2.Testing the internal consistency of the variable „Compliance with environmental regulations"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	176	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,65	8

3.Testing the internal consistency of the variable „Environmental financial performance"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	176	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,729	9

4.Testing the internal consistency of the variable „Environmental operational performance"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	176	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,595	27

5. Testing the internal consistency of the variable „The relationship with various external entities"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	176	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,061	5

6. Testing the internal consistency of the variable „The relationship between organizational activities and state of the environment"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	176	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,832	13

7.Testing the internal consistency of the variable „Environmental strategic leadership"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	171	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,471	8

8.Testing the internal consistency of the variable „Environmental management of financial resources"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	171	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,717	3

9. Testing the internal consistency of the variable „Human resource management in environmental management"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	171	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,860	9

10.Testing the internal consistency of the variable „Environmental informational management"

Case Processing Summary

		N	%
Cases	Valid	170	99,4
	Excluded[a]	1	,6
	Total	171	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,900	30

11.Testing the internal consistency of the variable „Systemic-technological "infrastructure" with impact on environmental"

Case Processing Summary

		N	%
Cases	Valid	170	99,4
	Excluded[a]	1	,6
	Total	171	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,177	6

12.Testing the internal consistency of the variable „Organization's orientation to the environmental innovation"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	171	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,904	3

13. Testing the internal consistency of the variable „External environment with direct/ indirect implication in organization's environmental management"

Case Processing Summary

		N	%
Cases	Valid	171	100,0
	Excluded[a]	0	,0
	Total	171	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,736	15

14. Descriptive values regarding the „Organizational consequences of EMS implementation and integration"

Statistics

		I.1	I.2	I.3	I.4	I.5	I.6
N	Valid	171	171	171	171	171	171
	Missing	0	0	0	0	0	0
Mean		5,0332	5,2098	3,8012	3,9963	4,1368	3,8255
Std. Deviation		,55374	,60279	,99002	,53085	,82133	,97543

15. Descriptive values regarding the **„**Organizations orientation to environmental issues and implicitly in the EMS implementation and integration**"**

Statistics

		II.1	II.2	II.3	II.4	II.5	II.6	II.7
N	Valid	171	171	171	171	171	171	171
	Missing	0	0	0	0	0	0	0
Mean		4,9598	3,9591	4,6121	5,1147	4,6834	4,5556	4,4172
Std. Deviation		,63197	1,56481	1,14531	,74216	,61177	1,65288	,72532

ANNEX No.4: Correlation analyses between „Organizational consequences of EMS implementation and integration" variables set and „Organizations orientation to environmental issues and implicitly in the EMS implementation and integration" variables set

1.Correlation analysis between **„**Environmental strategic leadership**"** and the variables that define the EMS implementation/ integration quality

Correlations

			II.1	I.1	I.2	I.3	I.4	I.5	I.6
Spearman's rho	II.1	Correlation Coefficient	1,000	,460**	,508**	,561**	,396**	,452**	,659**
		Sig. (2-tailed)	.	,000	,000	,000	,000	,000	,000
		N	171	171	171	171	171	171	171
	I.1	Correlation Coefficient	,460**	1,000	,643**	,675**	,043	,436**	,785**
		Sig. (2-tailed)	,000	.	,000	,000	,580	,000	,000
		N	171	171	171	171	171	171	171
	I.2	Correlation Coefficient	,508**	,643**	1,000	,437**	,173*	,377**	,534**
		Sig. (2-tailed)	,000	,000	.	,000	,024	,000	,000
		N	171	171	171	171	171	171	171
	I.3	Correlation Coefficient	,561**	,675**	,437**	1,000	,393**	,606**	,665**
		Sig. (2-tailed)	,000	,000	,000	.	,000	,000	,000
		N	171	171	171	171	171	171	171
	I.4	Correlation Coefficient	,396**	,043	,173*	,393**	1,000	,338**	,092
		Sig. (2-tailed)	,000	,580	,024	,000	.	,000	,233
		N	171	171	171	171	171	171	171
	I.5	Correlation Coefficient	,452**	,436**	,377**	,606**	,338**	1,000	,417**
		Sig. (2-tailed)	,000	,000	,000	,000	,000	.	,000
		N	171	171	171	171	171	171	171
	I.6	Correlation Coefficient	,659**	,785**	,534**	,665**	,092	,417**	1,000
		Sig. (2-tailed)	,000	,000	,000	,000	,233	,000	.
		N	171	171	171	171	171	171	171

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

2.Correlation analysis between „Environmental management of financial resources" and the variables that define the EMS implementation/ integration quality

Correlations

			II.2	I.1	I.2	I.3	I.4	I.5	I.6
Spearman's rho	II.2	Correlation Coefficient	1,000	,722**	,378**	,813**	,105	,530**	,841**
		Sig. (2-tailed)	.	,000	,000	,000	,173	,000	,000
		N	171	171	171	171	171	171	171
	I.1	Correlation Coefficient	,722**	1,000	,643**	,675**	,043	,436**	,785**
		Sig. (2-tailed)	,000	.	,000	,000	,580	,000	,000
		N	171	171	171	171	171	171	171
	I.2	Correlation Coefficient	,378**	,643**	1,000	,437**	,173*	,377**	,534**
		Sig. (2-tailed)	,000	,000	.	,000	,024	,000	,000
		N	171	171	171	171	171	171	171
	I.3	Correlation Coefficient	,813**	,675**	,437**	1,000	,393**	,606**	,665**
		Sig. (2-tailed)	,000	,000	,000	.	,000	,000	,000
		N	171	171	171	171	171	171	171
	I.4	Correlation Coefficient	,105	,043	,173*	,393**	1,000	,338**	,092
		Sig. (2-tailed)	,173	,580	,024	,000	.	,000	,233
		N	171	171	171	171	171	171	171
	I.5	Correlation Coefficient	,530**	,436**	,377**	,606**	,338**	1,000	,417**
		Sig. (2-tailed)	,000	,000	,000	,000	,000	.	,000
		N	171	171	171	171	171	171	171
	I.6	Correlation Coefficient	,841**	,785**	,534**	,665**	,092	,417**	1,000
		Sig. (2-tailed)	,000	,000	,000	,000	,233	,000	.
		N	171	171	171	171	171	171	171

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

3.Correlation analysis between „Human resource management in environmental management" and the variables that define the EMS implementation/ integration quality

Correlations

			II.3	I.1	I.2	I.3	I.4	I.5	I.6
Spearman's rho	II.3	Correlation Coefficient	1,000	,593**	,501**	,593**	,097	,682**	,636**
		Sig. (2-tailed)	.	,000	,000	,000	,206	,000	,000
		N	171	171	171	171	171	171	171
	I.1	Correlation Coefficient	,593**	1,000	,643**	,675**	,043	,436**	,785**
		Sig. (2-tailed)	,000	.	,000	,000	,580	,000	,000
		N	171	171	171	171	171	171	171
	I.2	Correlation Coefficient	,501**	,643**	1,000	,437**	,173*	,377**	,534**
		Sig. (2-tailed)	,000	,000	.	,000	,024	,000	,000
		N	171	171	171	171	171	171	171
	I.3	Correlation Coefficient	,593**	,675**	,437**	1,000	,393**	,606**	,665**
		Sig. (2-tailed)	,000	,000	,000	.	,000	,000	,000
		N	171	171	171	171	171	171	171
	I.4	Correlation Coefficient	,097	,043	,173*	,393**	1,000	,338**	,092
		Sig. (2-tailed)	,206	,580	,024	,000	.	,000	,233
		N	171	171	171	171	171	171	171
	I.5	Correlation Coefficient	,682**	,436**	,377**	,606**	,338**	1,000	,417**
		Sig. (2-tailed)	,000	,000	,000	,000	,000	.	,000
		N	171	171	171	171	171	171	171
	I.6	Correlation Coefficient	,636**	,785**	,534**	,665**	,092	,417**	1,000
		Sig. (2-tailed)	,000	,000	,000	,000	,233	,000	.
		N	171	171	171	171	171	171	171

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.Correlation analysis between „Environmental informational management”and the variables that define the EMS implementation/ integration quality

Correlations

			II.4	I.1	I.2	I.3	I.4	I.5	I.6
Spearman's rho	II.4	Correlation Coefficient	1,000	,732**	,667**	,472**	-,006	,567**	,744**
		Sig. (2-tailed)	.	,000	,000	,000	,939	,000	,000
		N	171	171	171	171	171	171	171
	I.1	Correlation Coefficient	,732**	1,000	,643**	,675**	,043	,436**	,785**
		Sig. (2-tailed)	,000	.	,000	,000	,580	,000	,000
		N	171	171	171	171	171	171	171
	I.2	Correlation Coefficient	,667**	,643**	1,000	,437**	,173*	,377**	,534**
		Sig. (2-tailed)	,000	,000	.	,000	,024	,000	,000
		N	171	171	171	171	171	171	171
	I.3	Correlation Coefficient	,472**	,675**	,437**	1,000	,393**	,606**	,665**
		Sig. (2-tailed)	,000	,000	,000	.	,000	,000	,000
		N	171	171	171	171	171	171	171
	I.4	Correlation Coefficient	-,006	,043	,173*	,393**	1,000	,338**	,092
		Sig. (2-tailed)	,939	,580	,024	,000	.	,000	,233
		N	171	171	171	171	171	171	171
	I.5	Correlation Coefficient	,567**	,436**	,377**	,606**	,338**	1,000	,417**
		Sig. (2-tailed)	,000	,000	,000	,000	,000	.	,000
		N	171	171	171	171	171	171	171
	I.6	Correlation Coefficient	,744**	,785**	,534**	,665**	,092	,417**	1,000
		Sig. (2-tailed)	,000	,000	,000	,000	,233	,000	.
		N	171	171	171	171	171	171	171

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

5.Correlation analysis between „Systemic-technological "infrastructure" with impact on environmental" and the variables that define the EMS implementation/ integration quality

Correlations

			II.5	I.1	I.2	I.3	I.4	I.5	I.6
Spearman's rho	II.5	Correlation Coefficient	1,000	,216**	,302**	,221**	,399**	,501**	,009
		Sig. (2-tailed)	.	,005	,000	,004	,000	,000	,903
		N	171	171	171	171	171	171	171
	I.1	Correlation Coefficient	,216**	1,000	,643**	,675**	,043	,436**	,785**
		Sig. (2-tailed)	,005	.	,000	,000	,580	,000	,000
		N	171	171	171	171	171	171	171
	I.2	Correlation Coefficient	,302**	,643**	1,000	,437**	,173*	,377**	,534**
		Sig. (2-tailed)	,000	,000	.	,000	,024	,000	,000
		N	171	171	171	171	171	171	171
	I.3	Correlation Coefficient	,221**	,675**	,437**	1,000	,393**	,606**	,665**
		Sig. (2-tailed)	,004	,000	,000	.	,000	,000	,000
		N	171	171	171	171	171	171	171
	I.4	Correlation Coefficient	,399**	,043	,173*	,393**	1,000	,338**	,092
		Sig. (2-tailed)	,000	,580	,024	,000	.	,000	,233
		N	171	171	171	171	171	171	171
	I.5	Correlation Coefficient	,501**	,436**	,377**	,606**	,338**	1,000	,417**
		Sig. (2-tailed)	,000	,000	,000	,000	,000	.	,000
		N	171	171	171	171	171	171	171
	I.6	Correlation Coefficient	,009	,785**	,534**	,665**	,092	,417**	1,000
		Sig. (2-tailed)	,903	,000	,000	,000	,233	,000	.
		N	171	171	171	171	171	171	171

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

6.Correlation analysis between „Organization's orientation to the environmental innovation" and the variables that define the EMS implementation/ integration quality

Correlations

			II.6	I.1	I.2	I.3	I.4	I.5	I.6
Spearman's rho	II.6	Correlation Coefficient	1,000	,479**	,498**	,342**	-,124	,294**	,642**
		Sig. (2-tailed)	.	,000	,000	,000	,105	,000	,000
		N	171	171	171	171	171	171	171
	I.1	Correlation Coefficient	,479**	1,000	,643**	,675**	,043	,436**	,785**
		Sig. (2-tailed)	,000	.	,000	,000	,580	,000	,000
		N	171	171	171	171	171	171	171
	I.2	Correlation Coefficient	,498**	,643**	1,000	,437**	,173*	,377**	,534**
		Sig. (2-tailed)	,000	,000	.	,000	,024	,000	,000
		N	171	171	171	171	171	171	171
	I.3	Correlation Coefficient	,342**	,675**	,437**	1,000	,393**	,606**	,665**
		Sig. (2-tailed)	,000	,000	,000	.	,000	,000	,000
		N	171	171	171	171	171	171	171
	I.4	Correlation Coefficient	-,124	,043	,173*	,393**	1,000	,338**	,092
		Sig. (2-tailed)	,105	,580	,024	,000	.	,000	,233
		N	171	171	171	171	171	171	171
	I.5	Correlation Coefficient	,294**	,436**	,377**	,606**	,338**	1,000	,417**
		Sig. (2-tailed)	,000	,000	,000	,000	,000	.	,000
		N	171	171	171	171	171	171	171
	I.6	Correlation Coefficient	,642**	,785**	,534**	,665**	,092	,417**	1,000
		Sig. (2-tailed)	,000	,000	,000	,000	,233	,000	.
		N	171	171	171	171	171	171	171

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

7.Correlation analysis between **„**External environment with direct/ indirect implication in organization's environmental management**"** and the variables that define the EMS implementation/ integration quality

Correlations

			II.7	I.1	I.2	I.3	I.4	I.5	I.6
Spearman's rho	II.7	Correlation Coefficient	1,000	,030	-,028	-,213**	,076	,199**	,075
		Sig. (2-tailed)	.	,692	,718	,005	,326	,009	,330
		N	171	171	171	171	171	171	171
	I.1	Correlation Coefficient	,030	1,000	,643**	,675**	,043	,436**	,785**
		Sig. (2-tailed)	,692	.	,000	,000	,580	,000	,000
		N	171	171	171	171	171	171	171
	I.2	Correlation Coefficient	-,028	,643**	1,000	,437**	,173*	,377**	,534**
		Sig. (2-tailed)	,718	,000	.	,000	,024	,000	,000
		N	171	171	171	171	171	171	171
	I.3	Correlation Coefficient	-,213**	,675**	,437**	1,000	,393**	,606**	,665**
		Sig. (2-tailed)	,005	,000	,000	.	,000	,000	,000
		N	171	171	171	171	171	171	171
	I.4	Correlation Coefficient	,076	,043	,173*	,393**	1,000	,338**	,092
		Sig. (2-tailed)	,326	,580	,024	,000	.	,000	,233
		N	171	171	171	171	171	171	171
	I.5	Correlation Coefficient	,199**	,436**	,377**	,606**	,338**	1,000	,417**
		Sig. (2-tailed)	,009	,000	,000	,000	,000	.	,000
		N	171	171	171	171	171	171	171
	I.6	Correlation Coefficient	,075	,785**	,534**	,665**	,092	,417**	1,000
		Sig. (2-tailed)	,330	,000	,000	,000	,233	,000	.
		N	171	171	171	171	171	171	171

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

ANNEX No.5: Regression analysis between specific factors that characterizes the „Organizations orientation to environmental issues and implicitly in the EMS implementation and integration" and the variable "*Implementation of environmental policies and programs*" – that characterizes the EMS implementation/ integration quality

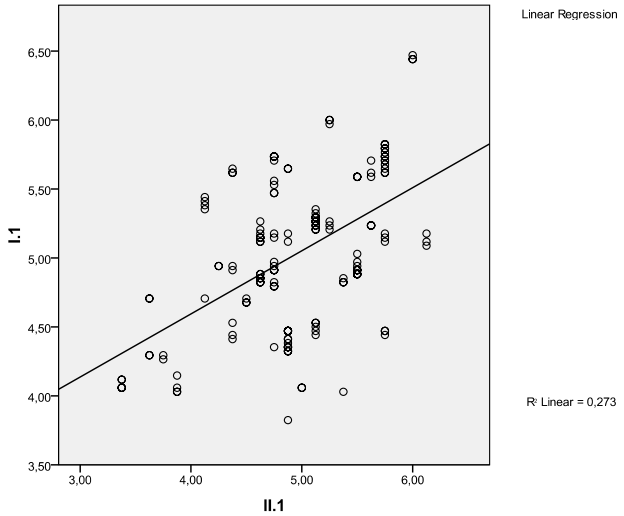


Figure 1. The relationship between "*Implementation of environmental policies and programs*"variable and *„Environmental strategic leadership"* variable

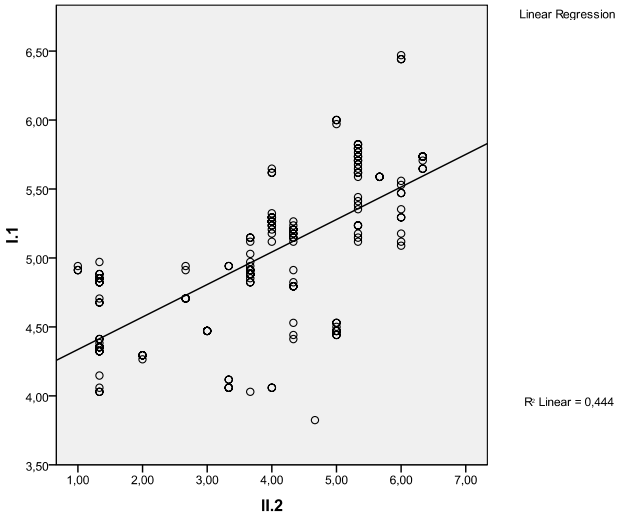


Figure 2. The relationship between "*Implementation of environmental policies and programs*"variable and *„Environmental management of financial resources"* variable

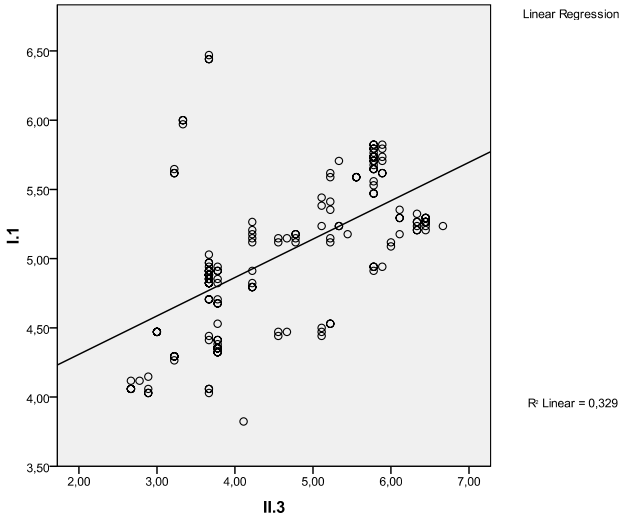


Figure 3. The relationship between "*Implementation of environmental policies and programs*"variable and *„Human resource management in environmental management"* variable

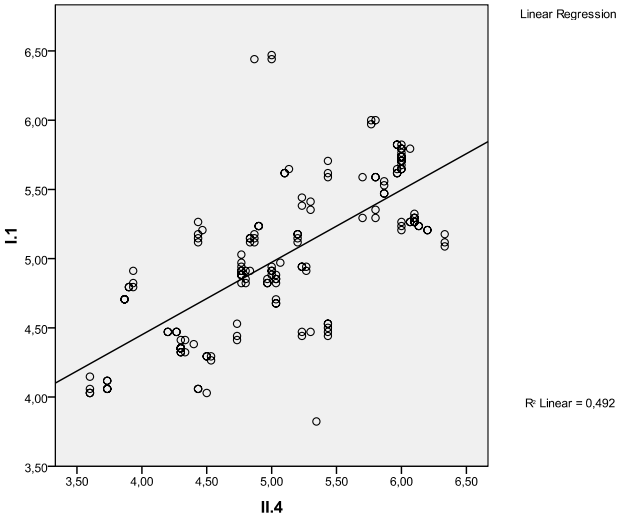


Figure 4. The relationship between "*Implementation of environmental policies and programs*"variable and *„Environmental informational management"* variable

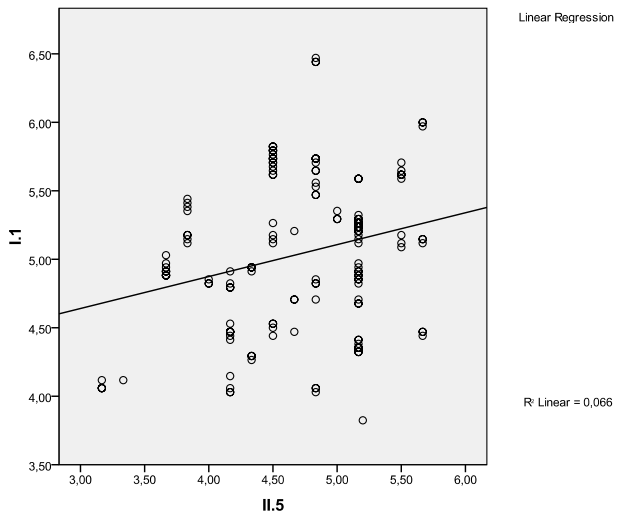


Figure 5. The relationship between "*Implementation of environmental policies and programs*"variable and **„***Systemic-technological "infrastructure" with impact on environmental***"**variable

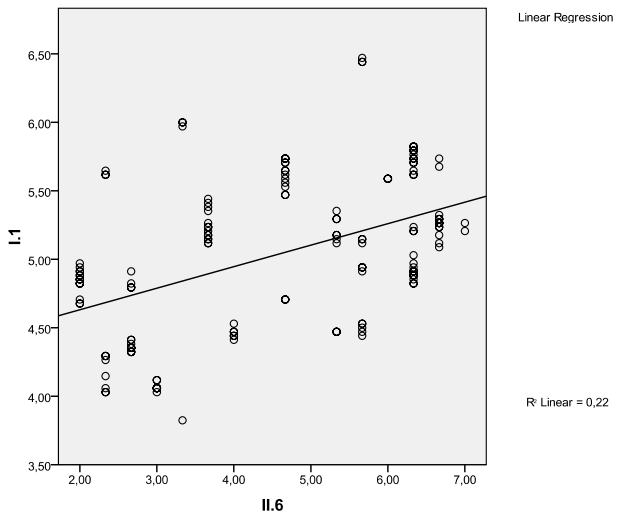


Figure 6. The relationship between "*Implementation of environmental policies and programs*"variable and **„***Organization's orientation to the environmental innovation***"** variable

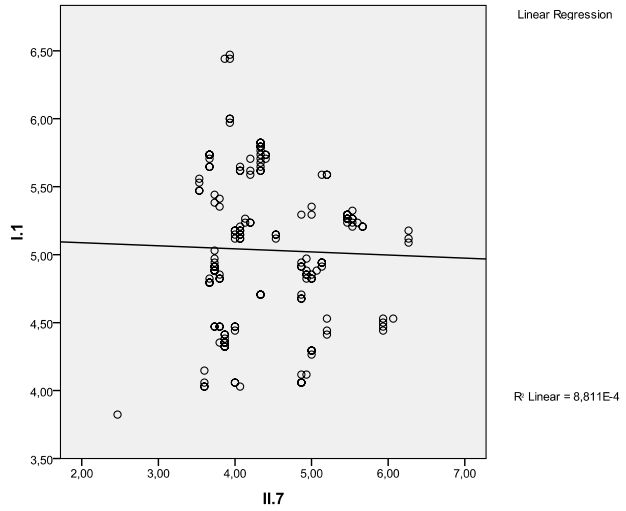


Figure 7. The relationship between "*Implementation of environmental policies and programs*"variable and **„***External environment with direct/ indirect implication in organization's environmental management***"** variable

Table 1 Testing regression models

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33,837	7	4,834	43,079	,000[a]
	Residual	18,290	163	,112		
	Total	52,127	170			
2	Regression	33,837	6	5,639	50,565	,000[b]
	Residual	18,291	164	,112		
	Total	52,127	170			
3	Regression	33,756	5	6,751	60,634	,000[c]
	Residual	18,372	165	,111		
	Total	52,127	170			
4	Regression	33,530	4	8,383	74,825	,000[d]
	Residual	18,597	166	,112		
	Total	52,127	170			
5	Regression	33,317	3	11,106	98,599	,000[e]
	Residual	18,810	167	,113		
	Total	52,127	170			

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.5, II.2, II.3, II.6, II.4

c. Predictors: (Constant), II.7, II.5, II.2, II.3, II.4

d. Predictors: (Constant), II.7, II.5, II.2, II.4

e. Predictors: (Constant), II.7, II.2, II.4

f. Dependent Variable: I.1

Table 2 Model parameters estimation

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2,742	,297		9,220	,000	2,155	3,329		
	II.1	,004	,063	,004	,058	,954	-,120	,128	,419	2,388
	II.2	,112	,025	,317	4,549	,000	,064	,161	,442	2,262
	II.3	-,072	,047	-,148	-1,542	,125	-,164	,020	,232	4,305
	II.4	,490	,074	,656	6,617	,000	,344	,636	,219	4,571
	II.5	,089	,061	,098	1,459	,147	-,032	,210	,473	2,115
	II.6	,020	,029	,058	,679	,498	-,037	,077	,291	3,442
	II.7	-,193	,045	-,253	-4,318	,000	-,281	-,105	,629	1,590
2	(Constant)	2,750	,263		10,462	,000	2,231	3,269		
	II.2	,113	,024	,318	4,617	,000	,064	,161	,451	2,217
	II.3	-,072	,046	-,150	-1,589	,114	-,162	,018	,242	4,140
	II.4	,490	,073	,657	6,733	,000	,347	,634	,225	4,454
	II.5	,091	,054	,100	1,669	,097	-,017	,198	,594	1,684
	II.6	,021	,024	,061	,852	,395	-,027	,068	,415	2,412
	II.7	-,194	,042	-,254	-4,560	,000	-,278	-,110	,691	1,447
3	(Constant)	2,786	,259		10,752	,000	2,275	3,298		
	II.2	,116	,024	,328	4,832	,000	,069	,163	,464	2,155
	II.3	-,063	,044	-,130	-1,422	,157	-,150	,024	,258	3,883
	II.4	,507	,070	,679	7,229	,000	,368	,645	,242	4,136
	II.5	,069	,048	,076	1,438	,152	-,026	,163	,768	1,302
	II.7	-,190	,042	-,249	-4,498	,000	-,273	-,106	,699	1,430
4	(Constant)	2,928	,240		12,205	,000	2,455	3,402		
	II.2	,105	,023	,297	4,606	,000	,060	,150	,518	1,932
	II.4	,446	,055	,597	8,038	,000	,336	,555	,389	2,568
	II.5	,066	,048	,073	1,380	,170	-,028	,160	,769	1,300
	II.7	-,204	,041	-,267	-4,940	,000	-,285	-,122	,738	1,355
5	(Constant)	3,104	,204		15,219	,000	2,701	3,507		
	II.2	,097	,022	,273	4,386	,000	,053	,140	,557	1,795
	II.4	,478	,050	,641	9,497	,000	,379	,577	,475	2,106
	II.7	-,203	,041	-,266	-4,922	,000	-,285	-,122	,738	1,355

a. Dependent Variable: I.1

ANNEX No.6: Regression analysis between specific factors that characterizes the „Organizations orientation to environmental issues and implicitly in the EMS implementation and integration" and the variable *„Compliance with environmental regulations"* – that characterizes the EMS implementation/ integration quality

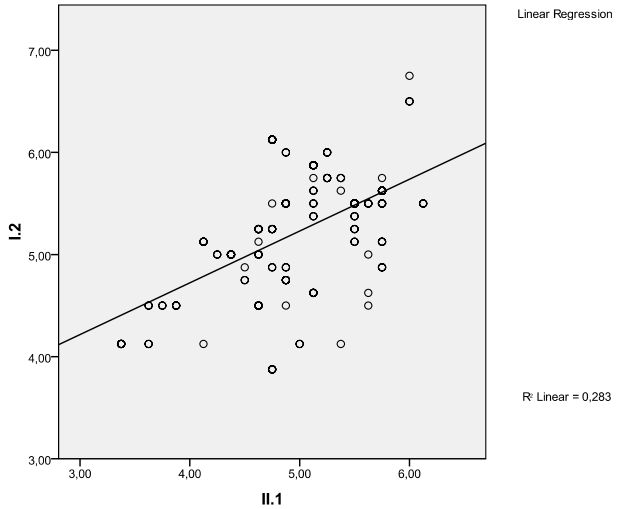


Figure 1. The relationship between *„Compliance with environmental regulations"*variable and *„Environmental strategic leadership"* variable

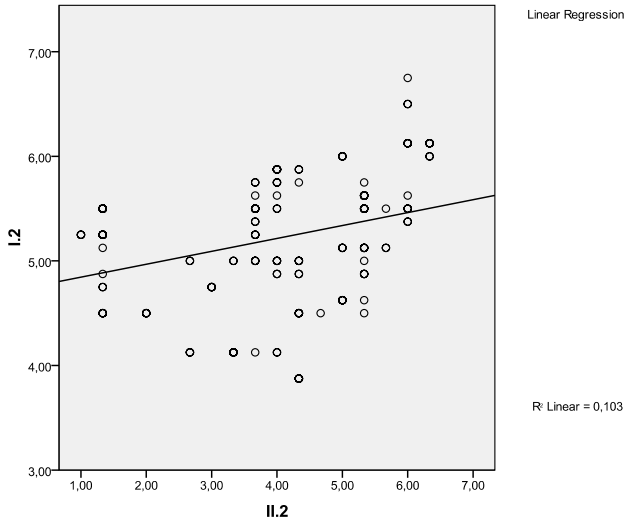


Figure 2. The relationship between *„Compliance with environmental regulations"*variable and *„Environmental management of financial resources"* variable

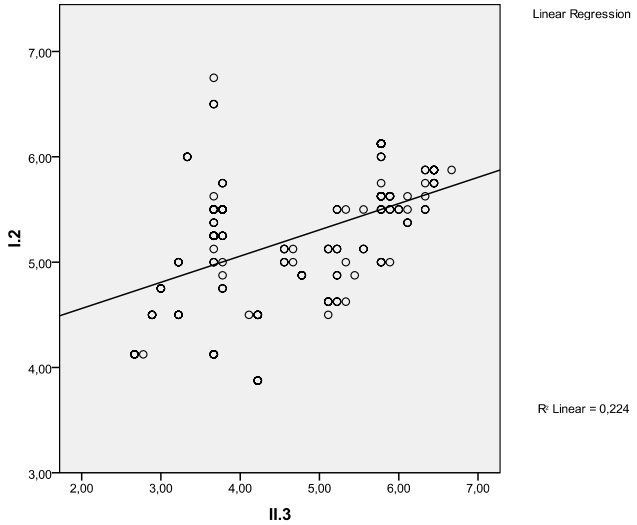


Figure 3. The relationship between *„Compliance with environmental regulations"*variable and *„Human resource management in environmental management"* variable

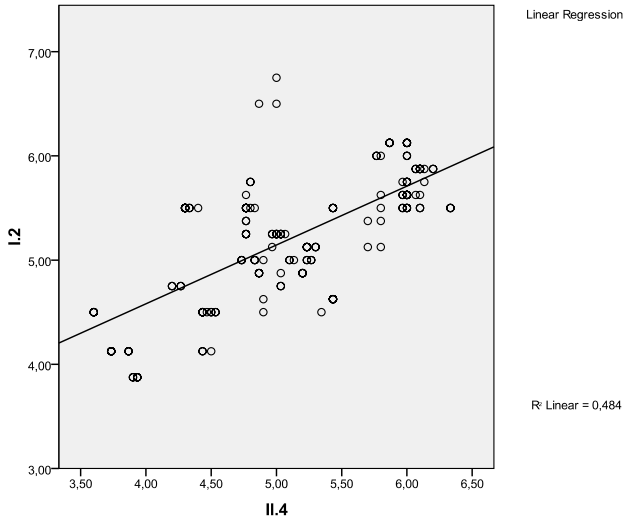


Figure 4. The relationship between *„Compliance with environmental regulations"*variable and *„Environmental informational management"* variable

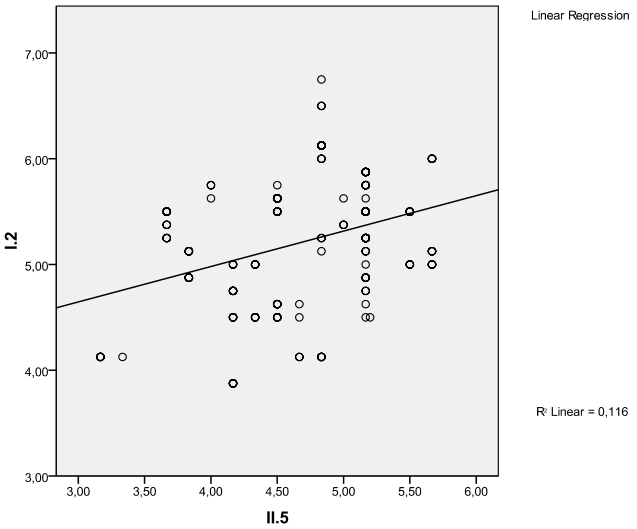


Figure 5. The relationship between *„Compliance with environmental regulations”*variable and *„Systemic-technological "infrastructure" with impact on environmental”* variable

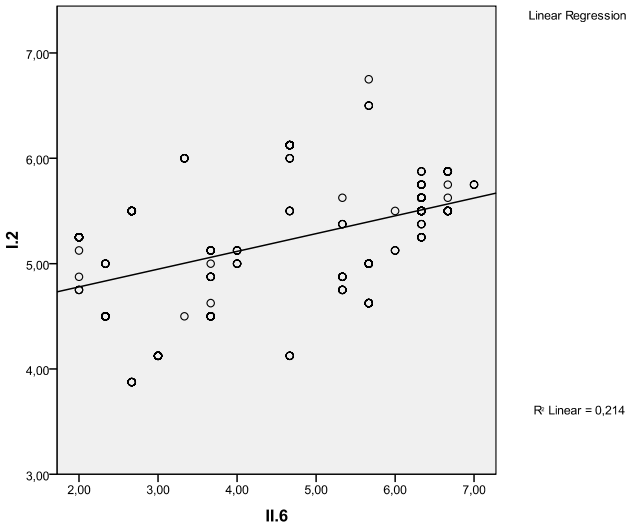


Figure 6. The relationship between *„Compliance with environmental regulations”*variable and *„Organization's orientation to the environmental innovation”* variable

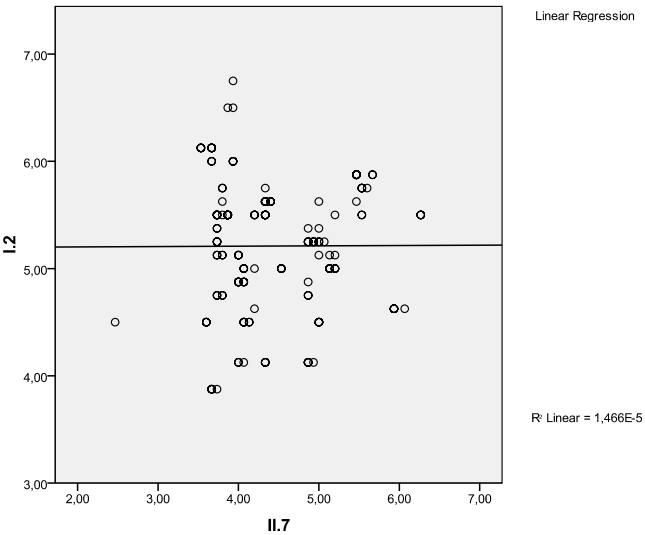


Figure 7. The relationship between *„Compliance with environmental regulations”*variable and *„External environment with direct/ indirect implication in organization's environmental management”* variable

Table 1 Testing regression models

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	42,220	7	6,031	50,288	,000[a]
	Residual	19,550	163	,120		
	Total	61,770	170			
2	Regression	42,203	6	7,034	58,954	,000[b]
	Residual	19,567	164	,119		
	Total	61,770	170			

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.5, II.2, II.3, II.6, II.4

c. Dependent Variable: I.2

Table 2 Model parameters estimation

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2,243	,307		7,293	,000		
	II.1	,025	,065	,026	,377	,706	,419	2,388
	II.2	-,122	,026	-,317	-4,779	,000	,442	2,262
	II.3	-,164	,048	-,312	-3,416	,001	,232	4,305
	II.4	,836	,077	1,029	10,922	,000	,219	4,571
	II.5	,164	,063	,167	2,601	,010	,473	2,115
	II.6	,117	,030	,320	3,920	,000	,291	3,442
	II.7	-,337	,046	-,406	-7,300	,000	,629	1,590
2	(Constant)	2,296	,272		8,446	,000		
	II.2	-,121	,025	-,313	-4,786	,000	,451	2,217
	II.3	-,168	,047	-,319	-3,569	,000	,242	4,140
	II.4	,840	,075	1,035	11,154	,000	,225	4,454
	II.5	,175	,056	,178	3,115	,002	,594	1,684
	II.6	,123	,025	,337	4,942	,000	,415	2,412
	II.7	-,342	,044	-,412	-7,793	,000	,691	1,447

a. Dependent Variable: I.2

ANNEX No.7: Regression analysis between specific factors that characterizes the „Organizations orientation to environmental issues and implicitly in the EMS implementation and integration" and the variable *„Environmental financial performance"* – that characterizes the EMS implementation/ integration quality

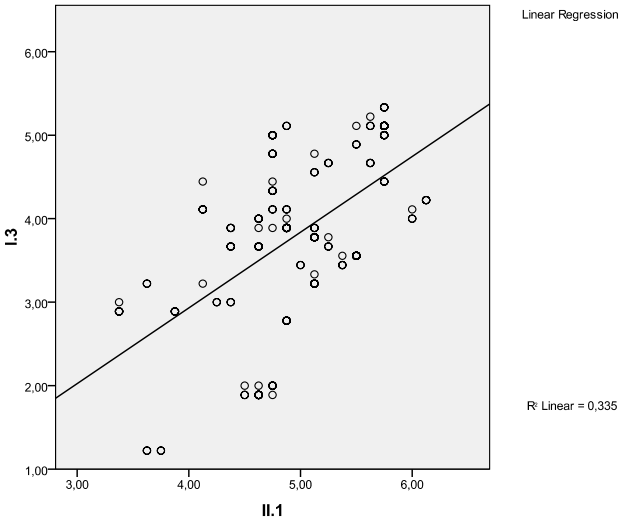


Figure 1. The relationship between *„Environmental financial performance"*variable and *„Environmental strategic leadership"* variable

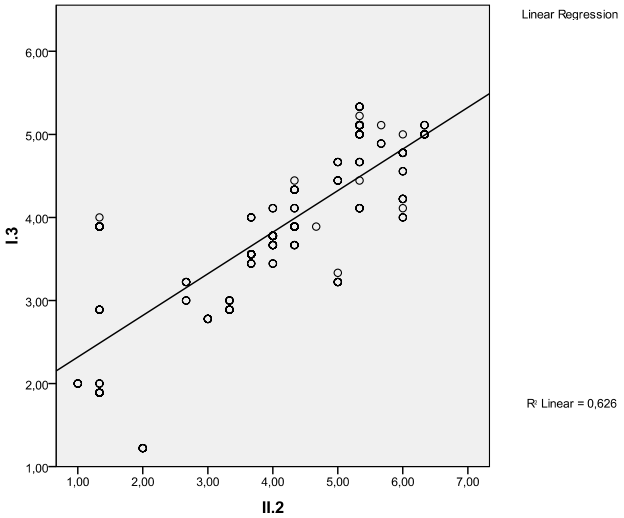


Figure 2. The relationship between *„Environmental financial performance"*variable and *„Environmental management of financial resources"* variable

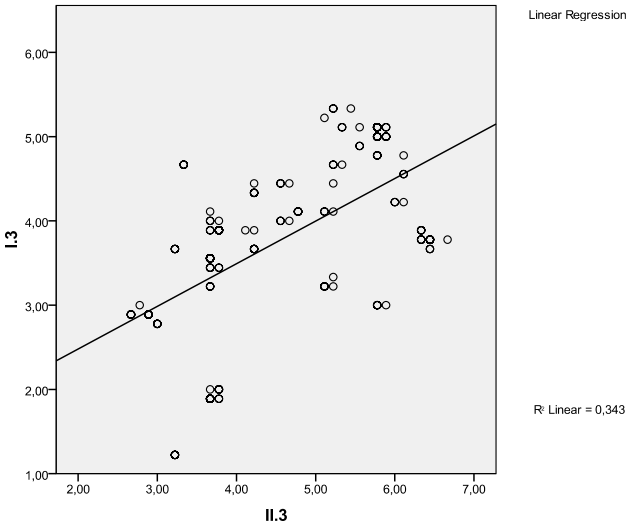


Figure 3. The relationship between *„Environmental financial performance"*variable and *„Human resource management in environmental management"* variable

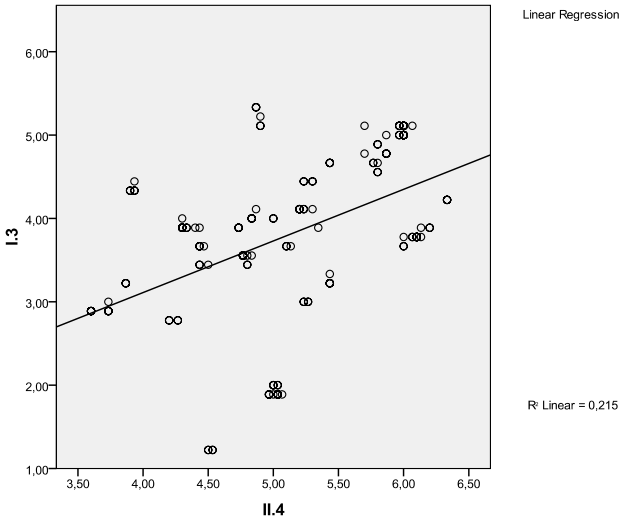


Figure 4. The relationship between *„Environmental financial performance"*variable and *„Environmental informational management"* variable

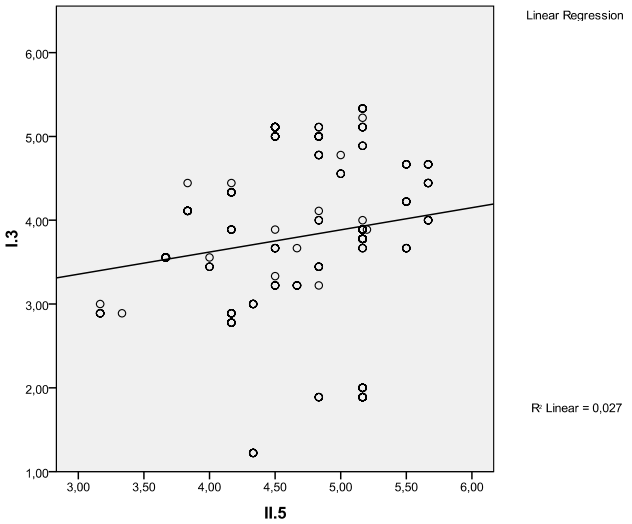


Figure 5. The relationship between *„Environmental financial performance"*variable and *„Systemic-technological "infrastructure" with impact on environmental"* variable

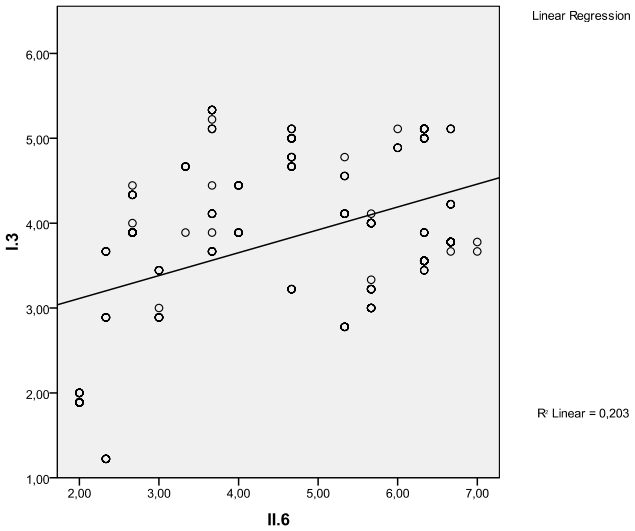


Figure 6. The relationship between between *„Environmental financial performance"*variable and *„Organization's orientation to the environmental innovation"* variable

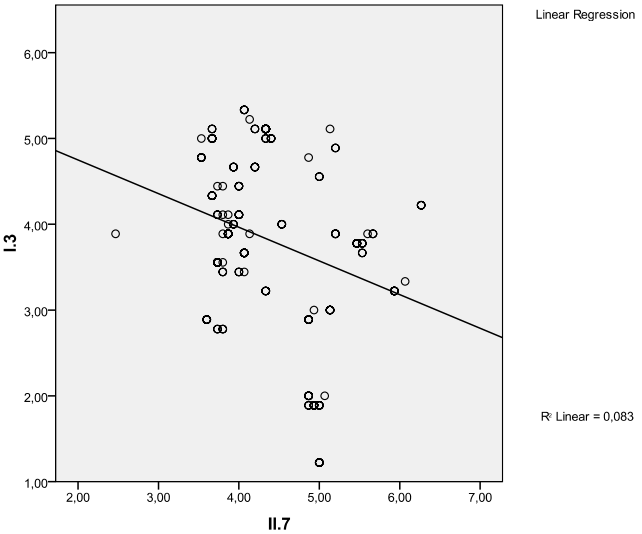


Figure 7. The relationship between *„Environmental financial performance"*variable and *„External environment with direct/ indirect implication in organization's environmental management"* variable

Table 1 Testing regression models

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	139,282	7	19,897	118,627	,000[a]
	Residual	27,340	163	,168		
	Total	166,622	170			
2	Regression	139,280	6	23,213	139,231	,000[b]
	Residual	27,343	164	,167		
	Total	166,622	170			

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.4

c. Dependent Variable: I.3

Table 2 Model parameters estimation

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2,222	,364		6,111	,000		
	II.1	,321	,077	,205	4,173	,000	,419	2,388
	II.2	,343	,030	,542	11,362	,000	,442	2,262
	II.3	,470	,057	,544	8,264	,000	,232	4,305
	II.4	-,452	,090	-,339	-4,997	,000	,219	4,571
	II.5	,225	,075	,139	3,019	,003	,473	2,115
	II.6	-,004	,035	-,007	-,126	,900	,291	3,442
	II.7	-,512	,055	-,375	-9,373	,000	,629	1,590
2	(Constant)	2,228	,359		6,201	,000		
	II.1	,315	,064	,201	4,918	,000	,597	1,674
	II.2	,343	,030	,542	11,410	,000	,444	2,254
	II.3	,468	,054	,542	8,683	,000	,257	3,887
	II.4	-,454	,089	-,340	-5,074	,000	,223	4,490
	II.5	,231	,059	,143	3,890	,000	,742	1,347
	II.7	-,514	,053	-,376	-9,744	,000	,671	1,490

a. Dependent Variable: I.3

ANNEX No.8: Regression analysis between specific factors that characterizes the „Organizations orientation to environmental issues and implicitly in the EMS implementation and integration" and the variable *„Environmental operational performance"* – that characterizes the EMS implementation/ integration quality

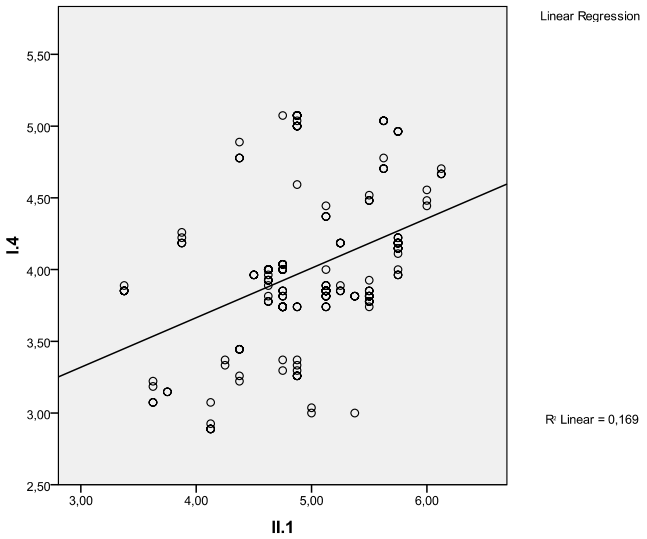


Figure 1. The relationship between *„Environmental operational performance"*variable and *„Environmental strategic leadership"* variable

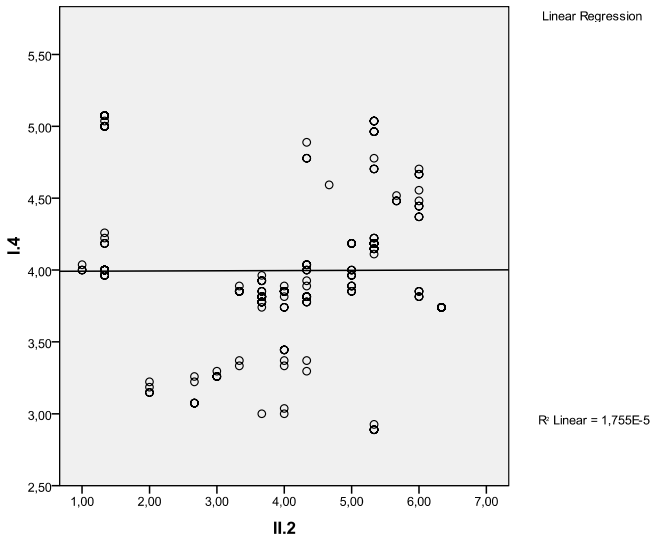


Figure 2. The relationship between *„Environmental operational performance"*variable and *„Environmental management of financial resources"* variable

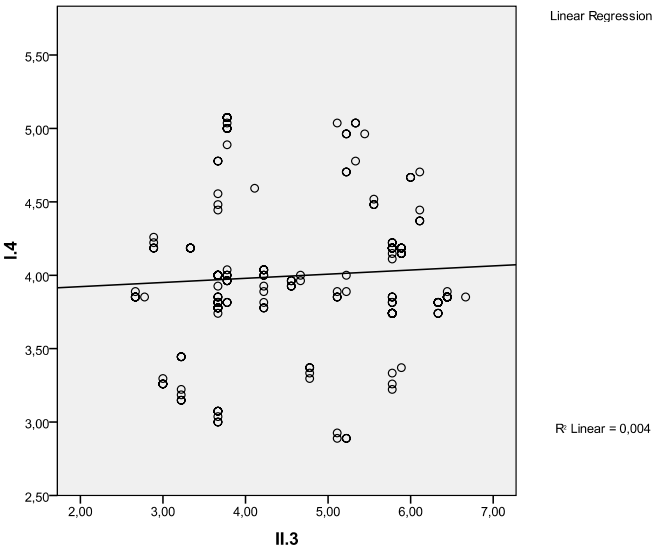


Figure 3. The relationship between *„Environmental operational performance"*variable and *„Human resource management in environmental management"* variable

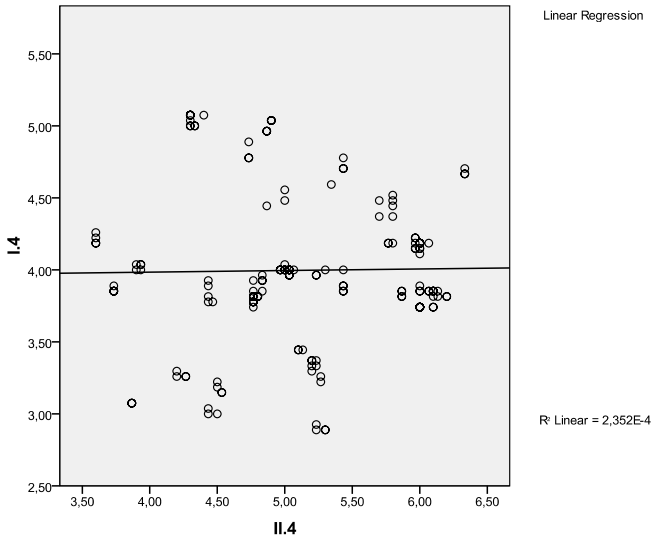


Figure 4. The relationship between *„Environmental operational performance"*variable and *„Environmental informational management"* variable

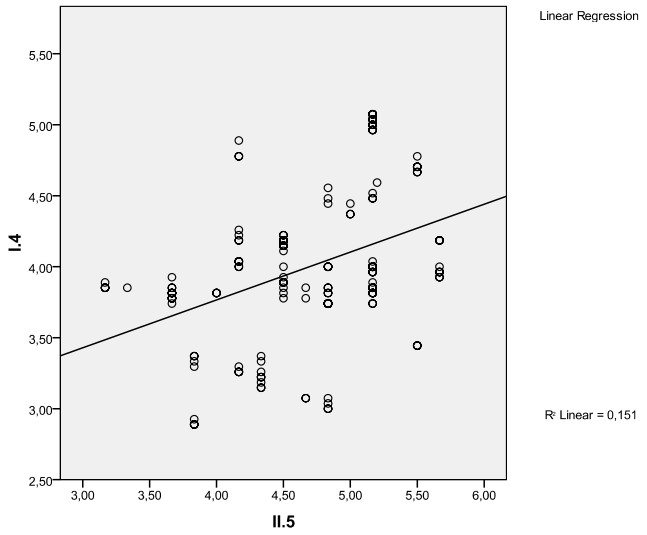


Figure 5. The relationship between **„***Environmental operational performance***”**variable and **„***Systemic-technological "infrastructure" with impact on environmental***”** variable

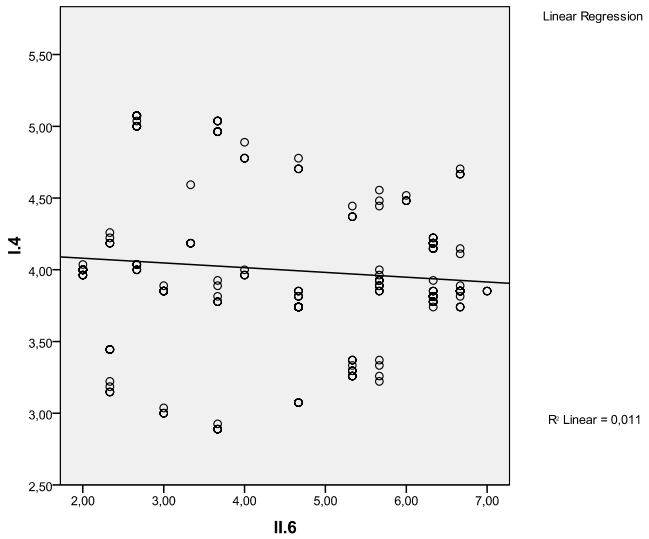


Figure 6. The relationship between between **„***Environmental operational performance***”**variable and **„***Organization's orientation to the environmental innovation***”** variable

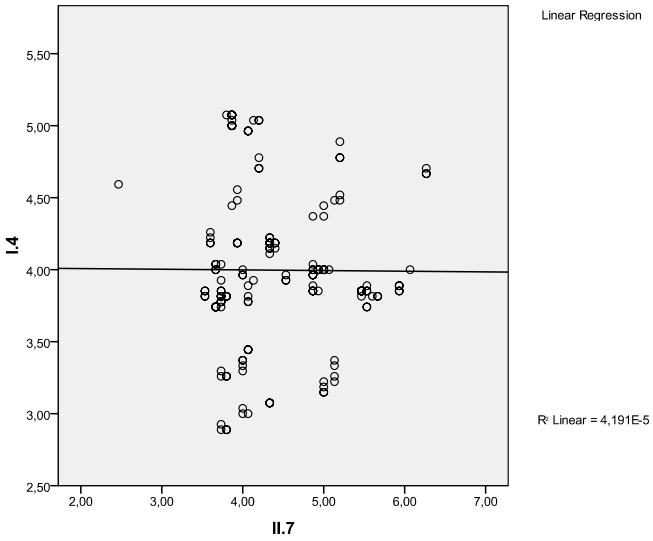


Figure 7. The relationship between **„***Environmental operational performance***”**variable and **„***External environment with direct/ indirect implication in organization's environmental management***”** variable

Table 1 Testing regression models

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21,519	7	3,074	18,990	,000[a]
	Residual	26,387	163	,162		
	Total	47,906	170			
2	Regression	21,516	6	3,586	22,285	,000[b]
	Residual	26,390	164	,161		
	Total	47,906	170			

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.1, II.5, II.3, II.6, II.4

c. Dependent Variable: I.4

Table 2 Model parameters estimation

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,533	,357		4,290	,000
	II.1	,651	,075	,775	8,630	,000
	II.2	-,004	,030	-,012	-,136	,892
	II.3	,162	,056	,350	2,900	,004
	II.4	-,402	,089	-,562	-4,520	,000
	II.5	,162	,073	,186	2,202	,029
	II.6	-,144	,035	-,447	-4,146	,000
	II.7	,103	,054	,141	1,919	,057
2	(Constant)	1,529	,355		4,304	,000
	II.1	,650	,074	,774	8,724	,000
	II.3	,160	,053	,345	2,994	,003
	II.4	-,405	,086	-,566	-4,691	,000
	II.5	,164	,072	,188	2,279	,024
	II.6	-,144	,034	-,448	-4,175	,000
	II.7	,105	,050	,144	2,098	,037

a. Dependent Variable: I.4

ANNEX No.9: Regression analysis between specific factors that characterizes the „Organizations orientation to environmental issues and implicitly in the EMS implementation and integration" and the variable *„The relationship with various external entities"* – that characterizes the EMS implementation/ integration quality

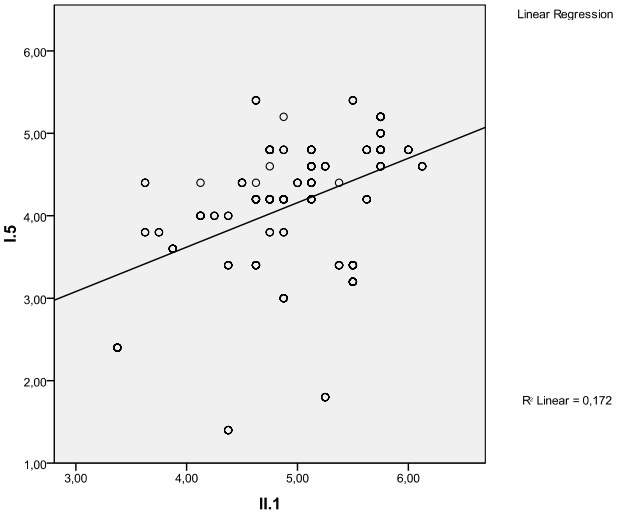


Figure 1. The relationship between *„The relationship with various external entities"*variable and *„Environmental strategic leadership"* variable

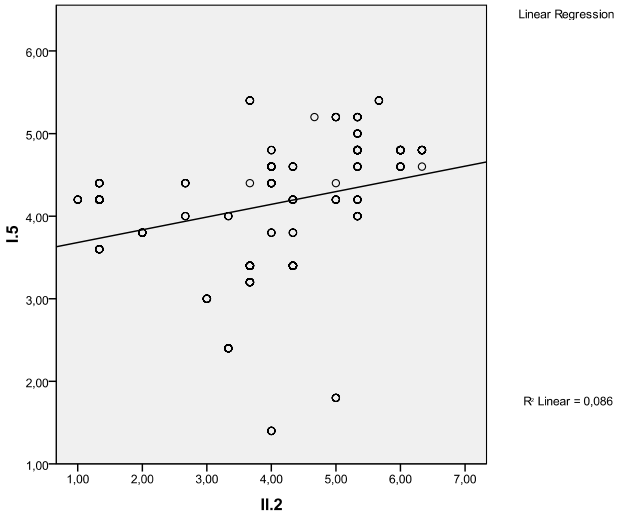


Figure 2. The relationship between *„The relationship with various external entities"*variable and *„Environmental management of financial resources"* variable

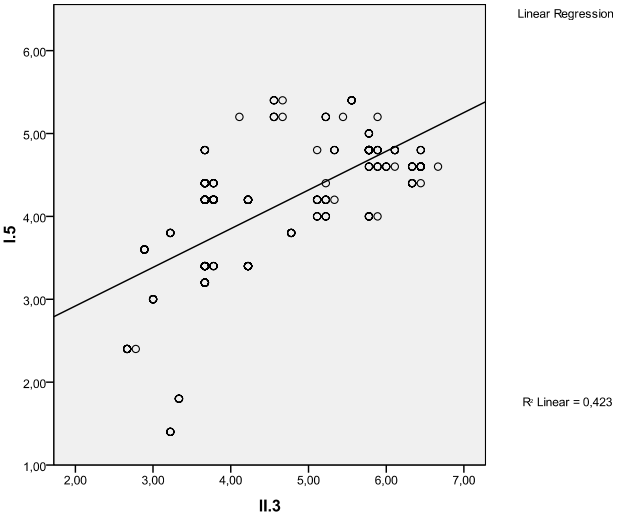


Figure 3. The relationship between *„The relationship with various external entities"*variable and *„Human resource management in environmental management"* variable

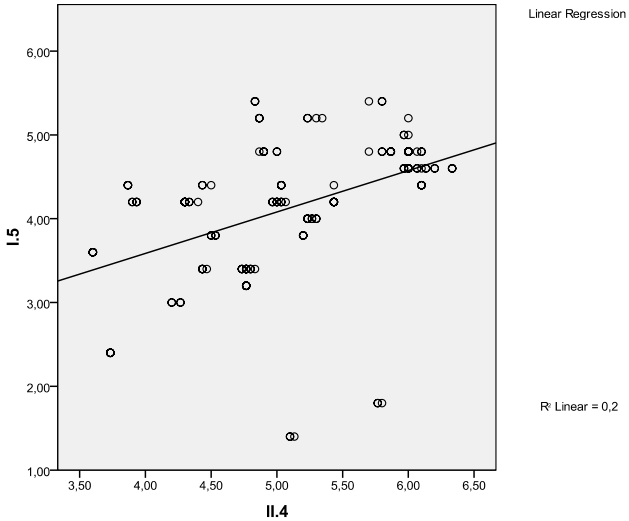


Figure 4. The relationship between *„The relationship with various external entities"*variable and *„Environmental informational management"* variable

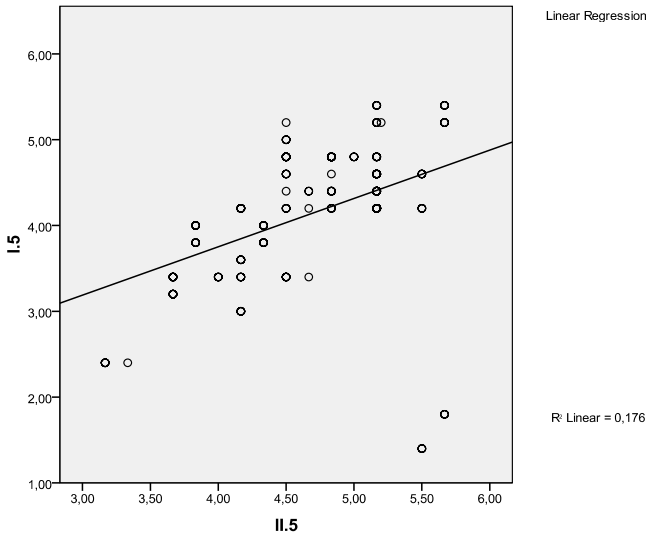


Figure 5. The relationship between *„The relationship with various external entities"*variable and *„Systemic-technological "infrastructure" with impact on environmental"* variable

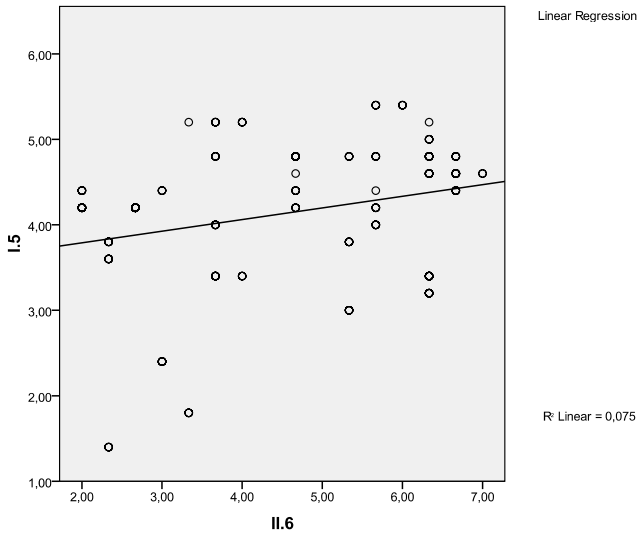


Figure 6. The relationship between between *„The relationship with various external entities"*variable and *„Organization's orientation to the environmental innovation"* variable

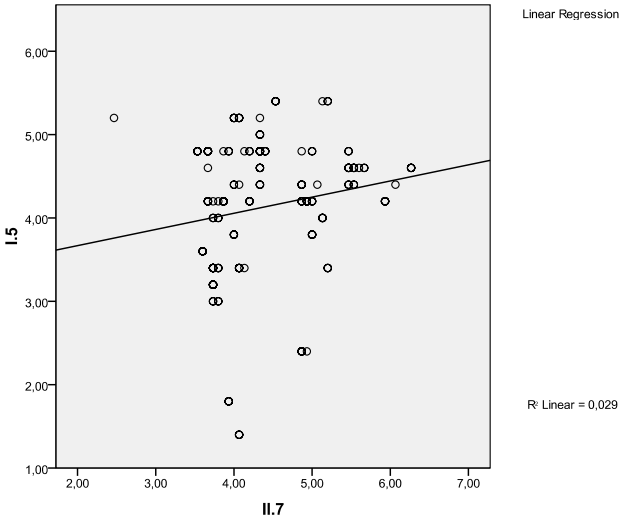


Figure 7. The relationship between *„The relationship with various external entities"*variable and *„External environment with direct/ indirect implication in organization's environmental management"* variable

Table 1 Testing regression models

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67,685	7	9,669	33,539	,000[a]
	Residual	46,993	163	,288		
	Total	114,678	170			
2	Regression	67,466	6	11,244	39,059	,000[b]
	Residual	47,212	164	,288		
	Total	114,678	170			

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.1, II.5, II.2, II.3, II.6, II.4

c. Dependent Variable: I.5

Table 2 Model parameters estimation

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,245	,477		2,612	,010
	II.1	,404	,101	,310	4,007	,000
	II.2	-,073	,040	-,140	-1,853	,066
	II.3	,789	,075	1,100	10,569	,000
	II.4	-,554	,119	-,501	-4,674	,000
	II.5	,232	,098	,173	2,369	,019
	II.6	-,095	,046	-,190	-2,045	,042
	II.7	-,062	,072	-,055	-,871	,385
2	(Constant)	1,057	,425		2,488	,014
	II.1	,430	,096	,331	4,479	,000
	II.2	-,062	,037	-,117	-1,657	,100
	II.3	,781	,074	1,089	10,549	,000
	II.4	-,576	,116	-,521	-4,977	,000
	II.5	,217	,096	,162	2,253	,026
	II.6	-,105	,045	-,211	-2,340	,020

a. Dependent Variable: I.5

ANNEX No.10: Regression analysis between specific factors that characterizes the „Organizations orientation to environmental issues and implicitly in the EMS implementation and integration" and the variable *„The relationship between organizational activities and state of the environment"* – that characterizes the EMS implementation/ integration quality

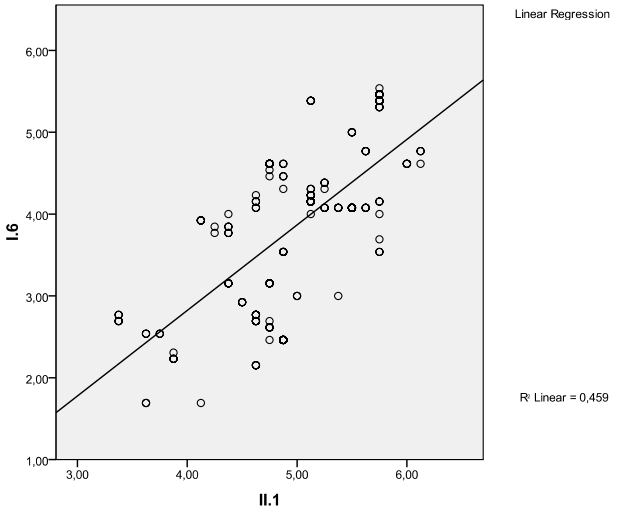


Figure 1. The relationship between **„***The relationship between organizational activities and state of the environment***"**variable and **„***Environmental strategic leadership***"** variable

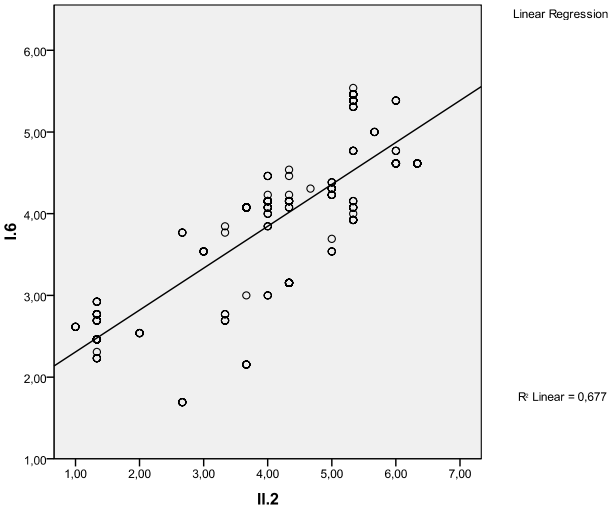


Figure 2. The relationship between **„***The relationship between organizational activities and state of the environment***"**variable and **„***Environmental management of financial resources***"** variable

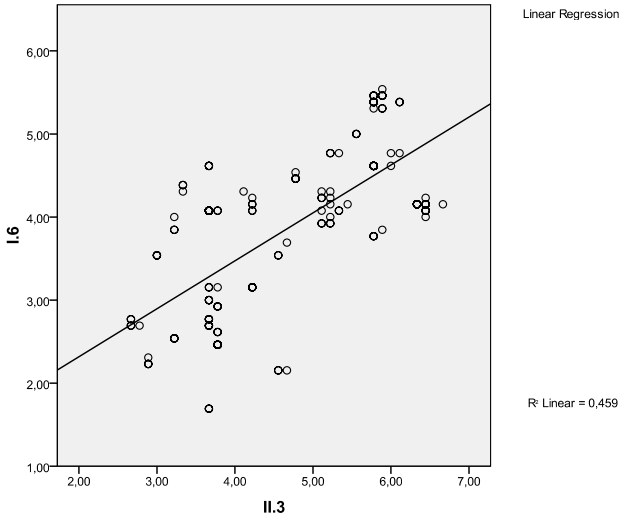


Figure 3. The relationship between **„***The relationship between organizational activities and state of the environment***"**variable and **„***Human resource management in environmental management***"** variable

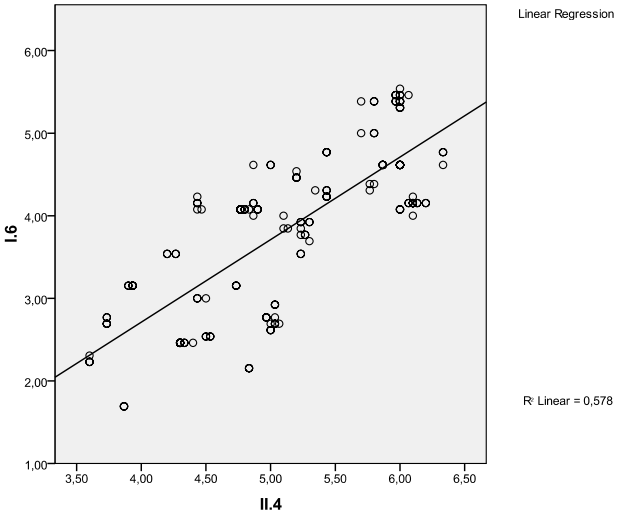


Figure 4. The relationship between **„***The relationship between organizational activities and state of the environment***"**variable and **„***Environmental informational management***"** variable

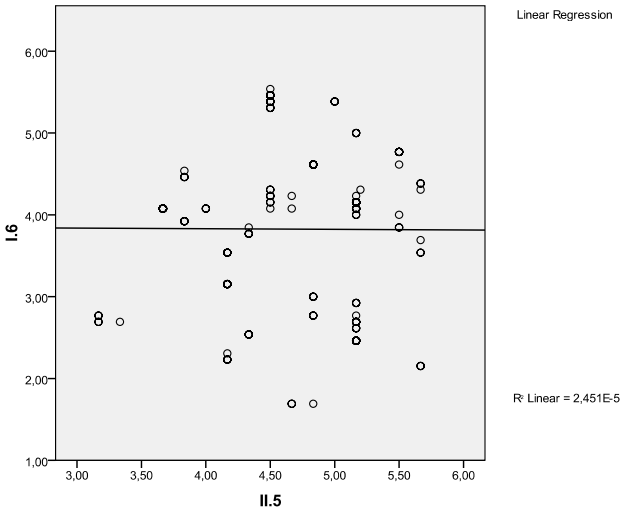


Figure 5. The relationship between **„***The relationship between organizational activities and state of the environment***"**variable and **„***Systemic-technological "infrastructure" with impact on environmental***"** variable

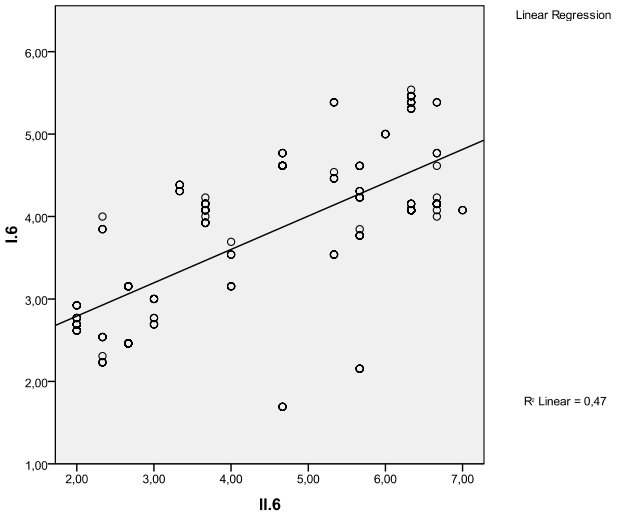


Figure 6. The relationship between between **„***The relationship between organizational activities and state of the environment***"**variable and **„***Organization's orientation to the environmental innovation***"** variable

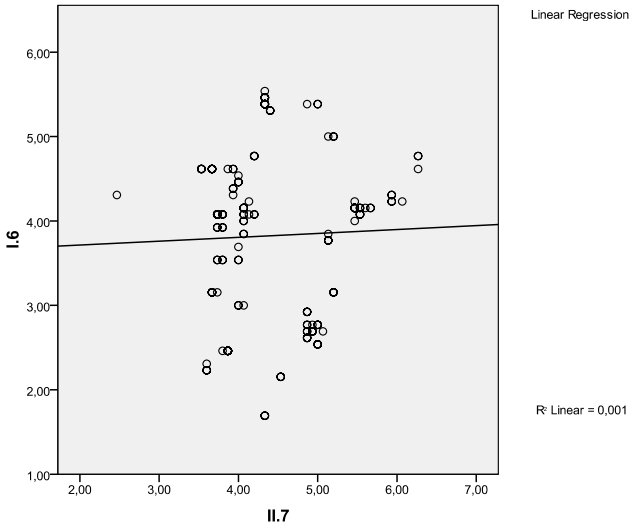


Figure 7. The relationship between **„***The relationship between organizational activities and state of the environment***"**variable and **„***External environment with direct/ indirect implication in organization's environmental management***"** variable

Table 1 Testing regression models

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	145,790	7	20,827	212,723	,000[a]
	Residual	15,959	163	,098		
	Total	161,749	170			
2	Regression	145,782	6	24,297	249,560	,000[b]
	Residual	15,967	164	,097		
	Total	161,749	170			

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.1, II.5, II.2, II.6, II.4

c. Dependent Variable: I.6

Table 2 Model parameters estimation

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,233	,278		-,838	,403
	II.1	,496	,059	,322	8,456	,000
	II.2	,234	,023	,375	10,138	,000
	II.3	,012	,043	,015	,287	,774
	II.4	,735	,069	,559	10,634	,000
	II.5	-,535	,057	-,336	-9,376	,000
	II.6	-,051	,027	-,087	-1,904	,059
	II.7	-,092	,042	-,069	-2,212	,028
2	(Constant)	-,254	,267		-,950	,344
	II.1	,493	,057	,319	8,590	,000
	II.2	,236	,022	,378	10,693	,000
	II.4	,746	,059	,567	12,692	,000
	II.5	-,531	,055	-,333	-9,576	,000
	II.6	-,049	,026	-,083	-1,915	,057
	II.7	-,091	,041	-,068	-2,200	,029

a. Dependent Variable: I.6

ANNEX No.11: "Questionnaire regarding the importance of environmental knowledge system at the organization level"

The questionnaire has four parts and attempts to identify the following levels of importance:

1.questions no.9 – Creating environmental knowledge (KC), with (a) the level of understanding the environmental task, and (b) the level of understanding the environmental informations

2.questions no.10 – Environmental knowledge accumulation (KA)

3.questions no.11 – Environmental knowledge sharing (KS)

4.questions no.12 – Environmental knowledge utilization (KU)

5.questions no.13 – Environmental knowledge internalization (KI), with (a) opportunity for environmental education, and (b) knowledge from environmental tasks

1. What is your education level?
- ❑ university
- ❑ master
- ❑ doctorate
- ❑ postdoctoral

2. Your age is:
- ❑ 18 – 25
- ❑ 26 - 35
- ❑ 36 – 45
- ❑ 46 – 55
- ❑ 56 - 65

3.Sex
- ❑ F
- ❑ M

4. What is the position occupied by you in the organization?
- ❑ top management
- ❑ middle management
- ❑ execution
- ❑ reserch
- ❑ academic

5. What is your organization's activity profile?
- ❑ university
- ❑ industrial
- ❑ agriculture
- ❑ services
- ❑ commercial
- ❑ nonprofit (NGO's)

6. What is the size of your organization?
- ❑ Micro-enterprise (1-10 employees)
- ❑ Small company (11-25 employees)
- ❑ Middle company (26-50 employees)
- ❑ Large company (51–250 employees)
- ❑ Huge company (>250 employees)

7.Your management experience level is situated:
- ❑ 0-5 years
- ❑ 5-10 years
- ❑ 10-15 years
- ❑ 15-20 years
- ❑ 20-25 years
- ❑ 25-30 years
- ❑ >30 years

8. Your environmental management experience level is situated:
- ❑ 0-5 years
- ❑ 5-10 years
- ❑ 10-15 years
- ❑ 15-20 years
- ❑ 20-25 years
- ❑ 25-30 years
- ❑ >30 years

Evaluate the following statements, depending on how you considered that would characterize your various activities at the level of your organization:

9.a.1. Using an electronic dashboard for environmental tasks

Strongly disagree	1	2	3	4	5	Strongly agree

9.a.2. Correct explaining of environmental task by environmental manager

Strongly disagree	1	2	3	4	5	Strongly agree

9.a.3. Proper understanding of the most important knowledge for environmental tasks

Strongly disagree	1	2	3	4	5	Strongly agree

9.b.1. The use of brainstorming sessions to share environmental information

Strongly disagree	1	2	3	4	5	Strongly agree

9.b.2. The use of different electronic sources of knowledge from organization level for carrying out environmental tasks

Strongly disagree	1	2	3	4	5	Strongly agree

9.b.3. Optimum use of different environmental software

Strongly disagree	1	2	3	4	5	Strongly agree

9.b.4. The use of alternative knowledge for solving environmental tasks

Strongly disagree	1	2	3	4	5	Strongly agree

10.a. Use of organization's databases to store environmental tasks

Strongly disagree	1	2	3	4	5	Strongly agree

10.b. Storing information regarding assessment from fulfillment of environmental tasks

Strongly disagree	1	2	3	4	5	Strongly agree

10.c. Storage of environmental legislation who was useful for solving environmental tasks

Strongly disagree	1	2	3	4	5	Strongly agree

10.d. Store's feedback from the external environment of the organization's environment

Strongly disagree	1	2	3	4	5	Strongly agree

10.e. Storing documents who were used to solve various environmental activities

Strongly disagree	1	2	3	4	5	Strongly agree

10.f. Storing all environmental education programs

Strongly disagree	1	2	3	4	5	Strongly agree

10.g. Storing the results of environmental education programs

Strongly disagree	1	2	3	4	5	Strongly agree

11.a. Distribution/ transfer/ sharing of environmental information/ knowledge by different methods (meetings followed by regular evaluations , and so on.)

Strongly disagree	1	2	3	4	5	Strongly agree

11.b. Using the results from the transfer of environmental information

Strongly disagree	1	2	3	4	5	Strongly agree

11.c. Using the intranet and internal electronic bulletin – regarding environmental issues

Strongly disagree	1	2	3	4	5	Strongly agree

11.d. Transfer of environmental information/ knowledge between different teams/departments of the organization

Strongly disagree	1	2	3	4	5	Strongly agree

12.a. Using environmental education programs for stakeholders of the organization

Strongly disagree	1	2	3	4	5	Strongly agree

12.b. Environmental research

Strongly disagree	1	2	3	4	5	Strongly agree

12.c. Use of environmental knowledge from external database

Strongly disagree	1	2	3	4	5	Strongly agree

12.d. Use internal policies to stimulate new ideas on the use of environmental knowledge

Strongly disagree	1	2	3	4	5	Strongly agree

12.e. The existence of an organizational culture that encourages environmental knowledge sharing

Strongly disagree	1	2	3	4	5	Strongly agree

13.a.1. Opportunity to follow environmental education programs for employees

Strongly disagree	1	2	3	4	5	Strongly agree

13.a.2. Opportunity to follow environmental academic programs (opportunity financially supported by the organization)

Strongly disagree	1	2	3	4	5	Strongly agree

13.b.1. The learning level though new environment tasks

Strongly disagree	1	2	3	4	5	Strongly agree

13.b.2. Using best practices in environmental tasks

Strongly disagree	1	2	3	4	5	Strongly agree

ANNEX No.12: Partial correlations

Table 1 – Partial correlations
(include also and the correlation between „Environmental strategic leadership" variable and EMS implementation/ integration quality synthetic variable)

Correlations

Control Variables			EMS quality	II.1	II.2	II.3	II.4	II.5	II.6	II.7
-none-[a]	EMS quality	Correlation	1,000	**,752**	**,749**	**,755**	**,746**	**,330**	**,571**	**-,040**
		Significance (2-tailed)	.	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,602**
		df	0	169	169	169	169	169	169	169
	II.1	Correlation	,752	1,000	,500	,467	,556	,294	,590	,000
		Significance (2-tailed)	,000	.	,000	,000	,000	,000	,000	,990
		df	169	0	169	169	169	169	169	169
	II.2	Correlation	,749	,500	1,000	,615	,598	,032	,562	-,039
		Significance (2-tailed)	,000	,000	.	,000	,000	,679	,000	,616
		df	169	169	0	169	169	169	169	169
	II.3	Correlation	,755	,467	,615	1,000	,842	,321	,635	,380
		Significance (2-tailed)	,000	,000	,000	.	,000	,000	,000	,000
		df	169	169	169	0	169	169	169	169
	II.4	Correlation	,746	,556	,598	,842	1,000	,403	,605	,386
		Significance (2-tailed)	,000	,000	,000	,000	.	,000	,000	,000
		df	169	169	169	169	0	169	169	169
	II.5	Correlation	,330	,294	,032	,321	,403	1,000	-,121	,246
		Significance (2-tailed)	,000	,000	,679	,000	,000	.	,114	,001
		df	169	169	169	169	169	0	169	169
	II.6	Correlation	,571	,590	,562	,635	,605	-,121	1,000	,244
		Significance (2-tailed)	,000	,000	,000	,000	,000	,114	.	,001
		df	169	169	169	169	169	169	0	169
	II.7	Correlation	-,040	,000	-,039	,380	,386	,246	,244	1,000
		Significance (2-tailed)	,602	,990	,616	,000	,000	,001	,001	.
		df	169	169	169	169	169	169	169	0
II.2 & II.3 & II.4 & II.5 & II.6 & II.7	EMS quality	Correlation	1,000	,581						
		Significance (2-tailed)	.	,000						
		df	0	163						
	II.1	Correlation	**,581**	1,000						
		Significance (2-tailed)	**,000**	.						
		df	163	0						

Correlations

Control Variables			EMS quality	II.1	II.2	II.3	II.4	II.5	II.6	II.7
-none-[a]	EMS quality	Correlation	1,000	**,752**	**,749**	**,755**	**,746**	**,330**	**,571**	**-,040**
		Significance (2-tailed)	.	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,602**
		df	0	169	169	169	169	169	169	169
	II.1	Correlation	,752	1,000	,500	,467	,556	,294	,590	,000
		Significance (2-tailed)	,000	.	,000	,000	,000	,000	,000	,990
		df	169	0	169	169	169	169	169	169
	II.2	Correlation	,749	,500	1,000	,615	,598	,032	,562	-,039
		Significance (2-tailed)	,000	,000	.	,000	,000	,679	,000	,616
		df	169	169	0	169	169	169	169	169
	II.3	Correlation	,755	,467	,615	1,000	,842	,321	,635	,380
		Significance (2-tailed)	,000	,000	,000	.	,000	,000	,000	,000
		df	169	169	169	0	169	169	169	169
	II.4	Correlation	,746	,556	,598	,842	1,000	,403	,605	,386
		Significance (2-tailed)	,000	,000	,000	,000	.	,000	,000	,000
		df	169	169	169	169	0	169	169	169
	II.5	Correlation	,330	,294	,032	,321	,403	1,000	-,121	,246
		Significance (2-tailed)	,000	,000	,679	,000	,000	.	,114	,001
		df	169	169	169	169	169	0	169	169
	II.6	Correlation	,571	,590	,562	,635	,605	-,121	1,000	,244
		Significance (2-tailed)	,000	,000	,000	,000	,000	,114	.	,001
		df	169	169	169	169	169	169	0	169
	II.7	Correlation	-,040	,000	-,039	,380	,386	,246	,244	1,000
		Significance (2-tailed)	,602	,990	,616	,000	,000	,001	,001	.
		df	169	169	169	169	169	169	169	0
II.2 & II.3 & II.4 & II.5 & II.6 & II.7	EMS quality	Correlation	1,000	,581						
		Significance (2-tailed)	.	,000						
		df	0	163						
	II.1	Correlation	**,581**	1,000						
		Significance (2-tailed)	**,000**	.						
		df	163	0						

a. Cells contain zero-order (Pearson) correlations.

Table 2 – Partial correlation between „Environmental management of financial resources" variable and EMS implementation/ integration quality synthetic variable

Correlations

Control Variables			EMS quality	II.2
II.1 & II.3 & II.4 & II.5 & II.6 & II.7	EMS quality	Correlation	1,000	**,425**
		Significance (2-tailed)	.	**,000**
		df	0	163
	II.2	Correlation	,425	1,000
		Significance (2-tailed)	,000	.
		df	163	0

Table 3 – Partial correlation between „Human resource management in environmental issue" variable and EMS implementation/ integration quality synthetic variable

Correlations

Control Variables			EMS quality	II.3
II.1 & II.2 & II.4 & II.5 & II.6 & II.7	EMS quality	Correlation	1,000	**,520**
		Significance (2-tailed)	.	**,000**
		df	0	163
	II.3	Correlation	,520	1,000
		Significance (2-tailed)	,000	.
		df	163	0

Table 4 – Partial correlation between „Environmental informational management" variable and EMS implementation/ integration quality synthetic variable

Correlations

Control Variables			EMS quality	II.4
II.1 & II.2 & II.3 & II.5 & II.6 & II.7	EMS quality	Correlation	1,000	**,204**
		Significance (2-tailed)	.	**,009**
		df	0	163
	II.4	Correlation	,204	1,000
		Significance (2-tailed)	,009	.
		df	163	0

Table 5 – Partial correlation between „Systemic-technological "infrastructure" with impact on environmental management" variable and EMS implementation/ integration quality synthetic variable

Correlations

Control Variables			EMS quality	II.5
II.1 & II.2 & II.3 & II.4 & II.6 & II.7	EMS quality	Correlation	1,000	**,129**
		Significance (2-tailed)	.	**,097**
		df	0	163
	II.5	Correlation	,129	1,000
		Significance (2-tailed)	,097	.
		df	163	0

Table 6 – Partial correlation between „Organization's orientation to the environmental innovation" variable and EMS implementation/ integration quality synthetic variable

Correlations

Control Variables			EMS quality	II.6
II.1 & II.2 & II.3 & II.4 & II.7 & II.5	EMS quality	Correlation	1,000	**-,128**
		Significance (2-tailed)	.	**,101**
		df	0	163
	II.6	Correlation	-,128	1,000
		Significance (2-tailed)	,101	.
		df	163	0

Table 7 – Partial correlation between „External environment with direct/ indirect implication in organization's environmental management"variable and EMS implementation/ integration quality synthetic variable

Correlations

Control Variables			EMS quality	II.7
II.1 & II.2 & II.3 & II.4 & II.5 & II.6	EMS quality	Correlation	1,000	**-,501**
		Significance (2-tailed)	.	**,000**
		df	0	163
	II.7	Correlation	-,501	1,000
		Significance (2-tailed)	,000	.
		df	163	0

ANNEX No.13: Regression analysis between specific factors that characterizes the „organizations orientation to environmental issues and implicitly in the EMS implementation and integration" and the synthetic variable that defines the EMS implementation/ integration quality

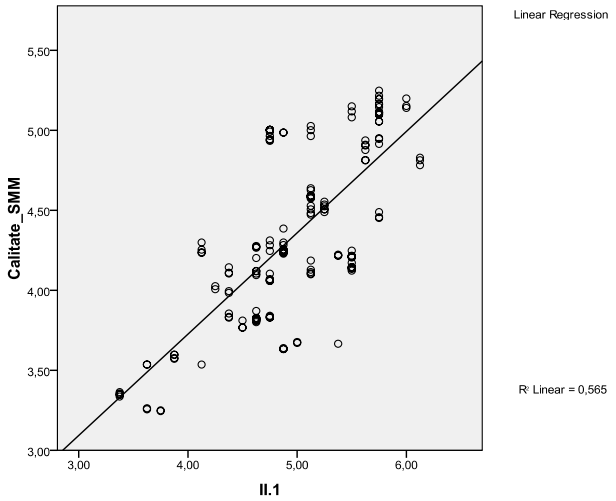


Figure 1. The relationship between "EMS implementation/ integration quality" synthetic variable and *„Environmental strategic leadership"* variable

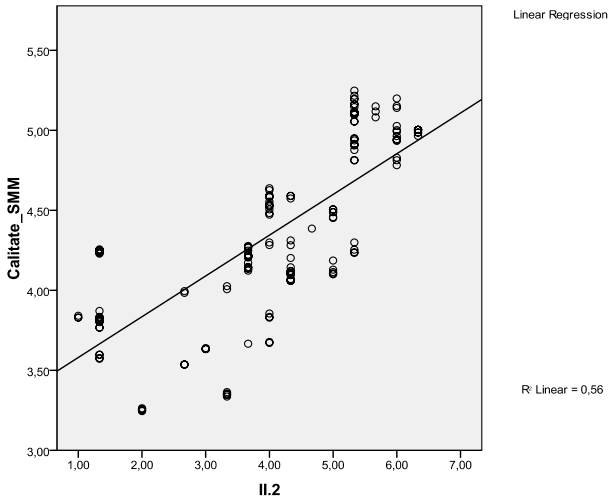


Figure 2. The relationship between "EMS implementation/ integration quality" synthetic variable and *„Environmental management of financial resources"* variable

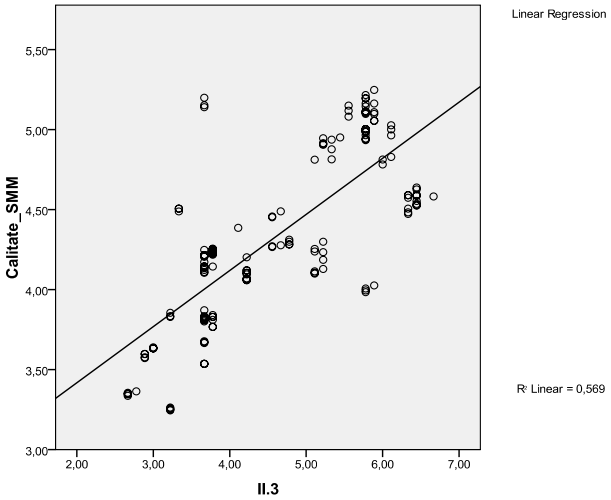


Figure 3. The relationship between "EMS implementation/ integration quality" synthetic variable and *„Human resource management in environmental management"* variable

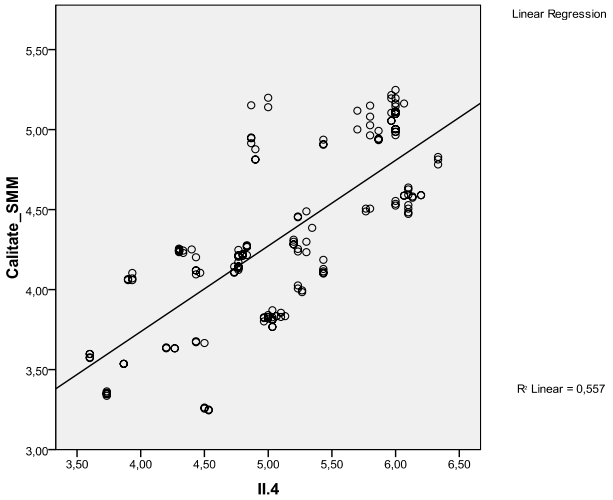


Figure 4. The relationship between "EMS implementation/ integration quality" synthetic variable and *„Environmental informational management"* variable

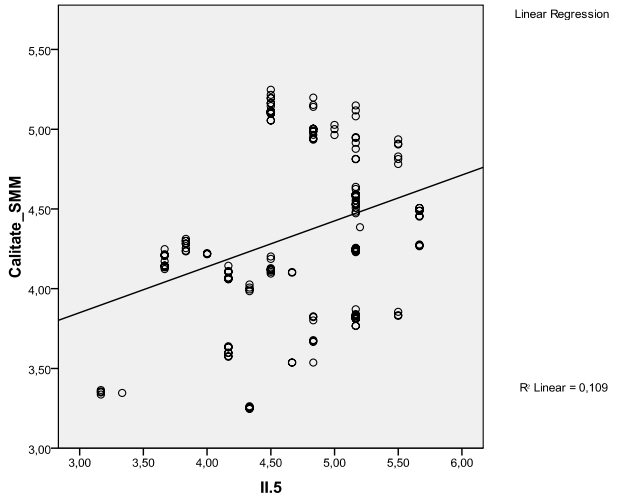


Figure 5. The relationship between "EMS implementation/ integration quality" synthetic variable and *„Systemic-technological "infrastructure" with impact on environmental"* variable

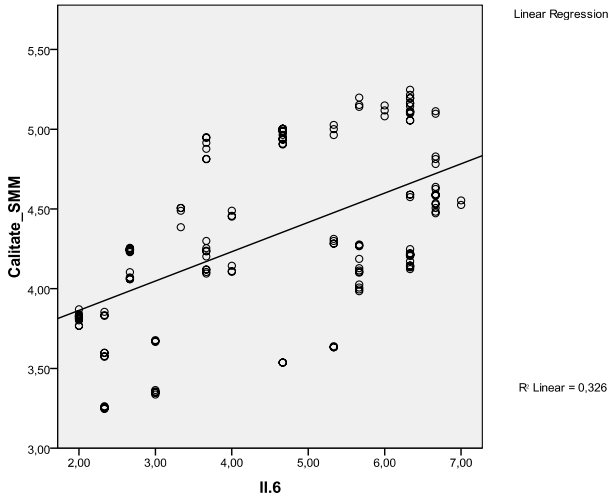


Figure 6. The relationship between between "EMS implementation/ integration quality" synthetic variable and *„Organization's orientation to the environmental innovation"* variable

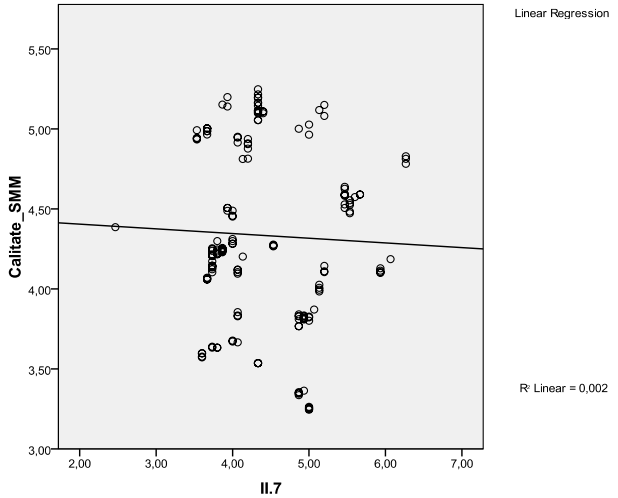


Figure 7. The relationship between "EMS implementation/ integration quality" synthetic variable and *„External environment with direct/ indirect implication in organization's environmental management"* variable

Tabel 1 Testarea modelelor de regresie

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	42,596	7	6,085	177,817	,000[a]
	Residual	5,578	163	,034		
	Total	48,174	170			
2	Regression	42,503	6	7,084	204,860	,000[b]
	Residual	5,671	164	,035		
	Total	48,174	170			

a. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.6, II.4

b. Predictors: (Constant), II.7, II.1, II.5, II.2, II.3, II.4

c. Dependent Variable : "EMS implementation/ integration quality" (synthetic variable)

Table 2 Model parameters estimation

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,625	,164		9,895	,000
	II.1	,317	,035	,376	9,125	,000
	II.2	,082	,014	,240	5,986	,000
	II.3	,200	,026	,429	7,763	,000
	II.4	,109	,041	,152	2,659	,009
	II.5	,056	,034	,065	1,667	,097
	II.6	-,026	,016	-,081	-1,647	,101
	II.7	-,182	,025	-,248	-7,389	,000
2	(Constant)	1,661	,164		10,151	,000
	II.1	,285	,029	,339	9,774	,000
	II.2	,080	,014	,236	5,866	,000
	II.3	,186	,025	,401	7,590	,000
	II.4	,100	,041	,139	2,449	,015
	II.5	,090	,027	,103	3,316	,001
	II.7	-,192	,024	-,262	-8,017	,000

a. Dependent Variable : "EMS implementation/ integration quality" (synthetic variable)

ANNEX No.14: Glogal frequency responses analysis regarding the applied questionnaire:"Researches regarding the implementation/ integration of an EMS at organizations level"

I.Dependent variables wich defines the "consequences of the Environmental management system implementation/ integration at the organisation level"

I.1. Variable: Implementation of environmental policies and programs

Dimensions:

I.1.1. General environmental objectives and targets

Table 1 – Frequency's level regarding the "General environmental objectives and targets" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.1.	50,3	23,4	2,3	15,2	8,2	0,6	-	76	8,8	67,2
I.2.	17	13,5	2,3	17	2,3	19,9	28,1	32,8	50,3	-17,5
I.3.	9,9	49,7	8,2	2,9	4,7	17,5	7	67,8	29,2	38,6
I.4.	29,8	17,5	18,1	11,7	10,5	3,5	8,8	65,4	22,8	42,6
I.5.	43,3	48,5	4,7	2,9	0,6	-	-	96,5	0,6	90,5
I.6.	31	19,3	7	19,9	-	4,7	18,1	57,3	22,8	34,5
I.7.	45	21,6	13,5	19,9	-	-	-	80,1	0	80,1
I.8.	4,7	12,9	7	9,9	15,8	22,8	26,9	24,6	65,5	-40,9
I.9.	45,6	26,9	9,9	8,8	2,3	6,4	-	82,4	8,7	73,7
I.10.	74,3	21,1	4,7	-	-	-	-	100	-	100

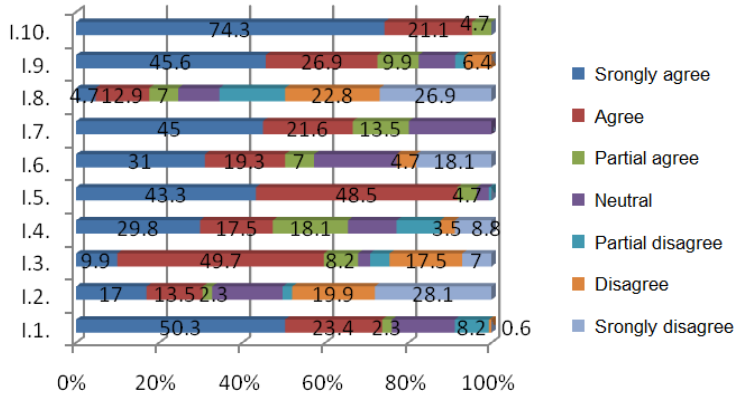


Figure 1 – Frequency's level regarding the "General environmental objectives and targets" dimension

I.1.2. The environment policy

Table 2 – Frequency's level regarding the "environment policy" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.11.	60,8	25,7	4,1	2,3	6,4	-	0,6	90,6	7	83,6

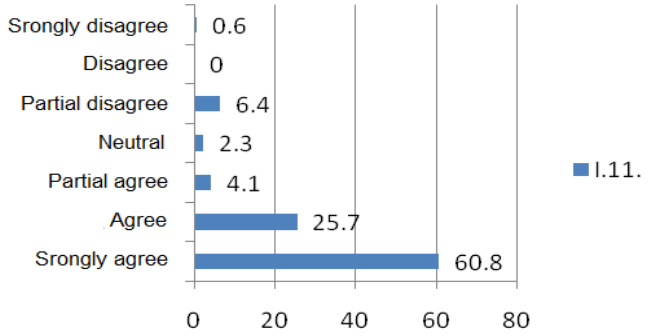


Figure 2 – Frequency's level regarding the "environment policy" dimension

I.1.3. Opinions and suggestions of the employees/ the management team/ suppliers/ clients/ representatives teams of the various public institutions with which the organization interacts/ NGO representatives, concerning the improvement of the environmental quality (in environmental issue)

Table 3 – Frequency's level regarding the "opinions and suggestions of the employees/ the management team/ suppliers/ clients/ representatives teams of the various public institutions with which the organization interacts/ NGO representatives, concerning the improvement of the environmental quality" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.12.	40,4	22,2	13,5	8,8	14	1,2	-	76,1	15,2	60,9
I.13.	29,8	46,8	4,1	14	4,7	-	0,6	80,7	5,3	75,4
I.14.	11,1	22,2	22,8	4,7	13,5	16,4	9,4	56,1	39,3	16,8

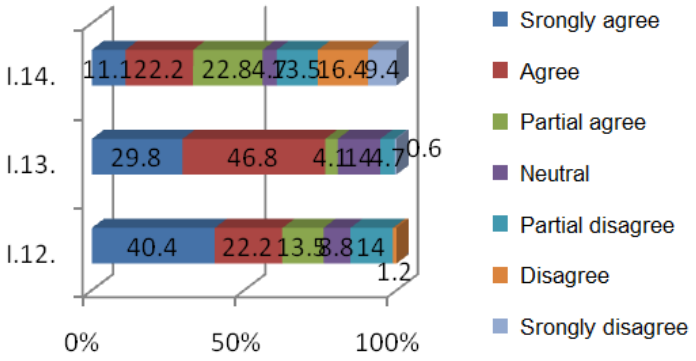


Figure 3 – Frequency's level regarding the "opinions and suggestions of the employees/ the management team/ suppliers/ clients/ representatives teams of the various public institutions with which the organization interacts/ NGO representatives, concerning the improvement of the environmental quality" dimension

I.1.4. Implemented actions regarding the prevention of environmental pollution

Table 4 – Frequency's level regarding the "implemented actions regarding the prevention of environmental pollution" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.15.	41,5	4,7	22,2	8,8	9,9	4,7	8,2	68,4	22,8	45,6
I.16.	45,6	32,7	12,9	-	-	8,8	-	91,2	8,8	82,4
I.17.	39,2	10,5	6,4	27,5	1,8	3,5	11,1	56,1	16,4	39,7
I.18.	36,8	6,4	19,3	20,5	2,9	7	7	64,5	16,9	47,6
I.19.	28,1	15,8	14	5,8	7,6	9,4	19,3	57,9	36,3	21,6
I.20.	35,1	15,2	14	10,5	4,1	17	4,1	64,3	25,2	39,1
I.21.	20,5	24	7,6	17	12,3	17	1,8	52,1	31,1	21
I.22.	11,7	16,4	22,2	6,4	6,4	18,1	18,7	50,3	43,2	7,1
I.23.	5,8	27,5	11,7	4,1	1,8	25,1	24	45	50,9	-5,9
I.24.	26,3	33,3	12,3	8,2	14,6	5,3	-	71,9	19,9	52
I.25.	35,1	36,8	17,5	8,8	1,8	-	-	89,4	1,8	87,6
I.26.	3,5	25,7	20,5	11,7	8,2	15,2	15,2	49,7	38,6	11,1
I.27.	13,5	40,4	23,4	2,9	6,4	11,1	2,3	77,3	19,8	57,5
I.28.	33,3	29,8	15,8	16,4	4,1	0,6	-	78,9	4,7	74,2
I.29.	38,6	20,5	24,6	14	1,8	0,6	-	83,7	2,4	81,3
I.30.	7,6	13,5	9,4	15,8	6,4	18,1	29,2	30,5	53,7	-23,2
I.31.	14,6	14,6	18,7	15,8	12,9	9,9	13,5	47,9	36,3	11,6
I.32.	27,5	8,8	15,8	19,9	22,8	5,3	-	52,1	28,1	24
I.33.	31	18,7	9,4	5,3	11,7	8,2	15,8	59,1	35,7	23,4
I.34.	39,2	24	17,5	16,4	2,3	0,6	-	80,7	2,9	77,8

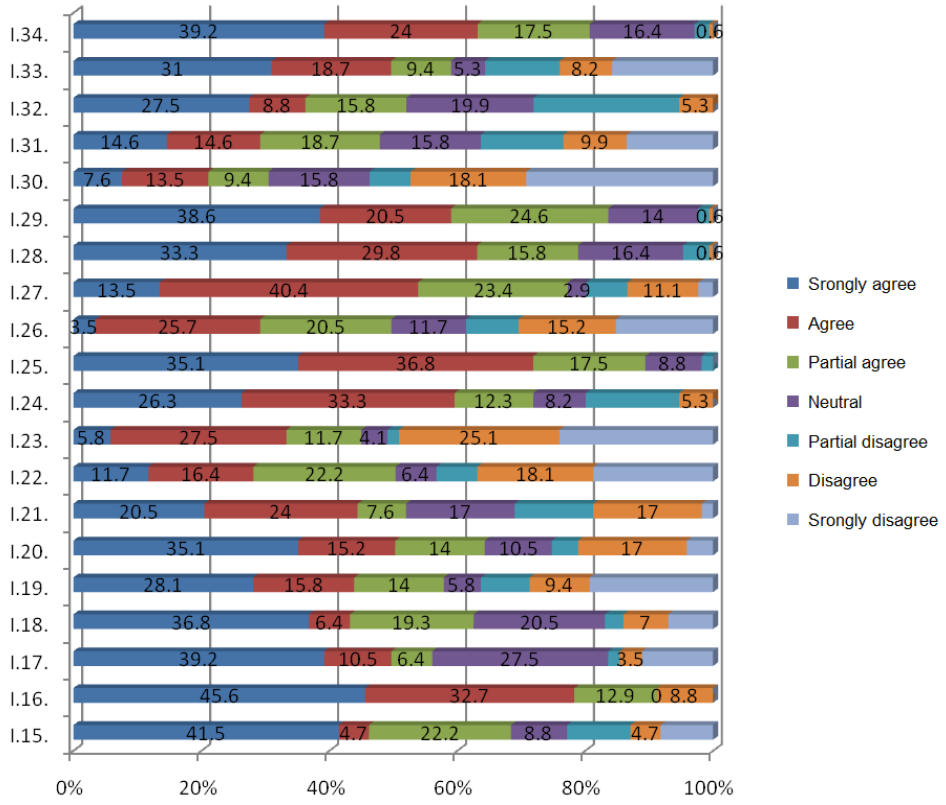


Figure 4 – Frequency's level regarding the "implemented actions regarding the prevention of environmental pollution" dimension

I.2. Variable: Compliance with environmental regulations

Dimensions:

I.2.1. Compliance with environmental regulations (at national/ European/ world level to which the organization has adhered)

Table 5 – Frequency's level regarding the "compliance with environmental regulations (at national/ European/ world level to which the organization has adhered)" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.35.	31,6	48,5	11,1	6,4	2,3	-	-	91,2	2,3	88,9
I.36.	8,2	4,1	3,5	-	4,7	18,1	61,4	15,8	84,5	-68,7

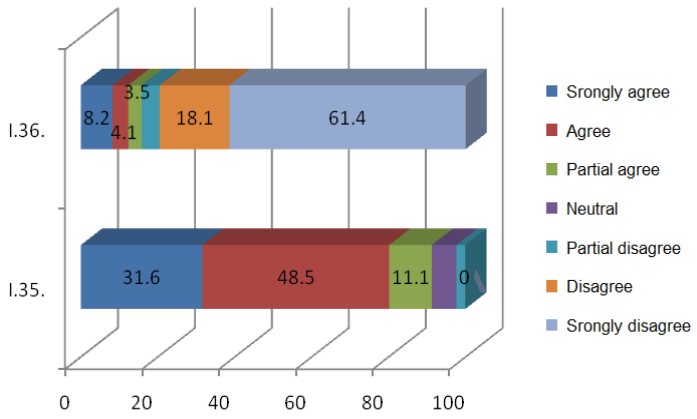


Figure 5 – Frequency's level regarding the "compliance with environmental regulations (at national/ European/ world level to which the organization has adhered)" dimension

I.2.2. Legal responsibility regarding compliance with environment regulations

Table 6 – Frequency's level regarding the "legal responsibility regarding compliance with environment regulations" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.37.	45,6	35,7	9,4	7	2,3	-	-	90,7	2,3	88,4
I.38.	37,4	30,4	9,4	4,7	0,6	3,5	14	77,2	18,1	59,1

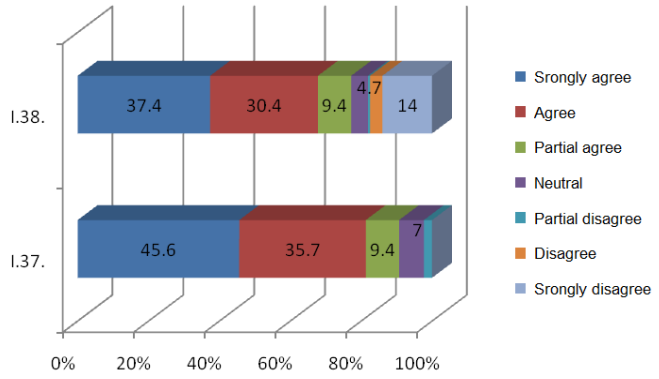


Figure 6 – Frequency's level regarding the "legal responsibility regarding compliance with environment regulations" dimension

I.2.3. The internal findings regarding environment aspects (their periodicity)

Table 7 – Frequency's level regarding "the internal findings regarding environment aspects" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.39.	49,1	28,7	8,8	11,1	2,3	-	-	86,6	2,3	84,3

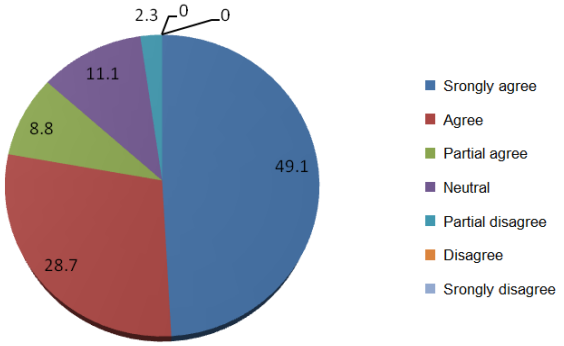


Figure 7 – Frequency's level regarding "the internal findings regarding environment aspects" dimension

I.2.4. The analyses concerning the environment impact induced by the specific activities carried out at the organizations level (their frequency)

Table 8 – Frequency's level regarding "the analyses concerning the environment impact induced by the specific activities carried out at the organizations level" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.40.	40,9	27,5	18,1	8,8	4,7	-	-	86,5	4,7	81,1
I.41.	8,2	5,3	30,4	40,4	15,8	-	-	43,9	15,8	28,1
I.42.	32,2	26,3	21,6	13,5	1,2	2,3	2,9	80,1	6,4	73,7

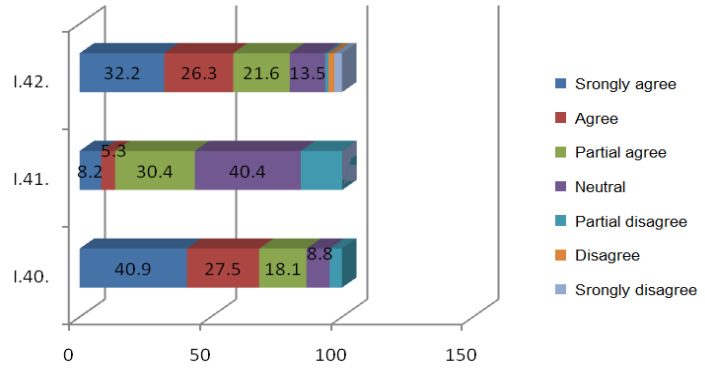


Figure 8 – Frequency's level regarding "the analyses concerning the environmental impact induced by the specific activities carried out at the organizations level" dimension

I.3. Variable: Environmental financial performance

Dimensions:

I.3.1. The costs (a.operational and b. capital) associated with environmental aspects related to the activities carried out (their level)

Table 9 – Frequency's level regarding "the costs (a.operational and b. capital) associated with environmental aspects related to the activities carried out" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.43.	12,9	12,9	12,3	15,8	16,4	15,2	14,6	38,1	46,2	-8,1
I.44.	1,8	11,7	32,7	19,9	15,8	15,8	2,3	46,2	64,3	-18,1
I.45.	7	19,9	18,1	9,4	26,3	8,2	11,1	45	45,6	-0,6

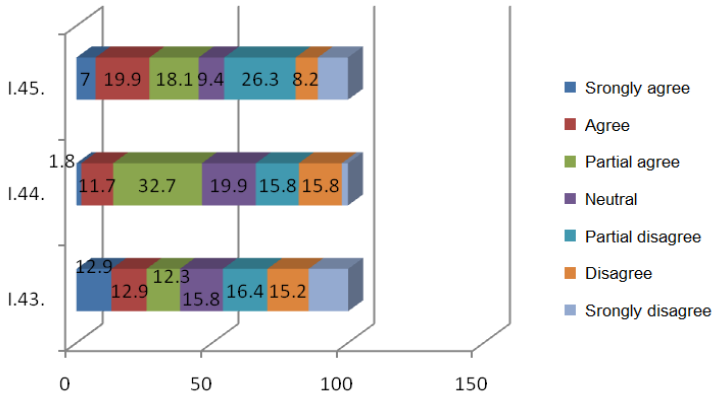


Figure 9 – Frequency's level regarding "the costs (a.operational and b. capital) associated with environmental aspects related to the activities carried out" dimension

I.3.2. The research and development funds associated with environmental management (for various environment projects)

Table 10 – Frequency's level regarding "the research and development funds associated with environmental management" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.46.	14,6	9,4	-	1,8	26,3	39,8	8,2	24	74,3	-50,3
I.47.	28,7	17	8,8	18,7	11,7	12,9	2,3	54,5	26,9	27,6
I.48.	10,5	27,5	14,6	5,8	9,9	7,6	24	52,6	41,5	11,1

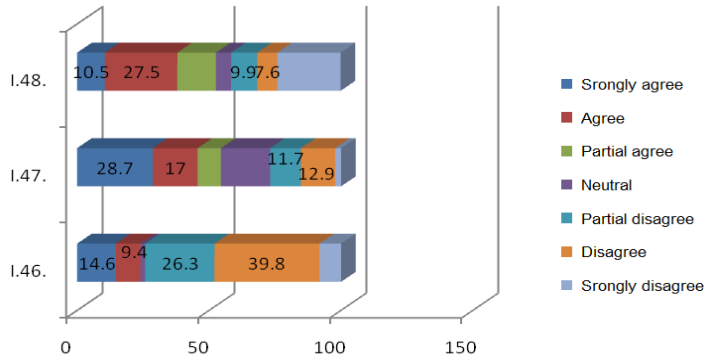


Figure 10 – Frequency's level regarding "the research and development funds associated with environmental management" dimension

I.3.3. The legal responsibility associated to the financial management associated with the environmental management (for various environmental projects)

Table 11 – Frequency's level regarding "the legal responsibility associated to the financial management associated with the environmental management" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.49.	18,1	31,6	18,7	6,4	8,8	14	2,3	68,4	25,1	43,3

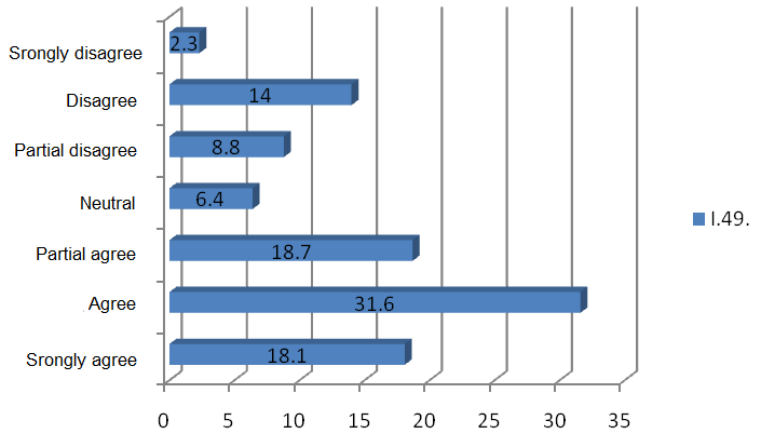


Figure 11 – Frequency's level regarding "the legal responsibility associated to the financial management associated with the environmental management" dimension

I.3.4. Environment benefits (direct and indirect)

Table 12 – Frequency's level regarding the "environment benefits" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.50.	0,6	7,6	9,9	9,4	23,4	38	11,1	18,1	72,5	-54,4
I.51.	-	3,5	3,5	3,5	19,9	36,3	33,3	7	89,5	82,5

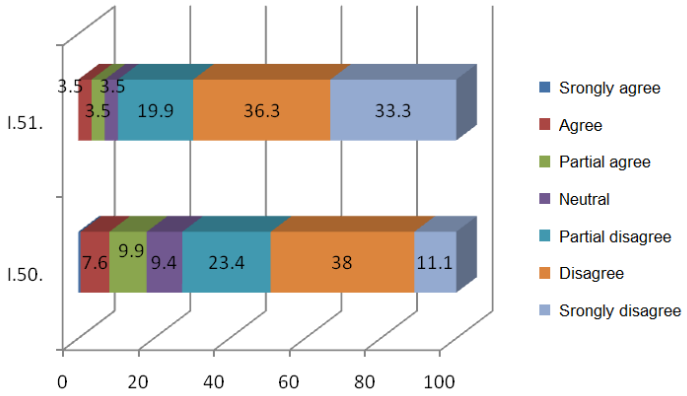


Figure 12 – Frequency's level regarding the "environment benefits" dimension

I.4. Variable: Environmental operational performance

Dimensions:

I.4.1. Environmental operational performance: reported to the materials

Table 12 – Frequency's level regarding the "environmental operational performance reported to the materials" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.52.	15,2	13,5	8,2	12,9	4,7	12,3	33,3	36,9	50,3	-13,4
I.53.	22,8	26,3	14,6	9,9	5,8	15,8	4,7	63,7	26,3	37,4
I.54.	5,3	3,5	0,6	6,4	14,6	23,4	46,2	9,4	84,2	-74,8
I.55.	21,6	21,6	18,7	5,8	12,9	6,4	12,9	61,9	32,2	29,7
I.56.	4,7	2,9	12,3	7,6	4,1	28,7	39,8	19,9	72,6	-52,7

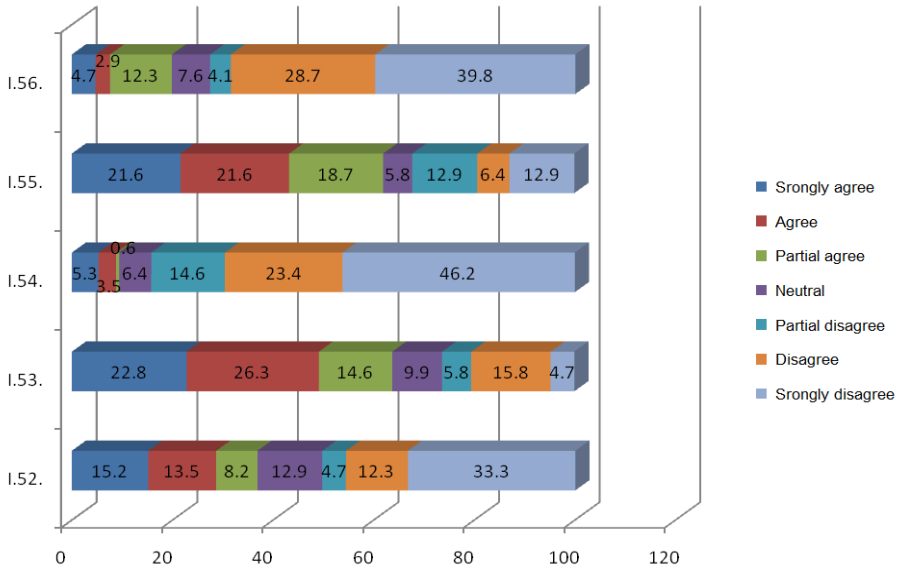


Figure 12 – Frequency's level regarding the "environmental operational performance reported to the materials" dimension

I.4.2. Environmental operational performance: reported to services (provided by the third parties) that supports the activity of the organization

Table 13 – Frequency's level regarding the "environmental operational performance reported to services (provided by the third parties) that supports the activity of the organization" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.57.	6,4	17	15,8	14	10,5	13,5	22,8	39,2	46,8	-7,6
I.58.	27,5	15,2	8,2	7,6	-	14	27,5	50,9	41,5	9,4
I.59.	60,8	28,7	1,8	6,4	2,3	-	-	91,3	2,3	89

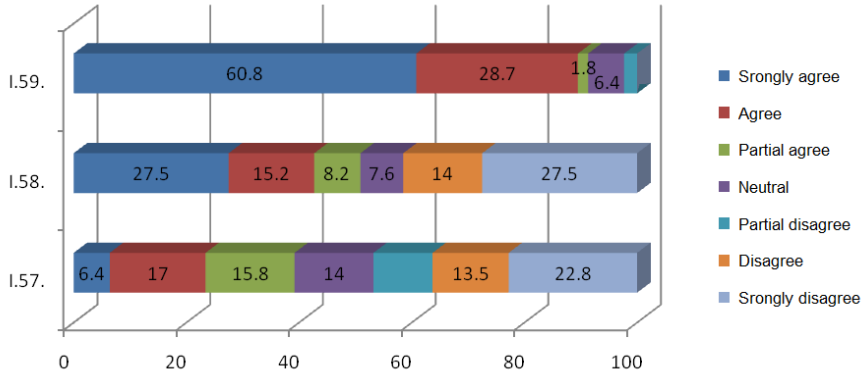


Figure 13 – Frequency's level regarding the "environmental operational performance reported to services (provided by the third parties) that supports the activity of the organization" dimension

I.4.3. Environmental operational performance: reported to the energy used

Table 14 – Frequency's level regarding the "environmental operational performance reported to the energy used" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.60.	56,1	21,6	12,3	6,4	1,8	1,8	-	90	3,6	86,4
I.61.	36,8	17,5	13,5	4,1	14,6	11,7	1,8	67,8	28,1	39,7
I.62.	46,8	33,3	4,7	-	1,8	11,1	2,3	84,8	15,2	69,6

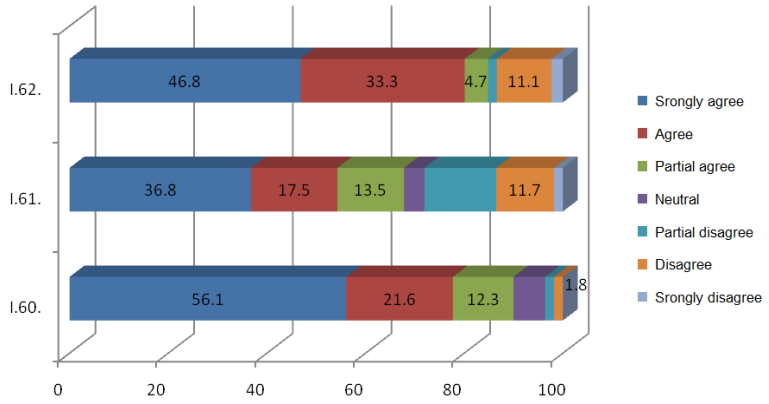


Figure 14 – Frequency's level regarding the "environmental operational performance reported to the energy used" dimension

I.4.4. Environmental operational performance: reported to fixed assets and equipments

Table 15 – Frequency's level regarding the "environmental operational performance reported to fixed assets and equipments" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.63.	-	1,8	13,5	4,1	12,3	20,5	48	15,3	80,8	-65,5
I.64.	11,1	12,3	24,6	15,8	24,6	6,4	5,3	48	36,3	11,7
I.65.	14,6	36,8	12,9	9,9	13,5	8,8	3,5	64,3	25,8	38,5
I.66.	17,5	22,2	12,3	5,3	7,6	20,5	14,6	52	42,7	9,3

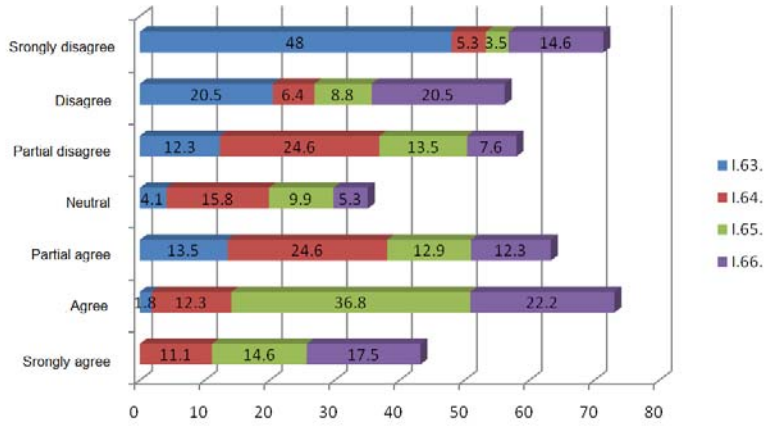


Figure 15 – Frequency's level regarding the "environmental operational performance reported to fixed assets and equipments" dimension

I.4.5. Environmental operational performance: reported to provision

Table 16 – Frequency's level regarding the "environmental operational performance reported to provision" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.67.	7	1,8	16,4	11,7	21,1	17	22,2	25,2	60,3	-35,1
I.68.	-	21,1	7,6	14	11,7	17,5	28,1	28,7	57,3	-28,6

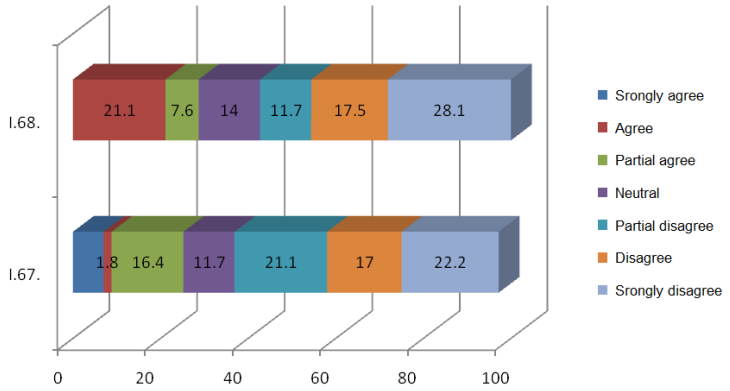


Figure 16 – Frequency's level regarding the "environmental operational performance reported to provision" dimension

I.4.6. Environmental operational performance: reported to products

Table 17 – Frequency's level regarding the "environmental operational performance reported to products" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.69.	11,1	15,2	5,3	11,7	11,7	12,3	32,7	31,6	56,7	-25,1
I.70.	9,9	15,2	35,7	13,5	10,5	12,9	2,3	60,8	25,7	35,1
I.71.	21,1	22,8	20,5	2,3	2,9	17,5	12,9	64,4	33,3	31,1

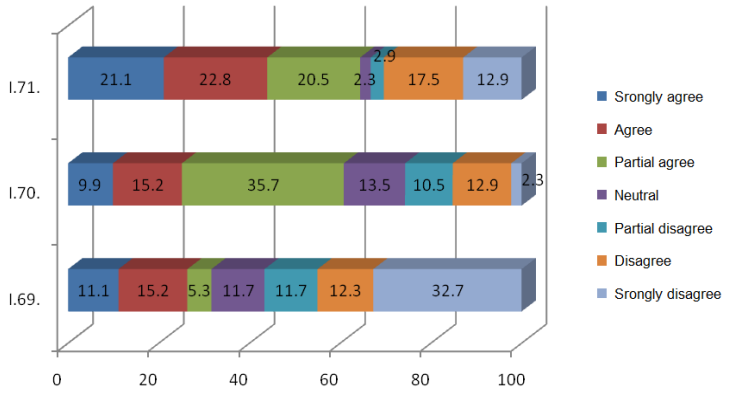


Figure 17 – Frequency's level regarding the "environmental operational performance reported to products" dimension

I.4.7. Environmental operational performance: reported to waste

Table 18 – Frequency's level regarding the "environmental operational performance reported to waste" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.72.	5,8	9,9	8,2	9,4	8,2	18,1	40,4	23,9	66,7	-42,8
I.73.	-	1,8	3,5	14,6	25,1	21,1	33,9	5,3	80,1	-74,8
I.74.	-	8,8	19,3	13,5	15,2	28,1	15,2	28,1	58,5	-30,4

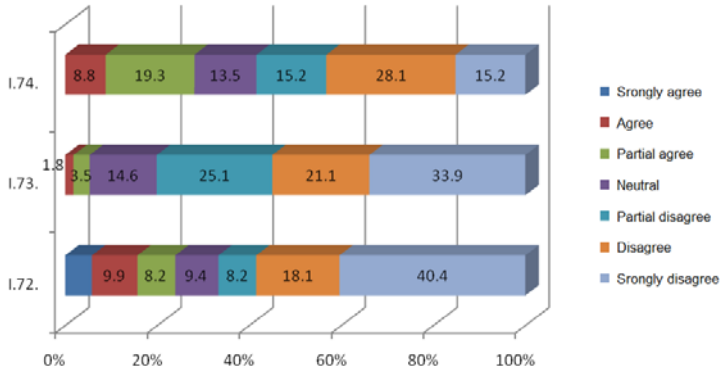


Figure 18 – Frequency's level regarding the "environmental operational performance reported to waste" dimension

I.4.8. Environmental operational performance: reported to emissions

Table 19 – Frequency's level regarding the "environmental operational performance reported to emissions" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.75.	25,7	21,1	15,8	4,1	5,3	23,4	4,7	62,6	33,4	29,2
I.76.	-	4,1	2,3	-	0,6	39,8	53,2	6,4	93,6	-87,2
I.77.	14	13,5	19,3	19,3	13,5	18,7	1,8	46,8	34	12,8
I.78.	23,4	31	28,1	15,2	2,3	-	-	82,5	2,3	80,2

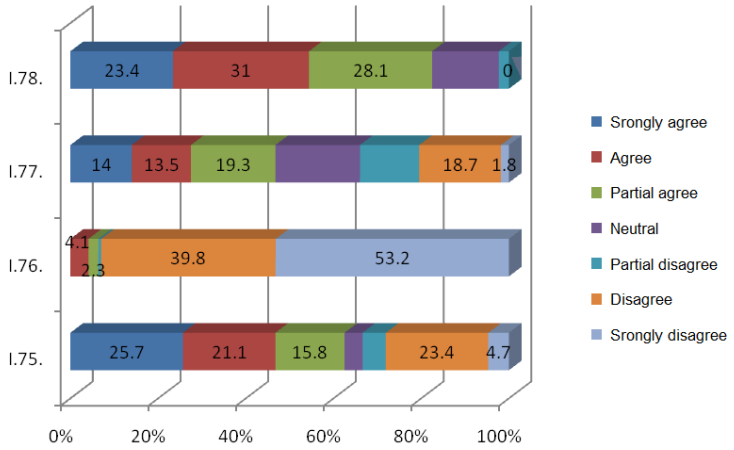


Figure 19 – Frequency's level regarding the "environmental operational performance reported to emissions" dimension

I.5. Variable: Relationship with various external entities

Dimensions:

I.5.1. The relationship with the state institutions that monitor the compliance with the environmental regulations

Table 20 – Frequency's level regarding "the relationship with the state institutions that monitor the compliance with the environmental regulations" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.79.	-	-	1,8	4,1	4,7	37,4	52	1,8	94,1	-92,3

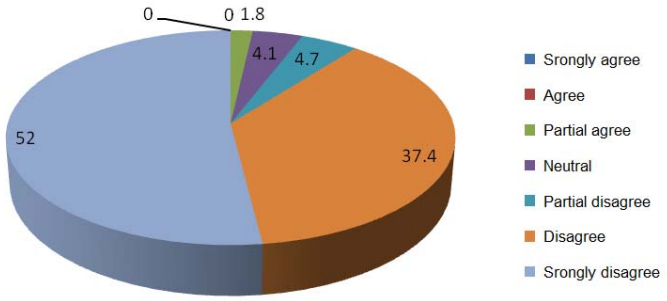


Figure 20 – Frequency's level regarding "the relationship with the state institutions that monitor the compliance with the environmental regulations" dimension

I.5.2. The relationship between the organization and the local community

Table 21 – Frequency's level regarding "the relationship between the organization and the local community" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.80.	27,5	17	5,8	7,6	4,7	22,2	15,2	50,3	42,1	8,2
I.81.	24	43,3	15,2	4,7	-	5,3	7,6	82,5	12,9	69,6
I.82.	22,2	32,2	12,3	20,5	4,7	1,8	6,4	66,7	12,9	53,8

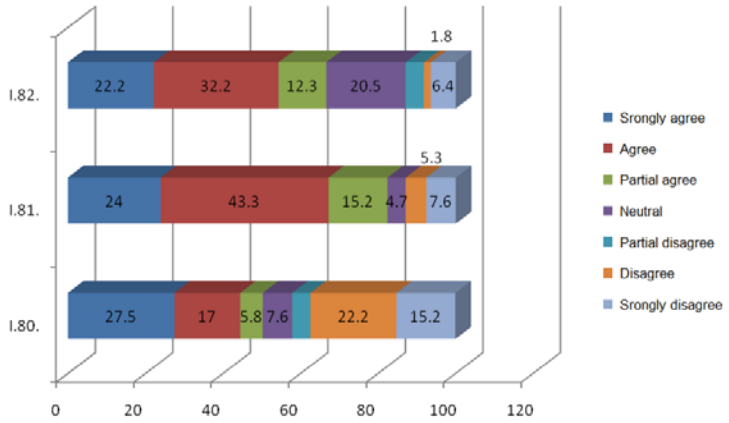


Figure 21 – Frequency's level regarding "the relationship between the organization and the local community" dimension

I.5.3. The relationship of the organization with the stakeholders (internal/ external stakeholders)

Table 22 – Frequency level regarding "the relationship of the organization with the stakeholders" dimension

Item	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.83.	5,3	32,2	19,3	6,4	12,9	4,1	19,9	56,8	36,9	19,9

I.83.

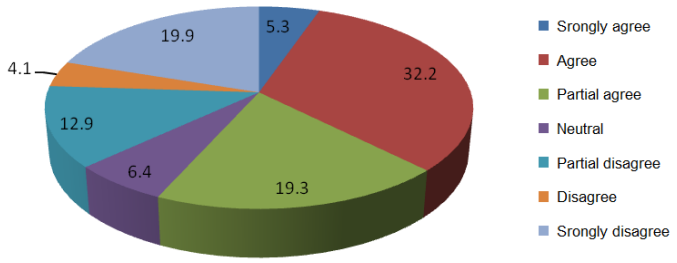


Figure 22 – Frequency level regarding "the relationship of the organization with the stakeholders" dimension

I.6. Variable: The relationship between the organization's activity and the state of the environment

Dimensions:

I.6.1. The quality (state) of the environmental factor - AIR

Table 23 – Frequency's level regarding "the quality (state) of the environmental factor – AIR" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.84.	26,9	22,8	9,9	8,8	6,4	16,4	8,8	59,6	31,6	28
I.85.	40,9	20,5	7,6	17,5	9,9	1,8	1,8	69	21,6	47,4
I.86.	6,4	41,5	24,6	5,8	10,5	8,8	2,3	72,5	21,6	50,9

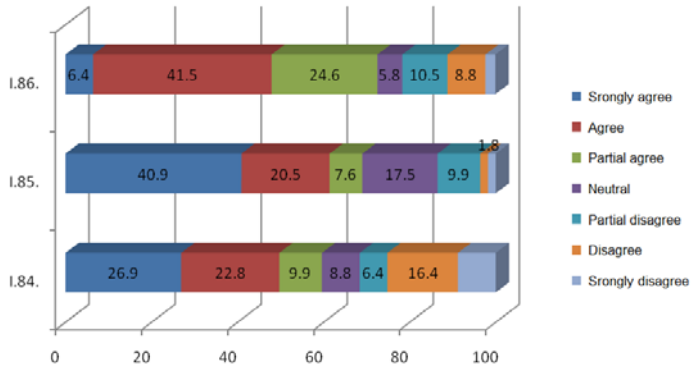


Figure 23 – Frequency's level regarding "the quality (state) of the environmental factor – AIR" dimension

I.6.2. The quality (state) of the environmental factor - WATER

Table 24 – Frequency's level regarding "the quality (state) of the environmental factor – WATER" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.87.	47,4	21,6	9,9	13,5	4,1	3,5	-	78,9	7,6	71,3
I.88.	-	-	9,9	7,6	3,5	38,6	40,4	9,9	82,5	72,6
I.89.	42,7	25,7	2,3	12,3	10,5	4,7	1,8	70,7	17	53,7

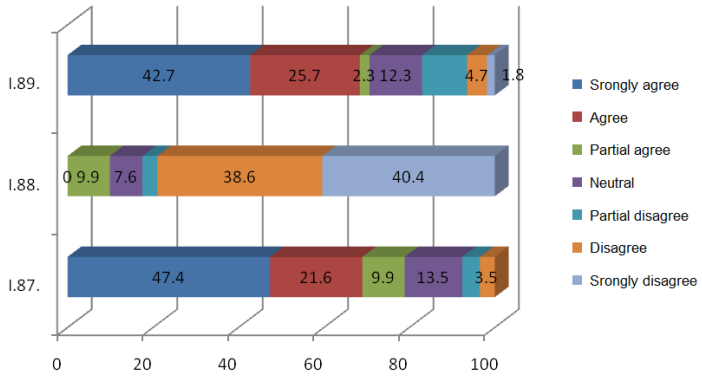


Figure 24 – Frequency's level regarding "the quality (state) of the environmental factor – WATER" dimension

I.6.3. The quality (state) of the environment factor - SOIL

Table 25 – Frequency's level regarding "the quality (state) of the environment factor – SOIL" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.90.	27,5	11,7	6,4	19,9	8,2	6,4	19,9	45,6	34,5	11,1
I.91.	30,4	19,9	2,9	14,6	5,8	4,7	21,6	53,2	32,1	21,1

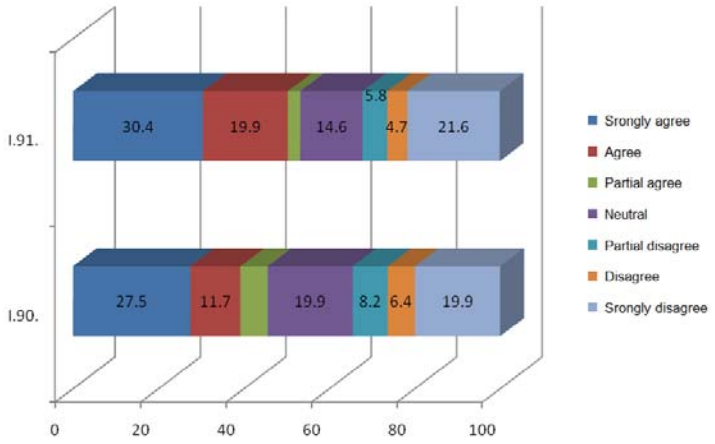


Figure 25 – Frequency's level regarding "the quality (state) of the environment factor – SOIL" dimension

I.6.4. Relationship organization - population

Table 26 – Frequency's level regarding "relationship organization – population" dimension

Item	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.92.	-	1,8	6,4	28,7	10,5	19,3	33,3	8,2	63,1	-54,9

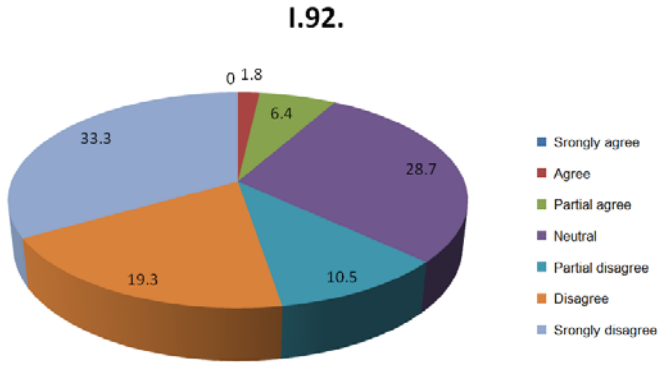


Figure 26 – Frequency's level regarding "relationship organization – population" dimension

I.6.5. Relationship organization - flora

Table 27 – Frequency's level regarding "relationship organization – flora" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.93.	-	-	-	-	5,8	35,1	59,1	-	100	-100
I.94.	4,1	18,1	4,1	22,8	16,4	8,8	25,7	26,3	50,9	-24,6

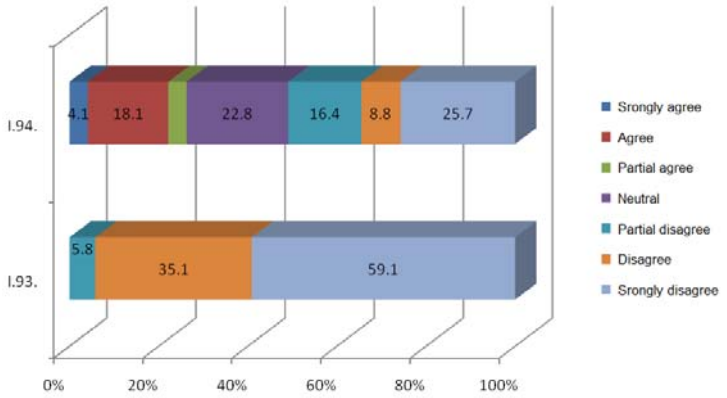


Figure 27 – Frequency's level regarding "relationship organization – flora" dimension

I.6.6. Relationship organization - fauna

Table 28 – Frequency's level regarding "relationship organization – fauna" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
I.95.	-	-	-	4,1	5,3	28,7	62	-	95,9	-95,9
I.96.	9,4	12,3	2,9	18,1	8,2	22,8	26,3	24,6	57,3	-32,7

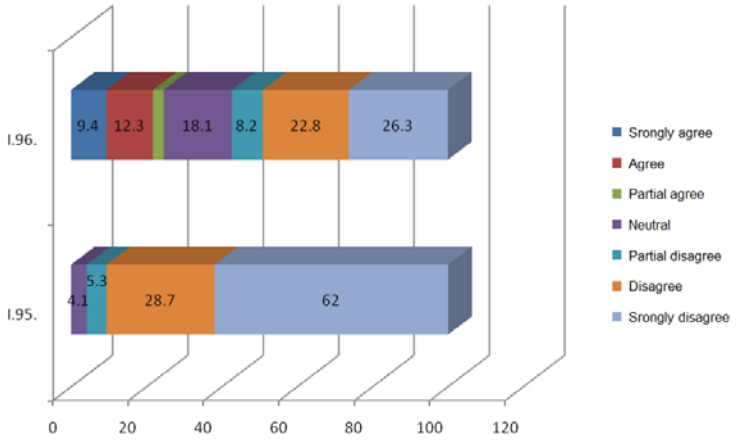


Figure 28 – Frequency's level regarding "relationship organization – fauna" dimension

II. Variables wich defines the „organizations orientation to environmental issues and implicitly in the EMS implementation and integration"

II.1. Variable: Environmental strategic leadership

Dimensions:

II.1.1. Environmental vision of the organization (LS.1)

Table 29 – Frequency's level regarding "environmental vision of the organization" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.1.	49,7	24	17	8,8	0,6	-	-	90,7	0,6	90,1

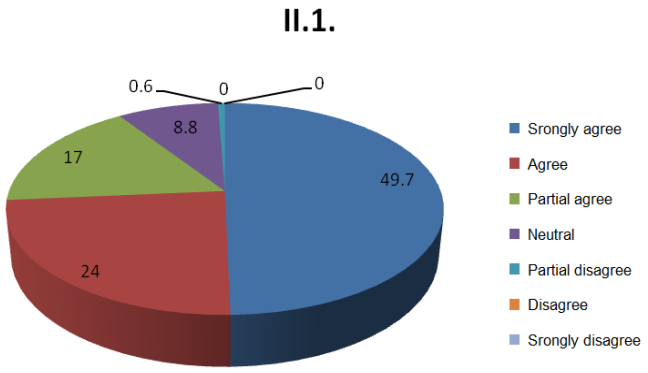


Figura 29 – Frequency's level regarding "environmental vision of the organization" dimension

II.1.2. The "flexibility"of the organizational structure (LS.2)

Table 30 – Frequency's level regarding "the <flexibility>of the organizational structure" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.2.	5,3	19,3	7	2,3	27,5	25,1	13,5	31,6	66,1	-34,5
II.3.	1,8	7	19,9	26,9	9,4	12,3	22,8	28,7	44,5	-15,8
II.4.	-	1,8	17	18,1	17,5	28,7	17	18,8	63,2	-44,4

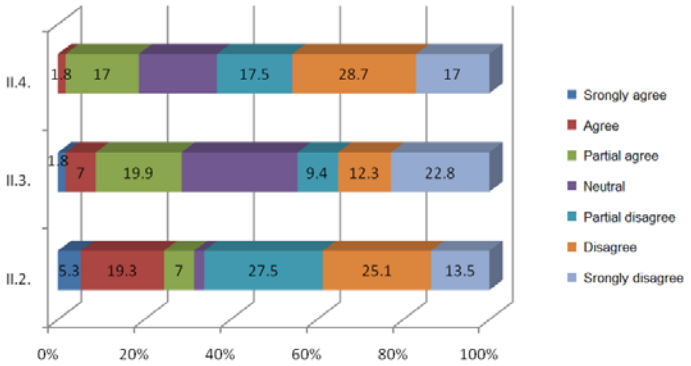


Figure 30 – Frequency's level regarding "the <flexibility>of the organizational structure" dimension

II.1.3. Environmental objectives and targets of the organization (LS.3)

Table 31 – Frequency level regarding "environmental objectives and targets of the organization" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.5.	50,3	13,5	17	11,7	4,7	2,9	-	80,8	7,6	-73,2

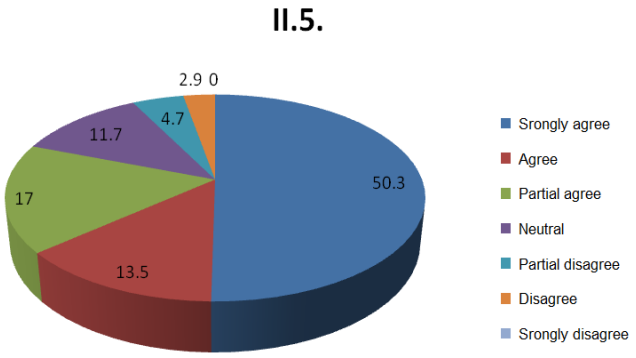


Figure 31 – Frequency level regarding "environmental objectives and targets of the organization" dimension

II.1.4. Analysis and assessment (LS.4)

Table 32 – Frequency's level regarding the (environmental) "analysis and assessment" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.6.	45,6	21,6	25,1	7,6	-	-	-	92,4	-	92,4
II.7.	46,8	31	13,5	6,4	2,3	-	-	91,3	2,3	89
II.8.	39,2	21,1	19,9	17	2,9	-	-	80,1	2,9	77,2

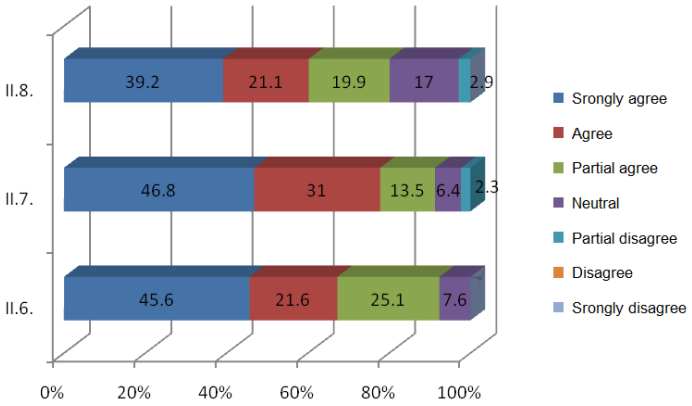


Figure 32 – Frequency's level regarding the (environmental) "analysis and assessment" dimension

II.2. Variable: Environmental management of financial resource

Dimensions:

II.2.1. Budget allocation (MRF.1)

Table 33 – Frequency's level regarding the organizations "budget allocation" dimension for environmental issue

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.9.	42,7	20,5	9,4	7,6	2,3	6,4	11,1	72,6	19,8	52,8
II.10.	-	7,6	28,7	13,5	16,4	11,1	22,8	36,3	50,3	-27,5

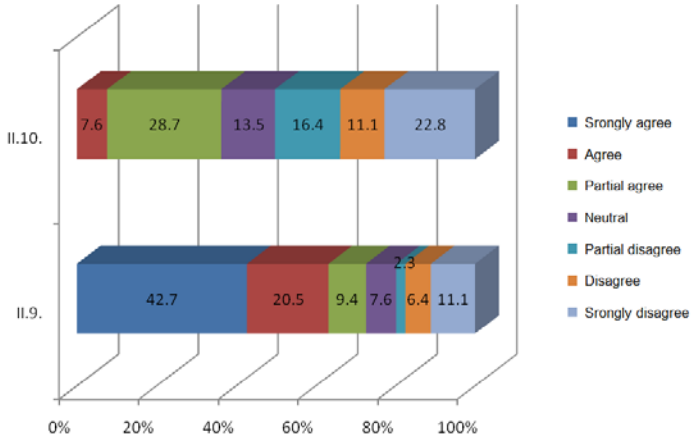


Figure 33 – Frequency's level regarding the organizations "budget allocation" dimension for environmental issue

II.2.2. Fund-raising (MRF.2)

Table 34 – Frequency's level regarding "fund-raising" dimension for environmental activities

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.11.	7,6	12,9	4,7	23,4	4,7	12,9	33,9	25,2	51,5	-26,3

II.11.

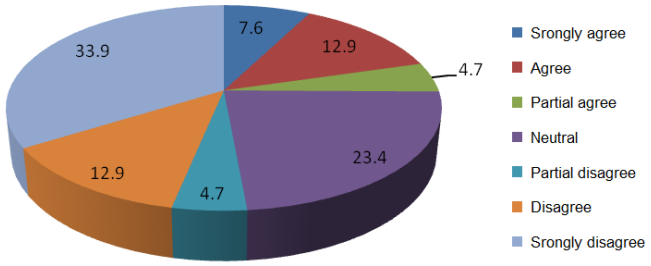


Figure 34 – Frequency's level regarding "fund-raising" dimension for environmental activities

II.3. Variable: Human resource management in environmental management

Dimensions:

II.3.1. Personnel - Environmental specializations/ trainings (MRU.1)

Table 35 – Frequency's level regarding the environmental specializations/ trainings of the "personnel" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.12.	17	8,8	21,6	22,2	4,1	2,9	23,4	47,4	30,4	17
II.13.	11,7	11,7	14,6	8,8	11,1	19,9	22,2	38	53,2	-15,2
II.14.	38	28,1	23,4	10,5	-	-	-	89,5	-	89,5
II.15.	30,4	12,3	24,6	28,1	4,7	-	-	67,2	4,7	62,5
II.16.	24,6	26,9	12,3	29,2	7	-	-	63,8	7	56,8

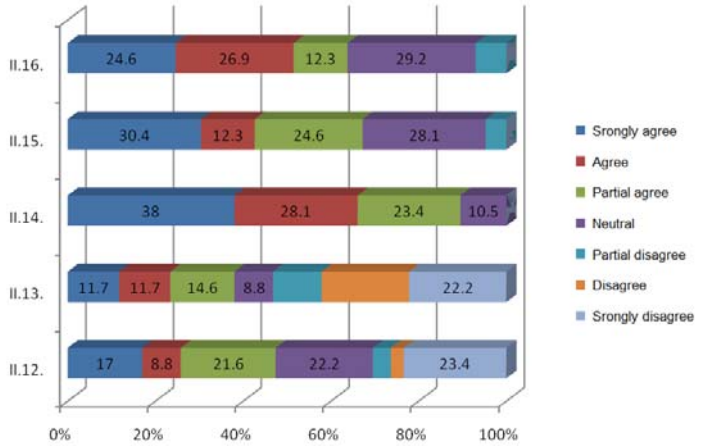


Figure 35 – Frequency's level regarding the environmental specializations/ trainings of the "personnel" dimension

II.3.2. Responsibilities – environmental responsibilities (MRU.2)

Table 36 – Frequency's level regarding the "environmental responsibilities" dimension

Item	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.17.	2,3	23,4	33,3	4,1	14,6	22,2	-	59	36,8	22,2

II.17.

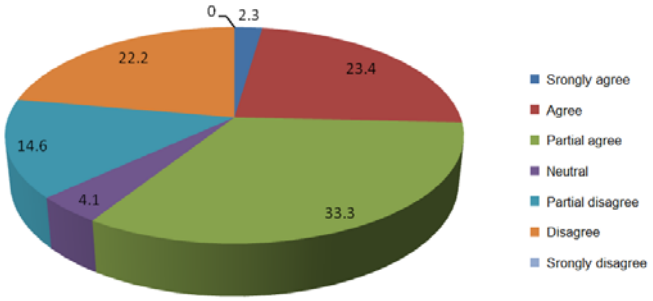


Figure 36 – Frequency's level regarding the "environmental responsibilities" dimension

II.3.3. Reward system: relationship reward system and environmental performance (MRU.3)

Table 37 – Frequency's level regarding the "relationship reward system - environmental performance" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.18.	2,3	21,6	11,1	22,8	9,9	19,3	12,9	35	42,1	-7,1
II.19.	20,5	29,2	23,4	12,9	5,8	6,4	1,8	73,1	14	59,1

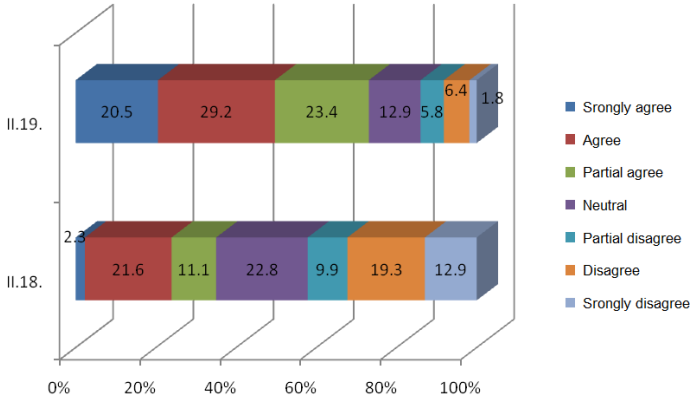


Figure 37 – Frequency's level regarding the "relationship reward system - environmental performance" dimension

I.3.4. Motivation: relationship employees' motivation - environment performance (MRU.4)

Table 38 – Frequency level regarding the "relationship employees' motivation - environment performance" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.20.	11,7	15,2	20,5	12,3	11,7	13,5	15,2	47,4	40,4	7

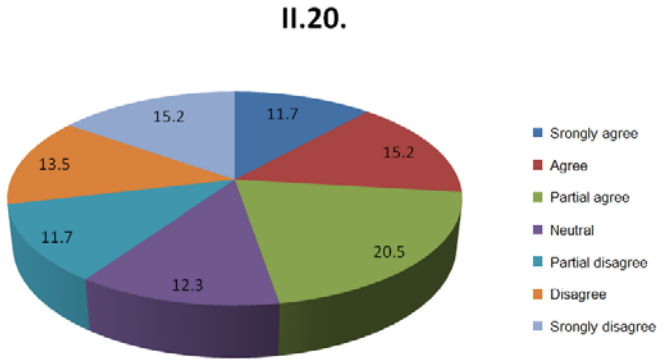


Figure 38 – Frequency level regarding the "relationship employees' motivation - environment performance" dimension

II.4. Variable: Environmental informational management

Dimension:
II.4.1. Environmental decision-making system (MI.1)

Table 39 – Frequency's level regarding the "environmental decision-making system" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.21.	11,7	9,9	39,8	12,3	18,7	7,6	-	61,4	26,3	35,1
II.22.	4,1	28,1	33,9	9,9	9,9	11,7	2,3	66,1	23,9	42,2
II.23.	-	4,1	11,1	10,5	8,2	33,3	32,7	15,2	74,2	-59
II.24.	5,3	24,6	23,4	27,5	14,6	4,7	-	53,3	19,3	-34
II.25.	17	28,1	35,7	10,5	6,4	2,3	-	80,8	8,7	72,1
II.26.	36,3	29,8	17,5	14	2,3	-	-	83,7	2,3	81,4
II.27.	7,6	24	32,7	19,3	5,3	8,8	2,3	64,3	16,4	47,9
II.28.	9,4	18,7	10,5	4,7	5,3	29,8	21,6	38,6	56,7	-18,1
II.29.	26,3	23,4	29,8	20,5	-	-	-	79,5	-	19,5

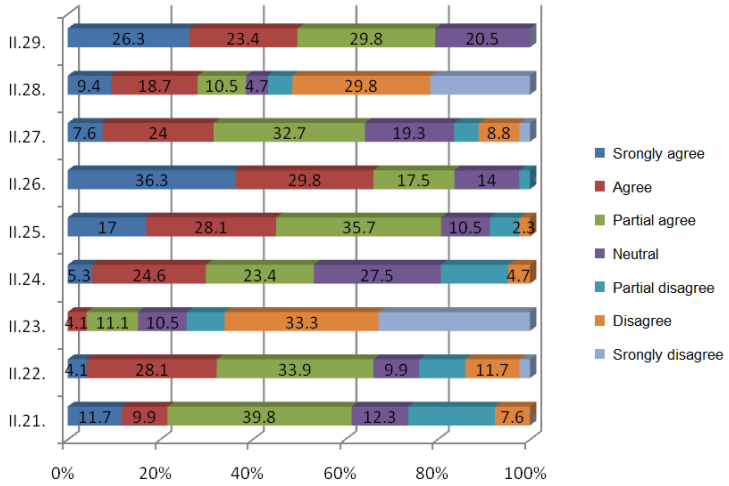


Figure 39 – Frequency's level regarding the "environmental decision-making system" dimension

II.4.2. Environmental organizational informational system (MI.2)

Table 40 – Frequency's level regarding the "environmental organizational informational system" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.30.	36,8	24	19,9	12,3	4,1	2,9	-	80,7	7	73,7
II.31.	36,3	37,4	15,8	8,2	2,3	-	-	89,5	2,3	87,2
II.32.	38,6	30,4	12,9	15,8	2,3	-	-	81,9	2,3	79,6
II.33.	31,6	13,5	29,2	12,3	4,1	9,4	-	74,3	13,5	60,8
II.34.	37,4	32,7	22,8	7	-	-	-	93	-	93
II.35.	52	31	12,3	4,7	-	-	-	95,3	-	95,3
II.36.	33,9	25,1	17	11,1	6,4	3,5	2,9	76	12,6	63,4
II.37.	1,8	14	17	9,9	20,5	24,6	12,3	32,8	57,4	-24,6
II.38.	50,3	24	12,9	9,9	2,9	-	-	87,2	2,9	84,3

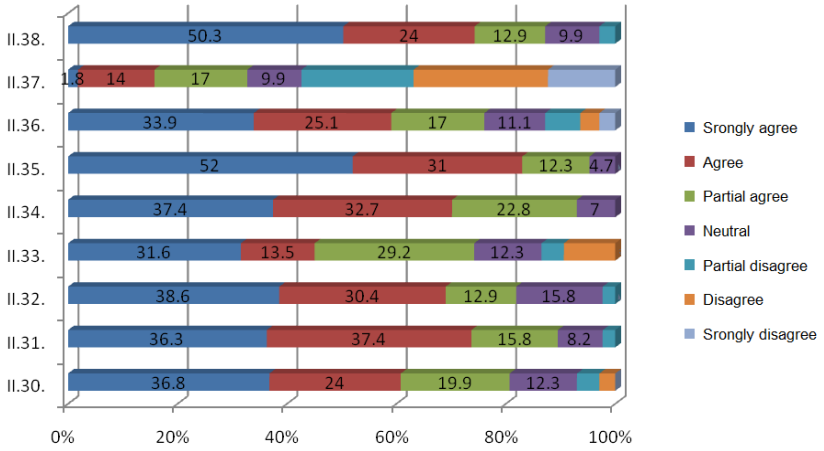


Figure 40 – Frequency's level regarding the "environmental organizational informational system" dimension

II.4.3. The environmental knowledge management system (MI.3)

Table 41 – Frequency's level regarding the "environmental knowledge management system" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.39.	29,8	31,6	12,9	4,7	11,7	9,4	-	74,3	21,1	53,2
II.40.	8,8	14,7	18,2	7,1	9,4	22,4	19,4	41,7	51,2	-9,5
II.41.	19,3	35,7	18,7	21,6	4,7	-	-	73,7	4,7	69
II.42.	46,2	29,8	8,2	6,4	6,4	2,9	-	84,2	9,3	74,9
II.43.	21,1	38	12,3	11,7	14	2,9	-	71,4	16,9	54,5
II.44.	26,9	14	22,8	22,8	2,3	8,8	2,3	63,7	13,4	50,3
II.45.	23,4	29,2	5,3	12,9	17,5	7	4,7	57,9	29,2	28,7
II.46.	20,5	36,8	19,3	1,8	-	17	4,7	76,6	21,7	54,9
II.47.	28,1	24,6	16,4	17,5	2,3	8,8	2,3	69,1	13,4	55,7

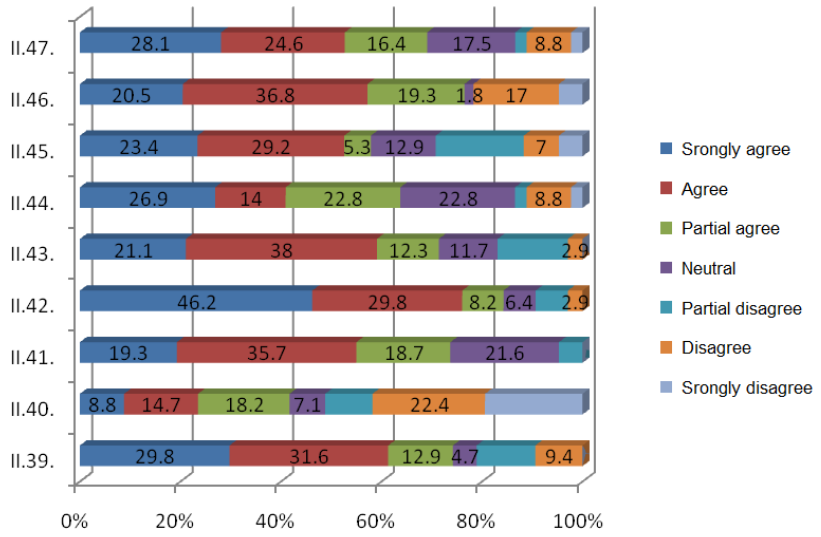


Figure 41 – Frequency's level regarding the "environmental knowledge management system" dimension

II.4.4. Environmental monitoring and control (MI.4)

Table 42 – Frequency's level regarding the "environmental monitoring and control" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.48.	37,4	16,4	26,9	16,4	2,9	-	-	80,7	2,9	77,8
II.49.	27,5	29,2	12,3	17,5	8,8	4,7	-	69	13,5	55,5
II.50.	26,3	18,7	25,7	11,7	8,8	8,8	-	70,7	17,6	53,1

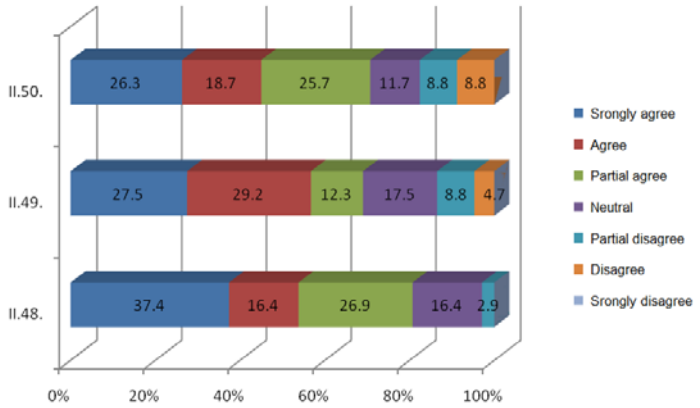


Figure 42 – Frequency's level regarding the "environmental monitoring and control" dimension

II.5. Variable: Systemic-technological "infrastructure" with impact on environmental management

Dimension:
II.5.1. Technological level (ISTech.1)

Table 43 – Frequency's level regarding the "technological level" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*

II.51.	29,8	21,1	20,5	8,8	8,2	1,8	9,9	71,4	19,9	51,1
II.52.	-	0,6	8,2	21,6	28,7	25,7	15,2	8,8	69,6	-60,8
II.53.	-	6,4	4,1	19,9	19,3	32,7	17,5	10,5	69,5	-59
II.54.	9,9	19,9	46,8	9,4	2,9	8,8	2,3	76,6	14	62,6

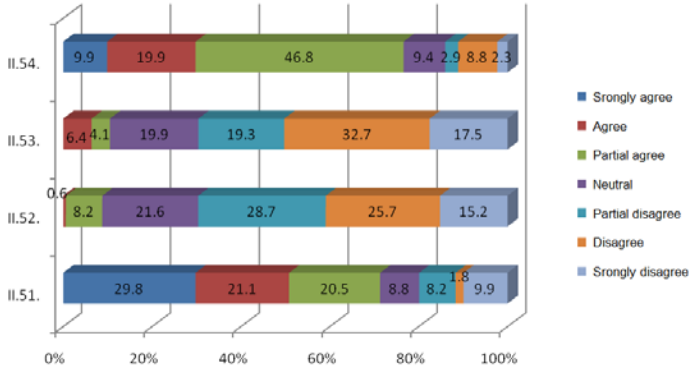


Figure 43 – Frequency's level regarding the "technological level" dimension

II.5.2. The existence of other management systems (ISTech.2)

Table 44 – Frequency's level regarding "the existence of other management systems" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.55.	66,7	21,6	2,9	6,4	2,3	-	-	91,3	2,3	89
II.56.	45,9	35,3	7,1	2,9	6,5	2,4	-	88,2	8,9	79,3

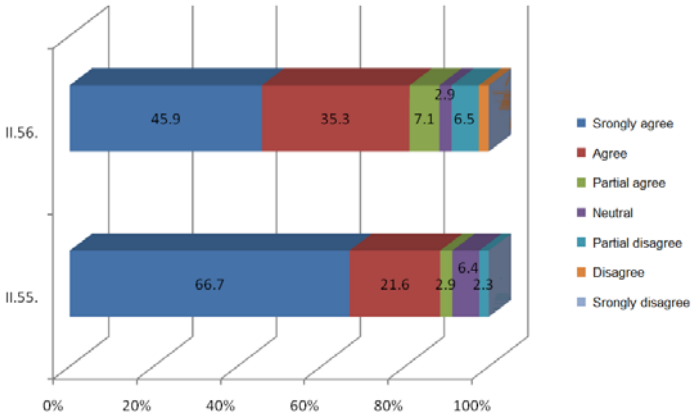


Figura 44 – Frequency's level regarding "the existence of other management systems" dimension

II.6. Variable: Organization's orientation to the environmental innovation

Dimensions:
II.6.1. Environmental innovation (CO.1)

Table nr.45 – Frequency's level regarding the "environmental innovation" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.57.	4,1	33,3	12,3	14,6	13,5	13,5	8,8	49,7	35,8	13,9
II.58.	18,7	23,4	5,8	8,8	19,3	12,9	11,1	47,9	43,3	4,6
II.59.	24,6	21,6	12,3	26,9	11,7	2,9	-	58,5	14,6	43,9

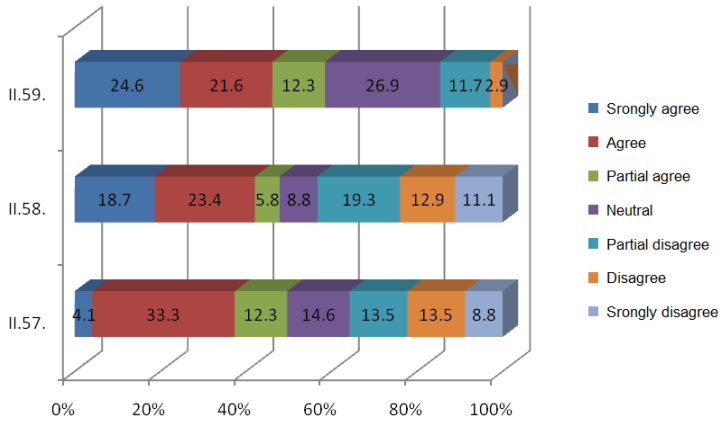


Figure 45 – Frequency's level regarding the "environmental innovation" dimension

II.7. Variable: External environment with direct/ indirect implication in organization's environmental management

Dimensions:
II.7.1. Environmental regulations (ME.1)

Table 46 – Frequency's level regarding the "environmental regulations" dimension

Item	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.60.	15,8	33,3	21,1	15,2	7,6	7	-	70,2	14,6	55,6

II.60.

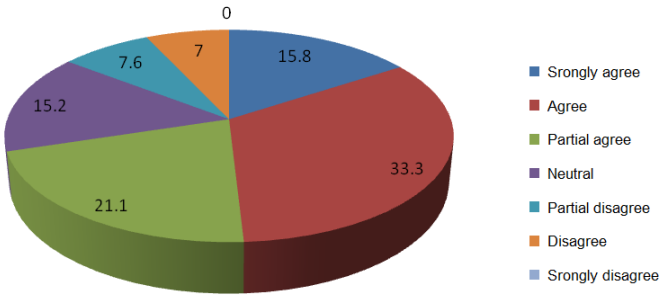


Figura 46 – Frequency's level regarding the "environmental regulations" dimension

II.7.2. Socio-economic context (ME.2)

Table 47 – Frequency's level regarding the "socio-economic context" dimension

Items	Strongl y agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.61.	7	34,5	18,7	19,3	-	11,7	8,8	60,2	20,5	39,7
II.62.	22,8	11,1	15,2	26,9	-	17,5	6,4	49,1	23,9	25,2
II.63.	22,2	8,2	13,5	23,4	5,8	18,1	8,8	43,9	32,7	11,2
II.64.	59,6	21,6	18,7	-	-	-	-	100	-	100
II.65.	45,6	16,4	38	-	-	-	-	100	-	100

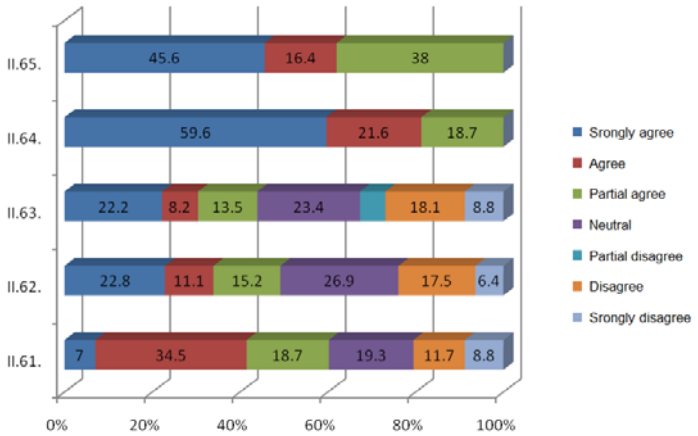


Figure 47 – Frequency's level regarding the "socio-economic context" dimension

II.7.3. External stakeholders (and, indirectly, internal stakeholders) (ME.3)

Table 48 – Frequency's level regarding the "external stakeholders (and, indirectly, internal stakeholders)" dimension

Items	Strongly agree	Agree	Partial agree	Neutral	Partial disagree	Disagree	Strongly disagree	% Agree	% Disagree	Difference %
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9=2+3+4*	*10=6+7+8*	*11=9-10*
II.66.	-	9,4	12,3	17	11,7	39,7	9,9	21,7	61,3	-39,6
II.67.	-	4,7	3,5	11,7	14,6	39,2	26,3	8,2	80,1	-71,9
II.68.	14	7,6	19,9	42,7	7	6,4	2,3	41,5	15,7	25,8
II.69.	38	13,5	25,7	20,5	2,3	-	-	77,2	2,3	74,9
II.70.	17	7,6	22,8	22,8	24,6	4,7	0,6	47,4	29,9	17,5

II.71.	1,8	12,3	12,3	15,2	32,7	13,5	12,3	26,4	58,5	-32,1
II.72.	32,2	23,4	17,5	8,8	8,8	6,4	2,9	73,1	18,1	55
II.73.	2,3	8,8	7,6	15,8	14,6	25,1	25,7	18,7	65,4	-46,7
II.74.	12,9	8,2	8,2	15,2	12,9	22,8	19,9	29,3	55,6	-26,3

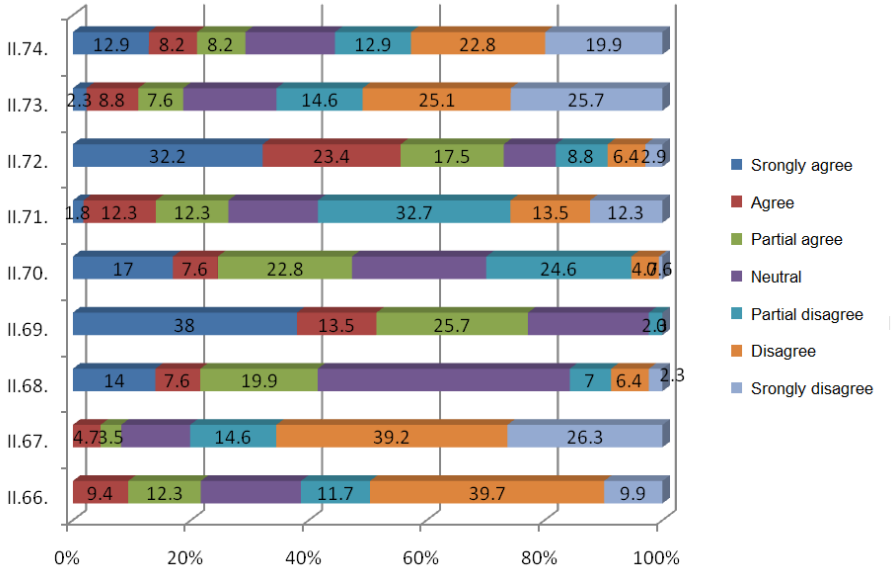


Figure 48 – Frequency's level regarding the "external stakeholders (and, indirectly, internal stakeholders)" dimension

ANNEX No.15: Descriptive statistics and internal consistency validation of construct for the EMS implementation and operation phase analysis

Descriptive statistics and internal consistency validation of considered construct, as it follows:

*** EMS IMPLEMENTATION AND OPERATION PHASE:**

A. SETTING ENVIRONMENTAL RESPONSABILITIES AT EMS LEVEL

I. Organizational structure through implementation of EMS environmental policies and programs (Table 1)
II. Qualified staff in environmental management issues (Table 2)
III. Establishing environmental responsibilities (at EMS level) (Table 3)
IV. Existence of another management system implemented at the organisational level (Table 4)
VI. Operation of EMS internal audits (Table 5)

B. ENVIRONMENTAL TRAINING

1. Environmental training (Table 6)
2. Registration environmental trainings results (Table 7)
3. Registration of environmental trainings effects through performed environmental activities (Table 8)

C. ENVIRONMENTAL COMMUNICATION

1. External environmental communication (Table 9)
2. Internal environmental communication
*at environmental information level (a) (Table 10)
*at environmental knowledge level (b) (Table 11)

D. CONTROL AT EMS LEVEL

1. Control of environmental documents (Table 12)
2. Operational control (Table 13)
3. Operational control externalization (Table 14)

*** FLEXIBILITY OF ORGANISATION TO ASSIMILATE EMS ARCHITECTURE TRANSFORMATION AND ADAPTATION:**

A. Flexibility of organisational structure (Table 15)
B. Orientation of organization managers – environmental decentralization objectives and targets/decentralization of decisional process (Table's 16/ 17)

Table 1. Organizational structure through implementation of EMS environmental policies and programs

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Formalizing environmental activities	171	4.5380	.75873	.630	5
Specialization of environmental activities	171	5.1178	.64883	.610	7
Centralization of environmental activities	171	4.4503	1.73261	.656	2
Decentralization of environmental activities	171	4.9450	.68291	.560	4
Functional cooperation (departmental/ interdepartmental)	171	4.6374	1.04058	.599	6
Valid N (listwise)	171				

Table 2. Qualified staff in environmental management issues

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Environmental indoctrination	171	4.0390	.99201	.70	3
Valid N (listwise)	171				

Table 3. Establishing environmental responsibilities (at EMS level)

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Establishing environmental responsibilities	171	4.2807	1.56530	-	1
Valid N (listwise)	171				

Table 4. Existence of another management system implemented at the organisational level

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Quality management sistem existence	171	6.4386	.98848	.926	2
Valid N (listwise)	171				

Table 5. Operation of EMS internal audits

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
EMS internal audits	171	6.0936	.96863	.895	2
Valid N (listwise)	171				

Table 6. Environmental training

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Environmental training	171	4.6117	1.49205	.853	5
Valid N (listwise)	171				

Table 7. Registration environmental trainings results

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Registration environmental trainings results	171	5.3158	1.44089	-	1
Valid N (listwise)	171				

Table 8. Registration of environmental trainings effects through performed environmental activities

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Registration of environmental trainings effects through performed environmental activities	171	6.0877	1.13678	-	1
Valid N (listwise)	171				

Table 9. External environmental communication

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
External environmental communication	171	4.2632	1.92378	-	1
Valid N (listwise)	171				

Table 10. Internal environmental communication - 1

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Internal environmental communication *at environmental information level (a)	171	5.3494	.98760	.778	4
Valid N (listwise)	171				

Table 11. Internal environmental communication - 2

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Internal environmental communication *at environmental knowledge level (b)	171	5.0526	1.2932	.610	3
Valid N (listwise)	171				

Table 12. Control of environmental documents

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Control of environmental documents	171	5.8246	1.23607	.812	2
Valid N (listwise)	171				

Table 13. Operational control

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Operational control	171	4.9873	1.14504	.886	12
Valid N (listwise)	171				

Table 14. Operational control externalization

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Operational control externalization	171	5.5614	1.45138	-	1
Valid N (listwise)	171				

Table 15. Flexibility of organisational structure

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Flexibility of organisational structure	171	3.2495	1.49862	.877	3
Valid N (listwise)	171				

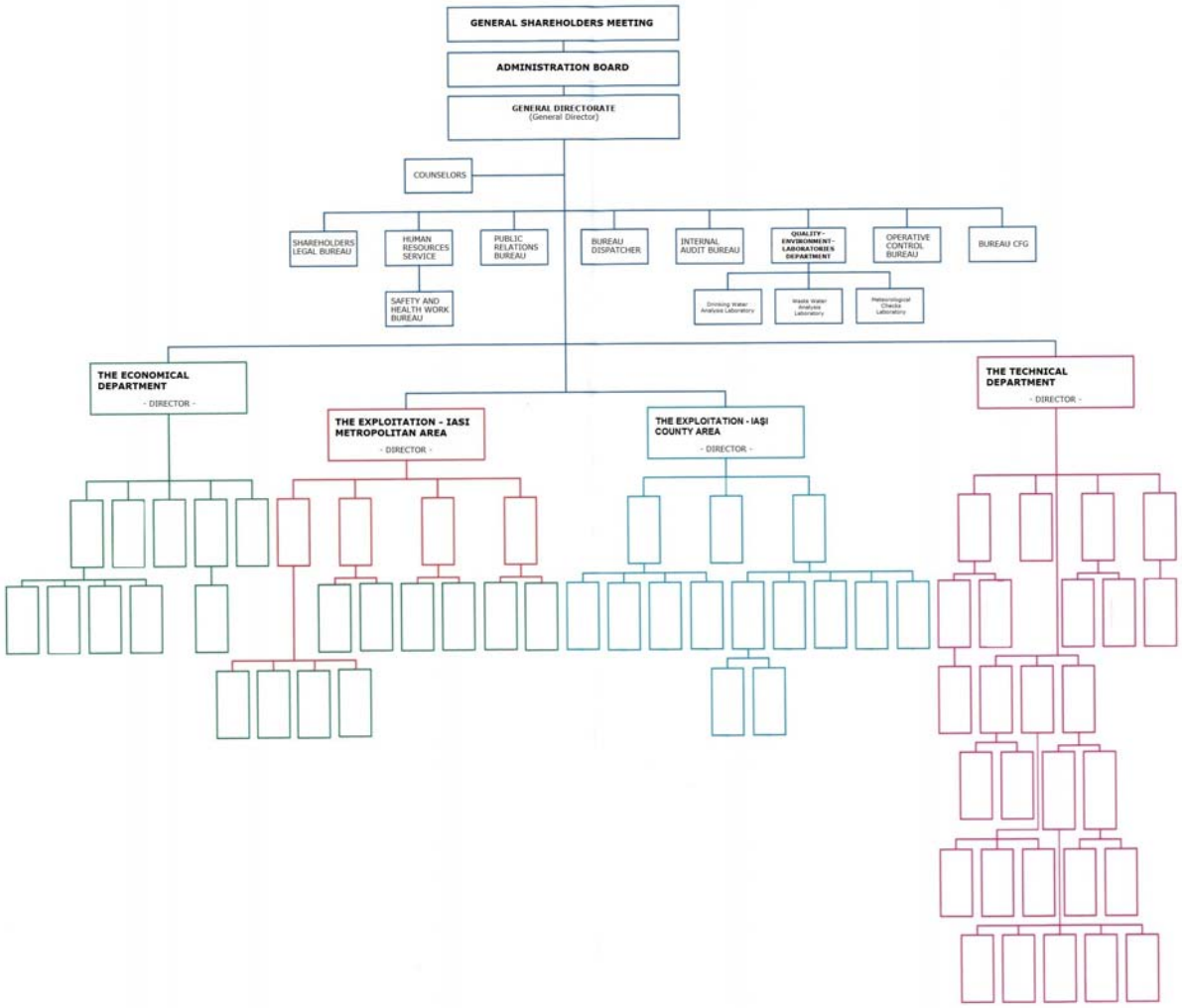
Tabel 16. Orientation of organization managers – decentralization of environmental objectives and targets/ decentralization of decisional process - 1

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Orientation of organization managers – decentralization of environmental objectives and targets/ decentralization of decisional process * Establishing, modifying and updating environmental objectives and targets at department level/ divisions of organisations guided by a set of environmental objectives and targets as general-directive (strategic orientation)	171	6.6959	.55406	-	1
Valid N (listwise)	171				

Tabel 17. Orientation of organization managers – decentralization of environmental objectives and targets/ decentralization of decisional process - 2

Descriptive Statistics				Reliability Statistics	
	N	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Orientation of organization managers – decentralization of environmental objectives and targets/ decentralization of decisional process * Decentralization of environmental decision-making process (each employee has to decide for themselves in performed environmental current activities (guided by a code of good environmental practices)	171	3.4620	2.15093	-	1
Valid N (listwise)	171				

ANNEX No.16: Commercial Society (S.C.) APAVITAL S.A. Iaşi Romania - organizational chart



ANNEX No.17: MANOVA between dependent variables that defines the EMS implementation/ integration quality and independent variables (factors that characterizes organization orientation on the environmental environmental issues and implicitly in the EMS implementation and integration)

1. MANOVA between dependent variables that defines the EMS implementation/ integration quality and „Environmental strategic leadership" variable (as factor)

Table 1. Multivariate tests

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,997	7480,703[a]	6,000	146,000	,000	44884,217	1,000
	Wilks' Lambda	,003	7480,703[a]	6,000	146,000	,000	44884,217	1,000
	Hotelling's Trace	307,426	7480,703[a]	6,000	146,000	,000	44884,217	1,000
	Roy's Largest Root	307,426	7480,703[a]	6,000	146,000	,000	44884,217	1,000
II.1	Pillai's Trace	2,921	7,540	114,000	906,000	**,000**	859,504	1,000
	Wilks' Lambda	,011	8,856	114,000	847,846	**,000**	951,547	1,000
	Hotelling's Trace	8,024	10,160	114,000	866,000	**,000**	1158,197	1,000
	Roy's Largest Root	3,202	25,447[c]	19,000	151,000	**,000**	483,494	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. **Design: Intercept + II.1**

Table 2. Univariate tests regarding the effects induced by the „Environmental strategic leadership" variable on each dependent variable

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power[b]
Corrected Model	I.1	31,892[a]	19	1,679	12,526	,000	237,990	1,000
	I.2	28,585[c]	19	1,504	6,846	,000	130,067	1,000
	I.3	101,599[d]	19	5,347	12,418	,000	235,939	1,000
	I.4	24,559[e]	19	1,293	8,360	,000	158,842	1,000
	I.5	61,487[f]	19	3,236	9,187	,000	174,551	1,000
	I.6	97,603[g]	19	5,137	12,092	,000	229,755	1,000
Intercept	I.1	2191,868	1	2191,868	16356,391	,000	16356,391	1,000
	I.2	2322,597	1	2322,597	10568,227	,000	10568,227	1,000
	I.3	1088,497	1	1088,497	2527,764	,000	2527,764	1,000
	I.4	1356,236	1	1356,236	8771,769	,000	8771,769	1,000
	I.5	1448,733	1	1448,733	4112,707	,000	4112,707	1,000
	I.6	1165,461	1	1165,461	2743,476	,000	2743,476	1,000
II.1	I.1	31,892	19	1,679	12,526	**,000**	237,990	1,000
	I.2	28,585	19	1,504	6,846	**,000**	130,067	1,000
	I.3	101,599	19	5,347	12,418	**,000**	235,939	1,000
	I.4	24,559	19	1,293	8,360	**,000**	158,842	1,000
	I.5	61,487	19	3,236	9,187	**,000**	174,551	1,000
	I.6	97,603	19	5,137	12,092	**,000**	229,755	1,000
Error	I.1	20,235	151	,134				
	I.2	33,186	151	,220				
	I.3	65,023	151	,431				
	I.4	23,347	151	,155				
	I.5	53,191	151	,352				
	I.6	64,147	151	,425				
Total	I.1	4384,080	171					
	I.2	4703,047	171					
	I.3	2637,383	171					
	I.4	2778,871	171					
	I.5	3041,080	171					
	I.6	2664,189	171					
Corrected Total	I.1	52,127	170					
	I.2	61,770	170					
	I.3	166,622	170					

	I.4	47,906	170					
	I.5	114,678	170					
	I.6	161,749	170					

a. R Squared = ,612 (Adjusted R Squared = ,563)
b. Computed using alpha = ,05
c. R Squared = ,463 (Adjusted R Squared = ,395)
d. R Squared = ,610 (Adjusted R Squared = ,561)
e. R Squared = ,513 (Adjusted R Squared = ,451)
f. R Squared = ,536 (Adjusted R Squared = ,478)
g. R Squared = ,603 (Adjusted R Squared = ,554)

Table 3. Multivariate tests - Mancova

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,511	24,384[a]	6,000	140,000	,000	146,301	1,000
	Wilks' Lambda	,489	24,384[a]	6,000	140,000	,000	146,301	1,000
	Hotelling's Trace	1,045	24,384[a]	6,000	140,000	,000	146,301	1,000
	Roy's Largest Root	1,045	24,384[a]	6,000	140,000	,000	146,301	1,000
II.1	Pillai's Trace	3,353	9,666	114,000	870,000	**,000**	1101,942	1,000
	Wilks' Lambda	,002	14,730	114,000	813,304	**,000**	1568,659	1,000
	Hotelling's Trace	18,950	22,995	114,000	830,000	**,000**	2621,480	1,000
	Roy's Largest Root	11,459	87,452[c]	19,000	145,000	**,000**	1661,587	1,000
II.2	Pillai's Trace	,824	109,196[a]	6,000	140,000	,000	655,176	1,000
	Wilks' Lambda	,176	109,196[a]	6,000	140,000	,000	655,176	1,000
	Hotelling's Trace	4,680	109,196[a]	6,000	140,000	,000	655,176	1,000
	Roy's Largest Root	4,680	109,196[a]	6,000	140,000	,000	655,176	1,000
II.3	Pillai's Trace	,776	81,012[a]	6,000	140,000	,000	486,072	1,000
	Wilks' Lambda	,224	81,012[a]	6,000	140,000	,000	486,072	1,000
	Hotelling's Trace	3,472	81,012[a]	6,000	140,000	,000	486,072	1,000
	Roy's Largest Root	3,472	81,012[a]	6,000	140,000	,000	486,072	1,000
II.4	Pillai's Trace	,852	134,589[a]	6,000	140,000	,000	807,532	1,000
	Wilks' Lambda	,148	134,589[a]	6,000	140,000	,000	807,532	1,000
	Hotelling's Trace	5,768	134,589[a]	6,000	140,000	,000	807,532	1,000
	Roy's Largest Root	5,768	134,589[a]	6,000	140,000	,000	807,532	1,000
II.5	Pillai's Trace	,550	28,537[a]	6,000	140,000	,000	171,222	1,000
	Wilks' Lambda	,450	28,537[a]	6,000	140,000	,000	171,222	1,000
	Hotelling's Trace	1,223	28,537[a]	6,000	140,000	,000	171,222	1,000
	Roy's Largest Root	1,223	28,537[a]	6,000	140,000	,000	171,222	1,000
II.6	Pillai's Trace	,415	16,574[a]	6,000	140,000	,000	99,443	1,000
	Wilks' Lambda	,585	16,574[a]	6,000	140,000	,000	99,443	1,000
	Hotelling's Trace	,710	16,574[a]	6,000	140,000	,000	99,443	1,000
	Roy's Largest Root	,710	16,574[a]	6,000	140,000	,000	99,443	1,000
II.7	Pillai's Trace	,583	32,656[a]	6,000	140,000	,000	195,937	1,000
	Wilks' Lambda	,417	32,656[a]	6,000	140,000	,000	195,937	1,000
	Hotelling's Trace	1,400	32,656[a]	6,000	140,000	,000	195,937	1,000
	Roy's Largest Root	1,400	32,656[a]	6,000	140,000	,000	195,937	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. Design: **Intercept + II.1 + II.2 + II.3 + II.4 + II.5 + II.6 + II.7**

3. MANOVA between dependent variables that defines the EMS implementation/ integration quality and „Environmental management of financial resources" variable (as factor)

Table 4. Multivariate tests

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,995	5309,563[a]	6,000	151,000	,000	31857,376	1,000
	Wilks' Lambda	,005	5309,563[a]	6,000	151,000	,000	31857,376	1,000
	Hotelling's Trace	210,976	5309,563[a]	6,000	151,000	,000	31857,376	1,000
	Roy's Largest Root	210,976	5309,563[a]	6,000	151,000	,000	31857,376	1,000
II.2	Pillai's Trace	2,511	8,018	84,000	936,000	**,000**	673,549	1,000
	Wilks' Lambda	,010	13,161	84,000	848,004	**,000**	993,042	1,000
	Hotelling's Trace	15,102	26,849	84,000	896,000	**,000**	2255,274	1,000
	Roy's Largest Root	12,297	137,029[c]	14,000	156,000	**,000**	1918,409	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. **Design: Intercept + II.2**

Table 5. Univariate tests regarding the effects induced by the „Environmental management of financial resources" variable on each dependent variable

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power[b]
Corrected Model	I.1	33,470[a]	14	2,391	19,990	,000	279,857	1,000
	I.2	30,003[c]	14	2,143	10,524	,000	147,331	1,000
	I.3	131,756[d]	14	9,411	42,107	,000	589,504	1,000
	I.4	22,302[e]	14	1,593	9,706	,000	135,880	1,000
	I.5	45,701[f]	14	3,264	7,383	,000	103,357	1,000
	I.6	121,552[g]	14	8,682	33,695	,000	471,733	1,000
Intercept	I.1	1773,028	1	1773,028	14824,972	,000	14824,972	1,000
	I.2	1903,777	1	1903,777	9348,721	,000	9348,721	1,000
	I.3	939,771	1	939,771	4204,731	,000	4204,731	1,000
	I.4	1124,139	1	1124,139	6849,150	,000	6849,150	1,000
	I.5	1278,895	1	1278,895	2892,370	,000	2892,370	1,000
	I.6	1028,333	1	1028,333	3990,858	,000	3990,858	1,000
II.2	I.1	33,470	14	2,391	19,990	**,000**	279,857	1,000
	I.2	30,003	14	2,143	10,524	**,000**	147,331	1,000
	I.3	131,756	14	9,411	42,107	**,000**	589,504	1,000
	I.4	22,302	14	1,593	9,706	**,000**	135,880	1,000
	I.5	45,701	14	3,264	7,383	**,000**	103,357	1,000
	I.6	121,552	14	8,682	33,695	**,000**	471,733	1,000
Error	I.1	18,657	156	,120				
	I.2	31,768	156	,204				
	I.3	34,867	156	,224				
	I.4	25,604	156	,164				
	I.5	68,977	156	,442				
	I.6	40,197	156	,258				
Total	I.1	4384,080	171					
	I.2	4703,047	171					
	I.3	2637,383	171					
	I.4	2778,871	171					
	I.5	3041,080	171					
	I.6	2664,189	171					
Corrected Total	I.1	52,127	170					
	I.2	61,770	170					
	I.3	166,622	170					
	I.4	47,906	170					
	I.5	114,678	170					

	I.6	161,749	170					

a. R Squared = ,642 (Adjusted R Squared = ,610)
b. Computed using alpha = ,05
c. R Squared = ,486 (Adjusted R Squared = ,440)
d. R Squared = ,791 (Adjusted R Squared = ,772)
e. R Squared = ,466 (Adjusted R Squared = ,418)
f. R Squared = ,399 (Adjusted R Squared = ,345)
g. R Squared = ,751 (Adjusted R Squared = ,729)

Table 6. Multivariate tests - Mancova

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,758	75,660[a]	6,000	145,000	,000	453,957	1,000
	Wilks' Lambda	,242	75,660[a]	6,000	145,000	,000	453,957	1,000
	Hotelling's Trace	3,131	75,660[a]	6,000	145,000	,000	453,957	1,000
	Roy's Largest Root	3,131	75,660[a]	6,000	145,000	,000	453,957	1,000
II.2	Pillai's Trace	3,090	11,378	84,000	900,000	**,000**	955,752	1,000
	Wilks' Lambda	,003	17,495	84,000	814,562	**,000**	1308,200	1,000
	Hotelling's Trace	15,998	27,299	84,000	860,000	**,000**	2293,101	1,000
	Roy's Largest Root	9,955	106,657[c]	14,000	150,000	**,000**	1493,191	1,000
II.1	Pillai's Trace	,536	27,927[a]	6,000	145,000	,000	167,565	1,000
	Wilks' Lambda	,464	27,927[a]	6,000	145,000	,000	167,565	1,000
	Hotelling's Trace	1,156	27,927[a]	6,000	145,000	,000	167,565	1,000
	Roy's Largest Root	1,156	27,927[a]	6,000	145,000	,000	167,565	1,000
II.3	Pillai's Trace	,616	38,724[a]	6,000	145,000	,000	232,343	1,000
	Wilks' Lambda	,384	38,724[a]	6,000	145,000	,000	232,343	1,000
	Hotelling's Trace	1,602	38,724[a]	6,000	145,000	,000	232,343	1,000
	Roy's Largest Root	1,602	38,724[a]	6,000	145,000	,000	232,343	1,000
II.4	Pillai's Trace	,855	142,518[a]	6,000	145,000	,000	855,108	1,000
	Wilks' Lambda	,145	142,518[a]	6,000	145,000	,000	855,108	1,000
	Hotelling's Trace	5,897	142,518[a]	6,000	145,000	,000	855,108	1,000
	Roy's Largest Root	5,897	142,518[a]	6,000	145,000	,000	855,108	1,000
II.5	Pillai's Trace	,582	33,581[a]	6,000	145,000	,000	201,485	1,000
	Wilks' Lambda	,418	33,581[a]	6,000	145,000	,000	201,485	1,000
	Hotelling's Trace	1,390	33,581[a]	6,000	145,000	,000	201,485	1,000
	Roy's Largest Root	1,390	33,581[a]	6,000	145,000	,000	201,485	1,000
II.6	Pillai's Trace	,503	24,474[a]	6,000	145,000	,000	146,845	1,000
	Wilks' Lambda	,497	24,474[a]	6,000	145,000	,000	146,845	1,000
	Hotelling's Trace	1,013	24,474[a]	6,000	145,000	,000	146,845	1,000
	Roy's Largest Root	1,013	24,474[a]	6,000	145,000	,000	146,845	1,000
II.7	Pillai's Trace	,885	186,680[a]	6,000	145,000	,000	1120,081	1,000
	Wilks' Lambda	,115	186,680[a]	6,000	145,000	,000	1120,081	1,000
	Hotelling's Trace	7,725	186,680[a]	6,000	145,000	,000	1120,081	1,000
	Roy's Largest Root	7,725	186,680[a]	6,000	145,000	,000	1120,081	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d**. Design: Intercept + II.2 + II.1 + II.3 + II.4 + II.5 + II.6 + II.7**

3. MANOVA between dependent variables that defines the EMS implementation/ integration quality and „Human resource management in environmental issue" variable (as factor)

Table 7. Multivariate tests

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,994	4009,484[a]	6,000	141,000	,000	24056,904	1,000
	Wilks' Lambda	,006	4009,484[a]	6,000	141,000	,000	24056,904	1,000
	Hotelling's Trace	170,616	4009,484[a]	6,000	141,000	,000	24056,904	1,000
	Roy's Largest Root	170,616	4009,484[a]	6,000	141,000	,000	24056,904	1,000
II.3	Pillai's Trace	3,089	6,456	144,000	876,000	**,000**	929,714	1,000
	Wilks' Lambda	,004	8,974	144,000	831,931	**,000**	1241,140	1,000
	Hotelling's Trace	13,371	12,938	144,000	836,000	**,000**	1863,021	1,000
	Roy's Largest Root	7,663	46,615[c]	24,000	146,000	**,000**	1118,768	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. **Design: Intercept + II.3**

Table 8. Univariate tests regarding the effects induced by the „Human resource management in environmental issue" variable on each dependent variable

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power[b]
Corrected Model	I.1	31,992[a]	24	1,333	9,665	,000	231,965	1,000
	I.2	39,392[c]	24	1,641	10,708	,000	256,991	1,000
	I.3	97,340[d]	24	4,056	8,547	,000	205,127	1,000
	I.4	23,608[e]	24	,984	5,910	,000	141,850	1,000
	I.5	85,875[f]	24	3,578	18,137	,000	435,297	1,000
	I.6	113,489[g]	24	4,729	14,306	,000	343,337	1,000
Intercept	I.1	1798,024	1	1798,024	13037,124	,000	13037,124	1,000
	I.2	1882,429	1	1882,429	12280,992	,000	12280,992	1,000
	I.3	1131,255	1	1131,255	2383,916	,000	2383,916	1,000
	I.4	1206,953	1	1206,953	7252,175	,000	7252,175	1,000
	I.5	1253,836	1	1253,836	6355,639	,000	6355,639	1,000
	I.6	1102,728	1	1102,728	3336,062	,000	3336,062	1,000
II.3	I.1	31,992	24	1,333	9,665	**,000**	231,965	1,000
	I.2	39,392	24	1,641	10,708	**,000**	256,991	1,000
	I.3	97,340	24	4,056	8,547	**,000**	205,127	1,000
	I.4	23,608	24	,984	5,910	**,000**	141,850	1,000
	I.5	85,875	24	3,578	18,137	**,000**	435,297	1,000
	I.6	113,489	24	4,729	14,306	**,000**	343,337	1,000
Error	I.1	20,136	146	,138				
	I.2	22,379	146	,153				
	I.3	69,282	146	,475				
	I.4	24,298	146	,166				
	I.5	28,803	146	,197				
	I.6	48,260	146	,331				
Total	I.1	4384,080	171					
	I.2	4703,047	171					
	I.3	2637,383	171					
	I.4	2778,871	171					
	I.5	3041,080	171					
	I.6	2664,189	171					
Corrected Total	I.1	52,127	170					
	I.2	61,770	170					
	I.3	166,622	170					
	I.4	47,906	170					
	I.5	114,678	170					

	I.6	161,749	170					

a. R Squared = ,614 (Adjusted R Squared = ,550)
b. Computed using alpha = ,05
c. R Squared = ,638 (Adjusted R Squared = ,578)
d. R Squared = ,584 (Adjusted R Squared = ,516)
e. R Squared = ,493 (Adjusted R Squared = ,409)
f. R Squared = ,749 (Adjusted R Squared = ,708)
g. R Squared = ,702 (Adjusted R Squared = ,653)

Table 9. Multivariate tests - Mancova

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,700	52,556[a]	6,000	135,000	,000	315,338	1,000
	Wilks' Lambda	,300	52,556[a]	6,000	135,000	,000	315,338	1,000
	Hotelling's Trace	2,336	52,556[a]	6,000	135,000	,000	315,338	1,000
	Roy's Largest Root	2,336	52,556[a]	6,000	135,000	,000	315,338	1,000
II.3	Pillai's Trace	3,427	7,771	144,000	840,000	**,000**	1118,961	1,000
	Wilks' Lambda	,002	10,752	144,000	796,866	**,000**	1483,480	1,000
	Hotelling's Trace	15,922	14,743	144,000	800,000	**,000**	2122,988	1,000
	Roy's Largest Root	8,074	47,100[c]	24,000	140,000	**,000**	1130,412	1,000
II.1	Pillai's Trace	,719	57,698[a]	6,000	135,000	,000	346,190	1,000
	Wilks' Lambda	,281	57,698[a]	6,000	135,000	,000	346,190	1,000
	Hotelling's Trace	2,564	57,698[a]	6,000	135,000	,000	346,190	1,000
	Roy's Largest Root	2,564	57,698[a]	6,000	135,000	,000	346,190	1,000
II.2	Pillai's Trace	,679	47,540[a]	6,000	135,000	,000	285,243	1,000
	Wilks' Lambda	,321	47,540[a]	6,000	135,000	,000	285,243	1,000
	Hotelling's Trace	2,113	47,540[a]	6,000	135,000	,000	285,243	1,000
	Roy's Largest Root	2,113	47,540[a]	6,000	135,000	,000	285,243	1,000
II.4	Pillai's Trace	,761	71,719[a]	6,000	135,000	,000	430,316	1,000
	Wilks' Lambda	,239	71,719[a]	6,000	135,000	,000	430,316	1,000
	Hotelling's Trace	3,188	71,719[a]	6,000	135,000	,000	430,316	1,000
	Roy's Largest Root	3,188	71,719[a]	6,000	135,000	,000	430,316	1,000
II.5	Pillai's Trace	,324	10,763[a]	6,000	135,000	,000	64,579	1,000
	Wilks' Lambda	,676	10,763[a]	6,000	135,000	,000	64,579	1,000
	Hotelling's Trace	,478	10,763[a]	6,000	135,000	,000	64,579	1,000
	Roy's Largest Root	,478	10,763[a]	6,000	135,000	,000	64,579	1,000
II.6	Pillai's Trace	,494	22,007[a]	6,000	135,000	,000	132,042	1,000
	Wilks' Lambda	,506	22,007[a]	6,000	135,000	,000	132,042	1,000
	Hotelling's Trace	,978	22,007[a]	6,000	135,000	,000	132,042	1,000
	Roy's Largest Root	,978	22,007[a]	6,000	135,000	,000	132,042	1,000
II.7	Pillai's Trace	,819	101,522[a]	6,000	135,000	,000	609,133	1,000
	Wilks' Lambda	,181	101,522[a]	6,000	135,000	,000	609,133	1,000
	Hotelling's Trace	4,512	101,522[a]	6,000	135,000	,000	609,133	1,000
	Roy's Largest Root	4,512	101,522[a]	6,000	135,000	,000	609,133	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. **Design: Intercept + II.3 + II.1 + II.2 + II.4 + II.5 + II.6 + II.7**

4. MANOVA between dependent variables that defines the EMS implementation/ integration quality and „Environmental informational management" variable (as factor)

Table 10. Multivariate tests

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,999	14443,489[a]	6,000	123,000	,000	86660,936	1,000
	Wilks' Lambda	,001	14443,489[a]	6,000	123,000	,000	86660,936	1,000
	Hotelling's Trace	704,560	14443,489[a]	6,000	123,000	,000	86660,936	1,000
	Roy's Largest Root	704,560	14443,489[a]	6,000	123,000	,000	86660,936	1,000
II.4	Pillai's Trace	4,875	13,200	252,000	768,000	**,000**	3326,328	1,000
	Wilks' Lambda	,000	16,585	252,000	740,401	**,000**	4099,069	1,000
	Hotelling's Trace	42,103	20,272	252,000	728,000	**,000**	5108,457	1,000
	Roy's Largest Root	16,340	49,799[c]	42,000	128,000	**,000**	2091,539	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. **Design: Intercept + II.4**

Table 11. Univariate tests regarding the effects induced by the „Environmental informational management" variable on each dependent variable

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power[b]
Corrected Model	I.1	40,603[a]	42	,967	10,737	,000	450,963	1,000
	I.2	52,749[c]	42	1,256	17,820	,000	748,421	1,000
	I.3	144,047[d]	42	3,430	19,446	,000	816,724	1,000
	I.4	42,076[e]	42	1,002	21,996	,000	923,812	1,000
	I.5	96,366[f]	42	2,294	16,038	,000	673,602	1,000
	I.6	143,801[g]	42	3,424	24,417	,000	1025,517	1,000
Intercept	I.1	2699,140	1	2699,140	29978,574	,000	29978,574	1,000
	I.2	2850,055	1	2850,055	40437,567	,000	40437,567	1,000
	I.3	1482,531	1	1482,531	8405,724	,000	8405,724	1,000
	I.4	1732,798	1	1732,798	38045,059	,000	38045,059	1,000
	I.5	1751,897	1	1751,897	12245,807	,000	12245,807	1,000
	I.6	1480,635	1	1480,635	10559,175	,000	10559,175	1,000
II.4	I.1	40,603	42	,967	10,737	**,000**	450,963	1,000
	I.2	52,749	42	1,256	17,820	**,000**	748,421	1,000
	I.3	144,047	42	3,430	19,446	**,000**	816,724	1,000
	I.4	42,076	42	1,002	21,996	**,000**	923,812	1,000
	I.5	96,366	42	2,294	16,038	**,000**	673,602	1,000
	I.6	143,801	42	3,424	24,417	**,000**	1025,517	1,000
Error	I.1	11,525	128	,090				
	I.2	9,021	128	,070				
	I.3	22,576	128	,176				
	I.4	5,830	128	,046				
	I.5	18,312	128	,143				
	I.6	17,948	128	,140				
Total	I.1	4384,080	171					
	I.2	4703,047	171					
	I.3	2637,383	171					
	I.4	2778,871	171					
	I.5	3041,080	171					
	I.6	2664,189	171					
Corrected Total	I.1	52,127	170					
	I.2	61,770	170					
	I.3	166,622	170					
	I.4	47,906	170					
	I.5	114,678	170					

	I.6	161,749	170					

a. R Squared = ,779 (Adjusted R Squared = ,706)
b. Computed using alpha = ,05
c. R Squared = ,854 (Adjusted R Squared = ,806)
d. R Squared = ,865 (Adjusted R Squared = ,820)
e. R Squared = ,878 (Adjusted R Squared = ,838)
f. R Squared = ,840 (Adjusted R Squared = ,788)
g. R Squared = ,889 (Adjusted R Squared = ,853)

Table 12. Multivariate tests - Mancova

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,905	186,290[a]	6,000	117,000	,000	1117,740	1,000
	Wilks' Lambda	,095	186,290[a]	6,000	117,000	,000	1117,740	1,000
	Hotelling's Trace	9,553	186,290[a]	6,000	117,000	,000	1117,740	1,000
	Roy's Largest Root	9,553	186,290[a]	6,000	117,000	,000	1117,740	1,000
II.4	Pillai's Trace	5,115	16,788	252,000	732,000	**,000**	4230,677	1,000
	Wilks' Lambda	,000	29,760	252,000	704,715	**,000**	7326,129	1,000
	Hotelling's Trace	136,742	62,583	252,000	692,000	**,000**	15770,956	1,000
	Roy's Largest Root	86,046	249,943[c]	42,000	122,000	**,000**	10497,607	1,000
II.1	Pillai's Trace	,837	99,919[a]	6,000	117,000	,000	599,515	1,000
	Wilks' Lambda	,163	99,919[a]	6,000	117,000	,000	599,515	1,000
	Hotelling's Trace	5,124	99,919[a]	6,000	117,000	,000	599,515	1,000
	Roy's Largest Root	5,124	99,919[a]	6,000	117,000	,000	599,515	1,000
II.2	Pillai's Trace	,735	54,133[a]	6,000	117,000	,000	324,800	1,000
	Wilks' Lambda	,265	54,133[a]	6,000	117,000	,000	324,800	1,000
	Hotelling's Trace	2,776	54,133[a]	6,000	117,000	,000	324,800	1,000
	Roy's Largest Root	2,776	54,133[a]	6,000	117,000	,000	324,800	1,000
II.3	Pillai's Trace	,652	36,520[a]	6,000	117,000	,000	219,120	1,000
	Wilks' Lambda	,348	36,520[a]	6,000	117,000	,000	219,120	1,000
	Hotelling's Trace	1,873	36,520[a]	6,000	117,000	,000	219,120	1,000
	Roy's Largest Root	1,873	36,520[a]	6,000	117,000	,000	219,120	1,000
II.5	Pillai's Trace	,861	121,285[a]	6,000	117,000	,000	727,713	1,000
	Wilks' Lambda	,139	121,285[a]	6,000	117,000	,000	727,713	1,000
	Hotelling's Trace	6,220	121,285[a]	6,000	117,000	,000	727,713	1,000
	Roy's Largest Root	6,220	121,285[a]	6,000	117,000	,000	727,713	1,000
II.6	Pillai's Trace	,787	72,230[a]	6,000	117,000	,000	433,381	1,000
	Wilks' Lambda	,213	72,230[a]	6,000	117,000	,000	433,381	1,000
	Hotelling's Trace	3,704	72,230[a]	6,000	117,000	,000	433,381	1,000
	Roy's Largest Root	3,704	72,230[a]	6,000	117,000	,000	433,381	1,000
II.7	Pillai's Trace	,822	89,902[a]	6,000	117,000	,000	539,409	1,000
	Wilks' Lambda	,178	89,902[a]	6,000	117,000	,000	539,409	1,000
	Hotelling's Trace	4,610	89,902[a]	6,000	117,000	,000	539,409	1,000
	Roy's Largest Root	4,610	89,902[a]	6,000	117,000	,000	539,409	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. Design: Intercept + II.4 + II.1 + II.2 + II.3 + II.5 + II.6 + II.7

5. MANOVA between dependent variables that defines the EMS implementation/ integration quality and „Systemic-technological "infrastructure" with impact on environmental management" variable (as factor)

Table 13. Multivariate tests

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,991	2738,954[a]	6,000	151,000	,000	16433,726	1,000
	Wilks' Lambda	,009	2738,954[a]	6,000	151,000	,000	16433,726	1,000
	Hotelling's Trace	108,833	2738,954[a]	6,000	151,000	,000	16433,726	1,000
	Roy's Largest Root	108,833	2738,954[a]	6,000	151,000	,000	16433,726	1,000
II.5	Pillai's Trace	2,372	7,287	84,000	936,000	**,000**	612,078	1,000
	Wilks' Lambda	,039	8,005	84,000	848,004	**,000**	610,612	1,000
	Hotelling's Trace	4,752	8,448	84,000	896,000	**,000**	709,666	1,000
	Roy's Largest Root	1,717	19,130[c]	14,000	156,000	**,000**	267,817	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. **Design: Intercept + II.5**

Table 14. Univariate tests regarding the effects induced by the „Systemic-technological "infrastructure" with impact on environmental management" variable on each dependent variable

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power[b]
Corrected Model	I.1	22,024[a]	14	1,573	8,152	,000	114,130	1,000
	I.2	28,362[c]	14	2,026	9,459	,000	132,432	1,000
	I.3	54,341[d]	14	3,882	5,393	,000	75,500	1,000
	I.4	21,026[e]	14	1,502	8,716	,000	122,023	1,000
	I.5	52,990[f]	14	3,785	9,572	,000	134,004	1,000
	I.6	79,174[g]	14	5,655	10,684	,000	149,576	1,000
Intercept	I.1	1354,654	1	1354,654	7019,971	,000	7019,971	1,000
	I.2	1440,810	1	1440,810	6727,749	,000	6727,749	1,000
	I.3	784,064	1	784,064	1089,354	,000	1089,354	1,000
	I.4	883,373	1	883,373	5126,687	,000	5126,687	1,000
	I.5	868,784	1	868,784	2197,034	,000	2197,034	1,000
	I.6	829,866	1	829,866	1567,778	,000	1567,778	1,000
II.5	I.1	22,024	14	1,573	8,152	**,000**	114,130	1,000
	I.2	28,362	14	2,026	9,459	**,000**	132,432	1,000
	I.3	54,341	14	3,882	5,393	**,000**	75,500	1,000
	I.4	21,026	14	1,502	8,716	**,000**	122,023	1,000
	I.5	52,990	14	3,785	9,572	**,000**	134,004	1,000
	I.6	79,174	14	5,655	10,684	**,000**	149,576	1,000
Error	I.1	30,104	156	,193				
	I.2	33,409	156	,214				
	I.3	112,281	156	,720				
	I.4	26,880	156	,172				
	I.5	61,688	156	,395				
	I.6	82,575	156	,529				
Total	I.1	4384,080	171					
	I.2	4703,047	171					
	I.3	2637,383	171					
	I.4	2778,871	171					
	I.5	3041,080	171					
	I.6	2664,189	171					
Corrected Total	I.1	52,127	170					
	I.2	61,770	170					
	I.3	166,622	170					
	I.4	47,906	170					
	I.5	114,678	170					

	I.6	161,749	170					

a. R Squared = ,422 (Adjusted R Squared = ,371)
b. Computed using alpha = ,05
c. R Squared = ,459 (Adjusted R Squared = ,411)
d. R Squared = ,326 (Adjusted R Squared = ,266)
e. R Squared = ,439 (Adjusted R Squared = ,389)
f. R Squared = ,462 (Adjusted R Squared = ,414)
g. R Squared = ,489 (Adjusted R Squared = ,444)

Table 15. Multivariate tests - Mancova

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,636	42,304[a]	6,000	145,000	,000	253,824	1,000
	Wilks' Lambda	,364	42,304[a]	6,000	145,000	,000	253,824	1,000
	Hotelling's Trace	1,751	42,304[a]	6,000	145,000	,000	253,824	1,000
	Roy's Largest Root	1,751	42,304[a]	6,000	145,000	,000	253,824	1,000
II.5	Pillai's Trace	2,774	9,214	84,000	900,000	**,000**	773,963	1,000
	Wilks' Lambda	,011	11,964	84,000	814,562	**,000**	903,985	1,000
	Hotelling's Trace	8,668	14,790	84,000	860,000	**,000**	1242,367	1,000
	Roy's Largest Root	3,941	42,221[c]	14,000	150,000	**,000**	591,095	1,000
II.1	Pillai's Trace	,623	39,952[a]	6,000	145,000	,000	239,711	1,000
	Wilks' Lambda	,377	39,952[a]	6,000	145,000	,000	239,711	1,000
	Hotelling's Trace	1,653	39,952[a]	6,000	145,000	,000	239,711	1,000
	Roy's Largest Root	1,653	39,952[a]	6,000	145,000	,000	239,711	1,000
II.2	Pillai's Trace	,751	73,025[a]	6,000	145,000	,000	438,150	1,000
	Wilks' Lambda	,249	73,025[a]	6,000	145,000	,000	438,150	1,000
	Hotelling's Trace	3,022	73,025[a]	6,000	145,000	,000	438,150	1,000
	Roy's Largest Root	3,022	73,025[a]	6,000	145,000	,000	438,150	1,000
II.3	Pillai's Trace	,568	31,796[a]	6,000	145,000	,000	190,776	1,000
	Wilks' Lambda	,432	31,796[a]	6,000	145,000	,000	190,776	1,000
	Hotelling's Trace	1,316	31,796[a]	6,000	145,000	,000	190,776	1,000
	Roy's Largest Root	1,316	31,796[a]	6,000	145,000	,000	190,776	1,000
II.4	Pillai's Trace	,886	187,845[a]	6,000	145,000	,000	1127,071	1,000
	Wilks' Lambda	,114	187,845[a]	6,000	145,000	,000	1127,071	1,000
	Hotelling's Trace	7,773	187,845[a]	6,000	145,000	,000	1127,071	1,000
	Roy's Largest Root	7,773	187,845[a]	6,000	145,000	,000	1127,071	1,000
II.6	Pillai's Trace	,683	52,079[a]	6,000	145,000	,000	312,471	1,000
	Wilks' Lambda	,317	52,079[a]	6,000	145,000	,000	312,471	1,000
	Hotelling's Trace	2,155	52,079[a]	6,000	145,000	,000	312,471	1,000
	Roy's Largest Root	2,155	52,079[a]	6,000	145,000	,000	312,471	1,000
II.7	Pillai's Trace	,905	230,152[a]	6,000	145,000	,000	1380,910	1,000
	Wilks' Lambda	,095	230,152[a]	6,000	145,000	,000	1380,910	1,000
	Hotelling's Trace	9,524	230,152[a]	6,000	145,000	,000	1380,910	1,000
	Roy's Largest Root	9,524	230,152[a]	6,000	145,000	,000	1380,910	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. Design: Intercept + II.5 + II.1 + II.2 + II.3 + II.4 + II.6 + II.7

6. MANOVA between dependent variables that defines the EMS implementation/ integration quality and „Organization's orientation to the environmental innovation" variable (as factor)

Table 16. Multivariate tests

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,996	5679,393[a]	6,000	152,000	,000	34076,357	1,000
	Wilks' Lambda	,004	5679,393[a]	6,000	152,000	,000	34076,357	1,000
	Hotelling's Trace	224,187	5679,393[a]	6,000	152,000	,000	34076,357	1,000
	Roy's Largest Root	224,187	5679,393[a]	6,000	152,000	,000	34076,357	1,000
II.6	Pillai's Trace	2,634	9,449	78,000	942,000	**,000**	736,994	1,000
	Wilks' Lambda	,015	12,417	78,000	844,179	**,000**	859,604	1,000
	Hotelling's Trace	8,223	15,849	78,000	902,000	**,000**	1236,245	1,000
	Roy's Largest Root	4,348	52,505[c]	13,000	157,000	**,000**	682,563	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. **Design: Intercept + II.6**

Table 17. Univariate tests regarding the effects induced by the „Organization's orientation to the environmental innovation" variable on each dependent variable

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power[b]
Corrected Model	I.1	25,986[a]	13	1,999	12,005	,000	156,071	1,000
	I.2	29,493[c]	13	2,269	11,035	,000	143,456	1,000
	I.3	108,646[d]	13	8,357	22,632	,000	294,212	1,000
	I.4	16,298[e]	13	1,254	6,227	,000	80,955	1,000
	I.5	45,691[f]	13	3,515	7,999	,000	103,982	1,000
	I.6	98,587[g]	13	7,584	18,850	,000	245,055	1,000
Intercept	I.1	2492,704	1	2492,704	14970,929	,000	14970,929	1,000
	I.2	2662,328	1	2662,328	12949,735	,000	12949,735	1,000
	I.3	1449,970	1	1449,970	3926,508	,000	3926,508	1,000
	I.4	1604,898	1	1604,898	7971,779	,000	7971,779	1,000
	I.5	1673,171	1	1673,171	3807,779	,000	3807,779	1,000
	I.6	1439,452	1	1439,452	3578,002	,000	3578,002	1,000
II.6	I.1	25,986	13	1,999	12,005	**,000**	156,071	1,000
	I.2	29,493	13	2,269	11,035	**,000**	143,456	1,000
	I.3	108,646	13	8,357	22,632	**,000**	294,212	1,000
	I.4	16,298	13	1,254	6,227	**,000**	80,955	1,000
	I.5	45,691	13	3,515	7,999	**,000**	103,982	1,000
	I.6	98,587	13	7,584	18,850	**,000**	245,055	1,000
Error	I.1	26,141	157	,167				
	I.2	32,278	157	,206				
	I.3	57,977	157	,369				
	I.4	31,608	157	,201				
	I.5	68,987	157	,439				
	I.6	63,162	157	,402				
Total	I.1	4384,080	171					
	I.2	4703,047	171					
	I.3	2637,383	171					
	I.4	2778,871	171					
	I.5	3041,080	171					
	I.6	2664,189	171					
Corrected Total	I.1	52,127	170					
	I.2	61,770	170					
	I.3	166,622	170					
	I.4	47,906	170					
	I.5	114,678	170					

	I.6	161,749	170					

a. R Squared = ,499 (Adjusted R Squared = ,457)
b. Computed using alpha = ,05
c. R Squared = ,477 (Adjusted R Squared = ,434)
d. R Squared = ,652 (Adjusted R Squared = ,623)
e. R Squared = ,340 (Adjusted R Squared = ,286)
f. R Squared = ,398 (Adjusted R Squared = ,349)
g. R Squared = ,610 (Adjusted R Squared = ,577)

Tabel 18. Multivariate tests - Mancova

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,513	25,635[a]	6,000	146,000	,000	153,811	1,000
	Wilks' Lambda	,487	25,635[a]	6,000	146,000	,000	153,811	1,000
	Hotelling's Trace	1,054	25,635[a]	6,000	146,000	,000	153,811	1,000
	Roy's Largest Root	1,054	25,635[a]	6,000	146,000	,000	153,811	1,000
II.6	Pillai's Trace	2,490	8,240	78,000	906,000	**,000**	642,701	1,000
	Wilks' Lambda	,023	10,182	78,000	811,097	**,000**	707,797	1,000
	Hotelling's Trace	6,656	12,316	78,000	866,000	**,000**	960,675	1,000
	Roy's Largest Root	3,588	41,679[c]	13,000	151,000	**,000**	541,831	1,000
II.1	Pillai's Trace	,481	22,545[a]	6,000	146,000	,000	135,268	1,000
	Wilks' Lambda	,519	22,545[a]	6,000	146,000	,000	135,268	1,000
	Hotelling's Trace	,926	22,545[a]	6,000	146,000	,000	135,268	1,000
	Roy's Largest Root	,926	22,545[a]	6,000	146,000	,000	135,268	1,000
II.2	Pillai's Trace	,568	31,935[a]	6,000	146,000	,000	191,611	1,000
	Wilks' Lambda	,432	31,935[a]	6,000	146,000	,000	191,611	1,000
	Hotelling's Trace	1,312	31,935[a]	6,000	146,000	,000	191,611	1,000
	Roy's Largest Root	1,312	31,935[a]	6,000	146,000	,000	191,611	1,000
II.3	Pillai's Trace	,694	55,123[a]	6,000	146,000	,000	330,741	1,000
	Wilks' Lambda	,306	55,123[a]	6,000	146,000	,000	330,741	1,000
	Hotelling's Trace	2,265	55,123[a]	6,000	146,000	,000	330,741	1,000
	Roy's Largest Root	2,265	55,123[a]	6,000	146,000	,000	330,741	1,000
II.4	Pillai's Trace	,769	80,903[a]	6,000	146,000	,000	485,418	1,000
	Wilks' Lambda	,231	80,903[a]	6,000	146,000	,000	485,418	1,000
	Hotelling's Trace	3,325	80,903[a]	6,000	146,000	,000	485,418	1,000
	Roy's Largest Root	3,325	80,903[a]	6,000	146,000	,000	485,418	1,000
II.5	Pillai's Trace	,446	19,585[a]	6,000	146,000	,000	117,508	1,000
	Wilks' Lambda	,554	19,585[a]	6,000	146,000	,000	117,508	1,000
	Hotelling's Trace	,805	19,585[a]	6,000	146,000	,000	117,508	1,000
	Roy's Largest Root	,805	19,585[a]	6,000	146,000	,000	117,508	1,000
II.7	Pillai's Trace	,794	93,591[a]	6,000	146,000	,000	561,545	1,000
	Wilks' Lambda	,206	93,591[a]	6,000	146,000	,000	561,545	1,000
	Hotelling's Trace	3,846	93,591[a]	6,000	146,000	,000	561,545	1,000
	Roy's Largest Root	3,846	93,591[a]	6,000	146,000	,000	561,545	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. **Design: Intercept + II.6 + II.1 + II.2 + II.3 + II.4 + II.5 + II.7**

7. MANOVA between dependent variables that defines the EMS implementation/ integration quality and „External environment with direct/ indirect implication in organization's environmental management" variable (as factor)

Tabel 19. Teste multivariate

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,996	6069,222[a]	6,000	138,000	,000	36415,332	1,000
	Wilks' Lambda	,004	6069,222[a]	6,000	138,000	,000	36415,332	1,000
	Hotelling's Trace	263,879	6069,222[a]	6,000	138,000	,000	36415,332	1,000
	Roy's Largest Root	263,879	6069,222[a]	6,000	138,000	,000	36415,332	1,000
II.7	Pillai's Trace	3,482	7,326	162,000	858,000	**,000**	1186,740	1,000
	Wilks' Lambda	,003	8,512	162,000	819,014	**,000**	1334,447	1,000
	Hotelling's Trace	11,532	9,705	162,000	818,000	**,000**	1572,189	1,000
	Roy's Largest Root	4,030	21,344[c]	27,000	143,000	**,000**	576,278	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. **Design: Intercept + II.7**

Tabel 20. Univariate tests regarding the effects induced by the „External environment with direct/ indirect implication in organization's environmental management" variable on each dependent variable

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power[b]
Corrected Model	I.1	31,331[a]	27	1,160	7,979	,000	215,432	1,000
	I.2	29,999[c]	27	1,111	5,001	,000	135,026	1,000
	I.3	113,962[d]	27	4,221	11,462	,000	309,463	1,000
	I.4	28,131[e]	27	1,042	7,534	,000	203,430	1,000
	I.5	50,162[f]	27	1,858	4,118	,000	111,185	1,000
	I.6	86,031[g]	27	3,186	6,018	,000	162,476	1,000
Intercept	I.1	2216,401	1	2216,401	15240,167	,000	15240,167	1,000
	I.2	2399,998	1	2399,998	10802,265	,000	10802,265	1,000
	I.3	1260,371	1	1260,371	3422,533	,000	3422,533	1,000
	I.4	1455,070	1	1455,070	10522,325	,000	10522,325	1,000
	I.5	1617,467	1	1617,467	3585,140	,000	3585,140	1,000
	I.6	1314,476	1	1314,476	2482,491	,000	2482,491	1,000
II.7	I.1	31,331	27	1,160	7,979	**,000**	215,432	1,000
	I.2	29,999	27	1,111	5,001	**,000**	135,026	1,000
	I.3	113,962	27	4,221	11,462	**,000**	309,463	1,000
	I.4	28,131	27	1,042	7,534	**,000**	203,430	1,000
	I.5	50,162	27	1,858	4,118	**,000**	111,185	1,000
	I.6	86,031	27	3,186	6,018	**,000**	162,476	1,000
Error	I.1	20,797	143	,145				
	I.2	31,771	143	,222				
	I.3	52,661	143	,368				
	I.4	19,775	143	,138				
	I.5	64,516	143	,451				
	I.6	75,718	143	,529				
Total	I.1	4384,080	171					
	I.2	4703,047	171					
	I.3	2637,383	171					
	I.4	2778,871	171					
	I.5	3041,080	171					
	I.6	2664,189	171					
Corrected Total	I.1	52,127	170					
	I.2	61,770	170					
	I.3	166,622	170					
	I.4	47,906	170					
	I.5	114,678	170					

	I.6	161,749	170					

a. R Squared = ,601 (Adjusted R Squared = ,526)
b. Computed using alpha = ,05
c. R Squared = ,486 (Adjusted R Squared = ,389)
d. R Squared = ,684 (Adjusted R Squared = ,624)
e. R Squared = ,587 (Adjusted R Squared = ,509)
f. R Squared = ,437 (Adjusted R Squared = ,331)
g. R Squared = ,532 (Adjusted R Squared = ,443)

Tabel 21. Multivariate tests - Mancova

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,765	71,668[a]	6,000	132,000	,000	430,010	1,000
	Wilks' Lambda	,235	71,668[a]	6,000	132,000	,000	430,010	1,000
	Hotelling's Trace	3,258	71,668[a]	6,000	132,000	,000	430,010	1,000
	Roy's Largest Root	3,258	71,668[a]	6,000	132,000	,000	430,010	1,000
II.7	Pillai's Trace	4,126	11,174	162,000	822,000	**,000**	1810,257	1,000
	Wilks' Lambda	,000	16,417	162,000	783,759	**,000**	2555,819	1,000
	Hotelling's Trace	34,338	27,626	162,000	782,000	**,000**	4475,368	1,000
	Roy's Largest Root	22,709	115,226[c]	27,000	137,000	**,000**	3111,111	1,000
II.1	Pillai's Trace	,747	64,836[a]	6,000	132,000	,000	389,015	1,000
	Wilks' Lambda	,253	64,836[a]	6,000	132,000	,000	389,015	1,000
	Hotelling's Trace	2,947	64,836[a]	6,000	132,000	,000	389,015	1,000
	Roy's Largest Root	2,947	64,836[a]	6,000	132,000	,000	389,015	1,000
II.2	Pillai's Trace	,810	93,816[a]	6,000	132,000	,000	562,896	1,000
	Wilks' Lambda	,190	93,816[a]	6,000	132,000	,000	562,896	1,000
	Hotelling's Trace	4,264	93,816[a]	6,000	132,000	,000	562,896	1,000
	Roy's Largest Root	4,264	93,816[a]	6,000	132,000	,000	562,896	1,000
II.3	Pillai's Trace	,774	75,215[a]	6,000	132,000	,000	451,287	1,000
	Wilks' Lambda	,226	75,215[a]	6,000	132,000	,000	451,287	1,000
	Hotelling's Trace	3,419	75,215[a]	6,000	132,000	,000	451,287	1,000
	Roy's Largest Root	3,419	75,215[a]	6,000	132,000	,000	451,287	1,000
II.4	Pillai's Trace	,896	189,346[a]	6,000	132,000	,000	1136,078	1,000
	Wilks' Lambda	,104	189,346[a]	6,000	132,000	,000	1136,078	1,000
	Hotelling's Trace	8,607	189,346[a]	6,000	132,000	,000	1136,078	1,000
	Roy's Largest Root	8,607	189,346[a]	6,000	132,000	,000	1136,078	1,000
II.5	Pillai's Trace	,275	8,331[a]	6,000	132,000	,000	49,984	1,000
	Wilks' Lambda	,725	8,331[a]	6,000	132,000	,000	49,984	1,000
	Hotelling's Trace	,379	8,331[a]	6,000	132,000	,000	49,984	1,000
	Roy's Largest Root	,379	8,331[a]	6,000	132,000	,000	49,984	1,000
II.6	Pillai's Trace	,601	33,156[a]	6,000	132,000	,000	198,935	1,000
	Wilks' Lambda	,399	33,156[a]	6,000	132,000	,000	198,935	1,000
	Hotelling's Trace	1,507	33,156[a]	6,000	132,000	,000	198,935	1,000
	Roy's Largest Root	1,507	33,156[a]	6,000	132,000	,000	198,935	1,000

a. Exact statistic
b. Computed using alpha = ,05
c. The statistic is an upper bound on F that yields a lower bound on the significance level.
d. Design: Intercept + II.7 + II.1 + II.2 + II.3 + II.4 + II.5 + II.6

ABSTRACT

Although the literature presents many works that analyze the Environmental management system (EMS) at the organization level, very few focus on the quality of integration of this system (all integrated environmental practices), quality analyzed through the factors that influence it and also characterizes the organization's orientation to environmental issues. The **main purpose** of the doctoral theses it's to elaborate various quantitative and qualitative methodologies, methods and work tools to improve implementation, integration and functioning process that define the Environmental Management System at the organizational level.In order to achieve the intended purpose of the theses, it was conducted a research, based on questionnaire method, with a sample of over 70 organizations mainly industrial organization from N-E area of Romania, at the level of 178 managers.

Most important practical and theoretical contributions made, are : (1) clarification and the synthesis of the most important potential factors that have a general character unanimously valid for any organization, factors that may act as "barriers" in the implementing process of an Environmental management system; (2) development and proposal of EMS theoretical model - in accordance with ISO 14001, as a complex process; this scientific approach is unique and original in the specialized literature level consulted; (3) development of a conceptual framework and a coherent research methodologies that allow quantitative and qualitative study of the relationship between the organization orientation in environmental management issues and EMS implementation quality; (4) Development of a systematic model to improve environmental decision making process; (5) development of an investigation methodology of the environmental knowledge system importance due to its influence on the quality of environmental decision and of a simple method to quantify the importance level of this system; (6) development of models showing: (a) architecture of all influences between variables that describe the organization's orientation regarding environmental management and variables that describe EMS implementation and integration quality under certain conditions; (b) estimation of correlations between organization's orientation specific factors regarding environmental management and synthetic variable/ global that defines EMS implementation/ integration quality; (7) proposal and development of practical solutions to improve the quality of EMS implementation and integration at N-E Romania organizations level; (8) development of a conceptual framework and a coherent research methodology, that allow possibility to evaluate improvement of EMS implementation and operation quality by transforming and adapting its architecture based on fractal philosophy paradigm

keywords : Environmental management system (EMS), N-E Romania organization, organizational barriers on EMS implementation, fractal paradigm

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Thèse de Doctorat

Ionuț Viorel HERGHILIGIU

Recherche sur le système de management environnemental comme un processus complexe au sein des organisations

Résumé

Même si la littérature présente de nombreux ouvrages qui analysent le système de gestion environnementale (SGE) au niveau de l'organisation, très peu mettent l'accent sur la qualité de l'intégration de ce système (toutes les pratiques environnementales intégrées), la qualité analysée à travers les facteurs qui l'influencent et caractérise également l'orientation de l'organisation pour les questions environnementales. Le but principal de la thèse de doctorat, c'est d'élaborer diverses méthodologies quantitatives et qualitatives, méthodes et outils de travail pour améliorer le processus de mise en œuvre, l'intégration et le fonctionnement qui définissent le système de gestion de l'environnement au niveau de l'organisation. Pour atteindre l'objectif visé par la thèse, on a démarré une recherche, basée sur la méthode du questionnaire, sur un échantillon de plus de 70 organisations, principalement des organisations industrielles du secteur NE de la Roumanie, au niveau de 178 responsables

Les contributions théoriques et pratiques les plus importantes apportées sont les suivantes: (1) la clarification et la synthèse des facteurs potentiels les plus importants qui ont un caractère général et applicable pour toute organisation, des facteurs qui peuvent agir comme des «obstacles» dans le processus de mise en œuvre du système de gestion environnementale (2) le développement et la proposition d'un modèle théorique EMS - conformément à la norme ISO 14001, comme processus complexe, cette approche scientifique est unique et originale au niveau de la littérature spécialisée consulté; (3) le développement d'un cadre conceptuel et des méthodologies de recherche cohérentes qui permettent l' étude quantitative et qualitative de la relation entre l'orientation de l'organisation en matière de gestion de l'environnement et la qualité de la mise en œuvre du SME, (4) le développement d'un modèle systématique pour améliorer le processus de prise de décision environnementale, (5) le développement d'une méthodologie d'enquête sur l'importance du système de connaissance de l'environnement, en raison de son influence sur la qualité de la prise de décision environnementale et d'une méthode simple pour quantifier le degré d'importance de ce système; (6) le développement de modèles montrant: (a) l'architecture de l'ensemble des influences entre les variables qui décrivent l'orientation de l'organisation en matière de gestion de l'environnement et des variables qui décrivent la mise en œuvre du SME et de la qualité de l'intégration sous certaines conditions, (b) l'estimation des corrélations entre les facteurs spécifiques à l'orientation de l'organisation en ce qui concerne la gestion de l'environnement et la variable synthétique / globale qui définit la qualité de mise en œuvre / intégration du EMS; (7) la proposition et le développement de solutions pratiques pour améliorer la qualité de la mise en œuvre du SME et d'intégration au niveau des organisations du NE de la Roumanie; (8) le développement d'un cadre conceptuel et une méthodologie cohérente de recherche, qui donnent la possibilité d'évaluer l'amélioration de la mise en œuvre du SME et la qualité de l'opération par la transformation et l'adaptation de son architecture basée sur la paradigme de la philosophie fractale.

Mots clés: système de management environnemental (SME), organisation du NE de la Roumanie, obstacles organisationnels sur la mise en œuvre du SME, paradigme fractale

Abstract

Although the literature presents many works that analyze the Environmental management system (EMS) at the organization level, very few focus on the quality of integration of this system (all integrated environmental practices), quality analyzed through the factors that influence it and also characterizes the organization's orientation to environmental issues. The **main purpose** of the doctoral theses it's to elaborate various quantitative and qualitative methodologies, methods and work tools to improve implementation, integration and functioning process that define the Environmental Management System at the organizational level.In order to achieve the intended purpose of the theses, it was conducted a research, based on questionnaire method, with a sample of over 70 organizations mainly industrial organization from N-E area of Romania, at the level of 178 managers.

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