The Development Roadmap of the EWG-DSS Collab-Net Project: A Social Network Perspective of DSS Research Collaboration in Europe

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A Social Network Perspective of DSS Research Collaboration in Europe[1]

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Abstract. It is well-known that social network analysis has been playing an increasingly important role in evaluating scientific research collaboration within publication databases. This paper presents the development roadmap of the EWG-DSS Collab-Net Project of the EURO Working Group on Decision Support Systems. The current project serves as a means for a social network perspective of research collaboration within the Decision Support Systems community in Europe. The major key variable used for the network analysis is co-authorship. The network was designed to show the collaboration dynamics among the researchers, members of the EWG-DSS group. Newly in this paper is the specification of the ontology model to be used within the collaboration research network, stating its benefits to the project. The study provides a clear understanding of the community's strengths, in terms of key players, strong links and well researched topic areas; as well as weaknesses such as weak links and isolated researchers. The main goal of the project's network analysis is to allow researchers to seek opportunities for future collaboration within the DSS communities. Results achieved so far are briefly described within the paper.

Key words: Social Network Analysis, EWG-DSS, Scientific Research Collaboration, Co-authorship, Ontology Model, Project EWG-DSS-Collab-Net.

1 Introduction

Social network analysis produces an alternative view, where emphasis is not strongly given to the attributes of discrete units of analysis, but rather to their relationships and ties with other actors within the network. It focuses on how the structure of ties affects individual nodes, which can represent persons, organizations, states and their relationships. Social network analysis can provide insights into both interaction patterns and network statistics [1]. Its power mainly stems from its difference from traditional social scientific studies [2-3].

Collaboration and affiliation networks are specific types of social networks. An affiliation network can be seen as a network of individuals connected by common membership in groups of some sort, such as clubs, teams, or organisations [4]. Data on affiliation networks tend to be more reliable than those on other social networks, since membership of a group can often be precisely determined as a relationship. Similarly, scientific collaboration networks are typical social networks with vertices representing scientists and edges representing collaborations among them [5]. Tangible and well-documented forms of collaboration among scientists include co-authorship and co-citation [4, 6].

Over the years, the EURO Working Group on Decision Support Systems (EWG-DSS) of the Association of the European Operational Research Societies has identified the need to better structure its collaboration dynamics in order to provide its members with better chances for joint research work. Since its foundation in 1989, a number of well-qualified research co-operations within group members have been established, which have generated valuable contributions to the DSS field such as journal publications. More recently, those publications have been extensively encouraged with the organisation of the EWG-DSS annual research events. Evidences of those editions can be found in [7-15]. Since 2008, the EWG-DSS Co-ordination

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Board have been undertaking a network analysis project, defining a publication co-authorship network structure, which has been subject of further enhancements and updates up to date.

This paper describes the specifications and versions of the EWG-DSS Collaboration Network Project (EWG-DSS-Collab-Net), showing its new trends and advances. It is organised into six sections. The following section reviews the related work in scientific collaboration and co-authorship networks. Section 3 introduces the EWG-DSS and its project EWG-DSS-Collab-Net (versions 1 and 2). Section 4 describes the ontology model specified for the project. Section 5 briefly presents the new trends and proposals of the current developments of the EWG-DSS collaboration network. Section 6 concludes the work with future work.

2 Research Collaboration and Co-authorship

Many different forms of collaboration have been explored in scientific communities, such as through visiting scholars, co-editorialship, joint PhD supervision, collaborative research projects, and joint writing. In the most formal way, the collaboration can be tangibly documented such as via joint publications and shared patents. At other times, collaboration may be in a less formal way such as interaction at conferences, workshops, seminars, and feedback from reviewers and editors.

Existing work in social network analysis has investigated collaboration within affiliation networks in a wide range of disciplines, using formal and informal forms of collaboration. Some of the collaboration and co-authorship analysis literature focused on scientific fields including biology [16], computer science [5], geography [1], management and organisational studies [16-17], mathematics [18], physics [19], research and development [20], and tourism and hospitality management [21]. A few publications have discussed inter-disciplinary collaboration networks [22-23]. The collaboration has been reported at various levels, including individual level [18], national level [20, 22, 24], and international level [22].

Two tangible and well-documented methods used for the study of research collaboration are co-authorship and co-citation analysis. In co-citation networks, links between researchers are established through authors' references to each other's publications [18]. Co-authorship networks are quite distinctive, in the sense that the nodes of the networks are authors rather than papers [5], [22-23]. Therefore it is perceived that the co-citation networks depict the structure of knowledge in the scientific community, whereas co-authorship networks depict a scientific society, providing an opportunity to identify and measure the extent of social influence and interaction. While co-citation analysis might help identify the central and important scientific papers, co-authorship analysis can help identify the most influential scientists in the community [21], further help facilitate the knowledge flow within the network (knowledge diffuse through the key nodes and shortest paths), assess the resilience of the network (preventing attack to weakly connected nodes) and formulate strategies for the community growth (using the key players to influence others to join in the society). On the above basis, this paper adopted co-authorship analysis for the study of DSS research collaboration in Europe, specifically using the co-authorship as the primary indicator of relationship between the researchers of the EWG-DSS network.

3 The EWG-DSS and Project EWG-DSS-Collab-Net

The primary aim of EWG-DSS is to provide a platform for encouraging state-of-the-art high quality research and collaboration work within the DSS community [51]. Other aims include to encourage the exchange of information and knowledge among DSS researchers; facilitate international cooperation; promote the interest on DSS in the scientific community by organizing dedicated workshops, seminars, mini-conferences, etc.; disseminate high quality research by editing special and contributed issues in relevant scientific journals; enforce networking among its members and international DSS communities; and inspire the development of innovative models, methods and tools in the DSS field and related areas.

Since its creation, the EWG-DSS has held annual Meetings in various European countries, and has taken active part in the EURO Conferences on decision-making related subjects. The number of EWG-DSS members has substantially grown along the years. By the end of 2012, it counted with 163 registered members and more than 150 members in its Linked-In Group of Interest. So far, we have achieved 190 registered memberships.

Since 2008 the EWG-DSS Coordination Board has been conducting a study about research interests of the group members, with the intention to draw a knowledge map on Decision Support Systems within its community. The EWG-DSS Collaboration Research Network (EWG-DSS Collab-Net) has then started and has

been continuously enhanced. Some of the advances of the project were published in [25-31]. In this paper, we revisit the project work cited above, with a focus on social-academic network to provide an overall picture of the project. Newly presented in this paper is the specification of the project's Ontology Data Structure Model. In the following subsections, we give more details of the EWG-DSS Collab-Net project in its versions 1 and 2.

Initial Empirical Method & Building Methodology

For the acquisition of the academic production used in the first developed network of the EWG-DSS Collab-Net [25, 28], all the members of the DSS group were requested by the coordination board to submit relevant information, concerning their publications since 1989, stating for each of them the main areas of research, apart from the co-authorship and edition details. As a result, 70 members replied with their feedback. From the information received, a total of 1350 publications were taken into consideration for a case-study. Only international publications of the EWG-DSS members were considered. Outside collaborators of the publications, not members of the EWG-DSS, were not included in the initial network.

To construct and analyse the social academic network, five main steps were carried out: 1. acquisition process - collecting input data in a matrix, which could relate authors and their papers, as well as the papers classified into topics; 2. extraction process - creating the input files with nodes and labels to enable them to be manipulated by the network tools PAJEK [32-35] and NWB [36]; 3. transformation process - using Jaccard similarity measure [37], we constructed a set of weighted networks by combining matrices including authors, publications and research topics; 4. weighted network graphical analysis - using PAJEK and NBW graphical tools, we analyzed the main characteristics of the EWG-DSS group; and 5. network statistics - using PAJEK and NBW statistical tools, the main aspects of the academic network were depicted. For more details of the study undertaken for the initial implementation of the EWG-DSS network, the readers should refer to the work published in [25-28] and [31].

EWG-DSS-Collab-Net V.1

The EWG-DSS-Collab-Net in its version V.1 counted with 70 authors' input data of 1350 publications, covering the period from 1989 to 2008, of which 34 topics of research areas were extracted (see Table 1 below). It featured relationships like "author-publication-topic", taking into account one topic per publication for its analysis.

The EWG-DSS Collab-Net V.1 included sub-networks representing relationships among authors, publications, projects and research areas. The relations reflected the collaborations, joint-projects, journal-editions, etc. The initial objective was to detect the research distances among the members of the group; the major and minor areas of research concentration; the interaction in the group; new tendencies and working areas; as well as new opportunities for cooperation.

Table 1. Topics of research extracted from the 1350 publications

#	Research Topic	#	Research Topic
1	Business Models	18	Knowledge Management
2	Collaboration Dynamics	19	Multi-Agent Systems
3	Cooperative Decision Support Systems	20	Multiple Criteria Decision Aiding
4	Decision Analysis	21	Management Learning and Decision Making
5	Decision Aiding Process	22	Network
6	Data Mining	23	Operations research
7	Decision Support Systems	24	Preference analysis
8	Evaluation	25	Performance Evaluation
9	E-Business	26	Preference Modelling
10	Entreprise resource Planning	27	Production Planning and Scheduling
11	Expert Systems	28	Supply Chain Management
12	Economic Theory	29	Sustainable Development
13	Fuzzy Sets	30	Social Networks
14	Group Decision and Negotiation	31	Simulation Systems
15	Information Retrieval	32	Systems Software Evaluation and Selection
16	Information Systems	33	Virtual Communities
17	Information and Telecommunication Technology	34	Context

To accomplish those goals, we created the initial matrices needed to represent the relationships and we used matrix multiplication process to combine the information of both Boolean matrices including the authors and their publications and their respective research topics, via their input networks. For the graphical representation and analysis of the network, we chose the network frameworks PAJEK [32] and NWB [36]. The PAJEK framework is from design dedicated to large network analysis, whereas the NWB Network Workbench is a framework for pre-processing, modelling and analysing small networks. Both of them are MS-Windows-based programs designed for network analysis and visualization. Figure 1 illustrates the analysis of the network, concerning the output network "Publications x Authors". In Figure 2, we can identify the clusters of publications, relative to the topics listed in Table 1. In this visualization of the "Publications x Topics" network, it is clearly seen that almost 25% of the topics, relative to 8 larger sub-nets, concentrate the great majority of papers published among the EWG-DSS group members. More details about the EWG-DSS-Collab-Net V.1 implementation can be found in [27] and [28].

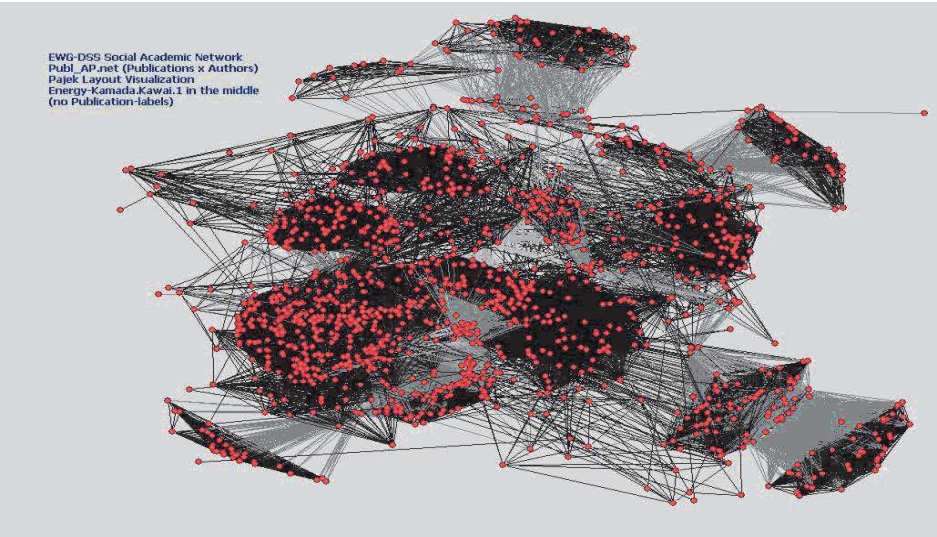

Fig. 1. EWG-DSS-Collab-Net V.1 - Publication collaboration among authors

Visualizations of single players, egonet visualizations, relating authors and research topics, were also analysed in version 1. In Figure 3 below, we can observe a *Radial Graph* visualization of the network "Authors x Topics", where it is possible to verify how the 70 authors are interconnected to each other with relation to their main topics of research, taking two arbitrarily authors as central nodes (A9 and A65). In this particular case, nodes A9 and A65 are bridging two different areas of research within the network. It is relevant to notice that

the darker connections, represented in the foreground, express the stronger connections among the authors and the nodes in focus.

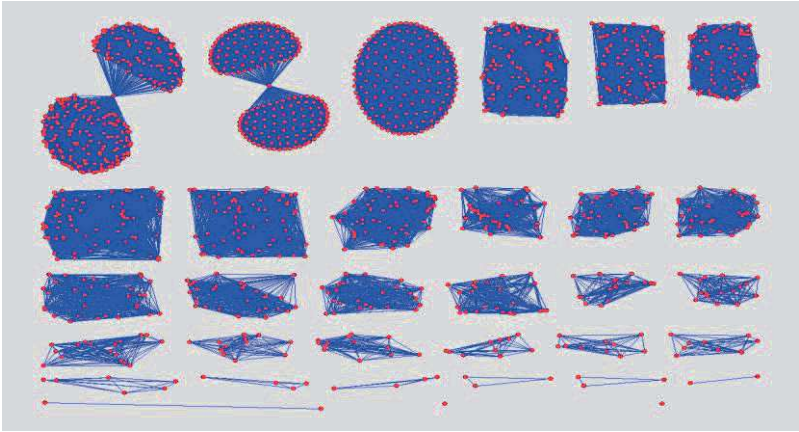

Fig. 2. EWG-DSS-Collab-Net V.1 - Publications distributed among the topics.

The EWG-DSS Collab-Net V.1 presented, however, analysis limitations due to the fact that it represented only "author-publication-topic" networks, without analysing multiple topics relationships. Further analysis of the Version 1 project has been developed by Dardenne from University of Namur in Belgium in cooperation with the EWG-DSS [38]. In [38], the usual measures on the graph and on its nodes, as well as the measures of centrality (degree centrality; betweenness centrality; eigenvector centrality) and applications of communities detection methods were used to respond to issues concerning the identification of the authors that were the most collaborative; the creation of sub-communities among the several connected components; and the existence of concentrations of authors within the network. To implement the network, the tool NodeXL was used [38]. The main goal of that study was to exploit and enhance EWG-DSS Collab-Net Version 1 in order to prepare it for Version 2 [30-31].

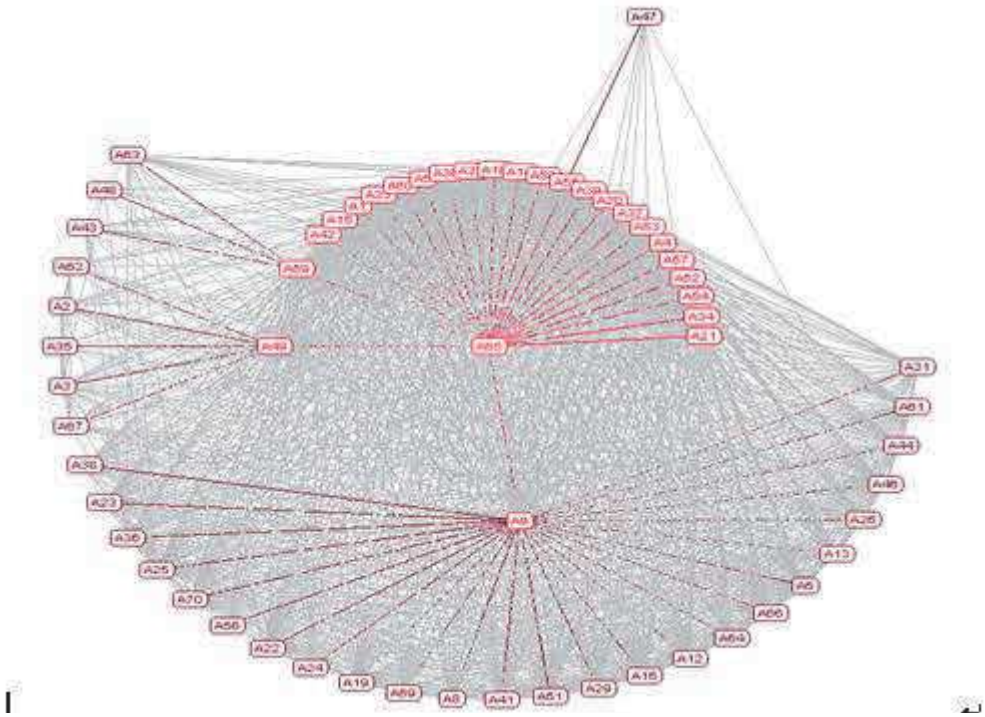

Fig. 3. EWG-DSS-Collab-Net V.1 – Egonet relating authors and topics.

Dardenne's analysis has brought us one step closer to reaching our main goals. Interesting observations of the community relations could be taken from the work in [38], via its centrality analysis. For instance, the case of people with a more modest centrality degree, having a high betweeness centrality was observed. They are key players of the DSS community, acting as bridges between non isolated clusters [30, 38]. Dardenne has

also introduced in his study the relation "Authors x Authors", in which authors are linked by their common publications. This way, the represented network identified extra 782 authors out of the original 70 authors, members of the EWG-DSS, who contributed to the original 1350 publications.

In conclusion, the collaboration relationships in EWG-DSS Collab-Net V.1 have shown how the researchers relate to each other in terms of topics of research; what the most relevant topics of research are; and the relevant statistical data concerning the publications. The output of this version devised an academic-social network analysis, which identified the collaboration relationship that exists among the group members, as well as how the group's dynamics has evolved since its foundation in 1989. The metrics of the network graphical representations helped us to build up a consistent basis for analyzing the network graphs that were generated via the input data available. Weak connections among researchers were identified. However, based on the study conducted by Granovetter in social networks [39], we have attributed great potential for the weak connections of the EWG-DSS network to be able to develop into strong ones. From [39], we know that information is far more likely to be "diffused" through weaker ties, than through already strong connections. In the particular case of the EWG-DSS network, also absent connections from isolated publications should be considered. They should be encouraged to become "weak ties", in order to gain more relevance within the network and consequently also within the group. This issue was little exploited in Version 1 and is addressed in the developments of EWG-DSS Collab-Net Version 2.

EWG-DSS-Collab-Net V.2

EWG-DSS-Collab-Net Version 2 extends the original implementation of Version 1 in many ways. It considers: 1) a hybrid methodology of input data collection (manual and automatic), using also web mining of electronic databases to automatically detect relationships of members; 2) a refined model of the publication relationship structure, taking into account "author-title-journal/conference-multiple keywords-multiple topics"; 3) an ontology-based data structure model; as well as 4) a more refined model of the collaboration relationship structure, which includes workshop/conference publications, informal work meetings, event co-organisations, scientific committees/boards, book/journal editorials, etc.

Along with social network analysis statistics, EWG-DSS-Collab-Net V.2 performs collaboration trend analysis, showing co-authorships and co-citations to further illustrate the dynamics of EWG-DSS publications overtime. The analysis features, among other characteristics, (a) the number and percentage of multi-author papers and co-authors in comparison with single-author papers; (b) number and percentage of co-citations; (c) identification of publications that are closely related to a given topic, as well as the authors involved. This last feature helps specially to find researchers who could be more appropriate to collaborate in reviewing papers for the annual EWG-DSS workshops and journal editions, as well as to find specifically skilled researchers among the members of the group to collaborate on projects. Most of all, the extended analysis of EWG-DSS Collab-Net V.2 plans to promote continued new research and collaboration among the academic members of the group and to attract new members for further fruitful collaboration.

In [28], it is shown how co-authorship has been explored as the key indicator for the collaboration among European DSS researchers. The research report [31] describes the development and analysis of the collaboration network V.2, in order to obtain a social network perspective on the DSS research collaboration across Europe, with the main purpose to improve the data objectivity and analysis accuracy to avoid the claimed shortcomings of social network analysis being poor statistical accuracy and intrinsic subjectivity. In Figure 4 we illustrate the blocks specification of the EWG-DSS-Collab-Net V.2 for its implementation, showing where the ontology model will be concentrated.

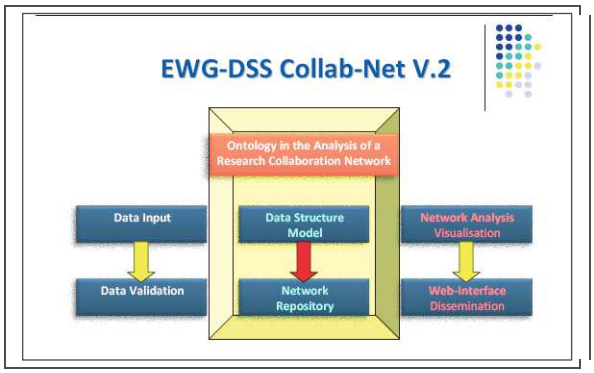

Fig. 4. EWG-DSS-Collab-Net V.2 – Implementation Specification

The data input for EWG-DSS Collab-Net V.2, conceives a hybrid methodology of input data collection (manual and automatic), including web mining of publications electronic databases like: DBLP Computer Science Bibliography; SciVerse Scopus; Google Scholar; Microsoft Academic Search; Private Publications URL; among others. The Data Validation module takes into account the various scripts and crawlers' codes to capture and filter the relevant input information from the chosen input web-environments. It caters for the validation of the publications input data (including knowledge areas, keywords) and authors' information, as well as for its normalization. Figure 5 illustrates how the Data Validation operates within EWG-DSS-Collab-Net V.2 Data Input Module.

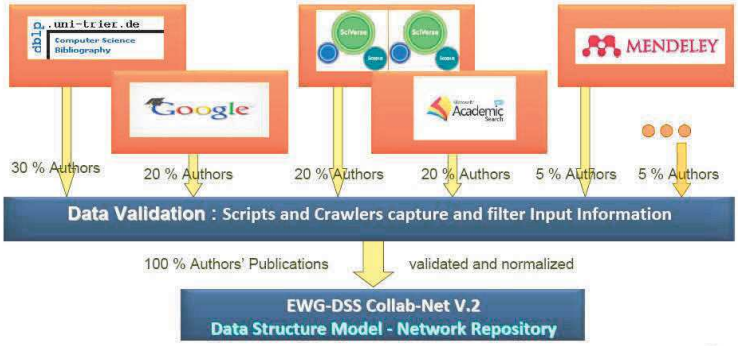

Fig. 5. EWG-DSS-Collab-Net V.2 – Data Input Module / Data Validation

Building upon the development of Version 1, EWG-DSS-Collab-Net V.2 tackles the following issues: appropriate data structure; ontology models to classify and interpret the data; selection of ready-to-use ontologies to be adopted, like bibo (Bibliographic Ontology Specification), foaf (FOAF Vocabulary Specification), owl (OWL Web Ontology Language) and skos (SKOS Core Vocabulary Specification); as well as the selection and implementation of appropriate network structures; social network environments; and analysis metrics for the network.

4 Ontology Model

The EWG-DSS-Collab-Net V.2 considers a publication relationship structured model, with authors-publications and multiple keywords and topics. The social network analysis shows co-authorships and co-citations overtime. In order to refine the identification of publications that are closely related to a given topic, an ontology model is specified [40]. This way, a common vocabulary of classifications relative to the main areas of the publications can be defined and matched with the existing publications key-words. The concern of applying ontology models to improve knowledge management and decision-making, was already introduced in [41], in which some of the inherent advantages were elicited.

An ontology is an explicit specification of a conceptualization. An ontology model can be described by defining its set of representational terms within a particular formal way. For knowledge-based systems, what "exists" is exactly that which can be represented: the *Universe of Discourse*. In an ontology, definitions associate the names of entities in the universe of discourse *(e.g., classes, relations, functions, or other objects)* with human-readable text describing what the names are meant to denote, and formal axioms that constrain the interpretation and well-formed use of those terms [43].

The EWG-DSS Collab-Net Ontology Model

In order to represent the EWG-DSS-Collab-Net V.2 Data Structure Model, the Resource Description Framework (RDF) is used. RDF is a method for expressing knowledge in a decentralized world and is the foundation of the Semantic Web, in which computer applications make use of distributed, structured information spread throughout the Web [49], [50]. RDF decomposes any type of knowledge into small pieces, with some rules about the semantics, or meaning, of those pieces. It is a particularly useful technology when you want to mesh together distributed information, including URL links. RDF can be defined in three simple rules: A fact is expressed as a triple of the form (*Subject, Predicate, Object*). It's like an English sentence. Subjects, predicates, and objects are names for entities, whether concrete or abstract, in the real world. Names are either 1) global and refer to the same entity in any RDF document in which they appear, or 2) local, and the entity it refers to cannot be directly referred to outside of the RDF document. Objects can also be text values, called

literal values. The subject denotes the resource, and the predicate denotes traits or aspects of the resource and expresses a relationship between the subject and the object. What makes RDF suited for distributed knowledge is that its applications can put together RDF files posted by different people around the Internet and easily learn from them new things that no single document asserted. It does this in two ways, first by linking documents together by the common vocabularies they use, and second by allowing any document to use any vocabulary. This flexibility is fairly unique to RDF. There are two complementary ways of looking at RDF information. The first is as a set of statements, each one representing a fact. The second way is as a graph, which is basically a network. Graphs consist of nodes interconnected by edges. In RDF, the nodes are names (not actual entities) and the edges are statements (see Figure 6).

The EWG-DSS Collab-Net Data Structure Model represented by RDF counts with the power of an ontology model in order to classify and interpret the data. For some specific tasks, like bibliography handling; vocabulary specification; memberships associations; thesauri, taxonomies and classification schemes, there are available solutions via the use ready-to-use ontologies. Based on the well-known performance of the available ontologies [44, 45, 46, 47, 48], the following ontologies are considered in the Ontology Model of our project:

- BIBO (Bibliographic Ontology) (*www.biblioontology.com)*;
- FOAF ("Friend of a Friend" Ontology) (*http://www.foaf-project.org/)*;
- OWL (OWL Web Ontology Language) *(*http://www.w3.org/TR/owl-ref/)*;* and
- SKOS (Simple Knowledge Organization System); &
- SKOS Core *(*http://www.w3.org/TR/swbp-skos-core-guide).

BIBO is a Bibliographic Ontology [44] that describes bibliographic things on the Semantic Web in RDF. It is mainly used as a citation ontology and as a document classification ontology. It can also be used as a common ground for converting other bibliographic data sources. It provides main concepts and properties for describing citations and bibliographic references (i.e. quotes, books, articles, etc) on the Semantic Web. BIBO includes 189 Resources, namely : 69 Classes {AcademicArticle; AudioDocument; Book; Jou*rnal; ...} ; 52* Object Properties *{authorList; citedBy; editor; reviewOf; ...}; 54* Data Properties *{abstract; chapter; edition; identifier; ...}; and 14* Individuals *{degrees/ms; degrees/phd; status/accepted; status/legal…}.*

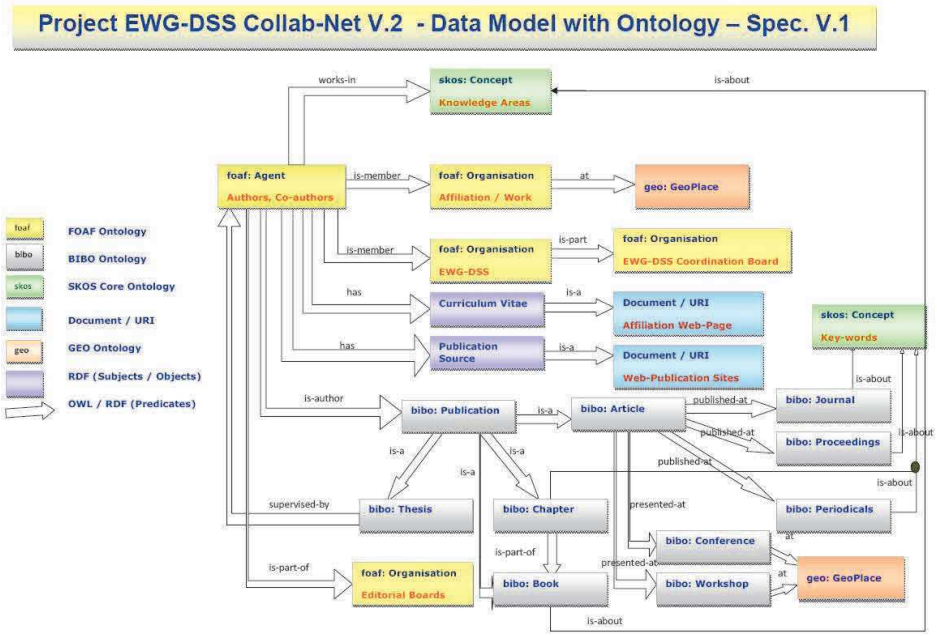

Fig. 6. EWG-DSS-Collab-Net V.2 – Data Model with Ontology Model.

The FOAF ontology ("Friend of a Friend") [45] is originated from a Semantic Web project described as a "practical experiment" in the application of RDF (Resource Description Framework) Data Model and Semantic Web technologies to social networking. FOAF is a project devoted to linking people and information using the Web. It integrates three kinds of network: social networks of human collaboration, friendship and association; representational networks that describe a simplified view of a cartoon universe in factual terms; and information networks that use web-based linking to share independently published descriptions of this inter-

connected world. FOAF includes Classes like*:* | *Agent* | *Document* | *Group* | *OnlineAccount* | *Organization* | *Person* | *Project* | *etc;* and Properties like*:* | *account* | *accountName* | *age* | *currentProject* | *familyName* | *gender* | *member,* among others.

OWL is a Web Ontology Language [46]**.** The OWL is intended to provide a language that can be used to describe the classes and relations between them that are inherent in Web documents and applications. It is a semantic markup language for publishing and sharing ontologies on the World Wide Web.

SKOS - Simple Knowledge Organization System [47], is a formal language and schema designed to represent such structured information domains as thesauri, classification schemes, taxonomies, subject-heading systems, controlled vocabularies, etc. Using SKOS, concepts can be: identified, labeled in natural languages, assigned notations, documented; linked to other concepts and organized into informal hierarchies and association networks; aggregated into concept schemes; grouped into labeled and/or ordered collections, and mapped to concepts in other schemes. SKOS Core [48] defines the classes and properties based on a concept-centric view of the vocabulary. Each SKOS concept is defined as an RDF data model resource. Each concept can have RDF properties attached to it. Concepts can be organized in hierarchies using broader-narrower relationships, or linked by non-hierarchical (associative) relationships. Concepts can be gathered in concept schemes, to provide consistent and structured sets of concepts, representing whole or part of a controlled vocabulary.

Contribution of the Ontology Model to the EWG-DSS Collab-Net Project

The Data Model including Ontologies will cater for the validation of the publications input data, taking into account the Knowledge areas; Keywords; Authors' information and Normalization. In Figure 4, the Ontology Model is illustrated within the project architecture. The Ontology Model will allow us to refine the publication relationship structure, as well as the collaboration relationship structure of the EWG-DSS Network. As a direct benefit, it represents better structured processes to take maximum advantage of knowledge. Also the ontologies can be leveraged to help improve knowledge management and allow for better decisions. This way, the DSS community can have better promotion of continued and further research collaboration among researchers and co-authors. In Figure 6, the EWG-DSS Collab-Net Data Model is illustrated with the Ontology Model's perspective.

5 Considerations about the Network Development

Previous pieces of work have addressed the social network of the EWG-DSS as a snapshot drawn on the basis of a set of publications [25-31]. The table below (Table 2) shows the development impacts, concerning data input and network analysis, of the existing versions of the EWG-DSS Collab-Net Project.

Table 2. Development Roadmap of the EWG-DSS Collab-Net Project

EWG-DSS Collab-Net	Version 1 [27,28,29]	Version 1' [38]	Version 2 [30, 31, 40]	Future Versions

Development & Data Input and Network Analysis Impacts	Manual Data Input. 70 Authors; 1350 Publications; 34 Topics. Author-Publication-Topic Relation (considering only 1 Topic per Paper). Co-authorship Analysis. 3 Networks analysed: Publications x Authors; Publiocations x Topics; Authors x Topics. Identification of Main Areas of Publications and Collaborations among Researchers.	New Analysis via different Centrality Measures. Relation Authors x Authors of common publications. Embedding of the Cooperating Authors (not members of the EWG-DSS) Enlargement of the Authors scope from 70 authors to 782. Identification & Analysis of Sub-Communities of Research Collaboration. Evaluation of new Network Analysis Frameworks.	Conceptual Model for Hybrid Data Collection, including automatic data input via several online publications analysis databases. Ontology-based Data Structure Model. Analysis with Multiple Keywords & Topics per Publication and Conferences & Editions. Co-authorship and Co-citations Analysis. Exploitation of suitable Data Structure and Network Analysis Frameworks.	Implementation & Improvement of the Automatic Collection of Data Input via online citation-databases. Temporal Evolution Analysis, considering co-authorships and co-participation relations. Deployment of a Web-based Version of the Collab-Net Publication Network to be used of the DSS Communities.

In the current developments of the EWG-DSS Collab-Net Version 2 and further, the social network is addressed in a new perspective: one which emphasizes the evolution of the DSS community in different aspects. This stage considers all the participants involved with the EWG-DSS organised research events, as well as all the authors and co-authors involved in the related publications. Also the topics of the papers and their research areas will be considered as other aspects of the evolution. On the basis of the author-defined key words, the study exploits existing clusters of publications, the temporal evolution of popular topics, the topic-related sub-group in EWG-DSS and their respective evolution.

The evolution of the so-built network will be mainly observed with regard to its researchers and their relationships (co-author and co-participation), via various relevant density metrics. This proposal will investigate the use of dynamic network analysis tools, in order to better observe and analyse the evolution of the DSS community within a European and international perspective. From the brief description of the current trends and developments of the EWG-DSS collaboration network, it becomes clear that the growing perspective of the EWG-DSS Collab-Net has already assured its landmark as a useful tool for the EWG-DSS members and as an important reference for the European DSS Community as whole.

6 Conclusions

In this paper we revisited the developments of the research collaboration network for the EURO Working Group on DSS, EWG-DSS Collab-Net Project, Versions 1 and 2, stating its objectives, achievements, limitations and current status. Some details of the EWG-DSS Collab-Net V.2 data model structure were newly presented here, including the dedicated ontology model. We strongly believe that the project EWG-DSS Collab-Net is on the right way for providing the DSS community in Europe with more accurate and up-to-date information about research projects and co-authorships, leading to much better future collaboration opportunities.

In terms of future work, there are a few development steps that still need implementation refinements and will be focus of our attention in the future. Namely: inclusion of missing input data (up to the current point in time); Encouragement for the isolated nodes of absent connections to become, at a first stage, nodes of “weak connections” within the net; reduction / elimination of the isolated nodes; deployment of a web-based version of the EWG-DSS Collab-Net project for the use of the European DSS community; augmentation of the EWG-DSS community via the association of the external collaborators (co-authors) present in the network.

To proceed with the planned and pending developments, the EWG-DSS Coordination Board needs the support of all researchers within the group and the DSS Community, via their participation in submitting their data / research production in joint-work, etc; as well as their constructive feedback and help as development force.

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