The Core Elements of Corporate Knowledge Management and Their Reflection in Research and Practice – The Case of Knowledge Management Systems

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Abstract. Knowledge management (KM) is nowadays a relevant topic of interest for numerous reference disciplines and involved parties in research and practice. Considering KM-literature, a fast-growing and heterogeneous collection of content exists, including various theories, topics, keywords and models which are discussed and used to handle KM-related problems and topics. The consequence is the absence of a common understanding and harmonization in KM. The paper presents a first approach towards a normative and scientifically evidenced corporate KM-framework that supports highlighting unexplored KM-topics and contributes to a common understanding of terminology, concepts and methods used in KM. The framework in this study focuses on KM-systems and is the result of the integration of most cited classification approaches. It serves as a starting point to consolidate the topics of the KM-discipline and helps in obtaining an overview of relevant topics to successfully address KM issues in research and praxis.

Keywords: Corporate knowledge management, Knowledge management framework, Design science research, Knowledge management systems.

1 Introduction

In recent years knowledge management (KM) became an increasingly important discipline [1]. The literature considering KM offers a fast-growing collection of insights consisting of various theories, concepts or topics. Depending on the relevant context and the underlying reference discipline this content might be quite heterogeneous or can be seen as inconsistent. Furthermore, different orientations are proposed for KM. In addition to the different reference disciplines and design possibilities, various concepts, attitudes and schools exist, which justify and explain KM. Moreover, it can be noticed that research and practice discuss and handle KM-related problems and topics differently. In conclusion, it seems that a common unified understanding of the discipline KM is lacking [2, 3].

The preceding overview illustrates how heterogenous KM is, both as a research discipline as well as from a practical perspective. Therefore, a main challenge in research will be to consolidate and order the various streams and trends of this discipline and to seek a common understanding of KM. Research will thereby be able to

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gain a base for the systematic comparison and classification of research results. Practitioners can rely on consistent methods and approaches when implementing KM-related activities and will be able to make the right decisions at the right time in the right place.

The paper presents a first approach towards a normative and scientifically evidenced corporate KM-framework that supports highlighting unexplored KM-topics and contributes to a common understanding of terminology, concepts, activities and methods used in KM.

The remainder of this paper is structured as follows: In Section 2 we shed some light on different streams of literature. Section 3 provides an overview of the research objectives and the research design followed by this paper. Subsequently we present a framework proposal for the corporate knowledge management beginning with Knowledge Management Systems (KMS). Finally we conclude with a summary of main results, limitations of the study and some directions and implications for future.

2 Literature Review

During past years, several attempts have been made, to consolidate and reorder the huge collection of findings in the KM-discipline e.g. by presenting a separate framework. These frameworks address and pick up special issues of KM and through the analysis of literature we could recognize four major streams of frameworks. Besides, the distinction according to these four streams of frameworks is one possible classification and does not claim the exclusive assignment of one referenced work to only one of the streams due to the multidimensionality and the different perspectives which could be adapted by the referenced papers.

Some of the studies conducted a meta-analysis of a huge number of KM-papers, whereas others outlined specific frameworks and models used in KM and classify them. Also, several studies examined and proposed frameworks for KMS or handled and discussed KM-related themes and frameworks in general. To date, it is widely accepted, that there is no generally and globally established consensus about these different KM-classifications [4]. This literature review builds on the above mentioned four streams and explains the main results according to them.

Studies of the **first steam** were carried out in form of a meta-analysis and investigate general issues and topics concerning KM such as most frequently used definitions of knowledge, often used research methodologies and most cited related work or productivity rankings of e.g. authors and countries. For instance, Nie et al. [5, 6] published a meta-analysis to answer questions about the importance of KM, actions and operations in the KM-field, the factors that enable the birth of KM, ways to implement and to support KM and applications of KM. Another example is an attempt of Heisig [2] to harmonize KM-frameworks. The author applied the method of content analysis to compare and analyze 160 frameworks with regard to the following categories: source (in the sense of title, author and year), origin according to country and region, type, knowledge definitions, frequently mentioned KM-activities and critical success factors.

Into the **second stream** fall studies, that examined and classified models, perspectives, schools of thought and approaches for KM. Some papers discussed KM models

and approaches in terms of related processes and activities as in the study of Vorakulpipat and Rezgui [1], who examined and evaluated different models, which fall into the category of knowledge category models. Other researchers proposed general own classification schemas or taxonomies to classify existing models and frameworks (cf. [4] or [7]). Lloria for example [4] reviewed seven different classifications of approaches, schools and models in this discipline. One of these approaches is that one of Nonaka and Takeuchi [8], who stated the following: whereas European countries are interested in the process of measuring knowledge, American ones manage knowledge and Japan is associated with the creating of knowledge. On the other side, Earl [9] specified three schools of KM: the technocratic school with its subdivisions into the system, the cartographic and the engineering school, the economic school and the behavioral school with its subdivisions into the organizational, the spatial and the strategic school. After reviewing these approaches they were integrated in an own classification proposal.

The **third stream** handled frameworks for KMS and contains, depending on the intended use, a variety of different classification proposals. Some approaches described KMS according to their support for the processes in the knowledge lifecycle or the SECI-model (e.g. [10–12]). Other approaches followed a strategy-oriented perspective and classified KMS according to their support for strategy [13] or according to different KM-perspectives like the transactional KM, the process-based KM or the analytical KM [14]. Besides, there exist some more technology-oriented [15, 16] or context-oriented approaches [17]. Nevertheless this diversity of different orientations may sometimes be helpful, depending on the considered context and application.

A representative of the **fourth stream** is the global KM-framework of Pawlowski and Bick [18]. The authors stated the absence of a clear task understanding of KM in praxis. In addition, it is often unclear, how benefits could be reached through the realization and implementation of KM. The global KM-framework is described in its core by processes differentiated according to knowledge processes, business processes and external processes. These processes are in relation with several other components like strategies, stakeholders, culture and instruments and results in outcomes like performance or valuable knowledge.

The collection of all these frameworks enables researchers and practitioners to get an overview of existing related work. Thus, the choice for a suitable approach or model is simplified and can be carried out faster.

3 Research Objectives of the Study and Research Design

The general purpose of our study is contributing to a common view of relevant research topics in KM and identifying gaps between research and practice including:

- Attainment of a common understanding of terminology, concepts and methods used in the field of KM
- Identification of white spots on the landscape of KMS (with no research activities or low number of studies)

In this paper, we present the results of a preliminary study starting with the reflection of KMS as a subdomain of KM and addressing the following research questions:

1. Does a core consensus or dissent exist about already available KMS-frameworks?
2. What are key areas addressed by academic research and which topics are seen as relevant by practice?

The study is following a design science oriented approach [19]. According to this approach, first the problem needs to be identified. Based on that, solution objectives should be identified, followed by the steps of design and development, demonstration, evaluation and communication of the results.

The first step of this approach is represented here by the demonstration of the overall importance and relevance of this work to the KM-field which is described in the introduction section. The steps 2-4 correspond to the presentation of a first draft of a framework for corporate KM focusing in particularly on KMS. The evaluation phase will take place in form of discussions within the KM-community in order to evaluate, validate and improve the framework suggested here.

First of all, a structured literature review was conducted aiming to examine and analyze already existing KM-frameworks in literature. This review follows a taxonomy presented by Cooper and adjusted by vom Brocke et al. [20, 21]. Besides papers in different high ranking scientific journals related to KM (e.g. "Knowledge Management Research and Practice" or "Journal of Knowledge Management"), also relevant conference papers were taken into consideration. Forward and backward search was performed too by running through the references of relevant papers and looking for further interesting papers respectively looking for papers citing these of our sample. This procedure helped us to find further papers of relevance which were included into our sample. The literature was searched based on relevant keywords such as "Knowledge Management" or "Knowledge Management Systems" in conjunction with "Meta-Analysis", "State of the Art", "Review" and "Framework". These keywords were used for the automated search of electronic databases e. g. AiSEL, Science Direct and journal websites. Initial hits were reduced by analyzing their titles in a first step. In a second synthesizing step, abstracts of the initial hits were analyzed in-depth by checking their relevance to the objectives of this paper. The resulting hit list consisted altogether of 24 relevant papers. A summary of the review results was already discussed in section 2.

4 First Results – Corporate KM-Framework

In this section we present a first approach towards a normative and scientifically evidenced KM-framework that contributes to a common understanding of terminology, activities, concepts and methods used in KM.

The divergence and heterogeneity of the existing classification approaches underlines the need for a common understanding but also the need to consolidate and harmonize the different frameworks.

This study can be seen as a first step towards this consolidation by suggesting and creating a normative framework. We understand this normative framework as a conceptual consolidation of already existing classification approaches that serves as a starting point for further analysis in our research. In the future, we will build on this framework, to empirically test its validity and improve it.

Table 1. Overview of reviewed publications according to the four categories of KM research

	Publication	Category			
		M	**A/M**	**KMS**	**G**
	Scholl et al. (2004) [22]	x			
	Serenko & Bontis (2004) [23]	x			
	Nie et al. (2007), Nie et al. (2009) [5, 6]	x			
	Heisig (2009) [2]	x	x		
	Serenko et al. (2009) [24]	x			
	Lee and Chen (2012) [25]	x			
Focus of the paper	**Alavi & Leidner (2001)** [10]			**X**	x
	Binney (2001) [14]			**X**	x
	Tyndale (2002) [16]			**X**	
	Liao (2003) [15]			**X**	
	Jennex (2006) [17]			**X**	
	Saito et al. (2007) [13]			**X**	
	Becerra-Fernandez & Sabherwal (2011) [11]			**X**	
	De Carvalho & Ferreira (2011) [12]			**X**	
	Holsapple & Joshi (1999) [7]		x		
	McAdam & McGreedy (1999) [26]		x		
	Kakabadse et al. (2003) [27]		x		
	Asl & Rahmanseresht (2007) [28]		x		x
	Vorakulpipat & Rezgui (2008) [1]		x		
	Lloria (2008) [4]		x		
	Jafari et al. (2009) [29]		x		x
	Moteleb and Woodman (2007) [30]				x
	Pawlowski (2012) [18]				x

M : Meta-Analysis; A/M : Approaches/Models; KMS : Knowledge Management Systems; G: General

The creation of the normative framework is based on the analysis and aggregation of already existing frameworks, which were identified in scientific journals ex ante (cf. section 2). The classifications (table 1 gives an overview of reviewed classifications with their categorization according to the four streams mentioned in section 2) were extracted and integrated into a mind map. The choice of this design format made it possible to visually illustrate the collection of classification approaches and thus to obtain an overall picture of the state of the art. Subsequently we started the aggregation process by looking for similar or related classifications, which could be integrated into a new classification schema. In this stage of progress, we had some discussions within our team, to ensure the validity of the aggregations. Finally we build new main categories, which include the integrated classifications.

Subject matter of this study is a normative approach starting with KMS. Despite of the fact that KMS are one of the basic and important fundaments of KM, no broad agreement about the term KMS exists [17]. A popular definition of KMS is related to Alavi and Leidner who proposed the following: *"KMS refer to a class of information*

systems applied to managing organizational knowledge. That is, they are IT-based systems developed to support and enhance the organizational process of knowledge creation, storage/retrieval, transfer, and application" [10].

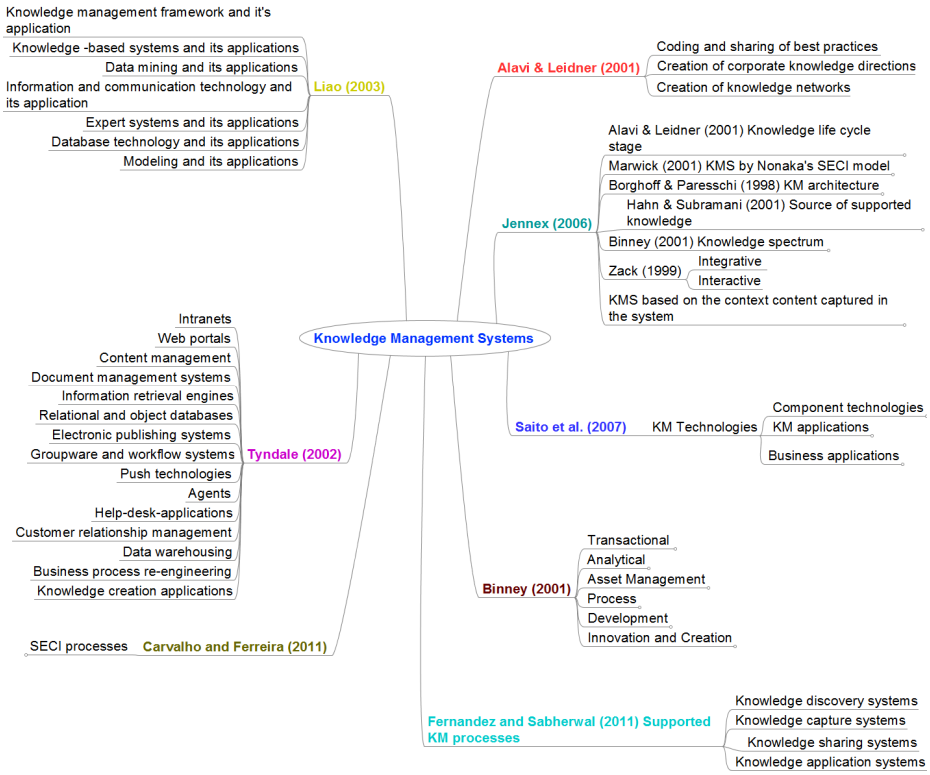

Fig. 1. Mind map of KMS classification approaches

Figure 1 illustrates the mind map of nine main KMS-classifications according to different authors, who propose or reflect our findings namely: Alavi and Leidner [10], Jennex [17], Saito et al. [13], Binney [14], Fernandez and Sabherwal [11], Liao [15], Tyndale [16], Carvalho and Ferreira [12].

The analysis of the mind map uncovers some noticeable aspects:

- KMS can be applied and adopted for a wide range of knowledge processes such as the generation, identification, structuring, storing and distribution of knowledge. Innovations in the field of information technologies offer new possibilities to support the organizational knowledge base as well as the tasks and processes of KM. This involves less the automated management of big data than the linkage between human and mechanical skills. This could be enhanced by the increasing integration and the combination of technologies, which could be used in an integrated or isolated manner.
- Some classification approaches follow a strategy oriented perspective and classify KMS according to their support of either codification or personalization strategy.

These classifications take into account the concept of the enterprise architecture with its distinction between several enterprise levels such as the strategic or the operational level.

- A final group of classification schemas characterize KMS differentiating between different task processing modes and the context of system use. This includes for example the distinction whether the task has been performed in an integrative or in an interactive manner but also the distinction between the task coordination in a distributive or collaborative working environment.

Based on the preceding analysis, the normative framework with its multidimensional categories and subcategories has been created. The design of this framework is based on the adaption and visualization of generally used classification schemas or classification schemas, which were discussed and mentioned frequently by more than one paper in literature. The framework presented here is an attempt to reflect and summarize already existing KMS classification schemas highlighting the consensus and dissents between them. The new integrated KM-framework will be created in the next steps and can be used to categorize research papers in the field of KM. As mentioned before this study is preliminary and describes only a part of the overall framework by focusing on KMS. Multidimensionality means here, that it is possible to assign elements within the framework to more than one single category. For example the element "social web" could represent a subcategory of a category "KM-processes", but it could also be assigned to a category named "Strategy oriented KMS" or to other suitable categories.

Figure 2 (cf. figure 2) shows the proposed framework structure for KMS. The initial framework consists of three main categories:

- **Category 1:** Process orientation
- **Category 2:** Strategy orientation
- **Category 3:** System type orientation

The decision for choosing these three categories reflects the three main classification approaches that can be found in the relevant literature.

The "**process"-category** subsumes approaches, which describe KMS according to their support of processes in the knowledge life cycle. Naming this category as the process oriented refers to the selected sources in the literature review. The authors of these sources investigate several KMS in terms of their support to the processes in the knowledge chain or activities as named in the well known life cycle model according to Probst et al. [31]. Advocates of this approaches are e. g. [10, 11] and [32] Based on the classification schemas we suggest to split this category into four subcategories according to the SECI Model [33]. The resulting subcategories (Socialization, Externalization, Combination and Internalization) could be refined by assigning suitable knowledge- or KM-processes such as sharing, transferring, distributing or storing of knowledge. These processes are tagged in the relevant literature by different keywords which are often used synonymously but describe the same process. To group and identify the process oriented keywords, a content analysis [34] on a sample of research articles of the Journal of Knowledge Management was done. The sample

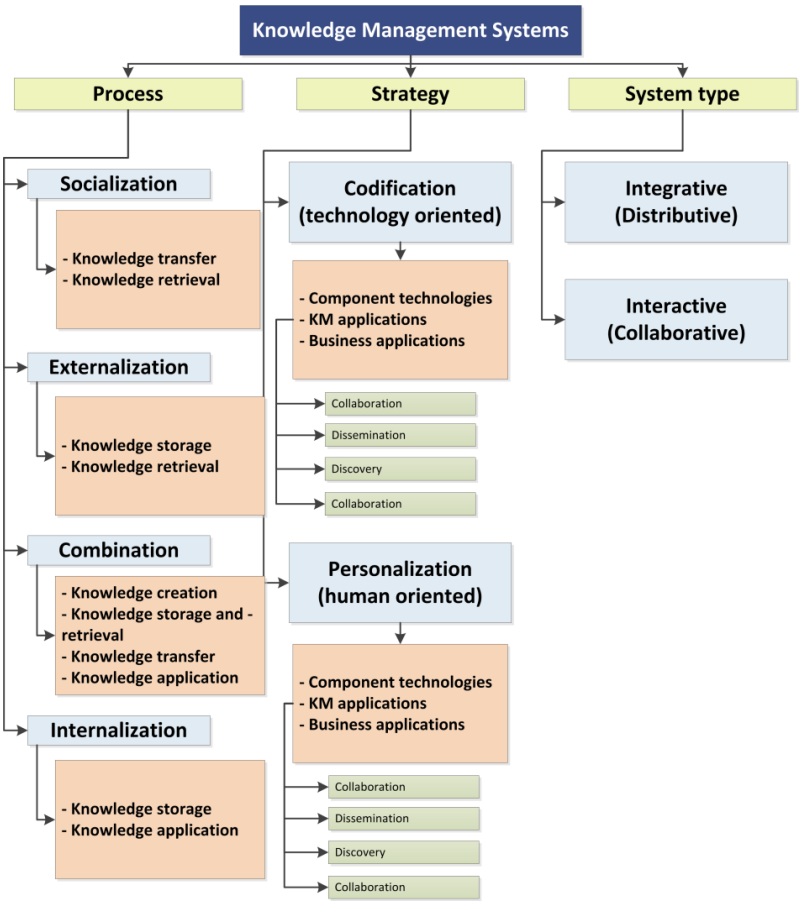

Fig. 2. Partial normative framework proposal for knowledge management systems

consists of 394 articles (time span 2005 to 2013) obtained from the abstract and citation database scopus (www.scopus.com). We decided to focus only on the abstracts and keywords during the content analysis because the summary contains the main aspects. Focusing only on parts of the papers like title, keywords and abstracts is a common procedure when doing a content analysis based upon literature. The abstracts and keywords of the sample were tagged and a word frequency count resulted in a list of 34 knowledge life cycle processes. In a synthesizing step these keywords were assigned to the four main categories by Alavi and Leidner [10]. The decision for choosing this categorization as a benchmark is motivated by the popularity and citation index of the author's publication (cf. table 2).

For example, all the processes of assimilating, recombining, generating and producing knowledge could be summarized as processes, in which new knowledge is created. On the other side, when sharing, diffusing or exchanging knowledge, a transfer of knowledge is taking place.

Table 2. Knowledge life cycle processes categorization (Basis sample (n= 394): Journal of Knowledge Management 2005-2013)

Knowledge creation	Knowledge storage / retrieval	Knowledge transfer	Knowledge Application
Assimilation	Access	Diffusion	Appropriation
Generation	Accumulation	Dissemination	Attrition
Production	Acquisition	Distribution	Conversion
Recombine	Capture	Exchange	Exploration
	Collection	Sharing	Exploitation
	Documentation		Integration
	Harvesting		Obtaining
	Maintaining		Recycling
	Preservation		Utilization
	Retention		Validation

Based on the categorization in table 2, the four main knowledge life cycle processes were assigned to the SECI-model (cf. figure 2). The stage of socialization could be characterized for example by the transfer and retrieval of knowledge, whereas the externalization phase could be described by the storage and retrieval of knowledge. In addition, whilst combining knowledge, new knowledge is created, transferred, stored and applied later on. In the internalization stage, most of the activities focus on the storage and application of knowledge.

Finally each one of these processes could be facilitated or supported by the use of several technologies. Social web based systems e.g. facilitate the processes of sharing, storage and transfer of knowledge, whereas databases fit best for storing and retrieving knowledge.

The strategy oriented categorization, as proposed by Saito et al. [13] classifies KMS according to their support of a certain strategy into a technology oriented or human-oriented approach. The first approach represents the codification of knowledge and puts the focus on technology support for KM-related tasks especially the creation and transfer of knowledge. The human-oriented approach focuses primarily on the personalization strategy and on creating and transferring knowledge between individuals. Saito et al. distinguished between component technologies, KM-applications and business applications and propose that each one of these technologies could be supported by special collaboration-, dissemination-, discovery- and repository technologies.

Last but not least the system type can be used as the third main category in the normative framework. According to Zack [35] some technologies support doing and processing tasks integrative, whilst others are suitable for those tasks that deliver the best outcomes when being executed interactively. Park and Jeong [36] present a corresponding approach distinguishing between distributive KMS and collaborative KMS according to integrative and interactive KMS. Integrative oriented KMS are for example data warehouse systems, data mining systems and databases, whereas groupware and instant messaging systems need to be used interactive in order to deliver the requested results.

5 Concluding Remarks and Limitations of the Study

In this paper we presented a first approach towards a corporate KM-framework by addressing two main research questions:

1. Does a core consensus or dissent exist about already available KMS-frameworks?
2. What are key areas addressed by academic research and which topics are seen as relevant ones for practice?

Focusing on KMS, we reviewed and analyzed the most cited classification approaches to identify similarities and differences in the proposed frameworks. Based on the analyses we combined three common classification approaches and built a new normative framework. The resulting schema sheds light on key areas of interest for research and practice. In the future we will build on these results to extend the framework by enabling elements and categories covering the KM discipline as a whole and not only KMS in particular.

Concluding, our study has some limitations that should be mentioned at this point. At the moment our framework is restricted to KMS and needs to be extended by integrating the missing topics but also the relationships and dependencies between the categories. This task will be done in the next steps as continuation of this study. Even though the first discussions and validations within our team have shown the applicability of the framework, we are aware, that our results still needs additional and scientific validation. The framework is normative and represents the result of a mainly conceptual work. Anyway, the idea is to set up this framework as a starting point of an iterative process until reaching the expected and desired final and common KM-framework. This includes qualitative research in form of an extensive content analysis, but also interviews within the community to test and evaluate the results.

We contribute to research by presenting a first step towards consolidation and obtaining a single common understanding of the KM-discipline. A unified view helps to reflect the research field with its core values, assumptions and attitudes, and supports a cumulative research process in this field. The systematic comparison and the proposed classification schema can be used as a starting point for further research in order to get an overview of the state of the art and to classify new research projects. With regard to the practical impact, businesses get help for introducing and implementing KM within the company.

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