MANAGING ORGANISATIONAL KNOWLEDGE ASSETS AT PUBLIC EDUCATION AND RESEARCH INSTITUTIONS: A PROCESS-ORIENTED APPROACH

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Abstract

This paper argues the case for a pragmatic process-oriented approach for the implementation of IT-supported knowledge management systems in public education and research institutions (PERI). The introduced procedure model helps to identify weak points in internal processes and the corresponding need for action. This analysis can be used as the basis for specifying a reasonable mix of organisational arrangements and the appropriate technical functionalities of the planned IT-supported knowledge management systems. The combination of organisational methods and software functions can resolve the identified knowledge problems in the PERI. The described procedure model integrates both long-term methodological experience in the fields of reference modelling, process modelling, and building of conceptual frameworks and practical experience in the domain of public education and research institutions.

Keywords: Reference procedure model, process-oriented knowledge management, knowledge management framework, knowledge asset, process analysis.

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1 Introduction

It is now several years since knowledge management (KM) ceased to be a buzzword. Private companies, in particular, have recognised the importance of concepts for managing organisational knowledge assets (Alavi & Leidner, 2001: 107-136) and many projects have been conducted under this label (Huber, 2001: 72-79). In contrast, there is an evident lack of IT-supported KM in public education and research institutions (departments at German universities). Furthermore, these are organisations whose primary mission is to transfer knowledge to the broad public and various partners. Besides this external aspect, however, knowledge is de facto the lynchpin of all activities of PERIs. Moreover, internally it is the only product that these institutions "manufacture". Accordingly, the primary activity of the PERI is the transformation of internal and external data and information into knowledge - contextual information and personal experience (explicit and implicit knowledge in terms of Nonaka and Takeuchi (Nonaka & Takeuchi, 1995)) and vice versa. It soon became apparent that concepts and instruments of knowledge management can be of substantial importance to the handling of the PERIs' main resource - explicit and implicit knowledge assets (Holsapple & Joshi, 1999).

The aim of the paper is thus to systemise and formalise the process of implementation of IT-supported knowledge management systems in public education and research institutions. With the support of the developed reference procedure, PERIs can deal with the identified knowledge problems by specifying an acceptable mix of organisational methods and appropriate IT support. Using this reference procedure can save PERIs time and development cost for the conceptual design of KM systems. Instead of describing every single step of the procedure model, the authors concentrate on the critical phase of assigning KM instruments to the processes.

In section 2, the authors start with a brief description of the underlying research methodology, such as the process-oriented view of organisations, the building of conceptual frameworks for a better overview of the processes, and reference modelling as a method for the storage and transfer of know-how. These approaches offer a methodological basis for further considerations. Section 3 introduces a conceptual framework for knowledge management (CF-KM). On the one hand, CF-KM emphasises the authors' views on knowledge management as a whole. On the other, it systemises general options for the support of knowledge management in PERIs. Following this view on knowledge management, the introduced procedural model sets out in section 4 how to systemise and formalise the process of implementation of IT-supported KM systems in PERIs. Due to the homogeneity of PERIs, the model can be used as a reference for process-oriented implementation of such KM systems. A further two frameworks, the conceptual framework for a process-oriented view of PERIs (CF-P) and the conceptual framework for the identification of need for action (CF-NA) are additionally presented. A reasonable mix of organisational methods and appropriate IT-support then has to be specified with the help of all three frameworks as the main elements of the procedure model. The authors outline the main problem of assigning KM instruments to the processes, but do not discuss the subsequent phases of system design / implementation and use. These are more technical in nature and consist of "classical" procedures for the implementation of IT systems.

2 Research methodology and related work

2.1 Process-oriented view of organisations

In recent decades, companies focused an efficient execution of individual functions and this has led to local optimisation and perfection of functional areas. Local optimisation, however, caused the interrelationships of the functions to retreat into the background. Even from as far back as the 1930's, Nordsieck highlighted the *necessity of a process-oriented corporate design* and continued to do so in the 1970's (Nordsieck, 1934: 77, 1972: 9). In spite of the early discussion of this topic in academic literature, process orientation only began to be practised in the 1980's, after Gaitaniedes, Scheer, Porter, Davenport as well as Hammer and Champy published their approaches (Davenport, 1993; Gaitanides, 1983; Hammer & Champy, 1993; Porter, 1985; Scheer, 1990).

While the organisational structure divides the company into sub-systems with their assigned tasks, a business process (further 'process') deals with the execution of these tasks as well as their coordination in time and sequence (Esswein, 1993: 551-561). "A *process* is a … closed, timely and logical sequence of activities which are required to work on a … business object" (Becker, Kugeler, & Rosemann, 2003: 4). An activity and/or a function are working steps that have to be executed in order to render a service. In this paper, the authors describe these activities and functions as a *process element*.

This information about processes is the basis for the identification of shortcomings and the recognition of potential improvements. Shortcomings such as organisational interfaces throughout a process or insufficient IT support, for example, can be detected (Becker, Kugeler, & Rosemann, 2003: 107). Sufficient knowledge of the current status promotes the understanding of relevant relationships and existing problems. This is a prerequisite for the development of a strategy for migration towards more efficient processes (Gaitanides, Scholz, Vrohlings, & Raster, 1994: 258).

2.2 Conceptual framework as an instrument for structuring processes

The findings from the process analysis should be summarised to serve as a guiding principle for the process to follow. A suitable way of doing this is to use a conceptual framework. A conceptual framework for processes divides the organisational structures on an abstract level and systemises the processes on the top level. (Meise, 2001: 62). The process framework is typically further developed and revised in the detailed process modelling phase, when more information about the individual process elements is available (Becker, Kugeler, & Rosemann, 2003: 99-105).

2.3 Reference modelling as an instrument of know-how transfer

Information models (models) are a core instrument for the analysis, design, and implementation of information systems (Becker, 1995: 133 - 150). Modelling has a very broad scope, e.g. the description and optimisation of organisational issues, such as process-based organisation analysis or software design and configuration (Scheer, 1998: 147-168, 1998: 177-202).

Reference models are an approach for accelerating and simplifying the development of enterprise-specific models by reusing domain-specific know-how (Becker, 2001: 399-400), e.g. in the PERI domain. Research on reference modelling can be divided into two groups (Fettke & Loos, 2003: 35-53). One group focuses on methodological aspects (Lang, Taumann, & Bodendorf, 1997: 264-290; Marshall, 1999; Schütte, 1998); the other concentrates on developing concrete reference models that can be used for domain-specific know-how transfer (Becker & Schütte, 2004; Hay, 1996; Scheer, 1994), e.g. the reference procedure model presented in this paper.

3 Conceptual framework for knowledge management

After around 10 years of lively discussion in the field of knowledge management, an overwhelming volume of definitions, concepts and views on knowledge management of differing focus have been presented. In addition, the software market offers a large number of standard and specialised applications under the KM label, not only for KM-specific functions such as information retrieval or automated classification, but also for "classical" digital data processing software such as relational databases or ERP systems.

The authors understand *knowledge management as an organisational philosophy, a vision of comprehensive management and of sharing data, information, and experience throughout the organisation, which can be supported by both organisational methods and IT-based functionalities (KM instruments)*.

It is evident that the handling of such a complex topic without targeted systematisation and structuring of available KM instruments with a defined level of abstraction is not possible. A conceptual framework or, in other words, a formalised abstract model, was therefore developed for that purpose. "A model is a representation of an object system (original) for the purpose of a subject (individual). This is the result of an individual's (modeller's) design … using a language" (Becker & Schütte, 2004: 65). The intention of the authors is not therefore to develop a universally valid framework for knowledge management. The aim is to build a framework that helps to systemise options for the implementation of knowledge management in PERIs (fig. 1).

3.1 Modelling language

As mentioned before, developing a formal correct model/framework requires a modelling language. The authors chose the *ERM - Entity Relationship Model*, which goes back to Chen (Chen, 1976: 9-36). This approach is well discussed in the literature (Batini, Ceri, & Navathe, 1992; Becker & Schütte, 2004: 87-91; Davis, Jajodia, Ng, & Yeh, 1983; Vossen, 2000: 80-109), is relatively easy to understand, and accords with the intended use. ERM differentiates between *Entities*, an item of a real or imaginary world, and *Relationships*, which represent the relevant relationships between entities. Similar entities are combined to form *Entitytypes* and relationships to form *Relationshiptypes*. Entitytypes are represented by rectangles, and relationshiptypes by rhombuses. The connection between an entitytype and a relationshiptype is characterised by cardinality and describes how often an entity of an entitytype goes into a relationshiptype. The cardinalities in figure 1 are shown in (min, max) notation (Schlageter & Stucky, 1983: 50). Another often used instrument of abstraction is generalisation/specialisation (Smith & Smith, 1977: 105-133), which is represented by a triangle. The letter *D* means disjunctive set, *N* – not disjunctive set, *T* means total generalisation and *P* - partial generalisation.

3.2 Structuring knowledge assets

The framework in figure 1 consists of two parts. The upper half of figure 1 deals with the detailed structuring of possible knowledge assets in an organisation. The first level of specialisation is a disjunctive differentiation (D, T) between *implicit* and *explicit* knowledge assets.

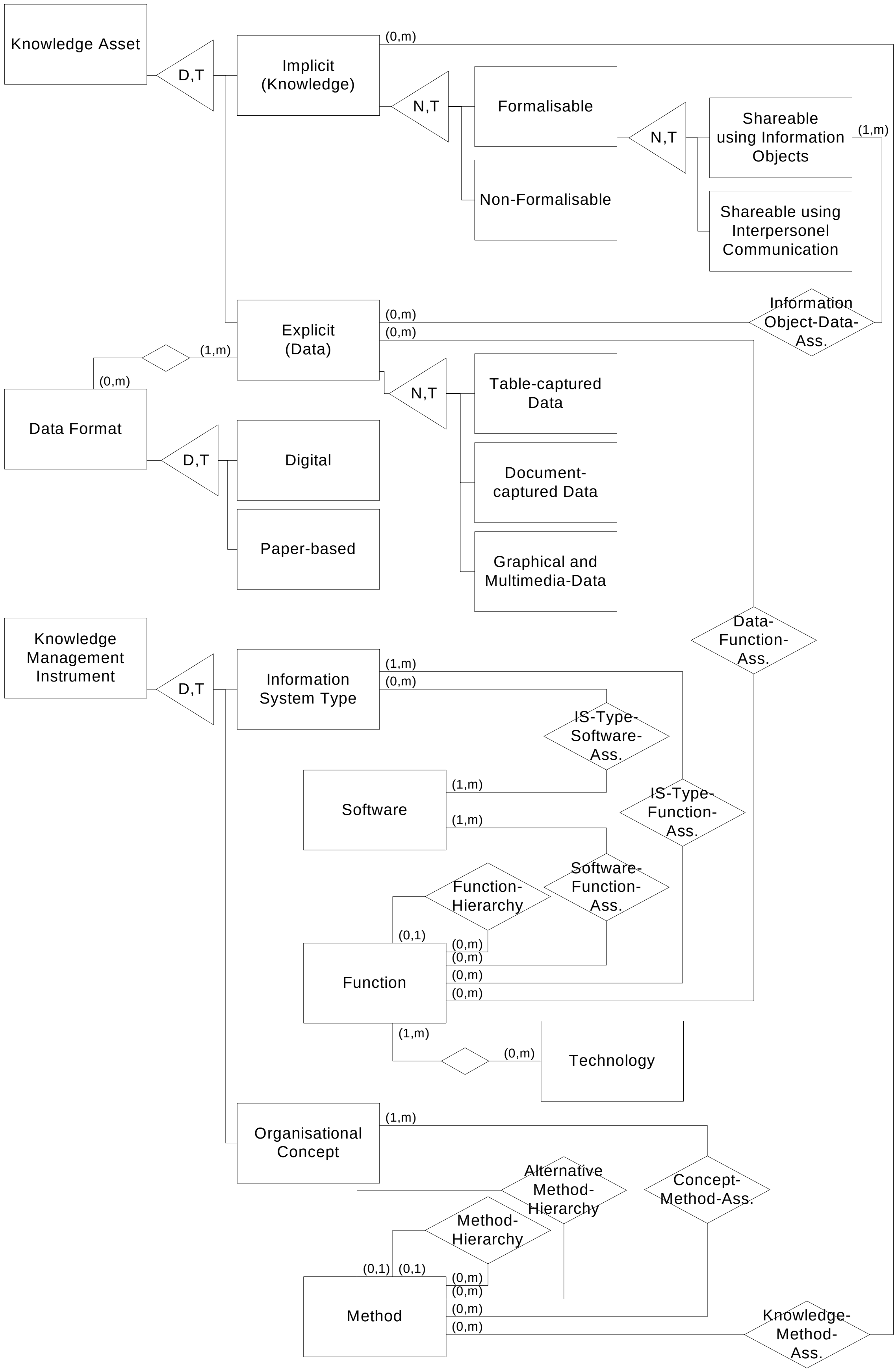

Fig. 1. CF-KM: Conceptual Framework for Knowledge Management

Explicit knowledge assets – data. The implicit-explicit distinction is applied to a single simple criterion - personal or non-personal knowledge. In other words, every piece of information outside the human brain is considered as *data*, which can exist only if it is stored in a minimum of 1 and maximum of m data formats ((1, m) cardinality, reading from 'Data' to 'Data Format'). (0, m) cardinality, reading from 'Data Format' to 'Data', means that there is a minimum of zero and maximum of m 'information objects' (data), which are stored in a particular data format. Also, paper-based documents such books, journals, papers, letters, faxes, etc. are considered as a different data format. Further, the authors define *information object* as data plus data format, where the data format is a necessary but not sufficient condition for the existence of this information object.

The body of data in PERIs comprises:

- *Table-captured data*, also known as well-structured data: the information content of well-structured data is described by table structures and is therefore familiar to the responsible organisation's employees.
- *Document-captured data*, also know as semi-structured or non-structured data: the information content of semi-structured data is described by natural language text which indicates the information pattern (Buneman, 1997: 117-121), and can partly consist of some table-captured data. These are information objects in different data formats such as 'doc', 'pdf', 'ppt', etc. or paper-based formats. The body of this data in the PERI consists of several information types: e.g. studies, investigations, descriptive and analytical reports, documented deliverables and findings from completed projects, surveys, findings of research workshops and brainstorming sessions, regulations, official policies, agreements, etc.
- *Graphical and multimedia data*: these are drawings, graphics and pictures, audio and video sequences stored as computer files in different formats.

The above mentioned specialisations are necessary for further considerations about the manipulation, sharing and storing of data using appropriate software.

Implicit knowledge assets – knowledge. According to the principle that a piece of information only becomes a piece of knowledge in the brain of a human being (Galliers & Newell, 2003: 5-13), the authors distinguish those implicit knowledge assets that are potentially formalisable and those that are non-formalisable. The specialisation attribute N (not disjunctive set in figure 1) emphasises that it is barely possible to make a clear distinction between formalisable and non-formalisable knowledge. The term *formalisable* directly corresponds to the term ‘structuring’, for the purpose of sharing. That means, changing into a form that is suitable for knowledge sharing. As *non-formalisable* knowledge, the authors define understanding of complex interrelations, experience, intuition and related cognitive phenomena.

However, considering the formalisation and therefore explication of knowledge is often a question of time, cost and motivation. Looking for a particular person is often much easier than the labour-intensive explication of potentially formalisable knowledge. Time, cost and motivation are the criteria for distinction between knowledge that is *shareable using information objects* and knowledge that is *shareable using interpersonal communication* (Polanyi, 1966). The relationshiptype ‘Information Object-Data-Ass.’ shows an existential dependency (Hars, 1994: 70) of formalised knowledge on the data, because such information objects are merely data in a particular data format.

3.3 Options for supporting knowledge management

The lower half of figure 1 constitutes the available *knowledge management instruments* (options for supporting knowledge management). The disjunctive specialisation of knowledge management instruments in information systems and organisational concepts corresponds directly to the differentiation between explicit and implicit knowledge assets.

Organisational Concepts. Social science disciplines such as organisational theory, psychology and sociology have developed a substantial body of *organisational concepts* aimed at establishing appropriate organisational structures. Particularly notable are, for example, change management, transparent organisation design, leadership theory, organisational culture, behaviour analysis, cognitive analysis, project management etc. (Kotter et al., 1998). Each of these concepts utilises many specific *methods* that help to find solutions for diverse organisational problems in terms of cognition and design. Depending on the desired granularity, methods can have many *hierarchical levels* through to atomic activities. In addition, *alternative method hierarchies* can be taken into account.

The relationshiptype ‘Knowledge-Method-Ass.’ in figure 1 shows, for example, that in order to capture, develop or share the identified implicit knowledge assets of individuals, certain selective organisational arrangements are necessary. In particular, the overcoming of motivational barriers is essential for successful support of knowledge management activities (Davenport & Prusak, 1998).

Information Systems. Information systems, too, are able to support knowledge management in an efficient way. According to CF-KM (figure 1) in general, different *types of information systems* are available on the market, e.g. DMS - document management systems, CMS - content management systems, CRM – customer relationship management, EIP - enterprise information portals etc. However, the lack of transparency in the *software* market for KM-related solutions is quite problematic. A clear product classification is therefore difficult. Many software companies sell their own IT competence, using the KM label for what is in fact "classical" digital data processing software, such as database or ERP systems.

More important is to identify the *functions* offered by the software. In so doing, the *technologies* on which these functions are based should not be neglected. Depending on the desired granularity, such as in the case of organisational methods, many *hierarchical* levels of functions are possible.

The relationshiptype 'Data-Function-Ass.' in figure 1 represents the authors' view of the role of information systems in the support of knowledge management. Since IT processes data rather than knowledge, the pure manipulation of any data using different functions of software more or less constitutes data management (Galliers & Newell, 2003: 5-13). Yet it is more important to be aware that knowledge management is, in the first instance, an organisational philosophy that can be supported by both organisational and IT-based instruments.

4 Reference procedure model for KM implementation in PERIs

4.1 Homogeneity of PERIs as the key factor for using reference procedures

The management of organisational knowledge assets is normally as specific as the organisation itself. In particular, differing business processes and organisational structures are the crucial factor that makes knowledge management specific to each private company. In contrast to private companies, PERIs are extensively harmonised due to legal and social factors. The broadly identical organisational structure of PERIs is characterised by a flat internal hierarchy:

- Only a few different groups of individuals: professors, research assistants / doctoral students, student assistants and administrative staff.
- Usually one professor as the head of department, who is responsible for strategic decisions.

- Medium-sized departments employ 5-10 research assistants. Some larger departments often have more than 15-20 researchers.

For most universities, not only are the organisational structures of PERIs similar, but also the operational structures (process-oriented view). The operational and organisational similarities between PERIs pose similar problems in respect of the enormous volume of knowledge assets that have to be managed:

- High turnover rate of research assistants, who usually leave the department as planned after 3-5 years. Information and know-how that is individually collected and acquired at high human cost and effort during the work process, is lost to the department when the assistants leave.
- In contrast to employees in private companies, research assistants often consider the department as an intermediate station in their career. This leads to differing goal and motivation structures, with implications for the sharing and storage of knowledge assets.
- It is often basically informal communication that prevents the ultimate reduction of organisational knowledge assets. However, medium-sized and large departments are faced with the problem that the informal channels fail.
- Overload of research assistants with administrative tasks.
- Insufficient financing.

4.2 Structure of the reference procedure model

In order to accommodate the above-mentioned specifics, the authors developed a reference procedure model (RPM) for implementation of IT-supported knowledge management in PERIs (fig. 2). The procedure model was created according to the idea of reference modelling described in Section 2.3, by taking account of the theoretical observation and long-term experience of the authors in the domain of public education and research institutions.

The procedure model follows the pragmatic, straightforward approach of the phase models. Such models describe a breaking down of the system development process into single, logically and chronologically sequential or partially overlapping tasks (Schwarze, 1995). The procedure model presented in this paper focuses exclusively on the conceptual phase of knowledge management implementation in PERIs. The reason for this, on the one hand, is the key role of conceptual modelling in the specification and design of IT-supported systems (Avison & Fitzgerald, 1995; Galliers & Swan, 2000:

74-82; Hirschheim, Klein, & Lyytinen, 1995). On the other hand, the subsequent phases 'design / implementation' and 'use' are of a more technical nature and in fact describe a standard, widely used procedure for the implementation of IT systems. These phases will therefore not be discussed in this paper.

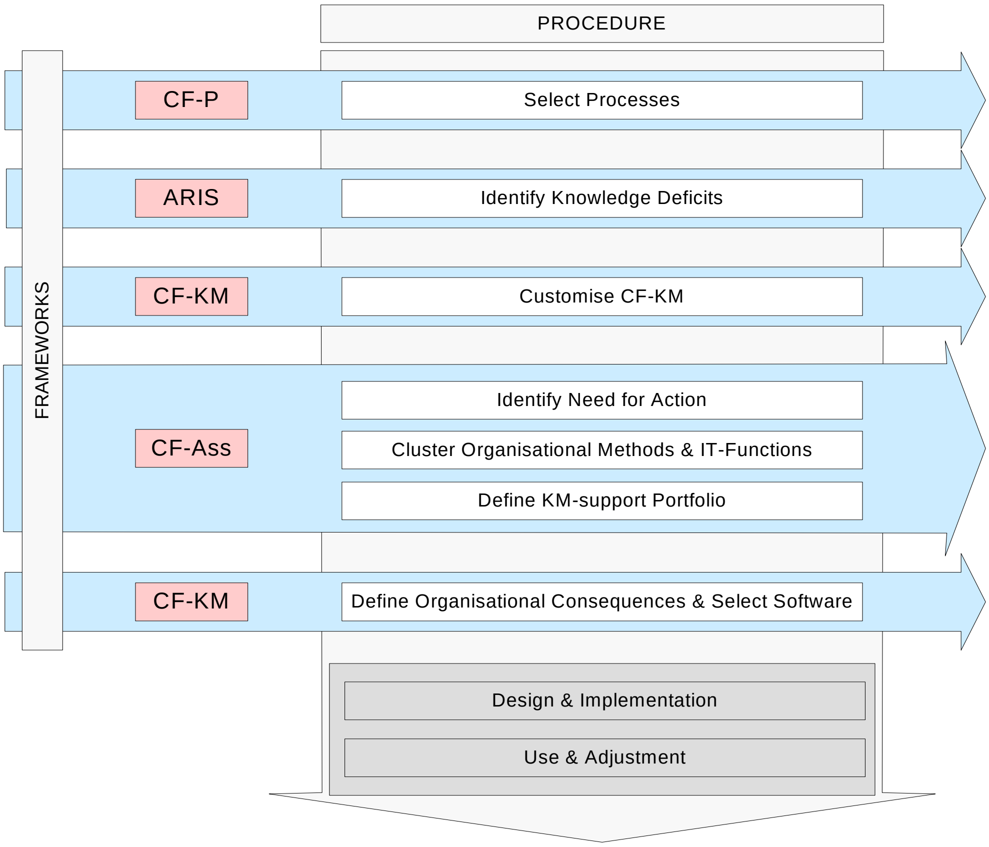

Fig. 2. Reference procedure model for implementation of IT-supported knowledge management in a PERI

The procedure model (Fig. 2) contains two main views on the implementation of knowledge management:

- *Procedure* as a dynamic component
- *Conceptual frameworks* as a static component

The procedure describes the main steps that are necessary to define a mix of organisational arrangements and to select appropriate software. Step-by-step, it helps to define the concrete activities of a PERI, taking account of the organisation's specific circumstances. The conceptual frameworks provide a certain level of abstraction and structure a problem with a certain degree of formalism. These are the tools for completing the defined tasks.

4.3 Description of the individual steps

Select processes. Based on a process-oriented view of organisations (Section 2.1), a conceptual framework (Section 2.2) for typical processes in PERIs (CF-P) was developed (Fig. 3). This represents the starting point for the top-down approach in process analysis. At this point, CF-P includes PERI's major functions at the highest level. This framework forms the basis that supports navigation through the process models. (Becker, Kugeler, & Rosemann, 2003: 16-17). There are three main categories of processes in PERIs: primary, support and coordination processes. According to the model of the value chain presented by Porter in the 1980's (Porter, 1989: 63), primary processes are value-creating activities with a direct relationship to the organisation's business mission. Support processes do not create value from the external point of view, but are necessary in order to execute primary processes. However, the boundaries between primary and support processes are floating, since the same process can be a primary or a support process, depending on context. Most activities in PERIs, and therefore the value creation chain, take place in two groups of primary processes, teaching and research. Thus, the consideration of the management of knowledge assets should focus, due to the restricted resources, on the first of these processes.

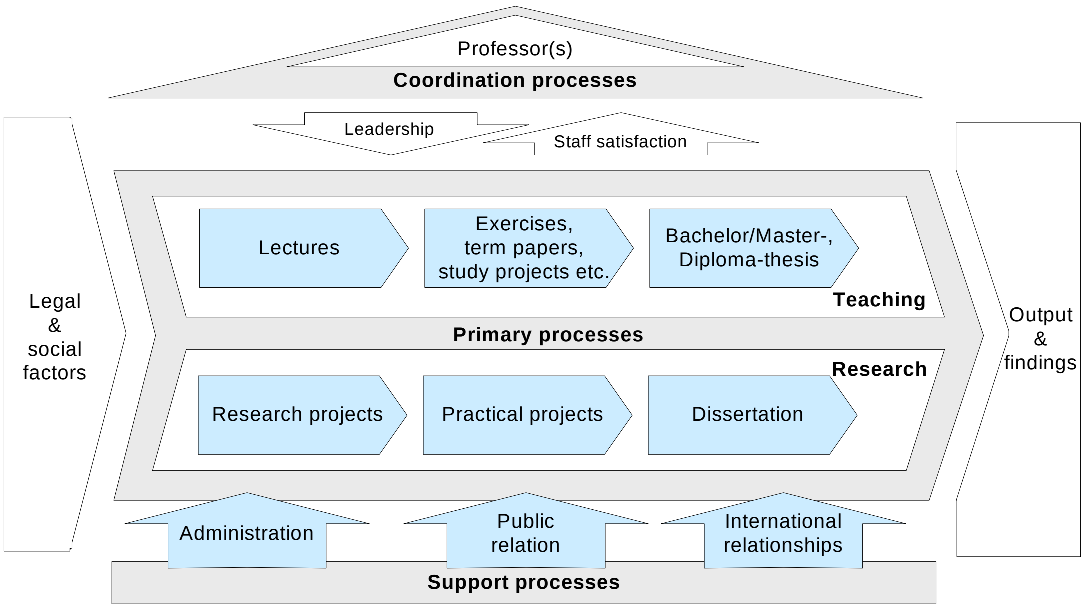

Fig. 3. CF-P: Conceptual Framework for Processes in PERIs

Identify knowledge deficits. The starting point is the detailed analysis of the primary and important support processes. A methodological basis is offered by the widely recognised *Architecture of Integrated Information Systems (ARIS)* (Scheer, 1992: 18;

Scheer, 1994: 10-80). ARIS is based on the idea that a process can be viewed in several ways: organisation (employees), data (explicit knowledge assets), and function (process elements). From this perspective, ARIS constitutes an integrated multi-view organisational framework (Becker, Kugeler, & Rosemann, 2003: 55).

The method of *Event-driven Process Chains (EPC)*, as one of ARIS's key methods, provides the basis for the breakdown of organisational processes into a sequence of interrelated process elements (Keller, Nüttgens, & Scheer, 1992; Scheer, 2000). Using EPC, processes that have been identified on the level of CF-P can be modelled in detail. A sufficient overview of the existing state supports an understanding of the relevant relationships and problems (Davenport, 1993; Davenport & Short, 1990: 11-27). The modified view in figure 4 illustrates a simplified example of an ARIS-based process analysis, here in the sub-process 'Dissertation'. It allows identification of knowledge-intensive process elements, and corresponding weak points. This is the case where permanent information and knowledge deficits occur.

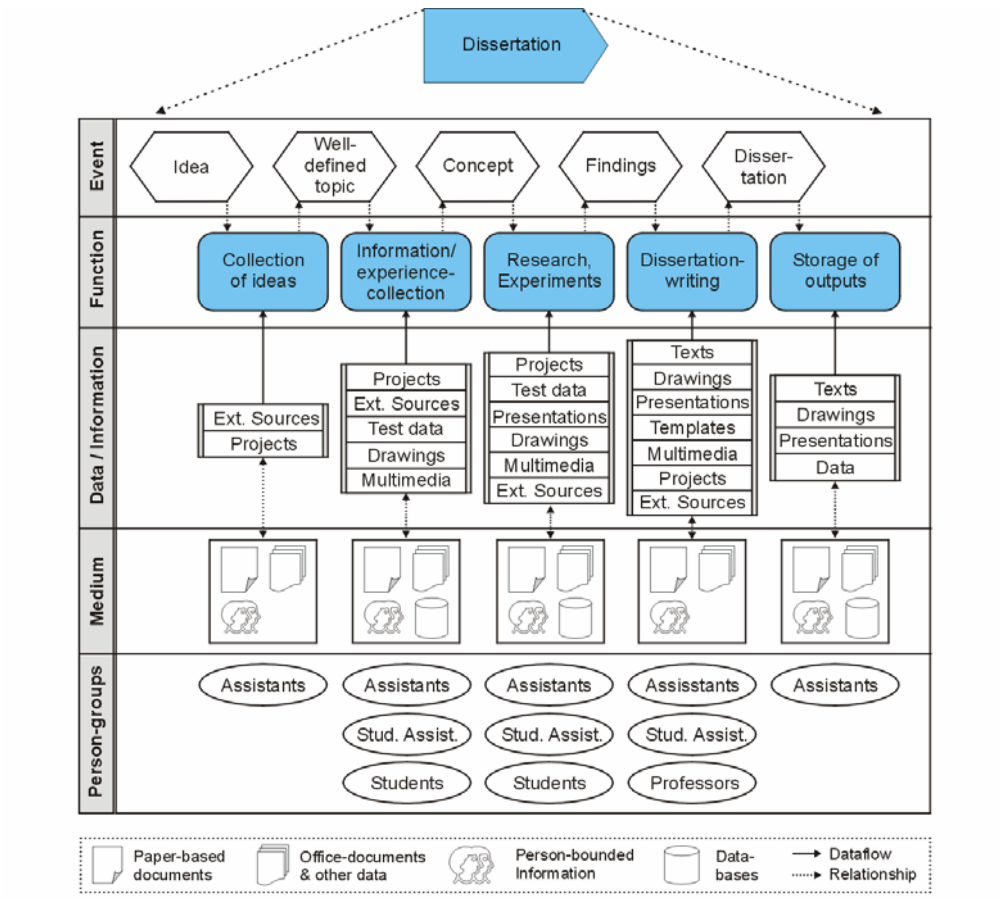

Fig. 4. Process "Dissertation": Main process elements and knowledge assets

Considering the wide use and acceptance of ARIS as a process analysis framework, the authors limit their description to the few examples below. These give an idea of the typical knowledge deficits in connection with the managing of knowledge assets in the ‘Dissertation’ process and are intended to demonstrate the result of the above-mentioned process-based analysis:

- Difficulties encountered in defining adequate and meaningful classification structures for collected documents: the information structure of documents in the file system of the document server is not sufficiently transparent, particularly for new employees. A substantial part of the documents are stored on PCs’ local drives and are inaccessible to other employees. It is therefore not unusual for several employees to separately develop personal structures for the information they work with, without having a uniform and integrated method of document classification.
- Difficulties with the retrieval and re-use of individually collected information and know-how, acquired at great human effort and direct monetary cost: on the one hand, ignorance of the existence of needed information results in repeated cost-intensive investigation and research. On the other hand, the search for information, even with awareness of its availability, can be time-consuming. This is the case if the precise location of an information object is unknown. A fragmentary overview of available and relevant information and its relationships can result in the decision-making process leading to incorrect conclusions.
- A significant proportion of paper-based documents cannot be made accessible throughout the computer network and the intranet and are thus, de facto, of no use to other employees.
- Employee changes due to recruitment or staff transfers result in loss of knowledge of information structures and its correlations.

Customise conceptual framework for knowledge management. Using the CF-KM described in Section 3 helps, on the one hand, to understand and classify the identified knowledge deficits. On the other hand, it can give an idea of which concrete organisational concepts and types of information systems can provide support when dealing with these problems. At this point, the authors did not complete the CF-KM on the instance level, which would mean a detailed function-oriented analysis of the market for KM-related software and a method-oriented analysis of the organisational theory. These are objectives of the authors' further research activities. In order to be used in further steps, the CF-KM therefore needs to be customised.

The main body of the examples of knowledge deficits identified in the analysis of the 'Dissertation' process refers to the PERIs' explicit knowledge assets. These weak points can therefore be eliminated more efficiently by means of data management instruments rather than organisational methods. With a precise idea of the functions required, a quick overview of the software market will help to identify the relevant group of software companies. Figure 5 shows an example of customised a CF-KM (methods) on the instance level.

In knowledge-intensive environments like PERIs, it is often basically implicit knowledge and interpersonal communication that prevent the ultimate reduction of implicit knowledge assets. Interpersonal channels often fail, however (Seagal & Horne, 1997). All of these problems have already been discussed in detail in many academic publications dealing with a wide range of concepts in the field of knowledge management (Allee, 1997; Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995; North, 1998; Probst, Raub, & Romhard, 2000; Sveiby, 1997). The necessary organisational arrangements based on proven organisational methods must therefore not be neglected. In general, these are the tasks of organisational theory in the CF-KM (fig. 1). Figure 6 shows an example of a customised CF-KM (functions) on the instance level.

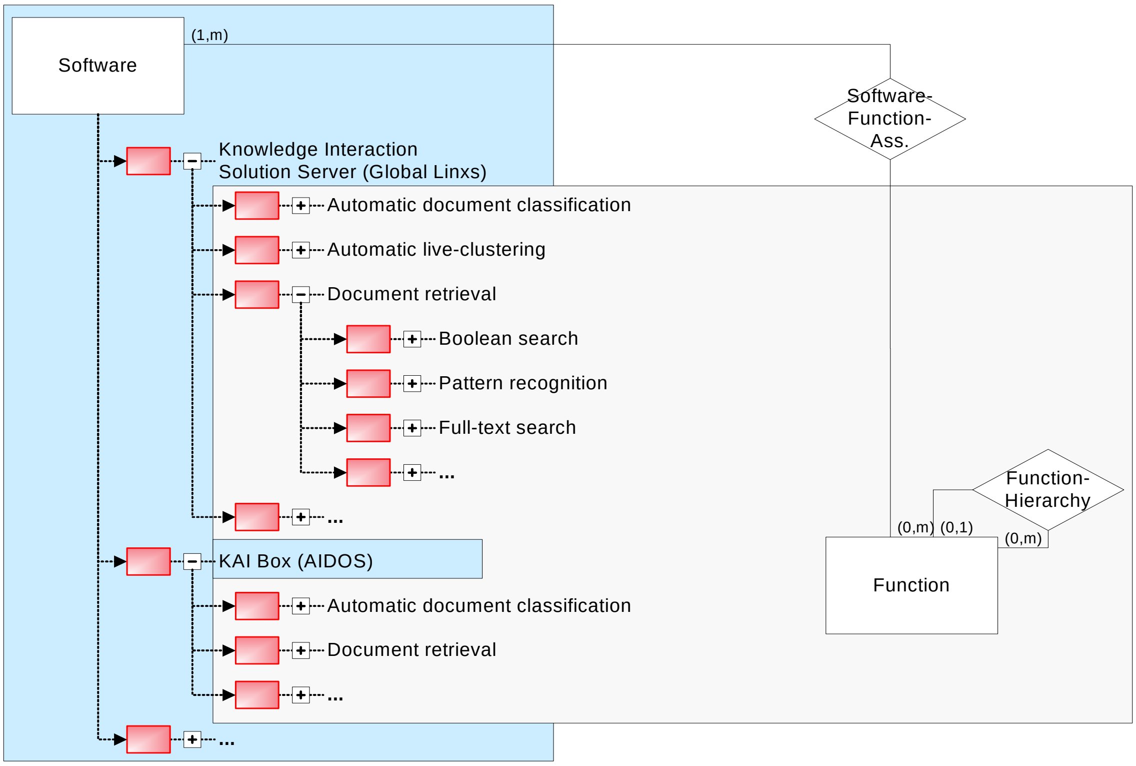

Fig. 5. A customised CF-KM: example of software and its functions

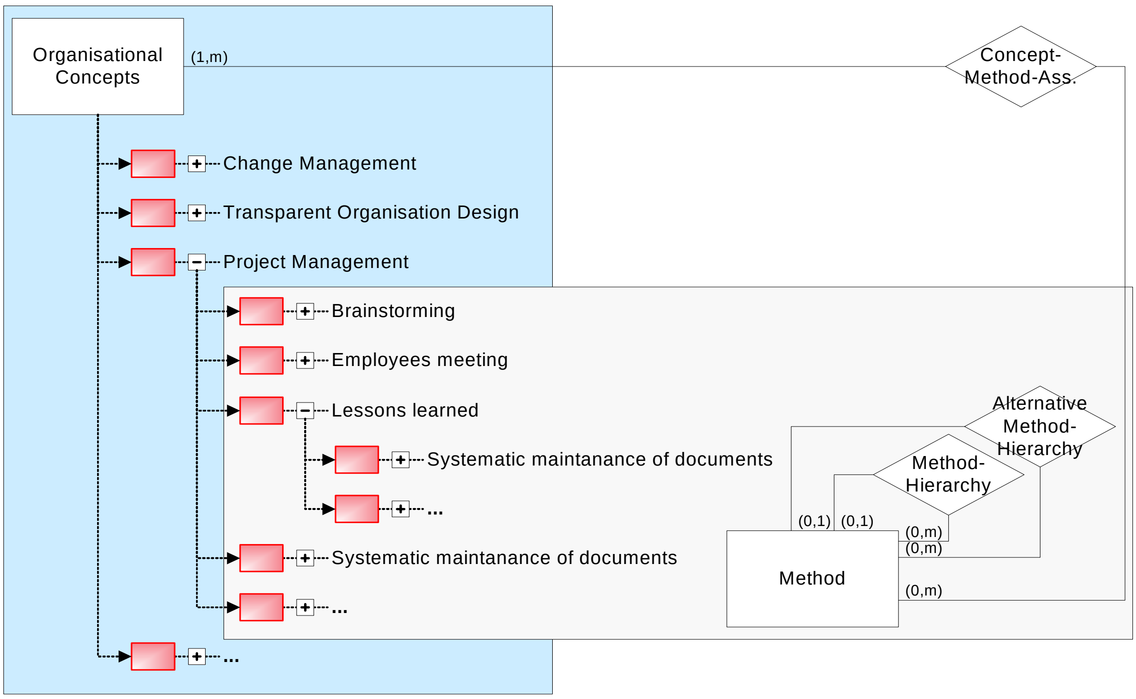

Fig. 6. A customised CF-KM: example of organisational concepts and appending methods

Identify need for action. With the process elements with identified knowledge deficits on the one side and a set of organisational methods and software functions on the other, it is possible to identify the concrete need for action. A decision must be made as to whether the organisational arrangements alone are enough to eliminate the identified knowledge deficits. Otherwise, IT support of the processes must be considered. Matching *process elements with identified knowledge deficits*, and *methods* and *functions* results in the *perceived need for action*. In other words, identification of need for action means that methods and functions (KM instruments) are assigned to the process elements with identified knowledge deficits without focusing on any particular or specific technology (fig. 7).

Process-Element with identified Knowledge Deficits	Collection of ideas	Information/ expirience collection	Research, Experiments	Dissertation-writing	Storage of outputs
Function – IT-Support					
Automatic document classification		X	X		
Automatic live-clustering		X			
Document retrieval	X	X	X	X	
Document digitalisation		X	X		X
Versioning & archiving				X	X
Multimedia management			X	X	X
...					
Method – Organisational arragements					
Brainstorming	X		X		
Employees meeting		X	X		
Lessons learned			X		X
Systematic maintanance of documents		X	X	X	X
...					

Fig. 7. Example of an identified need for action

The *Conceptual Framework for identifying Need for Action (CF-NA)* thus offers a formalised view of this issue and can be considered as a simplified data model for an appropriate tool (fig. 8).

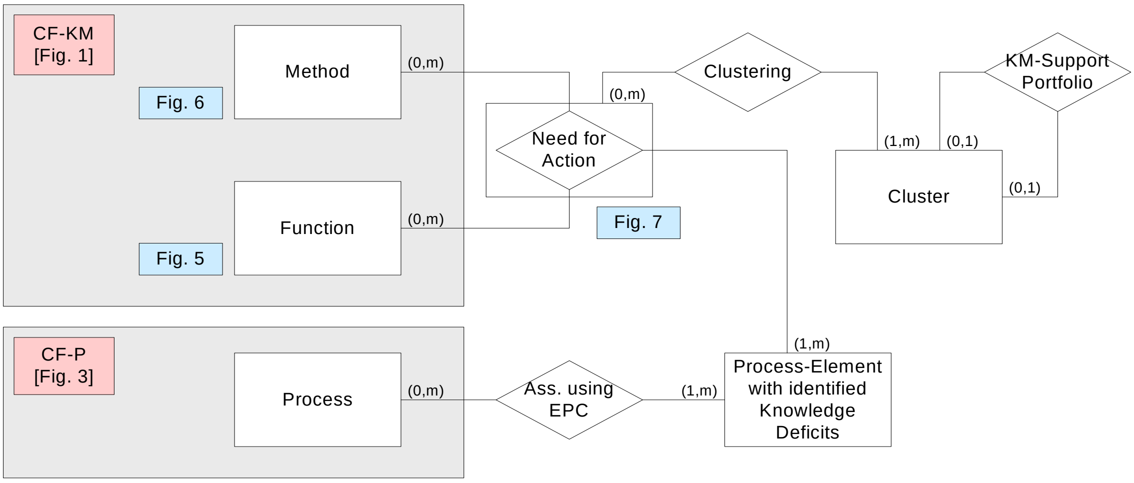

Fig. 8. CF-NA: Conceptual Framework for identifying perceived need for action and definition of a KM support portfolio

Cluster organisational methods and software functions. Consolidation of the identified needs for action in relation to both different process elements and processes results in a clustering of the similar needs for action. If, for example, the software function 'Document digitalisation' is required in different process elements or processes, it can be considered as one cluster.

Define KM support portfolio. Prioritising these clusters (modelled in figure 7 as a sequence relationship of the entitytype 'Cluster' with itself by cardinality (0, 1) - (0, 1)) leads to the specification of the KM support portfolio.

Define organisational consequences and select software. The customised CF-KM (figs. 1, 5 and 6) assists in the selection of concrete organisational arrangements and the software that fits best. Because of the specifics of the PERI (organisational size, staff workload, financial resources etc.), it is advisable to use the advantage of step-by-step, module-based design and implementation, applying the principle of "think big, start small".

5 Conclusions and Outlook

After the euphoria of the last few years with respect to knowledge management, practitioners have come up with the question as to how these, to some extent vague, perceptions can be used in real-world applications. A suitable procedure is necessary to face the specific tasks of the implementation of IT-supported knowledge management. The procedural model introduced in this paper systemises and formalises the establishment process of such systems in public education and research institutions (PERI). The model can thus be used as a reference for process-oriented implementation of IT-supported knowledge managemen in PERIs.

Since IT processes data - not knowledge - it is crucial to be aware that KM is nothing more than a combination of global vision, organisational concepts and information systems. Applying the reference procedure, a reasonable mix of organisational arrangements and appropriate software for the future KM system can be specified. Using this reference procedure can save PERIs time and development cost for conceptual design.

The future research of the authors will concentrate on:

- Improving this procedural model
- Completing the CF-KM on the instance level, which would mean a detailed function-oriented analysis of the market for KM-related software and a method-oriented analysis of the organisational theory.
- Delivering comprehensive empirical evidence for the adaptability of the procedure model to other domains.

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