

## **Human Resources Consultancy (HR) in France: On the tendency of Web service innovating to e-HR**

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### **Abstract :**

The European market of management consultancy (MC) and human resources (HR) goes remarkably well as revealed by the statistics of the total amount of businesses of this sector, which amount to 61.6 billion euros at the end of 2006. It is an increase of almost 14% on the amount in 2004.

The FEACO (in English: European Federation of Management Consultancy Associations), which was created in 1960, is an independent professional organization with non lucrative goal. Recently, the FEACO founded a new grid of reading of the activities carried out by the management consultancy companies. It has the role of representing and of promoting Management Consultancy profession in Europe. In the spheres of the professionals in HR, the increase in the sales turnover in the field remains partly ascribable to the actions of their federation.

As for the French HR market, it follows a strong marketing policy directed towards the innovation of the services and the respect of the ethical values of the profession. So many companies try to increase their market presence as a result of the putting in place of a network offer and of creation of new services panel.

The objective of this contribution is to present a study and an analysis of existing works concerning the innovating Web service in human resources consultancy. It is a question of observing new related activities to management consultancy and human resources market: training consultancy, assessment of competences, staff consultancy, management consultancy, experience validation and accompaniment.

In this study we have reports of certain great sites, by their notoriety due to a true indexing work and a good marketing policy, which succeed in monopolizing a great part of the market. In opposite, very few large cabinets opt for this type of offer of on-line HR services (e-HR). The problems exposed in this study make it possible to clarify a decisional problem for an e-HR decision maker. It is a stage of thought synchronization between the watchers and the decision maker in order to be able to reformulate the problem (of the decision maker) and to lock the research stakes. This move respects the transitions between the phases of economic intelligence process. We will develop, in particular, a project which we have carried out with a French company for the construction of a strategic information system within the framework of competence management. We have developed a data warehouse design based on the process of economic intelligence (EI) and requirement analysis in decisional information.

### **Key words:**

management consultancy (MC), human resources management (HRM or HR), innovating Web service e-HR, decision-making process, economic intelligence process, strategic information system, data warehouse design.



## 1. Introduction

Competition is directed more and more towards the capacity of organizations and the human community to mobilize transmit and develop their expertises and knowledge quickly and better than their competitors. As regards to competitiveness, companies opt for new approaches to human resources management where men and their individual and/or collective capacities have to make evolve the company, which embodies the first riches of any organization.

Confronted with increasing complex and competitive environment, the organizations must integrate the constraints of strategic piloting which implies choices making in time (increasingly short) while taking into account a volume of information (increasingly important).

The European market of management consultancy (MC) and human resources (HR) goes remarkably well as revealed by the statistics of the total amount of businesses of this sector, which amount to 61.6 billion euros at the end of 2006. It is an increase of almost 14% on the amount in 2004.

In relation to MC and HR, the FEACO (in English: European Federation of Management Consultancy Associations) which was created in 1960, is an independent professional organization with non lucrative goal. Recently, the FEACO founded a new grid of reading of the activities carried out by the management consultancy companies. It has the role of representing and of promoting Management Consultancy profession in Europe. In the spheres of the professionals in HR, the increase in the sales turnover in the field remains partly ascribable to the actions of their federation.

This present work recalls, firstly, decisional problems in human resources management and the transition of organizations towards e-HR, secondly, the construction of a strategic information system within the framework of competence management, and lastly, the design of data warehouse founded on the process of economic intelligence (requirement analysis in decisional information).

In practice, information and communication technologies, in particular computer, communication networks and the Internet, make it possible to integrate heterogeneous information (sources, natures).

In this work, we will present the concept of economic intelligence (EI) and that of strategic information systems (SIS) which is the core of any system of control according to Merise (Rochfeld89), and we will clarify the decision-making process and the inherent tasks in order to develop a decision-maker model by our approach. The decision-maker model in question is integrated in SIS with its conceptual scheme in the Meta data of data warehouse.

As an application of decision maker modelling in SIS and EI context, we have chosen the field of human resources management and, primarily, competence management. The principal idea in this work is to propose a decision support system which would meet the needs of decision maker (who wants to constitute a project team with qualified actors) while relying on his own representation and those of the employees by the means of their competence model. This work will be concluded by proposing, as prospect, a Web service innovating to e-HR. It recalls, firstly, the decisional problems in the human resources management and the transition of organizations towards e-HR, secondly, the construction of a strategic information system within the framework of competence management and, lastly, the design of data warehouse founded on the process of intelligence economic (requirement analysis in decisional information).

## 2. Decisional problems in human resources management

Today, human resources are essential like a strategic variable to company. A powerful company is distinguished above all by the quality of its human capital (dynamism, enthusiasm, implication, intelligence, creativity, etc). It is a new awakening owing to the fact that the "traditional" shapes of capital such as material, tools, technologies, are inert potentialities without the human capital which is able to convert this potential into wealth creation. In fact, Human resources have become the most valued discriminant of organization.

Our objective is to undertake a study and an analysis of existing works concerning the innovating Web service in human resources consultancy. We are faced with the task of observing new related activities to management consultancy and human resources market: training consultancy, assessment of competences, staff consultancy, management consultancy, experience validation and accompaniment.

For example, the French HR market follows a strong policy of marketing directed towards the innovation of services and respect of the ethical values of the profession. So many companies try to increase their market presence as a result of putting in place of a network offer and of creation of new services panel.

It is in this structural aspect that a human resources organization has as a principal role, to identify its capacities, to coordinate them and act in the field of economic intelligence to the profit of decision maker (Fig. 2).

According to the report of *Commissariat Général au Plan* directed by Henri Martre, "Economic Intelligence and companies strategy" (Marten 1994), Economic intelligence (EI) is presented as:

*"a set of coordinated actions of retrieval, treatment and distribution (for exploitation), of useful information for economic actors. These actions are carried out legally with all the necessary guarantees of protection to the safeguarding of company's patrimony, under the best conditions of quality, time and cost".*

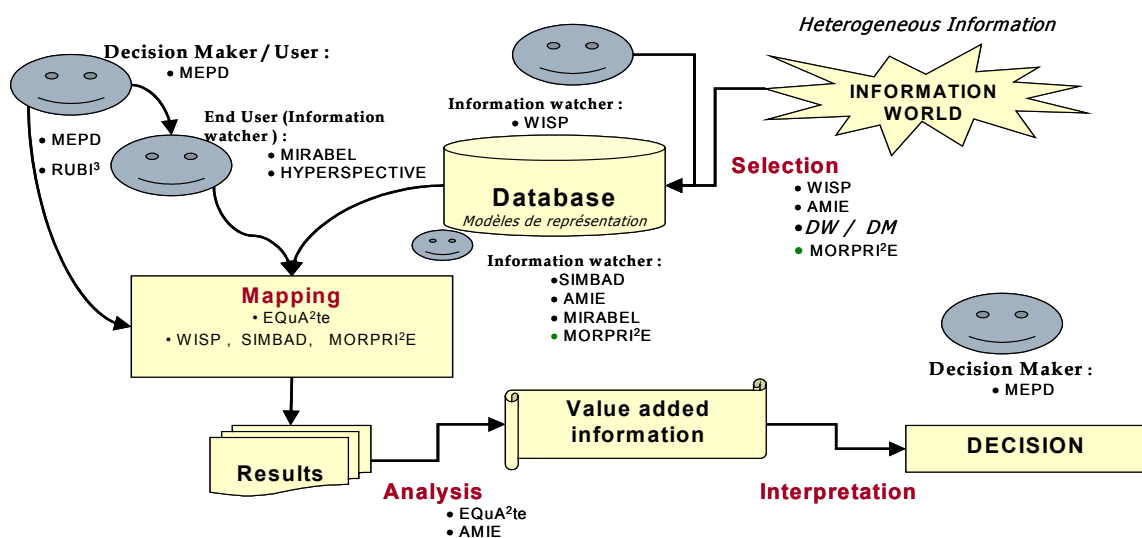


Fig. 2. : Architecture of an EI system according to research team SITE (SITE 2006).

On the aspect of the user profile in information systems, the interest shown on the integration of the profile in the system was presented by (Alloway, 1976 & 1983), which considers that:

*"the evolution of any information system concerns, as last resort, an individual equipped with a given psychological profile, confronted with a precise problem in a determined organisational context, problem for which this individual needs elements of decision-making. These elements are being perceived through a mode of representation specific to the decision maker ".*

Consequently, it is advisable to attach a great importance to the individual behaviours with respect to information. So, to model the decision maker in the context of clarification of a decisional problem, we retained parameters highlighted here below (Bouaka, 2004):

- Cognitive style,
- Personality traits,
- Factors related to the organization,
- Factors related to the environment.

At the French level (extended to the European vicinity) in human resources and competence management, it is essential to ensure the control of strategic information and to help the decision-makers to make "good decisions", by appropriation of modern and protected technological tools of collection and analysis of situations (Porter, 1986). This is what is proposed in the following paragraph.

### **3. Construction of a strategic information system within the framework of competence management**

#### **3.1. Strategic information system**

The systemic structuring of an organization can be modelled in the form of three subsystems, namely: control (or piloting) system, information system and operative system, which carries out the actions of transformation of resources to company's products (Moigne 1974).

The first two subsystems will be developed in this work. Indeed for a long time the control system was primarily human and rested on information communicated by the information system of the organization. The latter rested on information that is communicated to it by the operative system. For an illustration, we take an example of the management of orders and particularly the management of unpaid invoices: the delivery store (or operative system) communicates to the information system (IS) the list of the products delivered in order to establish the invoice. At this stage, IS is on itself sufficient to calculate and dispatch the invoices of delivery. On the other hand, if invoices are unpaid, the IS communicates to the control system the list of the late invoices. For example, not less than 33 entrepreneurs, coming from six areas of Quebec, find themselves today with unpaid invoices of 45 million dollars (Furrier & Paré, 2004). Until recently the renewal decisions were done by human (by telephone, letter of recall, etc). However with the current IS it is possible to leave the information system to make the first decisions, by bias of a standard letter of renewal. But to avoid making blunders (change of address, stoppage of activities, prohibited banking, death of the manager, etc,) it is necessary to have a good representation of the actors (interlocutors) of the system or again it is necessary to have strategic information systems (SIS).

The evolution of SIS in relation to the final use goal of the system resulted to the proposition of data warehouse. The data warehouse has now become not just a mode phenomenon but an essential instrument to the correct functioning of organization. They are indeed at the base of all strategy and decision-making of company. Thus, according to J.M. Free (Free, 1997), 95% of the top companies in the USA installed a data warehouse, primarily intended for marketing.

In consequence, the statistics are in clear increase since. For example, this year 2007, Teradata, a division of NCR Corporation (NYSE: NCR), announces that Mango (www.mango.com), prestigious creator, manufacturer and salesman of accessories and spanish ladies garments, doubled the size of its data warehouse in order to cater for the fast growth acquired by the company: an additional capacity which will make it possible to accommodate new users resulting from the marketing departments, product management, Logistic, e-HR, as well as new analytical tools.

According to Tardieu and Guthmann (Tardieu & Guthmann, 1991), IS can be strategic under two angles:

- On the one hand all the current IS of organizations comprise strategic information and allow the automation of the organization in order to satisfy better the strategic objectives of the management (*example: IS improving the inventory control, development starting from accounting incomes of summary tables*), this is called SIS (*Strategic Information Systems*");
- On the other hand, more and more of IS are dedicated only to decision-making (example: IS that helps in making marketing choice), This is what we called SIS ("systems" of strategic information"). Here, it is the IS in its entirety which is devoted to the strategic decisions and comprises only strategic information. *For example, IS can make it possible to observe results of sales turnovers per country over several years.*

For this study, we are interested in SIS i.e. IS of the second type, which has been an area of interest of researchers in economic intelligence and which rest on a Datawarehouse.

Let us recall that a data warehouse is defined initially as:

*"a collection of subject oriented data, integrated, non-volatile and historized, organized to support a decision support process"* (Franco, 97).

Data Warehouse can also be viewed as:

*"a set of means allowing to answer questions and to make decisions"* (Thiéry, 2004). It is structured in hypercubes, in multidimensional views or in data marts (i.e data store) (Kimball & Al, 1994).

A multidimensional structure characterizes a database dedicated to decision making by storing the data in the form of a multidimensional table.

As for the data warehouse, it gives rise to data marts (data stores).

Data marts are sub-bases of data warehouse intended for a function of the company: Marketing, Finance, Logistics, etc. They are fed periodically and rest on a multidimensional view of data, nonmodifiable by the users.

After this short recall, we would like to consider the aspect of inculcating users in the system (modeling of the actors), the various uses and the construction of a decision-making system around these uses and these users.

### **3.2. User Modelling and SIS**

In the context of use of a SIS as a decision support system in the human resources management, we privilege a type of user who is an executive of a company or its' decision-maker. Within a broader framework, the system's client is regarded as a type of user (for example, the client of an electronic platform of trade).

The executive (or leader) is the person that is capable to identify and pose the problem to be solved in term of stake, risk or threat which weighs on the company. This problem is translated generally in the form of (a) observation of certain parameters of the company's environment or (b) Hypothesis to be verified.

In case (a), the parameters of the environment to be monitored may be known (Trip hammer & Ribault, 1989). Thus, the type of result of the observation is easily identifiable. If the parameters of the environment are not known, the task of the observation consists in highlighting (or discovering) these parameters. The decisional act calls upon the following four cognitive processes:

- To observe company's parameters in terms of their evolution or their cross-checking (correlations between the observations and the company's data);
- To discover company's parameters which require monitoring (*detection of the dynamic factors of the company*);
- To verify hypothesis to confirm ideas (*future strategies or tactics*);
- To check laws or theorems (*to confront the data and simulations with reality*).

A SIS to be proposed will make it possible to adapt to the decision-makers who can then rely on any of the cognitive processes at a given moment. One of the problems is to define the parameters on the decision makers to be integrated in the user model so as to facilitate this adaptation. A basic idea for the adaptation of SIS entails that the system must allow the personalization of its answers.

The modeling of the user intervenes in two contexts of SIS for the composition of relevant information and the exploitation of SIS:

- In the first context, it is a question of using user model as a profile for the filtering of information to be integrated in the SIS.
- In the second context, it is a question of using the model like a tool for the adaptation of the system's behavior to the behaviors of the user.

The approach of information filtering by user profile is based on user modeling by integrating attributes of user identification, his behavior and context of use of information which he seeks. The filtering of information takes place in two contexts (*Fig. 3.2.*):

- In the stage of the constitution of the data warehouse by a **thematic filtering** and
- In the stage of the constitution of the data mart by a **functional filtering**.

Thus, a data warehouse gives birth, by filtering no more in relation to dimensions but in relation to user profiles, to data mart, which are subbases of the data warehouse and they are fed periodically. They rest on a multidimensional view of data (nonmodifiable by the users).

As an example, we cite two data mart obtained within human resources application framework from the data warehouse containing the historical data of the employees:

- The first data mart relates to "the evolution of the wages of the employees in the course of time". The recipient (or the end-user) is the "Financial Controller";
- The second data mart contains "the evolution of the careers of the employees since the creation of the company". For example, we discovered that since the past 20 years, the function of "console operator" in the data processing departments has gradually disappeared, on the other hand that of "database administrator" gradually appeared. Also, the function of "analyst" has evolved to "analyst-programmer" then to "system (or program) developer". The recipient is "trades observatory (mart)".

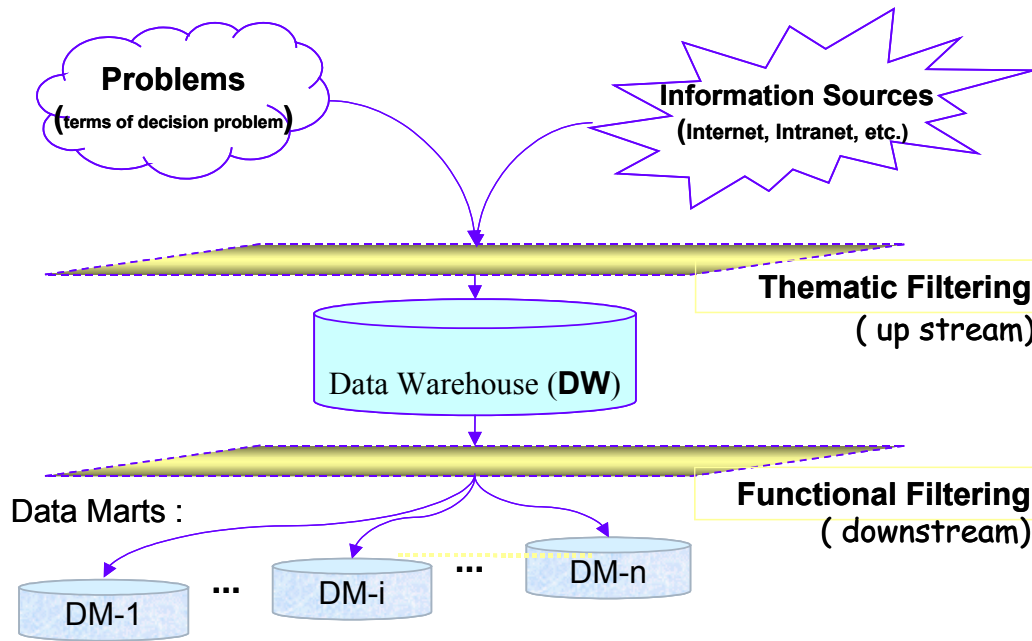


Fig. 3.2.: User Modeling approach and information filtering.

In this context, each user of the system will have a different vision of the data (Releases & AI, 2000) and it implies that only useful data in response to his information need should be proposed to him. This means that this need should not be calculated but represented in user model:

That falls back to a SIS, "to store among the metas-data of the system, an explicit representation of the structure of the various data marts", which constitutes an original point in the proposal.

The idea tends to represent at the maximum "decision rules" or "piloting" in SIS: that poses the problem of modeling decision-making process and its principal actor. This idea will be developed in the following paragraph.

### 3.3. Construction of a use-oriented decision making system: competence management application

A strategic system of piloting (controlling) key competences is the response to several disadvantages of the management tools in Human Resources:

Whereas the management of human resources see the "strategic importance of their role" growing, they do not have any tool that provides "support in their decision-making process of competences".

There may be operational information systems (or daily operational management) for the whole of support processes of organization activity, and an abundance of management tools, but as for HR management process, it is not equipped with complete piloting tools, particularly when it concerns competence management and piloting:

These tools for piloting only cover the administrative dimension of human resources management, and completely hides the "competence" dimension related to the revival role of the HRM and the e-HR services.

This lack of competence piloting and management tools are explained by various factors:

- Firstly, the data to be collected are primarily qualitative and thus painful to exploit by an information processing system, by a piloting and management tool;
- Secondly, the competence management has suffered from slow and difficult implementation, implying an important evolution of mentalities;
- Thirdly, as immediate consequence of upstream decision support systems, there exist only little operational information systems allowing data acquisition on competences.

Because of this lack of tools and inherent reasons with the data acquisition and management of competences, it is essential to promote necessary useful and lucrative developments of management tools, piloting tools and decision support systems tools in HR according to competences (Fig. 3.3a.). Indeed, as a result of the advanced state of communication and network technologies, companies are confronted with the need to respond to market's offers within increasingly short time and to make decisions according to strong signals in increasingly important volumes of information. The decision-making in HR can no more be intuitive by the unquantified appreciation of the decision maker, but it requires a true assistance by taking into account these constraints.

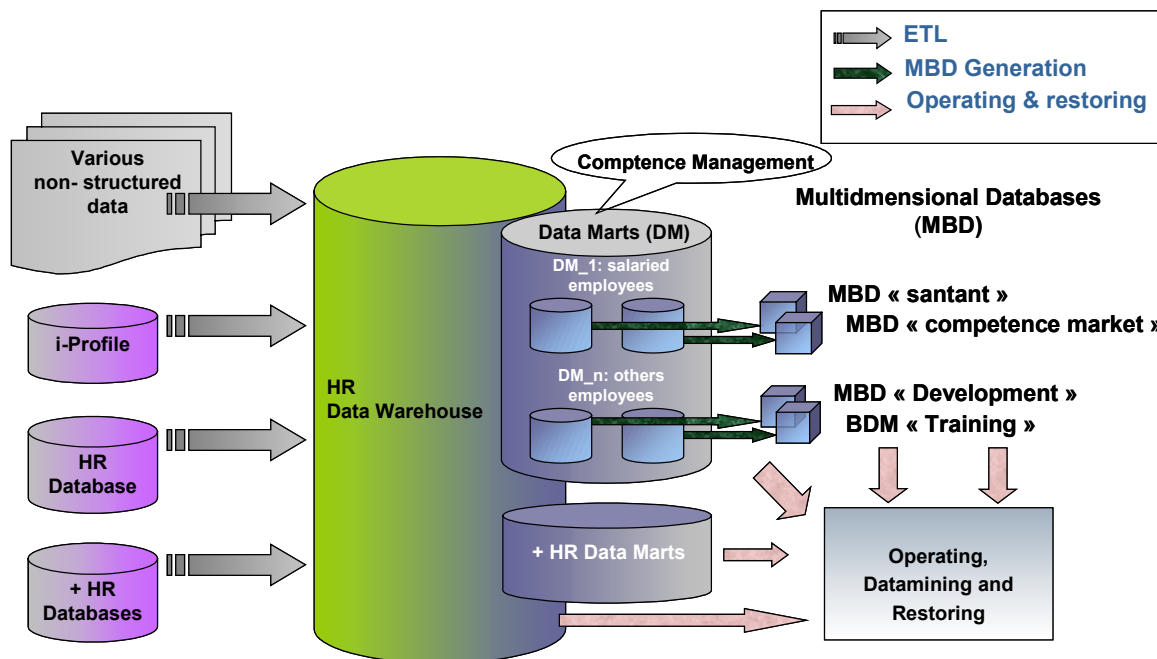


Fig 3.3a. : Data warehouse and Data store model in HR.

At the base of decision support system and competence piloting project in HR, the realization implies the need to equip the HRM (human resources management) with software assistants, allowing them to better manage competences (Darmon, 1993), and in particular the detection of key competences. It is a decision support information system dedicated:

- To the management of competences, intended to get a competitive advantage by the optimization of key competences.
- To the system deployment of an operational competence management tool developed beforehand by the client of the project. For example, BDC Multi-media human resources consultancy firm.

Within the framework of this work, the design of a piloting tool which respects modeling of competences having generic and extensible characteristics (figure 3) have to embody the representation that we set for the strategic information system in HR, system seen as a whole.

This system is centered on strategic decision-making technologies of data. The HR data warehouse, as evoked, has (as finality) to bring good information disseminated in the company, or exogenic, towards the end-user (here the HR decision maker) with:

- The level of desired quality,
- Within the best time,
- At the format adapted to its needs,
- Tactical or strategic decision-making view.

At the origin of data warehouse and data stores, we could find data sources. These sources of information are materialized by structured data (databases, Excel files, etc.) or non-structured data (organization charts, photographs, etc.) (TESTE 2000). These data sources can be:

- Internal to the organization: this includes organization HR database, and HR management tools (ERP or operational management tools of competences, with the image of I-Profile).
- External to the organization: like training catalogues or candidatures reservoir of recruitment organizations (for example). These data are extracted then integrated within the data warehouse according to a transformation scheme into a common model.

Exiting from represented system, and with the application view of the other fields of organization, we propose a return to user through the aid of the reporting tools, intended for the creation of reports, and data mining and analyses tools, intended to carry out more complex treatments (statistical or different).

On the particular module of competence piloting, the specificity of the application domain encourages us to implement a decision support system via a data store, a dedicated data mart, and thus to elude the realization of the totality of the HR decision making system presented hereabove. Thus, the choice to constitute a decision making system consists of withdrawing of data warehouse and focusing exclusively on a "competence"oriented data store (*Fig. 3.3b*).

The installation of data mart "competence management", in addition, respects the process of raw data transformation into information in data warehouse. It is precisely at this level that a thematic filtering of data is carried out. For example, select only the information likely to have an influence on the process of resolution of decisional problem bearing on competences: concerning the employees of an organization, certain criteria appearing in the data source (age, sex, remuneration level, or marital status). Exclude certain data not having decisional interest (the social security number of employee, which does not influence a priori the HR decisions). Once the data are filtered, the transformation into indicators follows upon a primary stage of cleaning and formatting in order to import them to the data store.

In addition, several multidimensional bases (datacubes) are built around the facts to be analyzed, for example:

- facts related to the required competences by the employment profiles, or
- facts related to the evaluated competences of employee on a project profile, or
- facts related to an employment profile,
- etc

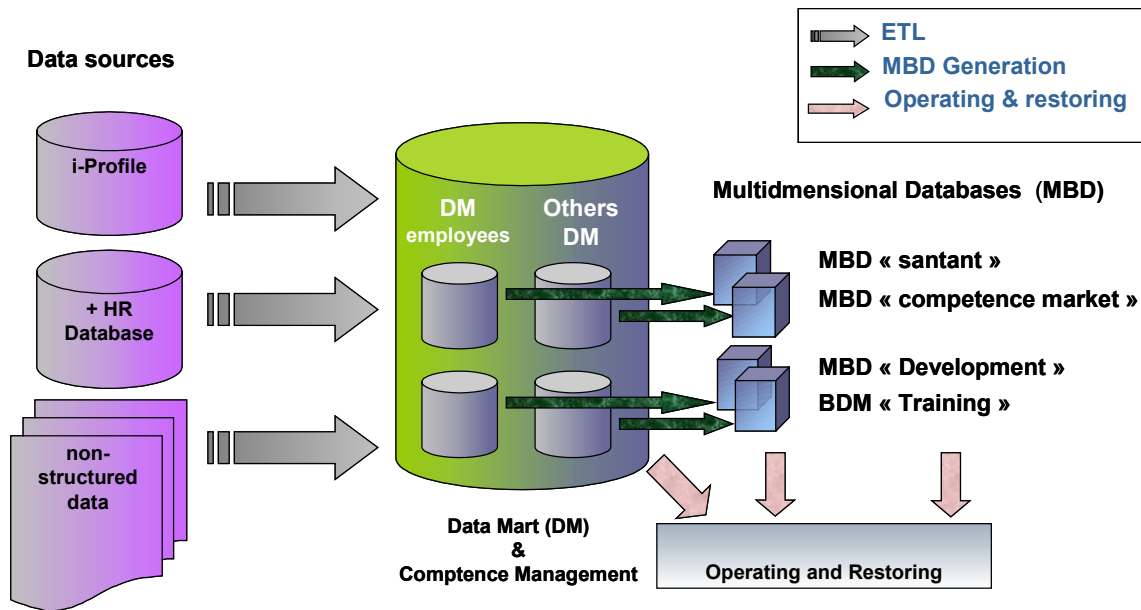


Fig 3.3b. : Datamart Application and Competence Management.

It is a question of measuring, at purely illustrative basis, the manpower according to various dimensions (time, employment, competences) with different hierarchies in the dimensions:

- Time: decade, year, quarter, month;
- Employment: management, department, employment occupied;
- Competence: type of competence (either knowledge or know-how or knowledge-to-be between others), field of competence (communication, computer science, etc), and competence (on a value scale).

In these examples and via restitution tool, the HR decision maker can know the annual manpower on the various services, for one or more competences, as well as the manpower of the last quarter of the sales department on the field of competences “communication”. The indicator is to be chosen among a list of possible measures, and does not limit itself to the manpower measure. These indicators are determined in relation to tactic or strategic decisional problems. These decisional problems can result from observations of the internal or external environment of the organization.

Thus, we see the importance of a model for the clarification of a decisional problem so determining, for example, dimensions to be integrated in the data warehouse. The adopted development mode being iterative, this strategic information system leads to the design of data warehouse, which will be the subject of the following paragraph.

#### 4. The design of data warehouse founded on economic intelligence process

It is a question of building a decisional system centered on a set of use of a single type of actor: “HRM”. This step is thus intended to allow the realization of a “generic system” responding to the principal stakes of the concerned field: “competence piloting”. The step of design of such a recommended decision making system is transposable to other fields other than the specific field of HR and competences.

When it implies a computerized and decision making project, the recommended methodology for the design and the realization of a system of control converges the theories of the project

control with a proper approach directed on the report of lacks. It is inspired in particular by the method RAD (Rapid Application Development) and the approach of R. Kimball (Kimball & Al, 1994). This step cuts out in several stages and sub-stages, naturally retaking some of the great stages of project control by associating stages and specific documents of projects to it. In this project, to avoid the pitfalls of the decision making systems (relevance, volume, response time, return on investment, etc.) we followed the following stages:

- Preparatory Phase: opportunity study and feasibility study
- Development of the functional schedule and census of the decisional information needs,
- Detailed technical Study,
- Design of the piloting system: qualitative analysis of operational systems "source", choice of data store structure, dimensional modeling,
- Establishment of the decision making system of piloting,
- Creation of the restitution module.

The adopted step is based on the principles of Economic Intelligence, in particular with regard to the stages of census of decisional information needs and modeling. That implies identifying of the major decisional problems related to future use:

- Problems and uses of HR decision-maker and,
- To collect his information needs in an explicit way. In parallel, we determined relevant indicators for piloting, and then selected the available, usable, and relevant data sources.

The originator of this strategic information system plays actually the role of watcher (Kislin, 2005). The first two stages of the processes of intelligence economic consist:

- Identification and definition of the decision making problem:
  - o To identify the problem to be solved in term of danger, risks or threats,
  - o To identify the indicators to be observed;
- Information Retrieval System:
  - o To identify the relevant sources of information,
  - o To collect relevant information,
  - o To carry out the necessary transformations on collected information,
  - o To calculate the indicators.

Our goal was to conceive and implement a relevant decisional making system, i.e. "use" and "user" oriented. This is why the census of decisional information need for the future users is essential. At this stage of development, the needs are precise at the time of the feasibility study by exhaustively counting the decisional information needs (DIN) to which the system would be able to respond to.

The principle is:

- To identify a maximum of DIN
- To evaluate the large possibilities, before clearly delimiting the targeted needs by the future decision making system and the aimed use.

Besides the traditional questionnaires and interviews used to collect the DIN, it appeared interesting to us, even essential, to introduce into this design of SIS, two new project documents: the DIN tree and the DIN table, which results to structuring of future users needs. These two documents contribute to facilitate the development of the functional schedule, project document with (almost) value contractual.

#### 4.1. Functional Schedule

The Functional Schedule (FS) is the conclusion of work of value analysis and functional analysis which symbolize the step of need expression. It is elaborated according to the following stages:

- To orientate the study: from the general to the specific one. The first point of the step thus will consist in looking at the project from an external point of view, to take retreat, to put forth the good questions.
- To seek information: the information retrieval must be channeled and formalized. It is a constant process throughout the project execution which must be rigorously carried out from the very start of the project in order to more precisely apprehend the essential characteristics of the need.
- To translate the needs into functions: the passage of the need to functions is carried out through the functional analysis which counts, characterizes, orders, treats on a hierarchical basis and develops the functions.
- To formalize work: this formalization consists in developing the Functional Schedule. It will take again the conclusions of the functional analysis.
- To control the FS need: the control of the document is very important. Indeed, it is noticed that this stage is generally not carried out in an optimal way whereas it is a brake to the dysfunctioning which can appear much later in the project.
- To validate the FS need: it is a question of making sure that the passage of the need expressed to the functional need is in conformity with the aimed objectives. It is a work which can prove to be tiresome and risky if the volume of information is important. The objective is thus here to make effective the validation by reducing its field of action while preserving its representativeness.

In the installation of a decision making information system, the realization of the FS has been facilitated not only by the tree structure of the DIN (selection of the DIN selected, by a thorough functional analysis), but also by the decision making requests table (translation of information needs to functions to determine the uses).

#### 4.2. Arborecence of Decisional Information Needs (DIN)

The arborecence of DIN is a document which reflects the exhaustive census of the DIN. The method of construction of this document allows a synthesis of the listed needs. To build a tree structure of the DIN, it is necessary to begin from the missions "job" of decision-makers, to which the decision making system is addressed, with each mission being detailed in sub-missions.

Thus, concerning the management and piloting of competence, the missions of the HR decision maker are organized around the three following poles:

- To carry out an inventory of fixtures of the organization according competences,
- To evaluate the imbalances between needs and resources from the point of view of competences and
- To determine and take actions of optimization, improvement, development of competences

From each defined mission, it is possible to determine sub-missions; for example, the first mission of inventory of fixtures can be broken up into two sub-missions:

- To carry out an inventory of fixtures of current and future competences requirements of the organization, but also,
- To make the inventory of fixtures of the resources (people and competences made available by these people) in the organization.

By analogy, one determines the “leaves” of the tree structure. These consist of information needs necessary to the good realization of the “parent” mission. In fact, certain transverse needs will appear several times in the tree structure of DIN, while others will already be in the form of numerical or graphical indicators. This is illustrated in the following figure.

In this example, the leaves of the DIN tree are two rates. These rates make it possible to the HR decision maker to fill the sub-mission of knowledge of the evolution of individual competences of a person or a group in the organization. By the mechanism described previously, one notes that these two rates are related to the mission of competence development in the organization.

The construction of this document synthesizes the various needs collected previously (interviews, questionnaires, readings, experiments, etc). Basing itself on missions of a job, it poses the bases of a decision making system on adequacy with the job needs of future users.

### **4.3. Decisional Requests table**

The decisional requests table has as a finality to structure the retained DIN according to the objectives of the decision making project. With this intention, it is necessary to cross the objectives of the project, typologies of available and relevant information, and the previously detected DIN. Thus, in this applied research project, the decision making system of competence piloting has as a role to assist the HR decision-maker in the realization of its principal missions.

Concretely, this system thus has three principal aims:

- To allow to carry out (always under the angle of competences) the inventory of fixtures of the organization,
- To allow to evaluate the balance between needs and resources in competence
- To allow to analyze the possible actions to be taken to optimize competences.

In parallel, one realizes that one has various categories of information: on the resources (people), on the organization (example: nature of the organization job, structuring in departments, services, etc), on competences necessary for the good exercise of an employment, or the good realization of a project for example, and on competences exerted and mobilizable by the employees.

From the tree structure of the DIN, we see shape taking of DIN groups according to their semantic proximity: one count, among others, the needs of locating key competences, or that of the ageing of the organization. Thus, in figure 6 of the following page, one sees for example, that certain DIN thematic groups take part in the achievement of several objectives, or that they bring in various types of different data. This is the case of DIN relating to key competences. To determine the list of key competences of the organization, it is necessary to know the complexity of each required competence, its scarcity, but more especially, the importance which the organization attaches to it (concept of competence weight): a competence to be put to work very frequently and which is of low complexity can nevertheless be strategic.

The decisional requests table makes it possible to structure the DIN not only according to information which they bring into play, but also according to the objectives of the decision making system of piloting. This document is precious since it is necessary to organize the functionalities of a restitution application, because it highlights families of semantically dependent functionalities.

## **5. Towards a web service innovating to e-HR: concepts, tools et implementation**

In this context, the French market of management consultancy in HR is in growth of 9% with a progression in recruitings of 8.50%. As for the e-HR market, it represented 1040 millions euros in 2004: 62% would be devoted to the provisions of services and 38% to the acquisition of HR software and packages. The e-HR applications gather according to Markess (<http://www.markess.fr/etudes.php>: [E-Administration]), applications responding to the specific functional needs of human resources which could be accessed by the whole unit of collaborators and which integrates the ICT (information and communication technologies). In forecast for 2008 in France and also in Europe, the processes which should be seen touched by information processing investments are mainly the activities of staff management, pay management, time management, competences offer and management, etc.

This lucrative e-HR market would represent, by 2008, 1.4 billion euros with an average growth rate annual of 15% (2004-2008 period). The people who would mainly be solicited for the e-HR projects are the software publishers and the integrators/SSII (81-90 %), the consultancy companies and service providers come far behind (10-19 %). It is on this first aspect that we are reactive to propose our approach for E-Rh.

A solution turned towards e-HR can propose a component workflow which is an essential part of any solution of integration intended to provide a treatment automated of workflow turned towards man by means of a management capacity of job processes and to play the central part which consists in carrying out the processes related to the interconnection of systems. These two tasks are completely distinct and different, but they are adapted perfectly to the use of the tools of workflow.

### **5.1 The approach of workflow for the e-HR decision maker**

Workflow of system integration may include some steps such as the extractions and regrouping of the systems' data, the validation of users' data and system updating with the aid of data entered and modified. For an e-HR decision maker, we propose a technological solution that is adapted to his needs for human resources management on the Web, especially an automatic management.

The human system of « workflow » and certain types among the most interaction representatives between man and the job processes can be classified into two major components (WFMC, 1999):

- Firstly, those made by human system workflow and their internal interactions in the course of their deployments in form of execution.
- The second correspond to types of conception of human workflow interaction and their implementation with the aide of internal interactions between the human systems workflow.

The human system workflow (HSW) has to take in charge the communication between person and the systems (softwears, packages, applications, etc.): a work list's state (waiting, recover, finish, failure) that changes constantly (*Fig. 5.1.*). These states permit the description of the life's cycle of a task in a conceptual way, the most frequents are:

- waiting : the creation of task,
- recover : a user has recovered the task and received the initial data,
- finish : a user has completed the task, by giving the final data,
- Failure: a user ended a task and supplied a relative message to an error.

For example, a supervisor's task begins with the "waiting" State. When he accepts the task, his state becomes "recover". Finally, when he authorise the request, the final state of the task is "finsh".

The service of task management consists of the principal component of the architecture workflow. In a scenario like an explicit service of task management, He:

1. Receive a request to task creation,
2. Interact with the identity service for the selection of all people that are capable of executing a task,
3. Include these in the list of tasks (to be realised / executed) associated to selected users, then
4. Fix the delay and relative tools to the task.

Finally, a system user decides to be occupied with a task by recovering it in order to:

1. To carry out a task or
2. Request for additional data

Many types of relations could be established between person and processes. The most recent is the mode of interaction between the people and the processes (human roles). For example, the company's personnel could be regrouped according to roles as regards to (semantic) a job activity, such as that of (processes administrator) or the (someone responsible for a task). The way in which processes identify the people to interact with (links and requests) consititute another current relation. In job processes, certain group of users are relevant from professional point view. The "personal" links represent the different group of person implied in the execution of processes (realisation of activity).A request founded on the company's annuals is used for identifying persons associated to a link.

In the example, the generic human role, "financial director" or the decision maker could be qualified by the link "personal supervisor", which is linked with a selected request "director of a department", the "department's name" been "finance".

The identity service manages the functions relating to user, especially:

- authentication,
- autorisation or
- peoples identification

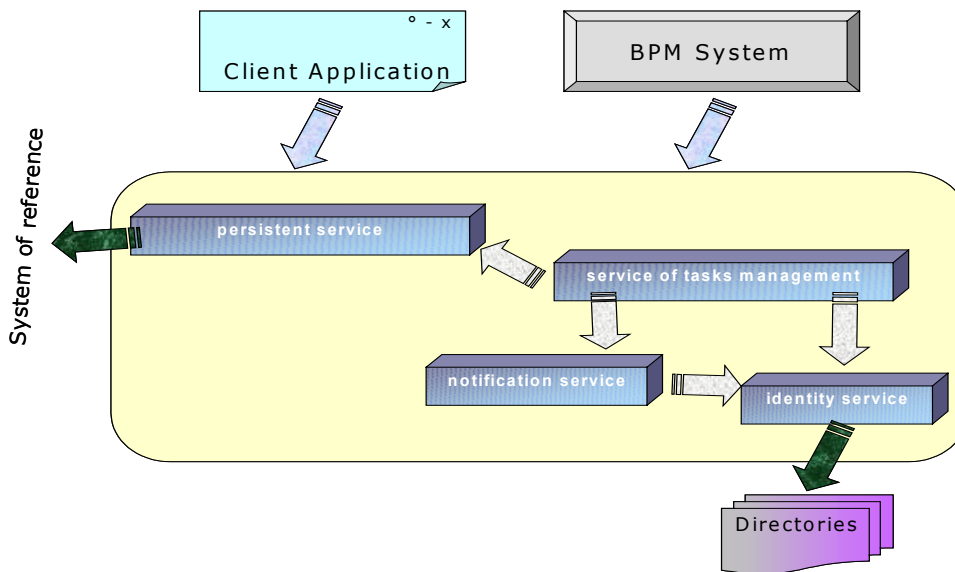


Fig. 5.1. : Principal components of a human workflow architecture.

The users' information are often stocked in the company's annuals (for example, annuals of service, LDAP annual (*Lightweight Directory Access Protocol, is a protocol that permits the interrogation and the modification of annuals of services*) or a database.). The identity services could function independently of the company's annual, it is possible to extract the annuals via the access providers, which could execute the requests and recollect the information. With this approach, the human workflow functions are to extract the user archives (user's profile base).

Our objective is not to draw out a catalog of human workflow models but we are presenting an approach of a model that is applicable to e-HR, under the architecture defined earlier on.

### 5.1 Proposition of Web Service innovating to e-HR

A distant application that communicates in a network (internet) could respond to the following problems:

- The data could be present solely on the distant server : for example, products catalogues, a classification of the service society in reel life, the relevant CVs of competences, etc.;
- The distant server could have at its disposal a calculating power or storage capacity ;
- The distant application could be used simultaneously by a great number of users and it is updated only in one place.

For these reasons, an interaction between the distant programmes could be useful. There a lot of technologies like CORBA, Java RMI and more recently Web Services which could be used to implement this (Bieberstein & al., 2005).

The Web services provide solution to the problem by defining a standard way of calling a distant application and the recollection of the results passing through the Web.

The Web services represent a mechanism of communication between the distant application by passing through the internet without depending on the programme language and the platform of execution:

- By using a protocol (example, HTTP) as a means of transport. Thus, the communications are effected on a universal support. They are mastered and generally not filtered by the fire wall ;
- by employing a syntax ( example, XML) for describing the distant functions calls and the exchanged data ;
- By organising the mechanism of call and of respond.

With the help of WebServices, the applications could be viewed as a set of job services, structured and rightly described, dialoguing according to an international standard rather than a set of objects and mixed methods: it's the object of work in human resources management. The actual normalisation around the Web services is nevertheless a vast depot that will be okay beyond the simple invocation of distant object method. Multiple works have thus, been started in order to try to define a real distributed infrastructures, capable of satisfying the whole of an application needs, in terms of exchange normalisation as well as of transverse services.

The HR Web services provoke an evident interest of actors, users and decision makers. The reoccurring question concerns the degree of maturity: the appropriate response to the problem of data exchange, HR application integration and the profitability of rendered services in HR.

The HR sector and e-HR sector use processes based on the resources for years. The knowledge acquired in the material are exploited to create a system of advanced workflow. These models extract workflow systems at different levels, especially task approbation, task creation and task state management. In return, we are presenting a proper model under an architectural angle defined earlier: The model of "parallel workflow".

The *parallel workflow* model is a scenario that requires a simultaneous approbation of a given task by different users. Each participant can add his personal comments and attachments. For example, a recruitment process is to select future employees. Each participant in the scenario (recruitment process) votes for or against a candidate. One estimates that with 75% of favorable votes according to fixed constraints, the candidate is hired. If not, his application is rejected at the rate of vote less than 35%. The candidate remains on the list of probable hiring if the rate of vote surpasses the point of rejection but it would be for another post with a profile that requires less competence so that he would be able to pass through another recruitment process. The processes is also conceived according to the model of parallel workflow, that permits each participant to vote without considering others.

The application of this solution implies three interactions:

1. Interaction with the task management service in order to classify the tasks and define the appropriate rules and the imposed constraints.
2. Define the order of intervention of implied users in the tasks.
3. Start the task by interacting with the task management service: the task management service forward the task to all the users. It will only end the task if all the interveners have finished working on it (voting as in the example above).

This model of parallel workflow could call certain types of activities or another parallel workflow or a sequential workflow. This last type of workflow is a scenario that requires a sequential approbation of the task by a group of users. For example, when an approbation system of order form use a job process for treating an order form of rendered HR service, this

is first of all evaluated by an employed “Supervisor” member of users group. As soon as it is approved, its director “decision maker” has to look at it so as to give his approver. Then, the order form is transferred to “e-services” of fracturation and expedition. This solution implies the invocation of former interactions.

The concepts and scenario presented in this projet is to simplify the comprehension of components of a Web service invoking to e-HR. Also, what one encounters in our days in human workflow platform and the workflow engine architecture conceived by the principal suppliers of integration servers. The context of our research approach on the parallel workflow is to integrate it in a functional architecture with strategic information system and database in the context of economique intelligence: to favour the cooperation of software tools and architecture for optimising the solutions offered to decision makers of an HR organisation. Reactive learning of future problem of knowledge, competences and activities, remain our utmost interest, for it concerns the consructions, the adaptation and the integration of new approaches, modelling and experiences.

## **6. Conclusion and perspectives**

In this article we presented our research context: strategic information systems, economic intelligence and data warehouses. Then, we clarified a particular user model: the model of the decision maker. Indeed it is the engine of the organization and, it is not only no more possible to develop information systems without the end-user, but more still it is excluded not to put end-user into account in SIS. We applied these concepts to various fields, in particular information retrieval at the first instance. This research is also applicable in close fields of software engineering as well as collaboratif work and the groupware. In this context also it appears extremely interesting to model not only user groups (which would only be for reasons of access security) but also the user himself and even his preferences as regards to the type of information collected, for example, from an Intranet as well as his posting preferences.

Currently one of our privileged application targets is human resources management where it seems obvious to us that our researches in the SIS and EI fields could be largely applied. We are concerned at first with competence management where, if the actors are not inevitably multiple, the interest of such a decision support system is essential. There however remain many developments to be made so that the establishment of the decision-maker model among the metadata of the warehouse could be effective and exploitable.

Also, in this article we proposed Web Services technology which can bring a solution to HR problems by defining a standard manner of calling a distant e-HR application and to recover their results through the Web. This technology can also call upon specific tasks or call upon another technology, case of Workflow technology. The latter is a new dimension to treat automated jobs then to transmit its results to the Web Service which will integrate them with the unautomated human interactions.

## **7. References**

Alloway R.M. (1976). Temporary management systems : application of contingency theory of the creation of computer based information system. Thesis D.B.A Havard University (USA).

Alloway R.M. , Quillard J. A. (1983). User Managers' Systems Needs. MIS Quarterly, Vol. 7, No. 2 (Jun., 1983), pp. 27-41.

Bieberstein & al. (2005). *Service-Oriented Architecture (SOA) Compass: Business Value, Planning, and Enterprise Roadmap (The developerWorks Series) (Hardcover)*. by Norbert Bieberstein (Author), Sanjay Bose (Author), Marc Fiammante (Author), Keith Jones (Author), Rawn Shah (Author). IBM Press (October 25, 2005).

BOUAKA N. (2004). *Model development for a decisional problem clarification: a tool of decision-making in the Economic Intelligence context*. Thesis University Nancy 2 (France), Décembre 2004.

CAUVIN, P., CAILLOUX, G. (2003). *Types of personalities: Method MBTI. ESF – Psychologie – Psychanalyse, ESF Editeur (coll « formation permanente »), Issy-les-Moulineaux (France) 2003.*

Darmon, R. Y. (1993). *Management of human resources to the sales forces*. Editions Economica (Paris) 1993.

FEACO. (2003). *Rapport FEACO, Etudes sur le Conseil : « Léger retour à la croissance du conseil en Europe en 2003 »*, Rapport 31 Août 2004, (visited 03-2007, <http://www.consultingnewslines.com/Info/Etudes/>).

FOUCAUT, O., THIERY, O., SMAILLI, K. (1996). *Systems design of information and event-driven programming: conceptual stage at the implementation*. InterEditions.

FOWLER M., SCOTT K. (1997). *UML Distilled, Applying the standard object modelling language*. Addison Wesley.

FRANCO J.M. (1997). *The Data Warehouse : objectives, definitions, architectures*, Eyrolles.

HAYES, J. et ALLINSON, C. W. (1998). *Cognitive style and the theory and practice of individual and collective learning in organisations*. Human relations, Vol. 51, N° 7.

KETTANI N. and alii. (2000). *From Merise to UML*. Eyrolles collection, Paris.

Kimball R., Reeves L., Thornthwaite W. (1994). *The Data Warehouse Lifecycle Toolkit: Expert Methods for Designing, Developing, and Deploying Data Warehouses*. Ed. Wiley Computer Publishing.

KISLIN P. et DAVID A. (2003). *De la caractérisation de l'espace-problème décisionnel à l'élaboration des éléments de solution en recherche d'information dans un contexte d'Intelligence Economique : le modèle WISP*. Conférence "Intelligence Economique : Recherches et Applications", Nancy, Avril 2003.

Kislin, Philippe. (2005). *Les activités de recherche d'information du veilleur dans le contexte d'IE : le modèle WISP*. in "Organisation des connaissances dans les systèmes d'informations orientés utilisation : contexte de veille et d'intelligence économique, Nancy, France", ISKO-France, INIST April 2005.

Lache R., Blaschke K.A., Little M., Breitsprecher C., Sonnenschein E., Toulemonde G., Ouchi T. (2000). *Deutsch Bank Global Equity Research, Automotive E-Commerce : A (Virtual) Reality Check*, June 2000.

Le MOIGNE J.L. (1974). *Decision Systems in the organizations*. Editions PUF, Paris.

MARTINET, B., RIBAULT, J. M. (1989), *La veille technologique concurrentielle et commerciale*, Les éditions d'Organisation (France).

MARTRE, H. (1994). *Intelligence économique et stratégie des entreprises*. Rapport du Commissariat Général au Plan, Paris. La Documentation Française, pp. 17,18

Pelletier S., Paré M. (2004). 45 millions de dollars de factures impayées. Le devoir.Com : Édition du mercredi 24 mars 2004 (visited 03-2007, <http://www.ledevoir.com/2004/03/24/50552.html>).

PORTER, M. (1986). Choix stratégique et concurrence. Technique d'analyse des secteurs et de la concurrence dans l'industrie, Editions Economica (Paris).

ROCHFELD A., MOREJON J. (1989). La Méthode Merise. Tome 3. Gamme opératoire, Editions d'Organisation, Paris.

SITE. (2006). Activity report : "Modeling and Development of Economic Intelligence Systems". Ed. INRIA-LORIA Lorraine, Dec 2006 (visited 03-2007, <http://site.loria.fr/rapports/site-ra-2006.pdf>).

Tardieu H., Guthmann B. (1992). « Le triangle stratégique : stratégie, structure et technologie de l'information ». Les éditions d'organisation, Paris.

TESTE O. (2000). Elaboration d'entrepôts de données complexes. Congrès Inforsid'2000, Lyon 16-19 Mai 2000.

WFMC (1999). The Workflow Management Coalition Specification : Terminology and Glossary - Document Number WFMC-TC-1011, Workflow Management Coalition Wfmc. February 1999, Document Status - Issue 3.0.