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IDSS used as a framework for collaborative projects in conglomerate enterprises

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ABSTRACT

Purpose: of this paper is to summarize the application study of the general framework of intelligent decision support system (IDSS) to collaborative projects in conglomerate enterprises. Today's market competition requires project managers to make correct decisions fast. In some situations, even with the knowledge of how to find right information and which decision making methods to apply, people do not have enough time to make right decisions at the right time. In this paper, the framework of an IDSS system to support real-time collaboration and enable seamless data exchange is presented. The IDSS system is able to support the information flow between internal and external sources. Data are shared, prepared, and streamlined to appropriate analytical tools. A case study of manufacturing projects in a specific European shipbuilding conglomerate is used to illustrate the process and usefulness of IDSS in combination with Enterprise Resource Planning (ERP) systems.
Design/methodology/approach: A model of internal and external information flows is proposed for enterprise information management. The important roles of facilitation and organization that the IDSS plays are demonstrated. In the case study examples of manufacturing projects analysis are given with the known methods, including Analytical Hierarchy Process and Bayes rule.
Findings: It was found that IDSS is an essential component to enhance decision makings with complex information flows in large conglomerates. Main conclusions is to show what we will achieve through IDSS systems, to show how perform analysis in logical way.
Research limitations/implications: The functionality of the developed framework is limited by the willingness of management style and culture changes in companies, as well as the level of interoperability between commercial software components.
Practical implications: Project engineers and managers need to adapt to the new IT-based working environment. Intensive use of software tools may become the major challenge for those who cannot absorb information based on the new format of information presentation.
Originality/value: The proposed new information management model and the framework of IDSS system enable ease of data sharing and processing by internal and external stakeholders in decision makings. The collaborative decision making consists of different parts: the management of information flow, the preparation of data for decision making, and actual decision making supported by several methods.
Keywords: Project management; Productivity and performance management; ERP; Intelligent decision support system

1. Introduction

Today the competitive marketplace requires that enterprises should be more flexible, innovative and responsive to their customers' needs. Therefore, the small and medium sized enterprises (SMEs), in order to gain competitive advantages, should change their traditional business models and adopt new ones to facilitate collaboration with suppliers and customers. Enterprises form collaboration networks that value speed, quality will have the ability to react dynamically according to individual objectives (e.g. customize a product, provide special services, outsourcing).

Because of the proliferation of the Internet and global networks, organizations are increasingly connected to one another, not only for the purpose of business transactions and exchanging data but also for making collaborative or negotiated decisions. In this environment, Enterprise Resource Planning (ERP) systems can serve as platforms for trans-organizational exchange. [1]

In previous work, it was introduced how the intelligent decision support system (IDSS) could be used for optimization of engineering and production planning for collaborative SME-s [2].

In this paper, the IDSS is applied to the manufacturing projects, introduced the knowledge management framework, information flow management by IDSS. Case study for analysis of real-life manufacturing projects is demonstrated.

2. IDSS in the collaborative network of enterprises

As World Wide Web is becoming an infrastructure of decision support systems and groupware applications, many companies apply groupware technologies to increase business-to-business collaborations among stakeholders in the supply chain over intranets and extranets. These include synchronous video conferencing, presentation, chatting, as well as asynchronous workflow management, document repository, wiki publication, etc.

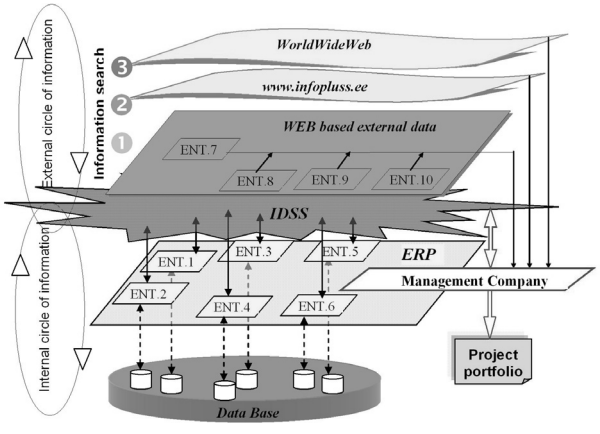

Fig. 1. Information flow model in the collaborative network of enterprises

In a conglomerate company, information flows among children SME-s can be divided into two main circles: internal and external. The proposed information flow model is illustrated in Fig. 1. Internal circle represents the internal environment of the concern including all SME-s (further *an internal enterprise*). Annually these enterprises prepare the sales forecasts for the coming year in a standard form for assessment. An external circle has three levels of information availability: companies that SME's are familiar to or have collaboration experiences with; new companies that are found from a national companies' database (for instance, *www.infopluss.ee* in Estonia); and totally unknown companies (domestic or abroad) with unknown technology.

The IDSS system is responsible for the management of information flows in the collaborative network of enterprises and enabling secure data transfers. The IDSS can enhance the effective usage of information available in the database of an ERP system. It also helps to archive and manage external information to make more reliable decisions. It is an intelligent system that can be trained towards the user's needs and preferences based on historical data. The system consists of two parts. One is responsible for structured decision support, and the other provides support for analysis of non-structured information. The structured decisions of IDSS are based on parameters specified by Management Company. Not structured decisions can be made in the way of modeling and analysis.

Based on stored information, several methods can be used to do reasoning and decision making such as Bayes rule [3], AHP[7,9], or optimal planning solver [2]. System interface will help the user to find out the right methods and to collect the results. The three types of explanations that contribute to the overall explanatory power of an intelligent interface: rule traces, strategic knowledge, and deep justifications [12].

3. Knowledge discovery for decisions making

As an important source of organizational knowledge, business and engineering data are constantly collected and archived by manufacturing companies. The huge amount of data is of little benefit unless it can be turned into useful information and knowledge [4]. Recognizing that distributed data with different formats are usually found in most of enterprises, database software companies implemented some forms of data warehousing to allow to bring these data together and support efficient enterprise report and analysis. As key information needs to reach multiple decision makers within an organization, inconsistencies of information and inefficiencies of information exchange will lead to catastrophes when data are distributed and shared across the organization. Artificial neural networks have proved their applicability in various data mining applications. These are generally used for function approximation, classification, and pattern reorganization problems. [10]. An ANN, just like a human being, learns by means of training [9].

Fig.2 shows various components of decision-making environments and the associated knowledge management activities. Data from internal and external sources, spread across operational databases, data warehouses are accessible by decision

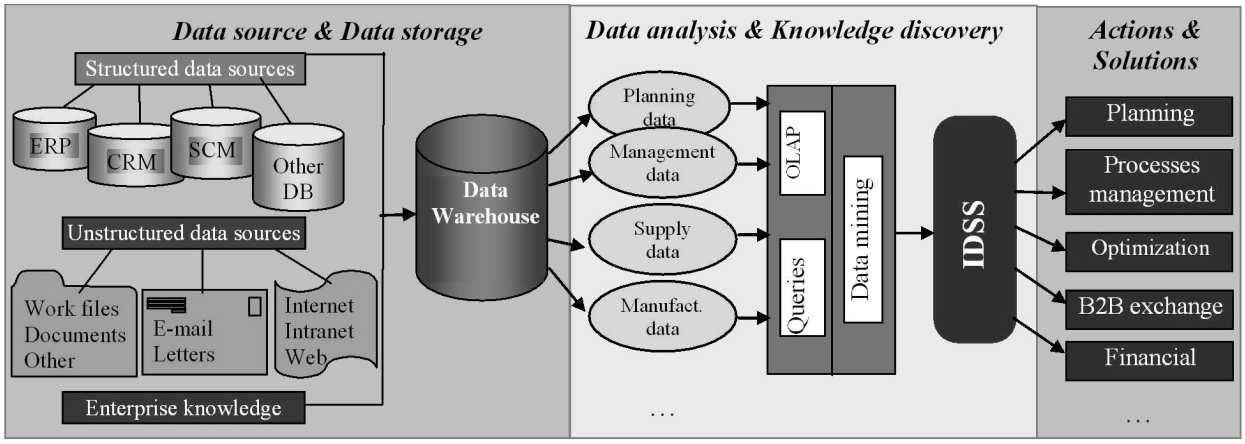

Fig. 2. Decision support and knowledge management activities

makers using tools for OLAP (online analytical processing), data mining, and queries. Decision makers, through the experience of using such tools and techniques, gain new knowledge pertaining to the specific problem area. The decision-making process itself results in improved understanding of the problem and the process, and generates new knowledge. In other words, the decision-making and knowledge creation processes are interdependent. Proper integration of decision support and knowledge management will not only support the required interaction but also provide new opportunities for enhancing the quality of support provided by the system [5]. Recent research efforts are devoted to generation and evaluation of alternative process plans and to the enlargement of manufacturing knowledge base [6].

Specific decision support systems are built based on data extracted from various data sources and decision making models extracted from various knowledge sources.When solutions are evaluated and found effective, the acquired knowledge can be externalised and then embedded into the organizational knowledge.

During the decision making process, it is important to present the intermediate results in user-friendly formats, such as search or calculation results, illustration with pictures, diagrams, summaries with tables, graphs, etc., and graphical illustration of casual-effect relationships.

4. Analysis framework for manufacturing orders supported by IDSS

Management of manufacturing projects can be widely applied in creation of new products, facilities, services, and events, in organizational changes and restructure, or recovery from natural or man-made disasters. Projects have starting and ending points in time and progress through a number of life cycle phases. In this case study we will give the illustration of how IDSS system is able to support selection and planning of manufacturing projects.

Step 1 - Collection of the required information.

The collection of the required information about quoted manufacturing projects from children companies (see Fig. 3). Children companies (D/companies) propose quoted manufacturing projects for future period. Since every company has its own distinctive development strategy, therefore a number of projects and their attributes are different as well. All this information (project description, feasibility study, etc.) is delivered from companies to the managing company that is engaged in verification, agreement, and further deployment of these projects.

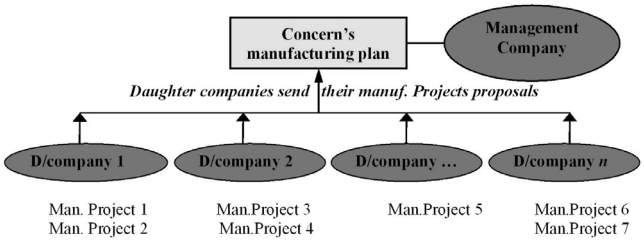

Fig. 3. Collection of quoted manufacturing projects

Step 2 - Project description.

This process requires a significant number of resources and knowledge of the project structure [13]. At the moment all collaboration is performed manually. IDSS must be able to support this process. Common format for all internal enterprises is developed and should be filled automatically by IDSS. The input of process will be collection of internal enterprise common files. Output will be the whole concern consolidated file. This file will be used for further step.

Step 3 - Preliminary planning of single projects.

At this stage all projects should be planned in detail. Firstly is necessary to estimate the projects on the base of corresponding criterions [14, 15]. IDSS will use common project template which includes tasks and steps: designing; manufacturing; installation; inspection. It is possible to include as much tasks and steps as necessary.

Step 4 - Calendar of manufacturing projects.

IDSS will include the calendar of all manufacturing projects in a consolidated fashion. Here users can see and compare all projects on the same screen.

Step 5 - Establishing the priorities.

The IDSS take into account all important aspects, and users can propose some logical solutions based on the result of data analysis. This process is based on AHP or Bayes rule. The AHP will be used if we have no exact information about future manufacturing projects. The Bayes rule can be used when we have enough information to select the most profitable or the less risky projects [11].

Step 6 - Optimisation of manufacturing project calendar.

If some resources are overloaded, the IDSS system will propose to re-plan resource usage backward. The projects with lower priorities will be postponed. It is possible to make this operation manually. It is also possible to track the solution methodology if required and will optimize the collaborative work.

5. Description of achieved results

5.1. General remarks

There are several advantages to use IDSS for project selection and management. In this case study several benefits were found, including the increased number of alternatives examined; fast response to unexpected situations; improved communication; control; cost savings; scale savings; better decisions; more effective team work; time savings; making better use of data resource; integrated risk assessment; logical selection of manufacturing projects.

6. Conclusions

The Intelligent decision support system is able to extend the use of the information stored in the database of ERP system. The Intelligent decision system will support and manage the information flow of internal and external cycles. It enables the fast and convenient collection of required information, it helps to select the appropriate analytical tool for better decision making and it is also able to study together with users in cases of non-structured problems. It enables the tracking of decision making process, which enables users to study and to better understand the made decision. The framework shows how the IDSS and ERP systems used together can help to analyze manufacturing projects.

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