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An Approach for a Bidding Process Knowledge Capitalization

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***Abstract*—**Preparation and negotiation of innovative and future projects can be characterized as a strategic-type decision situation, involving many uncertainties and an unpredictable environment.

We will focus in this paper on the bidding process. It includes co-operative and strategic decisions.

Our approach for bidding process knowledge capitalization is aimed at information management in project-oriented organizations, based on the MUSIC (Management and Use of Co-operative Information Systems) model.

We will show how to capitalize the company strategic knowledge and also how to organize the corporate memory. The result of the adopted approach is improvement of corporate memory quality.

***Keywords*—**Bidding process, corporate memory, Knowledge capitalization, knowledge acquisition, strategic decisions.

I. Introduction

In order to improve their efficiency, Companies are obliged to resort to the principles and to the methods of project management so as to be innovative on one hand and answer better and more quickly customer needs on the other hand [2].

The new way of distributing the tasks between the actors focuses on the key processes of the company. She allows identification of the key competences, which the company implemented, and necessary for these processes. This competence is maturity, in the sense of CMM (Capability Maturity Model) [7]. This capability can generate other knowledge; favour the innovation and the competitiveness.

We focus in this paper on the bidding process, which is a typical process. It is one of twenty key processes such as define by T.H. Davenport [8]. This process includes co-operative and strategic decisions [2].

A methodology for knowledge capitalization and corporate memory in improving bidding process is proposed. It aims to organize knowledge capture, storage and re-use in order to support strategic decisions at bidding process, through communication and information technology.

The approach presented here are aimed at information management in project-oriented organizations, based on the MUSIC (Management and Use of Co-operative Information Systems) Model [1], which is an information system structure and a generic model called Co-operative Information Systems Architecture.

The paper is organized as follows. Section 2 introduces the co-operative information system model.. Section 3 presents the co-operative work in the bidding process. The section 4 presents our approach. We first describe the structure of business memory and second ally the knowledge capitalization process. We show that corporate knowledge management process organizes Knowledge reuse and sharing and also learning from experiences. Lastly, we conclude the paper and discuss related works.

II. The Co-Operative Information System Model

Information Technology is the most powerful tool of change in project management, if fully exploited as a process innovation enabler for process-oriented organizations. Unfortunately management of information is largely neglected.

The application of such concepts to a situation, which is particularly valued in project management, is shown to demonstrate the significance of the proposed approach.

The approach is based on the MUSIC (Management and Use of Co-operative Information Systems) model [1].

The MUSIC model aims to design global intelligent information systems, integrating all decision support systems, process automation, all types of communication requirements, and their interactions.

The MUSIC model propose an architecture called co-operative Information System (Fig. 1) which is based on three concepts and related modeling:

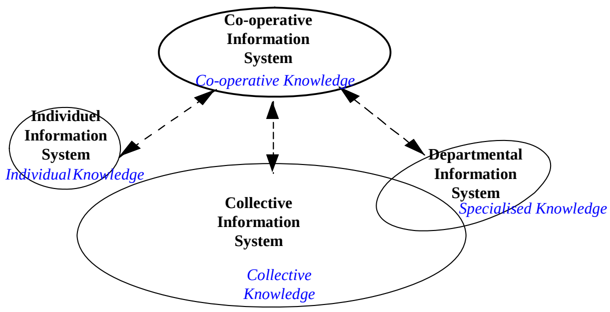

Fig. 1 Co-operative Information Systems Architecture model in MUSIC

• Information profoundness, which corresponds to differing degrees of interpretative, value and use:

- Knowledge, linked and leading to the modeling of decisions,
- Linguistics, semantics, and work organization,
- Data, and related software design.

• The spatial organization of information, which takes into account knowledge heterogeneity and distribution and the related upper co-operative structure:

- Centralization, or collective information system. It is the normalized knowledge, the common language that structures the enterprise as a global unit
- Decentralization or departmental and individual systems. Departmental or individual information system corresponds to decentralization and project division.

Co-operation between decentralized and autonomous systems through co-operative systems

• Time, which corresponds to knowledge construction in the organization and the modeling of the temporal evolution of the organization:

- Knowledge capitalization,
- Management of organization change,
- Evolution of information system.

The Co-operative Information System includes four sub-systems, linked by an upper co-operative and inter-operative structure:

• The Collective Information System or a whole organization collective semantics. The organization's efficiency requires coordination that spans an organization, implying consistency and standardized usage patterns. Collective Information System is the organization skeleton, and is necessary for its survival,

• The Departmental Information System: Information and processes have a specialized semantics, which is collective for a limited number of people (for example, a department),

• The Individual Information System: Collective or individual information semantics and individual process semantics. Each decider defines the meaning and aggregation for interpretations, analysis of actions, simulations, etc.

• The global Information System structure is completed by a communication model, defined as the totality of the communications between collective, departmental, and individual Information Systems. It provides exchanges between specialized organizational units to achieve a global finality. It is called Co-operative Information System, defined by cognitive, linguistic and conceptual modeling. The Co-operative Information System is a conceptual structure, which organizes appropriate access to the information needed for strategic decisions from the Information System of the company. It operates in a distributed context, with Departments considered as independent areas of excellence, outstanding in their own context and for their local decisions: machines, DSS, skills. The access is organized by co-operation with and between departments throughout transverse knowledge and semantics processes [12]

The model can be applied to differing situations: Decision Support Systems, co-operative work, knowledge capitalization and corporate memory.

III. The Co-Operative Work in the Bidding Process

The typical bidding process (Fig. 2) includes four activities [10]:

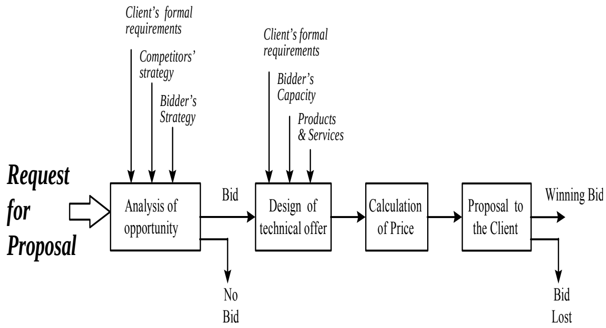

Fig. 2 The typical bidding process

• On receiving an ITD (Invitation To Tender), a decision to bid or not to bid is taken after a rough analysis of the ITD which provides the formal requirements. An estimate of the ability of the bidder to respond technically to this tender is a part of this decision making process. A rough analysis of the likely competitors' strategy is, in most cases, performed, as well as an analysis of the bidder's own strategy. This first activity ends by the decision to bid or not to bid.

• Before preparing the bid, a deep analysis of the buyer's formal requirements is performed in order to design the technical offer to be proposed to the buyer.

• Then, the cost of the offer is estimated and a business case is put together which analyses the bid environment (Bidders and expected Competitors' Strategy, advantages to win the bid, justification of the price asked.)

• Finally, the offer (both technical and financial) is submitted to the potential buyer.

The decision situation for the bidding process is identified according to the company objectives explained above:

• Answer to a bidding process only if there is a real possibility to get the contract: go/no go step. The evaluation step "go/no go" takes place as soon as the bidding process is done. It consists of quickly mobilizing the information that is necessary to evaluate the interest or the capability to get the contract,

• Improve the chances to get the contract. For this purpose, one must be able to elaborate a technical offer that satisfies the client needs at an attractive cost, while minimizing the risks incurred on the product or the industrial processes.

To design intelligent decision support for the bidding process, it is necessary to examine how the current bidding process could be modified in order to take maximal advantage of the possibilities offered by the capture and use of business knowledge alongside the use of existing information.

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In the field of industrial engineering, PDBMS (Product Data Base Management Systems) are in fact supposed to solve this problem. They are the centralized storage of detailed product (and partly process) description, that support the entire life-cycle of the product, and can even be shared with the customer. They are now normalized for certain types of product (initiative CALS by example -Continuous Acquisition Life-Cycle Support- of the DoD, with the MIL-STD-1388-2B norm for weapon systems) [6]. Storage and integration is an important problem for manufacturers, like CIM (Computer Integrated Manufacturing).

The experience of the manufacturers involved in the project contradicts this implicit belief held by the industrial engineering community. PDBMS are useful, but far from sufficient.

In fact, the assemblage of know-how is not the addition of specific data bases, joined together in a global, centralized and standardized product database.

Knowledge and consequently information is specific to skills, people, or functions in the company. It cannot be shared and does not need to be shared.

Even objects that could be shared are not likely to communicate easily between specialized skills. Each specialist has a different point of view on the same object or on the project. For example, a piece of sluice gate is not the same object from the point of view of the production manager, of the designer, financial manager, logistics support manager or project manager.

Nevertheless, a common technical language generally exists in a company. So this type of data can be modeled, but this «collective language » only represents a minimum. This is in fact the aim of the PDBMS.

Specific information exists in far higher proportions, and it needs to remain diverse. There must be coherence with collective data of the PDBMS and means of knowledge exchange are also necessary.

Means are required for suitable assemblage of know-how. This is achieved by integration, co-operation... The way this assemblage has to be made is a research prospective in itself.

From our point of view, this is achieved by defining at least two levels of languages:

• The first, clearly identified, is the level of the languages of specialist heterogeneous and diverse skills. These languages are considered diverse and heterogeneous, and must remain so, because they cannot or do not need to communicate in their specialized forms,

• The second, which is called corporate language or know-how, is the means by which integration, co-operation,... is constructed.

As a foundation for our work, we use the MUSIC model [1]. According to this model, the problematic of the co-operative work has been characterized in the following way (Fig. 3):

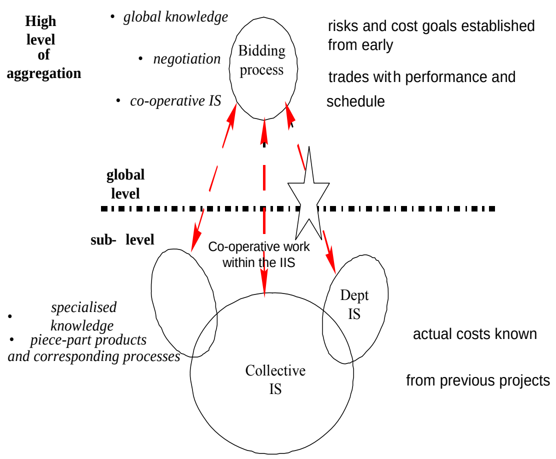

Fig. 3 Conceptual structure for the bidding process

IV. Approach for Bidding Process Knowledge Capitalization

A. Structure of Knowledge in the Bidding Process

The decision in the bidding process is a cooperative decision where several actors (logisticians, ecologists, and risks specialists) intervene for very precise contributions

For the knowledge capitalization problem, the model is used in the following way (Fig. 4):

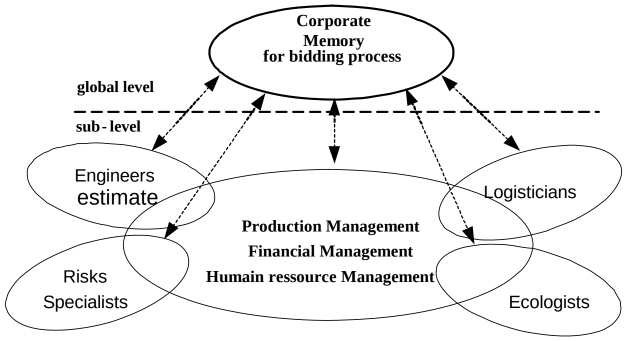

Fig. 4 Intelligent IS architecture for the bidding process

Knowledge is capitalized through an observer at a global level (In bidding process, sales managers and the bidder). This global level knowledge corresponds to the sales manager's work mainly the negotiation with the customer. This level of the Intelligent Information System includes the general requirements with a high level of granularity, the high level piece-parts of the product.

Sales managers can capture and store this specialized knowledge and expertise on products and processes in an aggregated form, which is the Cost Element Structure through the co-operative IS. This specialized knowledge of engineers in charge of quotations of products and processes is at a sub-level (lower level of granularity) and can be found in different Information Systems of the company.

For each proposal, bid managers:

• Use this Intelligent Information System to describe for example the Cost Breakdown Structure of the product using recurring sub-products (knowledge re-use and updating).

• Can enter, with the co-operation of the quotation engineers, the description of new components (innovation storage).

Knowledge manipulated (Fig. 5) by the specialized organizational units, as a part of the biding process, is structured around the PBS (Product Breakdown Structure) to support the cooperation between the different actors:

• The product functions: validate implicit and explicit customer requirements thanks to the functionalities defined after reading the biding process,

• PBS and functional analysis: goes from functionalities to the components of the future product by engineering approaches. It aims at defining industrial processes and associated resources,

• CBS (Cost Breakdown Structure): allocate cost estimation tasks to company jobs in order to negotiate an objective cost design. This generic structure has been developed as a part of the ESPRIT project (DECIDE project, ESPRIT °2298, ended in 1998) [3],

• LBS (Logistic Breakdown Structure): insert the support elements as well as the associated processes into the product [4],

• EBS (Environmental Breakdown Structure): analyze the product and the associated industrial processes, from an environmental point of view, to capture the ecological preoccupations [5],

• RBS (Risk Breakdown Structure): manage the risks in relation with the industrial organization of the company in order to negotiate a risk objective design. This generic structure has been developed as a part of PRIMA (Project Risk Management) project, n° IST-1999-10193, ended in 2002 [2].

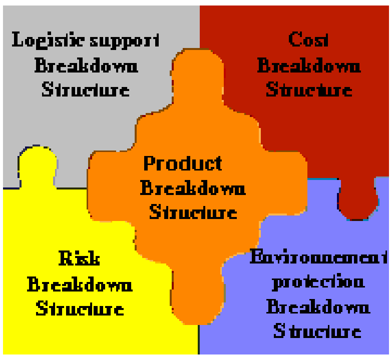

Fig. 5 Risk ontology for corporate memory organization

The corporate knowledge management process organizes:

• Knowledge reuse and sharing: Bid managers get knowledge they couldn't acquire by any other way (young employees for example),

• Learning from experience: The Corporate memory for the bidding process concentrates returns from experience, both from bids themselves and from detailed design corporate memory when it exists.

B. Memory Organization for Bidding Process

During the bidding process different kinds of information are required to design technical solutions. To support the different kinds of user, i.e. sales managers and engineers, the prototype developed allows one to create new technical solutions by re-using previous bids and the associated information concerning the products, the processes and the resources or by adding new information that concerns the cost and risks or the technical feasibility.

The corporate memory management is organized into tree kinds of item (the temporary items, the to-be examined items, the recurring items) (Fig. 6):

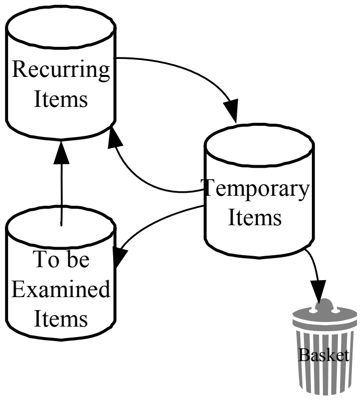

Fig. 6 Memory organization for bidding process

The temporary items are an extraction of the information system. The user creates completely new technical solution, products… at the moment of the bidding process. The temporary items form completely new technical solutions.

From the temporary items, users have the possibility of creating items to be examined. These items are those which could probably be reused for another bid. This required anticipating possible reusable items. It is worthwhile organising this anticipation as it occurs in a non-urgent situation. From the temporary and to be examined items, recurring items are created. Recurring items are those which are reused from previous bids and will certainly be reused for future bids. Recurring items could be reused just as they are or brought up to date.

V. Conclusion

Our objective in this paper was to provide an approach to strategic knowledge capitalization for the whole company..

The proposed approach capitalizes a company strategic knowledge through the bidding process, which is one of the twenty key processes [8]. The result is a corporate memory organization is in fact a part of an ODSS (Organizational Decision Support System) associated to this process [13]

From a practical point of view, we recommend to acquire of knowledge in two phases. In the first phase, it is necessary to feed the memory directly with risks. The second phase will consist in enriching this memory starting from the information system. The knowledge acquisition starting from heterogeneous sources that are the decision makers (departmental information system) concerned with the bidding process is a problem under study [11]. The potentially useful knowledge according to the point of view of decision makers are repatriate into business memory.

The result of the adopted approach is improvement of corporate memory quality considered as major component of ODSS.

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