A SERVICE BASED APPROACH FOR KNOWLEDGE MANAGEMENT

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Abstract

This paper introduces a new view point in knowledge management by introducing KM-Services as a basic concept for Knowledge Management. This text discusses the vision of service oriented knowledge management (KM) as a realisation approach of process oriented knowledge management.

In the following process oriented knowledge management as it was defined in the EU-project PROMOTE (IST-1999-11658) is presented and the KM-Service approach to realise process oriented knowledge management is explained.

The last part is concerned with an implementation concept that uses Web-technology to realize a service framework

Keywords: Process Oriented Knowledge Management, Knowledge Management Services.

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In the following process oriented knowledge management as it was defined in the EU-project PROMOTE (IST-1999-11658) is presented and the KM-Service approach to realise process oriented knowledge management is explained.
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Suggested track: A Managing organizational knowledge and competence.

1 Introduction

Knowledge Management evolved to a serious management discipline that aims to integrate in the orchestra of existing management approaches. Current knowledge management approaches merge only partly with existing management disciplines like strategic management (in the context of business intelligence), process management (in the context of process oriented knowledge management) or human resource management (in the context of skill and competence management). In contrast to rather weak integration on the management level the technological integration of knowledge - and information management is well advanced.

This can be explained by the historical development of this rather young (starting point around 1995) research discipline, as the root of knowledge management is seen in the artificial intelligence. Therefore the strong technical focus is still manifested in knowledge management.

Current status of knowledge management is therefore a tight coupling on the technical layer but a rather loose and weak integration at the management layer. The challenge of today's research is to integrate knowledge management not only at the technical but also on the management layer.

An integration on the management layer requires a homogenous concept, therefore a third layer – the conceptual layer – is defined that resides between the management and the technical layer. This conceptual layer has the task to connect the management view on knowledge management with technological possibilities. Process oriented

knowledge management belongs to the conceptual layer with the aim to integrate management issues and technological specifications.

The aim of this text is to introduce a new view point on knowledge management – Knowledge Management Service – that is seen as an implementation approach for process oriented knowledge management.

2 Process Oriented Knowledge Management

Process Oriented KM (POKM) is an entry point into KM independent on the used technology under the umbrella of organisational management. Process oriented knowledge management is therefore required as (Karagiannis, 2001):

- Knowledge has to be embedded in business processes,
- Knowledge processes are able to be modelled and
- A knowledge management system is a “Meta-tool”.

PROMOTE® is a homogeneous process oriented approach for knowledge management that is based on following three axioms (Telesko, 2001):

> **First**: Knowledge can be modelled. If it can not be modelled, there is the wrong modelling language in use.
>
> **Second**: A formal modelling language defines the super set of all operations. A concrete modelling language is an instance of the formal model.
>
> **Third**: Knowledge management models require a meta-model enabling the applicability of modelling languages.

PROMOTE® therefore support three steps of process oriented KM.

Processes as knowledge: The first step is to define processes as knowledge. PROMOTE® enables to model and analyse organisational sequences and points out knowledge intensive tasks.

Processes as an entry point: The second step is to define processes as the starting point to collect requirements for knowledge management.

Processes as management approach: The third step is to define management processes for knowledge.

PROMOTE® enables the combination of knowledge management with other management disciplines. Service based KM is introduced as an implementation approach for process oriented knowledge management.

3 The Services Based Approach

3.1 Vision of a Service Based World

The service based KM approach is guided by a vision of a service based world. This vision is based on the assumption that the virtual world becomes more and more important over the next years. The author assumes that the trend towards virtual services via the Internet will continuously grow.

A possible scenario for organisations is that software is not installed at the organisations site but on vendor servers accessible via the Internet. Administration would be out-sourced, as vendor have to assist and maintain their software.

A possible scenario for users is that the user is able to select interesting and useful services from the Internet. Starting to work with a new topic could require virtual course services, discussion forums or online tutorials.

A possible scenario for vendors is to combine virtual services with real services. Accompanying social events could strengthen virtual communities, special interest groups or online courses.

As a conclusion on the vision of a service based world is that it is possible to define the construct KM-Service, independent on the underlying technology that finally implements the service. The KM-Service framework therefore separates the conceptual view on knowledge management from the technological view on knowledge management.

This is especially important, as today's KM solutions suffer from:

- chaotic market situation, especially for decision makers it is very difficult to select the appropriate tool;
- several different KM-tools are required and have to work cooperatively;
- holistic KM needs both social and technical services, till date there is no concept that treats these services similar and
- global operating companies need KM solutions that are location independent.

3.2 Relevant literature on KM-services

As pointed out in (Kühn, Bayer, Junginger, Karagiannis, 2003) Enterprise Application Integration provides technical solution to integrate workflows, heterogeneous applications or enterprise applications (ebXML, 2003), (RosettaNet, 2003), (Vernadat, 1996), (OMG, 2003), (W3C, 2003), (Workflow Management Coalition, 2003).

It is reasonable that KM-platforms follow the trend of service oriented programming (SOP) as realised in the KM-platform of CSC (AlBanna, 1998) mentioned in (Schwendenwein, 1999) and discussed within the concept of nine keys in (Sivan, 2003) introducing Knowledge Services.

These platforms define services on a technological level, as pointed out in (Kühn, Bayer, Junginger, Karagiannis, 2003) and (Karagiannis, 2002) it is not sufficient to only emphasis the technological integration but it is also necessary to enhance the conceptual integration.

This conceptual integration in the context of KM is rarely discussed. (Valente and Housel, 2001) mentions a two dimensional framework for KM services defining services as "tasks or activities in handling knowledge that can be at least partially automated". A business-driven classification is introduced by (Roehl, 2000) that introduced KM-dimensions like work-oriented, person-oriented, communication-oriented etc. that has been used to classify tools in (Keller Ginsky, 2000).

A possible application scenario is introduces by (Frauenhofer, 2003) that provide a questionnaire according KM-dimensions, analyses the answers and suggests a set of KM-tools.

The KM-Service framework defines a context independent semantic service framework that is filled with the context for KM, provides interfaces to technological integration and points out application scenario. Parts of this approach have been published in (Woitsch and Karagiannis, 2002), (Woitsch and Karagiannis, 2003), (Woitsch and Karagiannis a, 2003).

The KM-Services separate technical implementation and conceptual requirements. The conceptual design is then developed using KM-Services and the technical implementation is realised by mapping technical solutions to KM-Services.

3.3 Web-Service: A technological approach

There are various different definitions of Web-Services that are either

business-oriented like:

> *"Web-services are loosely coupled reusable software components that semantically encapsulate discrete functionality and are distributed and programmatically accessible over standard Internet protocols" (Brend, 2001).*

process-oriented as:

> *"Web-Services are Workflows in the Internet" (Karagiannis, 2003)*

technical oriented as:

> *"Web-Services are loosely coupled reusable software components that semantically encapsulate discrete functionality and are distributed and programmatically accessible over standard internet protocols " (W3C, Web Services 2003)*

The above mentioned Web-Service only have a syntactical definition but not a semantic definition.

3.4 Web-Service: A technological approach

When using Web-Services for an E-Business portal there are three major drawbacks by global UDDIs:

- Maintenance is expensive, when running global UDDDIs professionally.
- The categorisation of services needs to be far more detailed including branches, topics and type of applications – current UDDIs are insufficiently classified.
- The offered services have to be consistent.

An expectation of the author is, that global UDDIs are becoming organisational UDDIs. A companies own classification can be used for the UDDI and vendors have to sign a contracts when uploading a service into the organisational UDDI.

For end user access of the service repository a User Interface management for the different services has to be provided by the portal.

The aim is to enable a semantic enriched UDDI like presented by IBM in (Lee, 2003) called SNODDI.

3.5 Knowledge Management Service: An implementation approach

A KM-Service is an intuitively grouped bundle of functions that manually, semi-automatically or automatically support KM activities.

This means that semantic services are defined by defining a KM – framework. The semantic services are implemented by using the KM-framework to generate KM-Services. The KM-framework, the KM-dimension, algorithms and methods are introduced in the following sections.

4 KM-Service Framework

The KM-Service Framework define the context of semantic services. In this section the knowledge management context is defined using KM-dimensions to enable the usage of algorithms and methods. This section depicts the basic idea of a service framework, defines the KM-context using KM-dimensions. The service portfolio management is introduced by discussing an algorithm for requirement analysis.

4.1 The KM-Dimensions

The semantic framework to classify KM-Services is defined by KM-Dimensions (Woitsch and Karagiannis, 2003),(Woitsch and Karagiannis a, 2003): Representation of Knowledge, Medium of Knowledge, Knowledge User, Time of Knowledge, Origin of Knowledge, Sophistication, Life Cycle of knowledge, Relevance of knowledge, Applicability of knowledge, Level of knowledge, Dynamic of knowledge, Expression of knowledge, Service boundaries, Knowledge abstraction, Knowledge action, Knowledge structure.

These KM-Dimensions depict a KM-Vector that describes the requirement of users in the business layer and the behaviour of a KM-Service in the technological layer. A bundle of KM-Services defines therefore the functional requirements for an E-KMS in the business layer and the implementation features on the technical layer.

The difference between the desired requirement vector of the business layer and the actual implement vector represent the E-KMS-Gap.

4.2 Service Framework: A basis for calculations

This section introduces how to analyse, simulate or verify a KM-system using the KM-framework introducing a simple algorithm.

The requirement vector r can be used as an input for algorithms to find the most appropriate KM-Service bundle. The following algorithm depicts a simple method to build a collection of service vectors that add up to the requirement vector and therefore simulates or verify an E-KMS.

Therefore the transformed requirement vector r’ is introduced as r’=r’-sx, for x=1..n

In the above example the procedure is the following:

1:r’ = r

2: repeat (r’ = r’-sn)

3: No dimensions left or all dimensions sufficiently covered.

To optimise the results of the Service selection more sophisticated algorithms are used instead of the simple backwards chaining algorithm. Detailed calculations consider the input and output vector of a service, as well as the intensity of the dimensions. A KM-Service changes the intensity of KM-Dimensions.

Beside the algorithm, a cost function for each vector has to be defined to map each dimension into a decimal representation. These mapping functions are either equally spread (like at the “origin of knowledge”), or have to consider a conceptual difference (like the “users of knowledge”), where a distortion spread has to be used. The selection of cost function allows a fine tuning of the service selection.

4.3 KM – Meta - Service Framework

The meta service framework is semantically independent, this means that dimensions can be adapted or exchanged without changing the meta service framework. This Meta-Service Framework enables therefore the definition of individual KM-frameworks combining both the standard algorithms for analysing, simulating or verifying a KM-system and the individuality of adapting the framework to special needs.

The above mentioned method is completely independent from the type and domain of KM - Dimensions. The Meta KM-Framework defines an E-KMS entirely consisting of KM-Services. The relation “composition” is used to point out the strict Service Based View. The KM-Service is depicted by a service vector, whereas the service vector consists of KM-Dimensions. Each KM-Dimension is defined by a domain.

The concrete value of the vector is represented by the object value. The value allows to store semantic description and the mapping into a computable number.

Technical requirements are depicted in an own object to allow the wrapping of technological information (e.g. tmodel of Web-Services).

5 Architecture of a Service Based Process Oriented E-KMS

This section gives an overview on a possible realization of an IT-based E-KMS. The KM-Service Framework is seen as the concept, that has to be implemented using standard Web-technology.

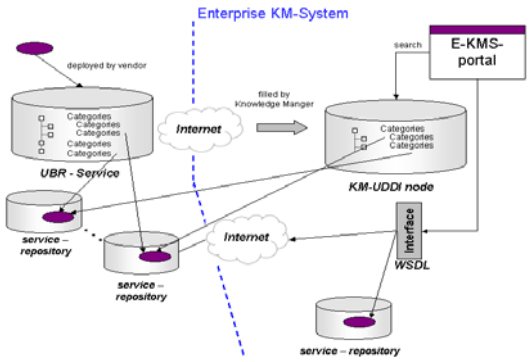

Figure 1 Basic Architecture of a Service Based PO E-KMS

Figure 1 depicts an overview on a Service Based E-KMS architecture. The blue line indicates the border between the Internet and the inner organisational system. The Web-Services are deployed by vendors and categorised using UDDI Services. In the following the KM-Dimensions are used to classify services with KM functionality.

This architecture is very dynamic by using internal and external Web-Service repositories. The PROMOTE® platform is coordinated by process models and manages the KM-Services.

This architecture enables the integration of management approaches like process management, business intelligence or strategic management with technical solutions such as the provision of Web-Services.

6 Summary

This paper introduces a new view point on knowledge management – the service based approach – to enable the integration of KM into existing management approaches.

The process oriented knowledge management of PROMOTE® has been used as a concept to define knowledge management requirements on the basis of business needs. The KM-Services approach has been introduced to implement the a KM-system on basis of the processes oriented knowledge management.

The KM-Service framework has been introduced to enable analysis, simulation and evaluation of KM-requirements and KM-solutions.

A Meta-Service framework has been defined to make the KM-service framework adaptable.

Interesting questions for the future are the identification and implementation of different knowledge management strategies as different KM-Service selection heuristics.

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