Managing Processes and Knowledge in Inter-Organisational Environments

Report Workshop 1/Workgroup 3

David Chen[1], (Ed.), Frank Lillehagen[2], Niek du Preez[3], Raul Poler Escoto[4], and Martin Zelm[5]

[1]LAP/GRAI, University Bordeaux I, France, [2]Computas AS, Norway, [3]Stellenbosch University, South Africa, [4]Universidad Politecnica de Valencia, Spain, [5]CIMOSA Association, Germany

chen@lap.u-bordeaux.fr

Abstract: see Quad Chart on page 2

1 PROBLEMS

Knowledge Management (KM) has been gaining significant momentum within enterprise organisations. However, the differences in understanding of what a KM system is range from enterprise-wide database and information systems to generalised knowledge-based systems, via enterprise modelling and integration systems. This could be a barrier for promoting KM in industry and, consequently, the scope and goal of KM need to be better defined. The workgroup represented the business end user, vendor, consultant and researcher on KM with experiences in KM applications as for example METIS tool of Computas or the EDEN software of Indutech or the IMAGIM tool of GRAISOFT supporting the use of the GRAI Methodology.

Further, the problem of lack of guidelines to support the implementation of KM system in companies was raised. The view hold was that enterprise modelling techniques (e.g. constructs, templates, models…) could provide help to capture and represent knowledge in an appropriate form. Nevertheless the relationship between enterprise modelling and KM needs to be better clarified (for example through a mapping between business process and

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KM). As more R&D work remains to be done to make KM a reality, the group also felt it important to identify future needs in this domain.

The following Quad-Chart (Table 1) summarises the work of the group that addressed those requirements. It identifies the approach taken to resolve the issues and proposes a concept for integrating the KM and BPM technologies and ideas for future work.

Table 1: Working Group Quad-Chart

<table>
<tr><td>EI3-IC Workshop 1
KM in Inter- and Intra Organisational Environments</td><td>Workgroup 3:
Managing Processes and Knowledge in Inter-Organisational Environments</td><td>2001-December-05/07
Paris, France</td></tr>
<tr><td colspan="2">Abstract:
KM is considered an important success factor in enterprise operation, however, capturing knowledge and using it across organisational boundaries is still a major challenge. Starting from a comparison of KM and BPM, the paper elaborates on methodologies for integrating enterprise modelling and KM in dynamic networked organisations. Examples of KM/BPM applications in SMEs are provided and discussed.</td><td>Major problems and issues:
– What are the definition of a KM system that cause issues like:
– Lack of a common understanding?
– A barrier for KM in industry?
– How to define the scope and goal of KM enabling to:
– Grow with the (system) life cycle?
– Adapt to evolving infrastructures?
– Why are existing standards not used?
– How to define guidelines for implementation and use of KM systems especially in SMEs?</td></tr>
<tr><td colspan="2">Approach:
– Define the scope of KM applying the GERAM life-cycle concept.
– Compare knowledge and business-process management.
– Discuss the requirements for a KM system infrastructure and the concept of the active knowledge model.
– Present and evaluate examples of actual KM application
– Refer to standards wherever possible, mainly ISO IS 15704, 14258 CEN ENV 40003, 12204, 13559 and others focussing on interoperability.
– Derive future needs from the above.</td><td>Results:
– Realising KM with BPM by mapping the basic KM tasks onto BPM.
– Requirements for KM system infrastructures
– Synthesis from examples of Process and KM applications
Further work needed:
– Define methodologies for scalable KM systems for decentralised decision-making.
– Investigate dependencies and interoperation of (process) model management and KM
– Define an infrastructure consisting of IT and non-IT services to support KM across organisational borders
– Design modules for user guidance and training to implement KM systems especially between SMEs for the network of knowledge value chains.</td></tr>
</table>

2 ISSUES

This section presents the main issues discussed and reflects results of the work carried out by the group members independently of the workshop.

2.1 Scope and Goals

The scope of a KM should cover the full system life cycle. According to ISO 15704, (1998) and pre EN ISO 19439, (2002) the life cycle starts from domain and concepts definitions, to requirement identification, design and implementation down to operation and decommission. The scope should also be capable of growing dynamically as the understanding and infrastructure evolves. At each phase of the system life cycle, the main tasks of KM are: (1) identifies, structures, and activates information to become knowledge, (2) structures the mass of information, to make it efficiently useable and (3) supports the co-ordination of collaborative work (Davenport, Probst, 2001).

The KM differs from the enterprise modelling in the fact that the latter deals with the development of the modelling languages and methodology (Vernadat, 1996) while the former is concerned with the capturing, structuring, localising, distributing and utilising the knowledge. In other words, enterprise modelling will provide techniques (constructs and formalisms) and tools to represent knowledge from various viewpoints.

The goal of KM is the improvement of the organisational capabilities to achieve a better utilisation and sharing of its knowledge. An effective KM system may have the following characteristics: (1) Enterprise-wide decision-making support and performance evaluation, (2) Clear knowledge mapping and indexing structures that are well communicated throughout the organisation to facilitate efficient collection of (and effective reuse of) critical information needed for decision-making, (3) Portal-based context-preserving User Environments, (4) Work-process driven development, change and evolution, (5) Infrastructure supported reuse, cultivation and re-engineering of knowledge and solutions, (6) Model managed solutions design, problem-solving and learning, and (7) Knowledge-integrated processes, activities and actions.

2.2 Knowledge and Business-Process Management

Knowledge and business-process management are closely linked. Business processes themselves are a particular type of enterprise knowledge. Associate KM with BPM has many advantages. First it allows to identify operational information as business processes modelling focuses on daily enterprise operation procedures with its needed information and knowledge.

Secondly because people are usually familiar with process structures, the use of the concept of process may facilitate the capture of knowledge. Third it leads to direct use for decision support e.g. simulating alternative scenarios, business cases etc. Moreover process modelling enables to continuous capturing of new knowledge. According to the changing environment of business, processes need to be modified and changed continuously. Furthermore it allows authorisation according to the specific business processes (Need to know basis). Finally knowledge captured in process models allows business partners to pursue common interests. Table 2 shows a tentative mapping between KM tasks and business processes modelling.

Table 2: Mapping Knowledge Management to Business Process Modelling

KM Tasks	Business Process Modelling
Capture knowledge	Inputs and outputs of an activity are relevant information to capture knowledge
Structure knowledge	Inputs and outputs of an activity determine the content of the model views
Identify knowledge	Via navigation across the model views
Localise knowledge	Identification of the higher level Information e.g. processes, enterprise objects
Utilise knowledge	Use the Inputs/outputs of activities for decision support (Simulation of the model)
Manage knowledge	Distribute knowledge and control access rights in the Model or parts of it

It has been considered important that the implementation of an active KM system will influence the behaviour of the system's users. Starting from current working processes, the effects can be evaluated and measured. Information and knowledge in use are presented in various forms such as routines, databases, manual procedures and reports. The accessibility and forms will have an impact on their way of working, and their behaviour.

In summary: (1) BPM is supported by many languages and methods, but often only used for documentation, process analysis and BP re-engineering, (2) With generic, standardised modelling constructs most process types (management, planning, operation, ...) can be modelled and used for dynamic decision support, in virtual enterprises, with real time data etc. and (3) In addition, 'external knowledge' as market analysis and work laws and procedures can be included.

2.3 Infrastructure of Knowledge Management System

The WG3 believes that information and communication technology plays a crucial role to evolve KM pragmatically. Hence, it was considered very

important to define and implement an infrastructure, which consists of both IT and non-IT services. In particular, when across-organisational co-operation moves beyond the buying and selling of goods and well defined services, there is need for a flexible infrastructure that supports not only information exchange, but also knowledge sharing, creation, utilisation and management within and across the traditional organisational borders.

The workgroup has studied the architecture for application methodology of operational Enterprise Engineering (EE) with METIS. It shows that different engineering teams can work on, use and modify collaboratively their solution model, each of which is derived from an underlying (solution) meta model. In addition, the teams can modify and adapt their modelling templates in the meta model. The meta models are based on and constrained by a common Meta Data repository representing the inner core of the infrastructure. The Meta Data repository enables exchange and interoperability of data, knowledge and solution models across the entire enterprise.

Then the group has considered the possible structure of an infrastructure being an architecture that provides a certain number of services with a layered structure: Layer 1 is the ICT platform, software architectures, tools, components and applications. Layer 2 is concerned with the knowledge content, representation, sharing and knowledge repositories access. Layer 3 is the model engineering and management layer, providing work processes and services. Layer 4 represents the solution modelling, meta-modelling and the work performance team environment.

2.4 The Active Model Concept

When implementing KM, there is a need to have some models and methodology to help to capture knowledge to perform enterprise modelling. There is also needs to use templates, constructs or meta-constructs to model/describe the knowledge. Enterprise modelling can provide such support, particularly, in capturing and managing the knowledge and using it in a dynamically changing environment and across organisational boundaries.

Constructs and relationships representing the so-called Active (knowledge) Model are implemented in the METIS tool and its constituents (Lillehagen, 2002). The purpose is to show the concept of multi-views and the instantiation from meta data of the active knowledge model. An Active Model is on the one hand composed of sub-models, which are presented with model views such as domain, scope or view style. On the other hand an Active Model consists of template objects derived from Meta Models. These Meta Models can be either viewed under system aspects with features like domain, scope etc. Or they can be represented under user aspects, which

means that they are instantiated from processes, activities, resources and organisation units.

2.5 The Standardisation Issues

Standardisation will play an important role to implement interoperable KM systems, especially in inter-organisational environments. Standards will: (1) provide common understanding of (knowledge) content; (2) enable interoperability between models; and (3) insure investments of users and vendors. One problem is that many standards are not used in industry, particularly in SMEs. The possible reasons are: (1) these standards are not known at the industry level, they are ignored; (2) some of them are not developed to a sufficient detail or be operational. As a consequence there is a need for better communication and promotion of standardisation activities.

3 EXAMPLES OF INDUSTRIAL APPLICATION

A summary of knowledge management applications in industry involving WG3 members is given to derive future needs from this experience.

3.1 Process and Knowledge Management Application in Spanish SMEs

CEMENTOS LEMONA, a cement producer with 250 employees has applied KM to improve their processes. The project started from a realistic basis centred on the search for effectiveness in the application of KM as a discipline for process improvement and was implemented to a subset of selected processes. Hence, pilot experience was gained from these processes permitting, at a later date, to apply this tool to other areas of the company. The marked commitment of the management of the company and its strong bet on new management methods constitute a guarantee of the project's success.

VICINAY CADENAS has carried out an important effort to introduce the culture of individual and collective knowledge during the last 10 years. In this way, the relationship between the company and the worker is based more on what he does well rather than on how much he does and with what effort. Two projects were centred in areas in which generated knowledge is crucial for the sustained improvement of its operations, namely the transmission of knowledge between shifts and the management of improvement suggestions. After the implementation of the methodology and a few organisa-

tional changes, the company has achieved operational improvements with KM being one of its key competitive elements.

JAZ ZUBIAURRE is an example to apply KM in SMEs supported by a methodology. The company is making production systems for metals surface treatment and a national leader in the production of metallic brushes with 70 employees. JZ applies the administration of the knowledge through a methodology called RUMBO (developed by the foundation Tekniker). The principles of this methodology are: (1) Operability like integrated group, (2) Mobilisation of the human resources, materials and assets toward attaining the adopted strategies, (3) Foment of the conditions that facilitate the acquisition and diffusion of the knowledge, (4) New forms of allotment of the power, (4) Team work, (5) Development of capacities for the administration of the change with success.

Information technology can play an important role to make enterprise-wide KM a reality, in particular for large companies. UNION FENOSA is a managerial group with business in the generation and distribution of eclectic energy with a size of 25.000 employees. It has developed a model for intellectual capital management. The UF knowledge portal has as main components: (1) A standard model that integrates the key elements for business management (strategy, organisation, processes, systems and infrastructure), (2) Contents structured for the elements of the pattern, (3) Databases, experiences and suggestions associated to the elements of the pattern and (4) A computer tool of support integrated in the intranet of the company.

ARTECHE with 1000 people consists of several companies producing electronic measure and protection goods. KM has become a key tool for this managerial group to treat the processes related to innovation, the information system and to learning process, all operated via their intranet.

Besides the support from methodology and information technology, experiences show that we must not forget the people. Human should be at the centre of any KM system as shown in the case of IRIZAR - a 2.300 employees company and leader in the production of luxury buses - famous for comfort, safety and reliability. The company has a Knowledge Project based on people: (1) The knowledge workers should manage themselves (They must have autonomy), (2) The continuous innovation should be part of the work, task and responsibility of the knowledge workers, (3) The knowledge work requires continuous learning, but it demands continuous teaching on the other hand, and (4) The knowledge workers productivity is not only question of quantity but also of the produced quality.

3.2 Enterprise Modelling Based Knowledge Management Applications in South Africa

Several interesting and diverse case studies of Enterprise modelling using knowledge maps and route guides are currently deployed in the southern African region. In all cases the modelling methodology and associated route guides uses a comprehensive life cycle approach and in most cases a multiple lifecycle context. The EDEN framework and software is used, as a modelling environment and invariably the knowledge mapping of each company is a variant of the generic knowledge maps available in the EDEN software.

The single most important common denominator is that of maturity of KM culture and the unqualified non-negotiable need to compete globally. A second very strong success factor is the presence of a project champion to persist in deploying the ICT enabled innovation support efforts. Some examples are listed below: (A) Innovation modelling in the product development process of wine for the global markets, (B) Innovation and deployment modelling of the Rapid ERP implementation process, (C) Capturing of the IP and Process modelling of the Product Development Process in a specialised vehicle manufacturing enterprise, (D) Strategy Deployment modelling of a Health Care and industrially limiting pandemic, (E) Deployment of ISO 9001 within a company, (F) Modelling of a component based supply chain 3D model simulator, (G) Deployment of a Rapid Product development process.

All of these diverse applications share a number of common characteristics. These are: (1) Speed and efficiency of innovation is crucial for success, (2) Multidisciplinary teams are essential for the integration and deployment, (3) Knowledge based innovation processes requires a common knowledge map, excellent storage categorisation and retrieval functionality, (4) Structure and flexibility in the innovation process, (5) An ICT facilitated use of a large variety of modelling, simulation and communication tools and (6) Most important of all a culture to innovate.

In conclusion, the universe of available and accessible Knowledge components varies widely from one company to the next. Mature companies like SCANIE invest a substantial portion of their development budget in growing their network of knowledge value chain, whereas others ignore the importance. However, any Knowledge map should provide for obtaining and filtering the basic resources. Subsequent evaluation and categorisation by a panel of experts could reduce the size of the haystacks in which future needles have to be found again. Industry and domain specific taxonomies and ontologies could assist in logically structuring the objects and adding appropriate meta data to the content. A subdivided set of information content can be indexed to provide a matrix of words and documents so that active search

engines can later retrieve appropriate knowledge objects. A very important key success factor for implementing KM successfully is the KM culture that requires all involved to participate in structuring the Knowledge Map of a company. Thus agreeing on and understanding of the structure is of paramount importance.

4 FUTURE NEEDS

Implementing enterprise-wide KM system will have an important impact on the organisation and the way of working (individually and collectively) as well as a change from sequential to parallel working. This will lead to the reorganisation of some human tasks and responsibilities and at the same time could cause a need for new reward systems. The decentralised way of working requires that the KM system provides integrated services supporting the mobile workers. The more an individual - usually in a multidisciplinary team - works in an autonomous and co-operative way, the more activity support via an integrated, globally consistent framework is needed.

Furthermore, an effective, scalable KM system allows decentralising decision-making. Consequently traditional hierarchical organisation tends to change to network organisation where autonomous and smaller production units co-operate. In this context, new project management techniques, new work management methods, new model/KM approaches as well as the control of systems engineering team are some research issues, for which the methodologies are missing today. Emphasis on multi-medial language complementary to traditional more coded and formalised languages will facilitate not only the representation (modelling) of knowledge but also it's understanding (interpretation) by end users, and thus create more interactions between actors.

A KM system will lead to the definition of new work processes. Model based business process monitoring, control and engineering can only become a reality if an appropriate enterprise wide infrastructure and the repository technology to support portable and interoperable KM systems is implemented as well. This infrastructure is an important condition to develop traceable, self-adapting, evolving solutions, which are features of KM systems. In particular, software packages supporting these services must be interoperable regardless of the type of computing platform used. Adequate human/machine and human/human interfaces are to be developed. Standardisation could be an important contributor to achieve interoperability.

Last but not least the human acceptance will always be determining to make any new project successful. More learning, training, education are required, not only to use new information technology but also to transform the

implicit/tacit knowledge into explicit knowledge, so that it can be exploited by information technology. In addition, knowledge dissemination, end user help and consulting should not be neglected. This is particular important for SMEs. More learning, training, education (life cycle support) are required at least under three aspects: (1) learn and train how to extract individual and collective knowledge and put it in an appropriate form, (2) how to involve everybody in the company to use appropriate infrastructure-based computer services, (3) learn and train how to use the knowledge to better perform the daily business and/or manufacturing activities by interacting more quickly and appropriately.

5 CONCLUSIONS

Knowledge Management can be realised and implemented with business process modelling. Employing model based decision support has large potentials. However, it requires a common user oriented modelling language, with a common presentation, visualisation and standardised constructs, as well as common understanding of the construct semantics and of the modelling process. Current industrial applications show a great variety of approaches, motivations and results. A common understanding of scope and content of KM leading to the elaboration of a global framework, will facilitate not only the integration of various necessary viewpoints and methodologies, but also the clarification and dissemination of the KM concept itself.

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