Designing Business Process Oriented Knowledge Infrastructures

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Abstract

This contribution aims to provide a starting point for discussions on how to build knowledge infrastructures that contribute to organizational value chains. Knowledge is recognized as the most important ressource in todays knowledge intensive organizations and knowledge infrastructures provide a fundament for effective management of relevant knowledge within organizations. After motivating the problem domain, the author demonstrates the relevance of knowledge processes concerning the design of business process oriented knowledge infrastructures by identifying common properties of them and by giving illustrative examples. Finally, the author raises research questions that aim to drive future work in that domain.

1 Introduction

Business processes are a widely accepted and implemented way of organizing companies [iso01]. Also, business process management already represents a big step towards the management of organizational knowledge by managing the knowledge about directly or indirectly value-generating processes. With the emergence of knowledge management, new and challenging questions arose: How does the effective management of knowledge contribute to an organizations value generating processes? How can knowledge management activities be integrated in current management approaches?

This contribution aims to provide motivation and a starting point for discussions concerning the effects that business processes (should?) pose on organizational knowledge infrastructures. The author aims to raise questions concerning the design of appropriate knowledge infrastructures and provides ideas to tackle the identified challenges.

2 Motivation

According to [Wol03], when BMW[1] planned for a new automobile development center in munich, the formulated requirements for the building hosting that center were somewhat different to regular architecting projects. *"Take care that the product development timeframe of our products declines from ten to four years"*. The approach that Gunter Henn, industrial architect and responsible

for designing the building, took to meet BMW's goals provides an interesting ground for discussing business process implications for organizations. In order to design BMW's new development center, he analyzed its targeted product development processes and elicited impacts on the building's architecture. Thereby, business processes (and according work processes) became the basis for the design of a building that supports an organization's business goals.

Interpreting that example, business processes obviously pose implications for the architecture of industrial buildings. In certain cases, the implementation of these implications even seem to be mandatory for organizations in order to effectively reach its business goals. The question that can be deduced from the analogy above, is the following: *"Should business processes also pose implications for the design of organizational knowledge infrastructures?"*

In order to deal with that question, first there is a need for a clarification of terms: An organizational *knowledge infrastructure* describes the set of all organizational activities, rules, guidelines, agreements and systems that enable the effective management of knowledge within organizations. Knowledge infrastructures thereby represent an environment for all conscious and unconscious organizational knowledge work. An appropriate knowledge infrastructure supports employees in performing their daily work and aids organizations in preserving knowledge that is relevent to them. Knowledge, in this contribution, is being defined as *information that is relevant for actions*.

Coming back to the question at hand: While a building's architecture (in an industrial context) deals with optimizing the management of physical entities (e.g. physical resources or employees), a knowledge infrastructure deals with optimizing the management of knowledge.

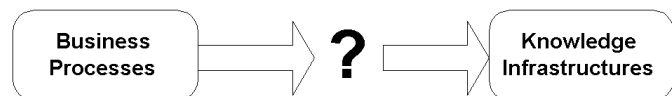Designing Business Process Oriented
Knowledge Infrastructures

Figure 1: Business Processes as the Basis for Designing Organizational Knowledge Infrastructures

Because knowledge is considered to be the most important resource of knowledge-intensive business processes, it becomes obvious that such business processes should

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[1]BMW...Bayrische Motoren Werke

have a strong effect on the architecture of organizational knowledge infrastructures. *But how can business processes support the process of designing knowledge infrastructures?*

Since knowledge intensive business processes [ESR99] often are weakly structured, they are not capable of being a direct basis for the design of knowledge infrastructures. Also, [RL00] argues that a successful improvement of knowledge intensive business processes stronger relates to knowledge flows than to workflows. A commonly used approach to overcome these challenges is to identify and model organizational knowledge processes *based on business processes* ([Str03], [Rem02, chapter 11.3], [GPSW03]) that visualize knowledge flows in an appropriate way. By utilizing knowledge processes, the question raised in the previous section can now be reduced to

"How can knowledge processes support the process of designing knowledge infrastructures?".
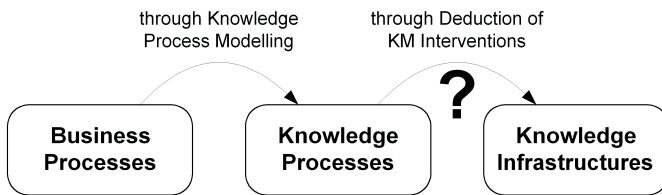

Figure 2: A Method for Designing Business Process Oriented Knowledge Infrastructures

Knowledge processes are considered to run within and/or orthogonally to business processes [DHMS00], and in that sense, are not fully captured by traditional business process modelling techniques. By explicitly focussing on the flow of knowledge within or across an organization's business processes, knowledge processes promise to be a sound basis for the design of business process supportive knowledge infrastructures.

While there are concepts for the business process oriented modelling of knowledge processes currently available, no structured, systematic approaches concerning the deduction of knowledge management interventions based on them exist. In order to provide a basis for the development of such new approaches, this contribution gives a brief overview over currently available knowledge process modelling approaches (section 3). Section 4 aims to identify common properties of knowledge processes in order to lay a basis for future models that tackle the identified challenges. Section 5 provides coarse starting points for answering the question on how knowledge processes can be utilized for designing business process oriented knowledge infrastructures.

3 Identification of Organizational Knowledge Processes based on Business Processes

Various approaches for identifying and modelling knowledge processes in relation to business processes exist in current literature. This section now briefly introduces some key concepts concerning the domain.

3.1 K-Modeler

In this approach, [GPSW03] aim to identify flaws and weaknesses within organizational knowledge processes. To achieve that, the approach extends current business process modeling techniques with elements focussing on describing knowledge work of organizations. Thereby, [GPSW03] instrumentalize Nonaka's [NT97] four specific knowledge activities (internalization, socialization, externalization, combination) to model current and targeted degrees of organizational management concerning knowledge processes. Knowledge flows are described by modeling the relationship between supplied and enquired "knowledge objects". The University of Oldenburg is currently developing the description language K-Modeler and an according software tool that aids in the integrated modeling of both, business and knowledge processes.

3.2 Concepts of Remus

[Rem02, chapter 11.3] aims to model knowledge processes as a basis for analysing, assessing and improving them. To achieve that, he uses various specific knowledge activities (e.g. knowledge generation, assessment, storage, transfer and others) to provide a knowledge view on business processes. By modeling knowledge processes, [Rem02] also talks about "value chains of knowledge", describing that value can not only be generated in business processes, but in knowledge processes as well. Here, the borders between business and knowledge processes blur. In this approach, knowledge flows are represented by knowledge generation and application relationships between business processes.

3.3 Concepts of the Author

[Str03] aims to identify knowledge processes in order to support them via focussed knowledge management interventions within organizations. This approach is not integrated into or based on a specific business process modeling technique, but can be applied to all workflow-oriented process modeling techniques. [Str03] uses a set of specific knowledge activities (knowledge generation, transfer, storage and application - based on [Hei01]) to describe knowledge work within and between organizational business processes. [Str03] also stresses the importance of identifying relationships between business processes by identifying knowledge processes that span across multiple business processes.

3.4 An Example of a Knowledge Process

Figure 3: An exemplarily Knowledge Processes

Figure 3 depicts a knowledge process, that describes how the knowledge domain "Knowledge about Customers" is handled in a fictitious organization. In this example, knowledge about customers is being generated via two main business processes: During the *aquisition process*, *sales* staff

generates knowledge about customers as well as *support* staff does, during execution of its *support* business process. The storage of the knowledge domain in question is not specified in any business process. The transfer of this knowledge domain is achieved through *informal meetings* between *sales* and *marketing* personnel. The application of knowledge about customers is relevant for the organisational roles *development* and *marketing*, although their according business processes do not support them in retrieving the appropriate knowledge.

Such knowledge process models, as exemplarily depicted in figure 3, aid in gaining a deeper understanding of relevant knowledge work within organizations. By providing an orthogonal (knowledge) view on organizations, knowledge processes promise to provide a profound basis for the deduction of a set of appropriate knowledge management interventions. The following section now aims to identify common properties of current knowledge process approaches in order to facilitate the development of strategies that focus on the design of knowledge infrastructures based on knowledge processes.

4 Common Properties of Organizational Knowledge Processes

Although visualisations and definitions of approaches to knowledge processes vary, common properties exist. Business process oriented knowledge processes in general consist of the following main properties in order to describe knowledge work of organizations:

- **Knowledge Flows:**[2] Knowledge flows depict business process relevant relationships between knowledge suppliers and enquirers. By identifying such relationships, communication channels that are essential in organizational value chains become visible.

- **Specific Knowledge Activities:** Specific knowledge activities (like the generation, externalisation, storage, etc of knowledge) further describe the handling of knowledge within and/or across business processes. The distinction between specific knowledge activities plays a vital role in designing supportive knowledge management interventions (e.g. in [PRR98] and [Rol03]).

- **Involved Persons or Roles:** By illustrating involved persons or organizational roles, "knowledge workers" of knowledge-intensive business processes become visible. This provides a profound starting point for designing people- or role-centric knowledge management interventions that support an organization's business processes. Often, information about involved persons or roles is gathered from existing business process models.

- **Associated Business Processes:** All of the above mentioned properties implicitly referred to associated business processes. The relationship between knowledge and business processes obviously is fundamental to the concept of business process oriented knowledge processes and therefore, needs to be represented in knowledge process models.

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[2]Knowledge is regarded to be context sensitive and is continously reconstructed by subjects and thus, can not flow. The term "knowledge flow" here only describes focussed relationships between knowledge suppliers and knowledge enquirers to illustrate relevant knowledge links within organizations.

Figure 4 illustrates a knowledge process (based on [Str03]) that suits the classification above. The model depicts how the four main properties of knowledge processes are represented in that exemplarily knowledge process.
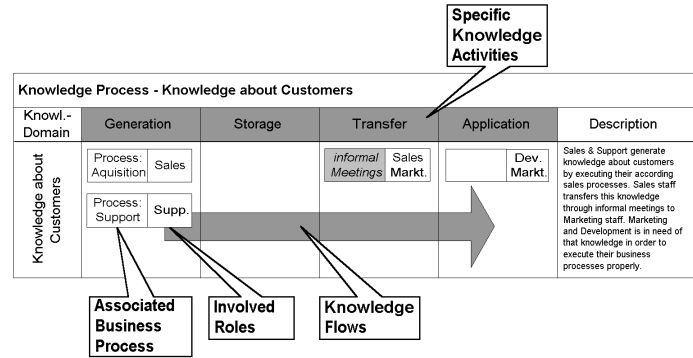

Figure 4: Common Properties of Knowledge Processes

While knowledge flows often are visualized by oversimplified flows of information, knowledge process visualizations take the complex nature of knowledge flows into account and thus, aids in gaining a deeper understanding of organizational knowledge work. The classifcation of main properties of knowledge processes provide a sound basis for discussing how knowledge processes can contribute to the design of knowledge infrastructures.

5 Examples for Designing KM Interventions based on Properties of Knowledge Processes

By identifying knowledge processes based on business processes, *relevant* knowledge activities within organizations are identified. This section aims to exemplarily illustrate ways of utilizing the main properties of knowledge processes for the design of business process supportive knowledge infrastructures. Knowledge management interventions thereby act as the building blocks of such knowledge infrastructures. Although these examples are not based on or deduced from any systematic approach, they illustrate the benefit of and motivate the need for developing such approaches.

5.1 Knowledge Flows

Knowledge flows represent a match between knowledge suppliers and knowledge enquirers. By visualizing such relationships an analyst can identify *relevant* communication channels within organizations. When designing organizational knowledge infrastructures, communication channels that provide knowledge links within or across business processes are of highest relevance, since knowledge infrastructures aim to support the transfer of such knowledge.

Furthermore, identified supply-demand relationships aid in designing knowledge infrastructures in multiple other ways. By analyzing knowledge demands of organizational roles, specific knowledge interventions (like personalized knowledge portals) can be designed in order to support roles in executing their according business processes. By analyzing knowledge suppliers, knowledge interventions like yellow pages can be designed more easily based on relevant knowledge that is required in and/or supplied by business processes.

5.2 Specific Knowledge Activities

By describing knowledge processes based on various specific knowledge activities (like internalisation, transfer, application, etc), understanding of knowledge work in organizations is enhanced. Current literature (e.g. [Rol03]) maps specific knowledge activities to available knowledge management technologies and thereby provides a profound instrument for the application of appropriate technological systems and/or functionalities in organizations. Such instruments can well be used to provide focussed support for business processes that comprise knowledge intensive tasks.

5.3 Involved Persons or Roles

Organizational roles that take part in the same knowledge process can be considered to be members of one knowledge community. Here, knowledge communities are communities that deal with knowledge domains which are processed within or across various business processes. Therefore, knowledge communities consist of employees that work in different (business) contexts, but deal with similar knowledge domains. Such identified knowledge communities represent *relevant* organizational communities since the knowledge they deal with is critical for executing an organization's business processes.

Knowledge processes make explicit where and by whom the knowledge of a certain knowledge domain is being e.g. generated, stored, transferred and applied. Thereby, knowledge processes aid in identifying (1) relationships between knowledge communities and business processes, (2) knowledge community types as well as knowledge community roles and (3) room for improving organizational support concerning these knowledge communities.
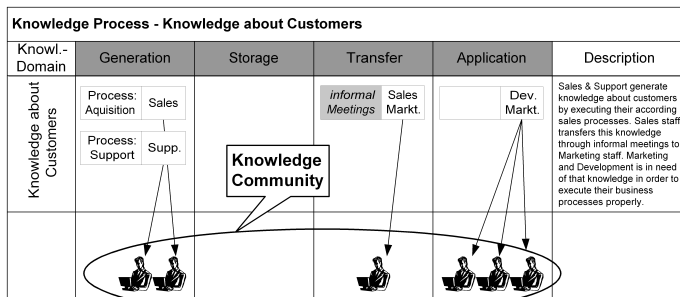

Figure 5: An Example of a Knowledge Community identified based on Knowledge Processes

Figure 5 illustrates how knowledge processes aid in identifying knowledge communities that typically are dislocated across a set of various business processes.

5.4 Associated Business Processes

Business process oriented knowledge processes provide a basis for assessing the relevance of identified knowledge flows. Knowledge management activities that are implemented as a result of knowledge process investigations visibly contribute to organizational value chains. Additionally, the benefits of implementing such knowledge management interventions can be measuered by indicators which may already be implemented in existing business processes.

By analyzing knowledge flows that span across multiple business processes, dependencies and interactions between business processes can be identified to a certain extent also. Considering these relationships, the effects of modifying a set of business processes can be estimated to a higher degree. Such knowledge flows that are not documented in traditional business process modeling techniques, may be the reason why a lot of BPR[3] projects have failed in the past since they only redesigned business processes and did not take according knowledge processes into account.

In order to implement knowledge management interventions, often business process modifications are necessary. Since knowledge processes are linked to associated business processes, such necessary modifications can be located more easily.

Summing Up: The main properties of knowledge processes act as a profound fundament for the deduction of knowledge management interventions. Examples were utilized to demonstrate the usefullness of knowledge processes in designing business process oriented knowledge infrastructures. Although currently no systematic approaches for the deduction of business process oriented knowledge infrastructures exist, the need for such concepts was illustrated.

6 Discussion

This contribution aimed to lay the basis for discussions on how business processes can contribute to designing business process supportive organizational knowledge infrastructures. The concept of knowledge processes got introduced and described briefly. The main properties of knowledge processes have shown to be a valuable ressource for defining knowledge infrastructures that support an organization's value generating processes. Examples illustrated, how common properties of knowledge processes can be instrumentalized to aid in designing business process supportive knowledge infrastructures.

Still, many questions remain unanswered: To which degree can knowledge management interventions causally be deduced from business processes? To what extent should knowledge management influence organizational business processes? What's the exact role of business processes as a factor of designing knowledge infrastructures beneath other factors like an organization's culture, goals, people and environments? What other qualities of knowledge infrastructures beneath value chain orientation play vital roles? What kind of indicators exist for targeted enhancements of existing knowledge infrastructures?

This contribution aimed to motivate discussions and future research concerning the above mentioned challenges by describing a promising way of utilizing business processes as the basis for designing knowledge infrastructures.

7 Conclusions

Since knowledge management increasingly has to strive for a justification of its expenses, in the future knowledge management projects will closely be aligned to organizational business processes and therefore, the topic at hand is of high relevance for designers of future knowledge infrastructures. By identifying knowledge processes within

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[3]Business Process Reengineering

or across value generating processes, business benefits of undertaken knowledge management efforts become more visible. Identified common properties of current knowledge process modeling approaches aim to provide a basis for the development of future concepts that target the design of business process oriented knowledge infrastructures. Examples introduced in this contribution demonstrate advantages of such approaches. This contribution argued for the need for dedicated, comprehensive frameworks and methodologies that guide practitioners in designing appropriate knowledge infrastructures in order to comprehensively support organizations in executing their knowledge intensive business processes.

Acknowledgments

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