Dagstuhl KM Seminar: Final Program
Monday, July 10, 2000

9:15 *Welcome/Introduction*

9:45 **Hans Akkermanns, Free Univ. Amsterdam**
Cross-disciplinary studies of knowledge management in virtual organizations

10:45 *Coffee break*

11:15 **Mike Uschold, Boeing, Seattle** Mike_Uschold
Knowledge Management Framework

12:00 *Lunch*

14:30 **Heinz Mandl, LMU Munic** Heinz_Mandl
Multiple Approaches Facilitating KM in Firms

15:30 *Coffee break*

16:00 **Balasubramaniam Ramesh, Georgia State Univ., Atlanta** Ramesh
Developing Reference Models for Organizational Memory: Issues and Challenges

16:45 **Wil van der Aalst, U Eindhoven** Wil_van_der_Aalst
Process Design by Discovery: Harvesting Workflow Knowledge from Ad-hoc Executions

19:30 Evening discussion

Tuesday, July 11, 2000

9:15 **Matthias Jarke, RWTH Aachen**
Experience-based Knowledge Management

10:00 **Steffen Staab, U Karlsruhe** Steffen_Staab
Using Metadata and Ontologies for Knowledge Management

10:45 *Coffee break*

11:15 **Dan O'Leary, U of Southern California** Daniel_OLeary
to be announced

12:00 *Lunch*

14:30 **Nigel Shadbolt, U Southampton**
Knowledge Technologies for Knowledge Management

15:30 **Rose Dieng, INRIA Sophia Antipolis**
Supporting Knowledge Management through New Technologies of Information and Communication (NTIC): Dream or Reality?

16:15 *Coffee break*

16:45 **Brigitte Bartsch-Spörl, BSR Consulting, Munic** Bartsch_Spörl
Lessons Learnt from Implementing Knowledge Management Processes and e-Support Systems

19:30 Evening discussion

Wednesday, July 12, 2000

9:15 **Gerhard Fischer, U Colorado, Boulder** Gerhard_Fischer
Knowledge Management - Promises, Hypes, Realities and Challenges

10:00 **Klaudia Grote, U Cologne**
Ralf Klamma, RWTH Aachen
The Influence of Mediality on Semantic Relations:
Comparison of Individual and Organizational Knowledge Structures

10:45 *Coffee break*

11:15 **Alun Preece, U Aberdeen** Alun_Preece
Better Knowledge Management through Knowledge Engineering

12:00 *Lunch*

Excursion

Thursday, July 13, 2000

9:15 **Pierre Dagneau, CSC Belux**
The CSC Knowledge Program: Becoming a Knowledge Organisation

10:00 **Klaus von Schierstedt, sd&m Munic** Schierstedt
Knowledge Management at sd&m

10:45 *Coffee break*

11:15 **Klaus-Dieter Althoff, Fraunhofer Institute Kaiserslautern** Althoff
Experience Factory: Combining Experimental Software Engineering Methods and Artificial Intelligence Techniques for Knowledge Management

12:00 *Lunch*

Thursday, July 14, 2000

14:30 **Andreas Abecker, DFKI Kaiserslautern** Andreas_Abecker
Software Support for Knowledge Management: Challenges and Opportunities

15:15 **Tom van Engers, Min. of Finance, Utrecht** Tom_van_Engers
to be announced

16:15 *Coffee break*

16:45 Wrap-up
Thomas Rose, FAW Ulm Thomas_Rose
Andreas Oberweis, U Frankfurt

19:00 Dinner

Title:An Integrated Framework for Knowledge Management

Authors: Mike Uschold , Rob Jasper and Ted Kitzmiller
Affilliation: The Boeing Company

Abstract

From the perspective of an industrial research organization, we argue that knowledge management (KM) is best viewed as a *management discipline* and a corresponding *culture* focused on *exploiting knowledge* for *competitive advantage.* We view information technology (IT) as a critical enabler of KM goals. IT is neither the major focus of KM, nor is it the primary source of savings. In the main part of this talk, we describe an integrated framework characterizing various aspects of Knowledge Management . This is intended to form the basis for a shared understanding and more effective communication about KM both within and outside The Boeing Company.

We describe six integrated frameworks. The central focus is *Knowledge Assets* (1). We identify various *Opportunities* (2) which are business drivers for *KM Activities* (3), which in turn utilize the Knowledge Assets. The KM Activities ultimately realize the Opportunities. We identify various *Roles and Actors* (4) which perform the KM Activities, and apply the Knowledge Assets. On the technological side, we describe a range of *Services* (5) which automate some of the KM Activities. Finally, we describe various *Representations* (6) which are used to express the Knowledge Assets. The Representations provide the basis for Services which in turn, manipulate the Representations.

We conclude by noting the need for a common enterprise KM strategy in which business objectives should drive the selection of the appropriate KM Activities.

Multiple Approaches – Facilitating Knowledge Management in Companies

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The goal of a responsable knowledge management is the creation or advancement of a learning organization. This consideration is the basis of a psychological approach on knowledge management and grants high significance to individual and organizational learning processes as well as to the promotion of these processes. Based on the fact that knowledge management can be seen as an intersection between information-technological, business-economical and psychological aspects, individual, organisation and technique can be designated as the three central components of knowledge management. Goal and evaluation extend knowledge management to a feedback-control-system. This knowledge management feedback-control-system can be applied to an individual as well as on an organizational level. The knowledge processes operating among goal and evaluation can be centralized to four categories: (1) knowledge representation (2) knowledge communication (3) development of knowledge (4) use of knowledge. These four categories of knowledge management are mutualy combined.

Possibilities to promote the knowledge management processes will be described by means of three projects.

(1) Individual knowledge management – Strategies for the individual handling of information an knowledge on the job. A project in cooperation with “Siemens Qualification and Training”.
(2) Knowledge Master - a modular netbased further education programme. A project in cooperation with “Siemens Qualification and Training”.
(3) Implementation of knowledge management to small and middle sized companies. A project in cooperation with the “Association of the Bavarian Metal and Electric Industry Companies” and “Management Academy Munich”.

The projects show successful possibilities facilitating Knowledge Management on individual and organisational level.

Developing Reference Models for Organizational Memory: Issues and Challenges

B. Ramesh,
Georgia State Univ., Atlanta

We define knowledge traceability as the ability to follow the life of a knowledge component from its origins to its use. Formally stated, knowledge traceability network can be defined as a semantic network in which nodes represent different knowledge components among which traceability is established through links of different types. This includes links to the stakeholders who are involved in the creation, maintenance and use of these knowledge fragments, as well as the sources in which such fragments are 'stored'. Such a network would facilitate understanding and communication of the context in which a knowledge fragment is created and used. We present a framework for representing explicit knowledge components and the ability to link to the sources of tacit knowledge components. Based on empirical studies in the domain of complex system engineering, we discuss how such a framework can be used to represent process knowledge in this domain. We discuss the role of managerial incentives in establishing a successful knowledge traceability scheme.

Process Design by Discovery:
Harvesting Workflow Knowledge from Ad-hoc Executions

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Abstract

Both ad-hoc changes and evolutionary changes in workflow processes are hardly supported by actual workflow management systems. The limitations stem from a rigid separation of *design* (i.e., the construction of predefined workflow models) and *enactment* (the actual execution of workflows). To tackle these problems, we recently started a project named "Process Design by Discovery: Harvesting Workflow Knowledge from Ad-hoc Executions". In this project, design and execution of the system are not separated: The actual executions of cases are used to create an initial design or to revise an existing design. The term *process mining* could be used describe the method of distilling a structured process description from a set of real executions. To achieve this, we use inductive learning techniques. These learning techniques have to employ relations between structured entities as workflow designs. A general investigation of relations between workflow representations based on inheritance is an important general foundation for these learning techniques. Inheritance is one of the cornerstones of object-oriented programming and object-oriented design. Traditional inheritance notions are restricted to the structure of a class (i.e., attributes and methods). These notions only refer to the *static* aspects. In our approach we will elaborate the inheritance notations to the *dynamic* aspects of classes. This allows us to relate and compare the dynamic behavior of several versions/variants of a given workflow process. The project will experiment with several notions of inheritance and learning techniques. The most promising learning technique will be integrated into an existing workflow management system to enable real experiments. The feedback of these experiments will be used to get insight into the practical limitations of the approach and to improve the robustness of the learning technique.

The approach used in this project *supports ad-hoc change* and *avoids the problems related to evolutionary change* by *learning*, i.e., the actual executions of cases are used as input for revising the design. The workflow engine (i.e., the enactment service) is no longer just a mechanism to route cases: It also provides controlled flexibility and captures historical data. This historical data is used to create an initial design or to revise an existing design (process mining). Consider for example the processing of insurance claims. Assume there is no process description. First, claims are handled by employees in an ad-hoc manner. The way these claims are handled is recorded. Then, the information recorded is used to distill an appropriate design. This design is used for handling new claims. The design can be seen as a template, i.e., ad-hoc modifications are needed (e.g., added or skipping a task). Not every modification is acceptable, i.e., the design is parameterized by one or more degrees of freedom. The execution of new insurance claims is recorded to detect discrepancies between the initial design and the actual processing. If needed, the design is revised based in this information. Compared to existing tools/approaches the main difference is the use of actual data to construct/revise workflow process definitions, i.e., "design learns from enactment" thus closing the control loop. Clearly such an approach improves the support of ad-hoc change. Moreover, evolutionary changes are easier to handle since the workflow process definitions are kept up-to-date and the degree of freedom is modeled explicitly, i.e., rigorous changes causing all kinds of anomalies can be avoided.

Ontology-based Knowledge Management
by Steffen Staab, Institute AIFB, University of Karlsruhe

Technology for knowledge management has so far focused on the management of knowledge containers. We present an approach that is oriented towards managing knowledge contents instead by identifying knowledge items at various levels of formality. This is done by providing various types of meta data that are tied to ontologies for conceptual interlinkage. Knowledge items are embedded into knowledge processes, which are supported by a suite of ontology-based tools for constructing the ontology and for generating meta data.

In order to elucidate our approach, we describe several case studies, viz. different knowledge portals that allow for the sharing of knowledge in a community. For instance, the KA2Portal allows sharing between researchers from the Knowledge Acquisition community, CHAR enables market analysts to share knowledge about company histories and OntoProPer links knowledge about human resources to business documents.

Knowledge Management:
An Analysis Based of Knowledge Use and Reuse1

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Abstract

Knowledge reuse is a critical concept for knowledge management. The extent of knowledge reuse can facilitate allocation for knowledge bases, software, hardware and network resources. In addition, reuse can guide choice of knowledge bases, and facilitate knowledge management system design.

Using data gathered from the knowledge management system of a "big 5" professional service firm, this paper analyzes the extent of knowledge reuse both on an intra and inter period basis. It is found that of the three primary service lines (audit, consulting and tax) tax has substantial intra and inter period knowledge reuse, whereas, consulting has significantly less knowledge reuse.

Such findings are important since it suggests that differential reuse will impact the design of knowledge management systems. In addition, differential resource requirements and corresponding benefits potentially can lead to organizational conflict across service lines.

Lessons Learnt from Implementing Knowledge Management Processes and E-Support Systems

Brigitte Bartsch-Spörl, BSR Consulting, München, Germany, brigitte@bsr-consulting.de

The talk essentially dealt with my personal experiences and conclusions drawn from a number of projects in different industrial environments that all aimed at the re-use of other people's experiences.
Most of these projects followed the approach of case-based reasoning. This means that one particular piece of experience is embodied in a case. A case consists at least of a problem description and a solution description. The problem description should follow a pre-defined model of the application domain. The solution description is not restricted to any form or format. Cases are stored in a case base. Re-use of experience now means to find cases with a similar problem problem description and re-using their solutions – either with or without adaptation. Since a few years, there are commercial tools available that help to build applications with considerably less effort than would be necessary for implementing an application from scratch.
The first critical point in such a project is to diagnose whether the experts are willing to give away their knowledge and whether the future users of the system would accept to adopt their solutions. This cannot always be taken for granted, e.g. because it is not creative to re-use other colleagues results and you cannot become famous for it – or it may be not save or not suitable to follow the same strategy that was successful when this problem occurred last time. Re-use of experience is rather well accepted in help-desk and service applications because people calling a service number or going to a service web address have already used their own creativity – without success.
The next critical point is to show that building such an application will pay off. There are situations where a classical returnon investment calculation is sufficient to show this result – but there are also situations where it is necessary to assign a monetary value to the cases collected with respect to their re-use during the lifetime of the case.
The talk ended with a few stories about keys of success for industrial KM projects. Among these topics were:

- the importance of champions
- the need to establish a business process for the quality assurance and maintenance of the knowledge and
- the importance of marketing efforts both for the widespread use and for showing the benefits of the system.

Knowledge Management
—
Problems, Promises, Realities, and Challenges

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Abstract

Traditional knowledge management (KM) approaches aim to archive information from the past so lessons will not be forgotten. This view implies that the information needs of the future will be the same as they were in the past. The basic assumption underlying our approach is that knowledge is not a commodity to be consumed but is collaboratively designed and constructed. This focus emphasizes innovation, continuous learning, and collaboration as important processes.

Our perspective on KM is human-centered — focusing not on knowledge as information stored in repositories, but rather on a continual process in which knowledge is created as a by-product of work, integrated in an open and evolving repository, and then disseminated to others in the organization when it is relevant to their work. Our work supports creative design in domains characterized by large-scale design projects of long duration involving many stakeholders, and represents one of the most challenging and interesting applications for KM.

The fundamental assumptions of our approach are:

- sustained knowledge creation is the primary goal of KM (that all other KM goals must serve);
- KM should be viewed as a part of everyday work and performed primarily by those who create knowledge as a part of their work;
- information repositories are living (open and evolving) entities; and
- KM support should be viewed as a fundamental capability of work tools, rather than an add-on or separate component.

In this paper we review the problems and promises of KM from this perspective, and illustrate the conceptual frameworks and prototype systems created in our research in support of a new integration of knowledge creation, integration and dissemination.

Keywords

knowledge creation, integration and dissemination; externalizations; communities of practice; communities of practice; information overload; attention; creative design; social creativity; information access and delivery; motivation; seeding, evolutionary growth, and reseeding; closed versus open systems; Envisionment and Discovery Collaboratory; DynaSites, collaboratively constructed, living information repositories; courses-as-seeds

Better Knowledge Management Through Knowledge Engineering

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Abstract
In recent years the term knowledge management has been used to describe the efforts of organisations to capture, store, and deploy knowledge. Most current knowledge management activities rely on database and web technology; currently, few organisations have a systematic process for capturing knowledge. The paper presents a case study in which knowledge engineering practices are being used to support knowledge management by a drilling optimisation group within a large service company. The three facets of the knowledge management task are illustrated: (1) Knowledge capture is performed by a systematic knowledge acquisition process in which a conceptual model of aspects of the company's business domain is used to guide the capture of experiential cases. (2) Knowledge storage is performed using a knowledge representation language to codify the structured knowledge in a number of knowledge bases, which together comprise a knowledge repository. (3) Knowledge deployment is performed by running the knowledge bases within a knowledge server, accessible by standard web browsers on the company intranet, and capable of answering far more complex queries than is possible using conventional database systems.

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The Knowledge Management System of sd&m adresses the needs of a software-company, that grows fast and that has to keep up with the development in the IT-area. In the IT-business knowledge is a scarce resource, that has to be distributed to the projects in a proper way. The Knowledge Management System of sd&m is not only a technical solution. The important elements within this system are people, subjects, organisation, processes and technical infrastructure. sd&m has established a department named technology management, were experienced software engineers work as so called knowledge broker. Knowledge broker work fulltime on a specified subject (e.g. databases, internet-technology, ...) for a limited period of time (1 to 2 years) as workers within the knowledge management department giving support to the projects of sd&m. One of the most important tools, that supports the knowledge work, is a well structured intranet with elements like a skill-repository and a customized search-engine.

Experience Factory - Combining Experimental Software Engineering Methods and Artificial Intelligence Techniques for Knowledge Management

Klaus-Dieter Althoff, Fraunhofer IESE

It is argued that basic methods and approaches from experimental software engineering (ESE) for continuous learning from experience like experience factory (EF) and goal-oriented measurement and evaluation are valuable not only for the management of software knowledge but also for other application domains. The integration of ESE methods with innovative artificial intelligence techniques like case-based reasoning and ontologies is presented. Based on this integration, the DISER methodology for building and running EF based experience management systems and their related processes is introduced. The IESE EF is presented as an example, which focuses on the learning from project experiences. First experimental results show that based on the DISER approach project workers using the EF information system work more efficient (retrieve more useful experiences in a given time period) and more effective (retrieve additional useful experience) if compared to the "just ask your colleague" approach. More detailed information can be found at http://www.iese.fhg.de/home/althoff/documents/.

Innovative Software Support for Knowledge Management

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In this talk, we present the main topics dealt with in
the near future's work in the DFKI Knowledge Management Group.
We start with an inventory of currently discussed organisational
Knowledge Management (KM) scenarios, and try to identify useful
contributions from software approaches which take serious the end
users' understanding of KM (which is business and not technology
driven), and nevertheless go beyond conventional software solutions.
To this end, we discuss the KnowMore reference architecture for
Organizational Memories and try to identify requirements and derived
research topics at the task, the knowledge description, and the
knowledge source level. In particular, we sketch our research approach
in the areas of (i) weakly-structured workflows for supporting
knowledge-intensive business processes; (ii) the use of
ontology-based document meta information for advanced knowledge
retrieval and access, as well as the design of tools which support
the ontology design processes and text-based ontology learning: and
(iii) the use of text classification and information extraction tools
in order to widen the document annotation bottleneck.

Facilitation of Business Process Redesign by constructing a Shared Conceptual Model: POWER

Tom M. van Engers, Ir. Erwin Glassée

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Abstract

The Dutch Tax and Customs Administration (DTCA in Dutch: Belastingdienst) conducts a research program POWER in which methods are developed that support a systematic translation of (new) legislation into the DTCA's processes. This program combines two frequently separated approaches in the knowledge management field; the stock or codification approach and the flow or organizational approach. The POWER program shows some preliminary results indicating that the methods although still under construction already have added value. The methods developed help to improve the quality of (new) legislation and codify the knowledge used in the translation processes in which legislation and regulations are transformed into procedures, computer programs and other designs. The transformation processes developed thus far facilitate the experts (in many cases working in knowledge groups) involved in these processes by providing them a focus point. Working together in the POWER-processes in which the POWER-methods are applied, these experts develop a common mental model (and concordant vocabulary). Working that way their knowledge and assumptions are made explicit and a corporate knowledge corpus is created. This knowledge corpus is designed in such way that its content becomes traceable (needed when old knowledge proves to be inadequate) and can be certified to applicable (needed to guarantee adequate, up to date knowledge and consequent equality before the law). The methods used and the ways these methods are supported and applied help knowledge workers involved in the implementation of new legislation also to develop a shared mental model of the implementation process itself.

KNOWLEDGE ENGINEERING IN ORGANIZATIONAL NETWORKS

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We present a knowledge engineering approach for the elicitation of know-how about engineering processes, the reuse of process patterns and its application to the coordination of engineering teams in organizational networks. Process know-how is instrumental to govern engineering tasks in a network of engineering teams as well as to accommodate changes to actual processes with regard to project-specific requirements. Process know-how also leads to an improved awareness in the process, that is, pro-active services deliver related information at the right time to the right person. Our approach is founded in an agent-based intelligent process management kit (AGIP). AGIP has been designed for information-intensive processes in the automotive sector. A process repository manages basic building blocks and structures of processes. Valuable design knowledge is collected for re-use in future projects by populating and maintaining the repository. AGIP is complemented by operators for adapting processes as well as orchestrating processes >from smaller pieces. Once integrating joint activity planning and continuous re-scheduling in the daily work practice, team members learn to better co-ordinate their individual contributions to the product.