

A Methodology to Support the Design and Deployment of Knowledge Management within Inter-organizational Networks

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ABSTRACT

A well-functioning Knowledge Management is a competitive advantage for enterprises that act in co-operative and distributed networks with knowledge intensive production processes. A Knowledge Management approach that integrates both, hard factors (e.g., Information Technology) and soft factors (e.g., cultural aspects) for distributed and dynamic entrepreneurial (inter-organisational) networks is currently missing. This paper presents research findings of a project that is developing a methodology to support a service provider responsible for the KM within distributed entrepreneurial networks.

Keywords: Knowledge Management, Knowledge Networks, Inter-organisational Networked Businesses, Collaborative Networks

1. MOTIVATION AND RESEARCH RATIONALE

In recent years two major trends could be observed in the sector of manufacturing enterprises. On the one hand, the companies concentrate more and more on their core competencies, while on the other hand knowledge is increasingly recognized as a success factor in the tough competition of the global market arena [17] [18].

As a result of the concentration on core competencies, peripheral functions are abandoned and taken over by external partners [11]. This trend leads to a higher productivity and flexibility of the companies' core businesses, but also increases the interaction between different business units [18]. While this gives much more flexibility to the production process as a whole, it also bears the challenge of handling these interactions efficiently.

Knowledge, on the other hand, has been accepted as a crucial factor in business life [13]. Many companies have therefore focused on Knowledge Management (KM) and hence implemented KM solutions [2]. However, such implementations are usually focused on internal, enterprise specific applications and are mainly technology driven [9] [12] [13] [14]. They are therefore suitable only to a very limited extent to support companies in order to face the challenges of KM in distributed business networks.

In addition, different goals, ethic values and cultures as well as a lack of trust inhibit the exploitation of the potentials of networked knowledge [4][6][10]. Appropriate models and methods and in particular a methodology for KM in distributed and globally

dispersed entrepreneurial networks are lacking [6] [16] [19].

Thus, the idea behind our research is that, in order to build up and maintain co-operation and establish knowledge transfer in business networks, the companies involved require external support. Networked enterprises have to be taught how KM along complex and networked value chains can be accomplished. An external knowledge manager who acts as an intermediary in the network and represents a neutral trust centre can analyse applicable tools and critical success factors for KM in networks.

The presented research project integrates both, new Information and Communication Technology (ICT) driven organisational concepts and human-oriented approaches with KM methodologies and instruments, in order to implement an innovative KM Service Provider for distributed networks.

2. A METHODOLOGY TO DESIGN KM WITHIN INTER-ORGANISATIONAL NETWORKS

A methodology to support the design of KM within inter-organisational networks is supposed to fulfil two essential requirements. On the one side it has to describe how KM in the considered network is structured and with which instruments the handling of knowledge can be organised in the network. On the other side, it has to describe how KM has to be implemented in the network, i.e. the methodology has to support the KM-deployment along the complete KM life cycle.

In analogy with the „Aachen PPS Model“ [15], we structured the methodology into a description and a procedure model. In the *description model* all relevant

elements to design and configure KM in business networks as well as their mutual relationships are described. In the *procedure model* it is explained how and in which phases KM can be implemented in the considered network. Within the methodology, also the interrelations between the two models have to be highlighted.

3. DESCRIPTION MODEL

The description model has four elements, which represent the relevant views for the service provider within the design of KM, namely: KM-tasks, Network, Design Areas of KM within Networks, KM-Methods and Instruments. As shown in Figure 1, the different views are strictly mutually interrelated.

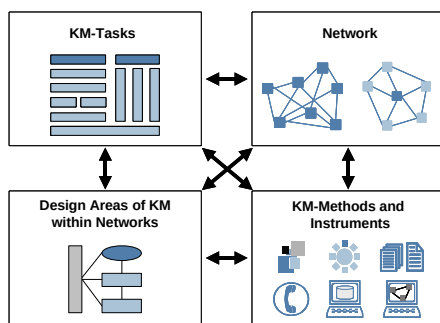


Figure 1: The elements of the description model

3.1 KM-Tasks

The KM-tasks that have to be dealt with are of the most different kinds [4] [6] [14] [16]. We distinguish between direct and indirect KM-tasks.

Direct KM-tasks involve directly the KM of the network; their fulfillment is of great influence on the whole KM process. To the direct KM-task group belong: a) definition of knowledge objectives, b) identification of knowledge, c) acquisition of knowledge, d) development of knowledge, e) distribution of knowledge, f) deployment of knowledge, and g) preservation of knowledge.

On the other hand, *indirect KM-tasks* involve functions that deal indirectly with the KM of the network, but which are nonetheless of great relevance within the conceptual design and implementation of KM within the network. Indirect KM-tasks are: a) KM-controlling, b) management of KM-infrastructure (e.g. IT), c) personnel management, d) fostering / cultivation of knowledge culture and KM-vision, and e) management of knowledge structure.

All such tasks have to be taken into consideration while analysing the existing KM and especially in the following phase, in which the new KM-approaches are modelled and appropriate instruments are selected.

3.2 Network

Distributed entrepreneurial inter-organisational networks can be described according to a variety of characteristics, which have an even wider range of potential expressions [9] [12] [17] [18]. In order to structure the field, a set of clusters of network characteristics was identified: a) *network size and demography* (e.g. number of partners, number of active partners, size of partner enterprises, number of active individuals); b) *legal, contractual and financial characteristics* (e.g. network borders, kind of commitment, funding); c) *economic characteristics* (e.g. position within the value chain of the partners, competitive relations among the partners, industrial sector, network reach); d) *temporal characteristics* (e.g. development phase of the network, time frame of planned cooperation); e) *characteristics related to the network organisation* (e.g. coordination, organisational structure, organisational forms within the network); f) *characteristics related to the management of information and knowledge within the network* (e.g. type of information exchange, type of communication, KM objectives, KM phase).

Clearly, the clusters are open and can be amended with new characteristics and expressions. Based upon all the identified characteristics and related sets of possible specifications a standardized framework for network analysis has been developed.

3.3 Design Areas

The different design areas of KM within inter-organisational networks are presented within the description model of KM within distributed intra-organisational and inter-organisational networks [7] [8]. The four core elements of the Knowledge Management of organisational networks are: Network Knowledge, KM-Processes, KM-Resources and KM-Culture of the network (see also Figure 2).

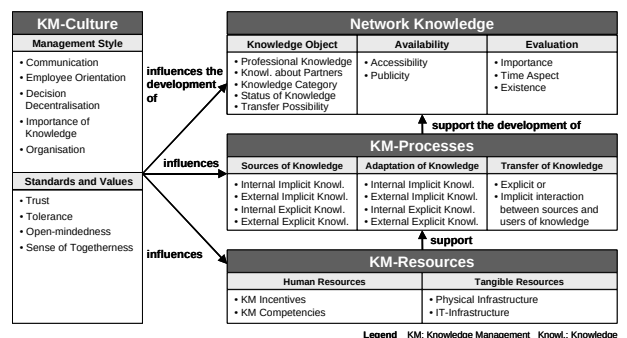


Figure 2: Design areas of KM

Starting point is the actual *knowledge within the network*: Its potential is the reason behind all KM activities. The network knowledge appears in different types of knowledge with specific attributes. It can be retrieved from different sources, and differs according to its accessibility [12] [20].

To realise the potential of Network Knowledge certain *KM processes* are necessary [12] [20]. They can be classified in processes needed to retrieve knowledge, to change knowledge and to pass on knowledge.

Such processes again rely on *appropriate resources* – both human and tangible. For example, employees need certain competencies to be able to carry out KM processes, but they also need the corresponding physical and IT infrastructure to fulfil their tasks [3] [5] [10].

These three areas are all influenced by a fourth one: the *KM culture of the network*. Cultural aspects can enhance an open knowledge transfer or inhibit a positive attitude towards sharing knowledge [1]. Thus a detailed consideration of the management style as well as the standards and values within the network is very important. Different aspects have to be examined in this context: communication, employee orientation, decision decentralisation, importance of knowledge, trust and tolerance etc.

Based upon all the attributes and related sets of possible specifications for each of the four areas an appropriate standardized framework for the analysis of the current KM within distributed Networks has been developed. This analysis framework consists of questionnaires, guidelines for interviews, screen-plays for workshops and tools for each area of the Knowledge Model to help the Knowledge Manager during the analysis of the existing KM in the network. The analysis framework was validated in four networks of industrial partners within the consortium.

3.4 KM-Methods and Instruments

The KM methods and Instruments are of the most different kinds [2] [4] [6] [7] [13] [19]. A vast number of KM-methods and instruments was collected and hence classified according to *a) related KM-Tasks, b) KM-design area of action, c) related form of knowledge representation, d) classification of method typology* (technological, organisational, personnel methods and instruments, see also Figure 3).

IT-Instruments for KM	Organisational Methods and Instruments for KM	Personnel Methods and Instruments for KM
- Knowledge Portals - Document Management Systems - Groupware Systems - Data Warehouse Systems - E-Learning-Systems - Information Retrieval Systems - Intelligent Agent Systems - Filter Systems - Workflow Management Systems ...	- Company Vision - Knowledge Map - Experience Exchange Circle - Competence Network - Experience Documentation - Job Rotation - Job Enrichment - Job Enlargement - Information Mapping ...	- Coaching/ Mentoring - Network for New Employees - Learning Coach - Interview Techniques - Creativity Techniques - Shadowing - Story Telling - Seminars ...

Legend: KM: Knowledge Management

Figure 3: Classification of KM-Methods according to their typology

Hence they have been structured into a tool map, which is currently being implemented into a software tool.

4. PROCEDURE MODEL

The procedure model for the deployment of KM within entrepreneurial networks has six phases, which are namely: Initialisation, Analysis, Conceptual Design, Implementation, Operational Management, and Termination.

Figure 4 shows the rough structure of the procedure model for the service deployment. Clearly, the task of the Service Provider for KM within a distributed network accompanies the whole lifecycle of KM within the network.

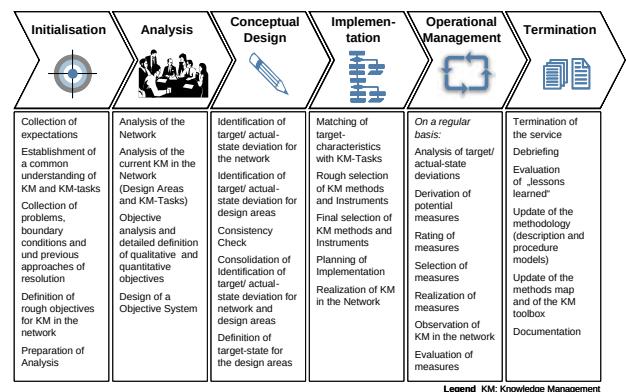


Figure 4: Phases of the procedure model

4.1 Initialisation

In the first phase, the initialisation, the Service Provider has to trigger the whole KM project within the involved inter-organisational network. After the collection of expectations of the different stakeholders, a common understanding of KM and KM-tasks within the considered network has to be established. Hence, current problems, boundary conditions and previous approaches of resolution of the KM issue in the considered network have to be collected, in order to be able to define rough objectives for KM in the network as well as the related evaluation criteria. Eventually, all the collected data and information have to be analysed and structured in order to prepare the following phase of analysis.

4.2 Analysis

In this phase the relevant elements of KM in the network have to be thoroughly analysed, in order to define a concrete basis for the conceptual design of the striven KM approach. In particular, a detailed analysis both of the Network and of the practiced KM in the Network (in particular with the help of the views "Network", "Design Areas" and "KM-Tasks") has to be conducted. Thus, within an analysis of KM objectives of the network, a set of detailed qualitative and quantitative objectives have to be defined in order to structure an objective system for the KM of the network. Eventually, appropriate evaluation criteria have to be defined.

4.3 Conceptual Design

Within this phase, the striven KM approach within the network has to be designed conceptually. First of all, the target/ actual-state deviation for the network as well as for the KM design areas has to be identified. Hence, such deviations have to be compared and, if necessary, harmonized in order to assure consistency between the network and the design areas. Eventually, after a consolidation of target/ actual-state deviation for network and design areas, a target state for the design areas can be derived.

4.4 Implementation

Within the implementation phase, with the help of the appropriate KM methods and instruments, the KM has to be implemented within the whole network. After a matching of the target states of the design areas with the related KM-Tasks, an initial rough selection of KM Methods and Instruments with the help of the tool map will be undergone. Thus, from all the methods and instruments potentially suitable for the considered network, a final, more restricted tool set will be selected. With this information the KM implementation will be hence planned and eventually realized.

4.5 Operational Management

The KM has to be then operationally deployed over the whole time the considered network is active. This phase, the operational KM, is the most time-consuming. On a regular basis, following steps have to be conducted within a control loop: basis target/ actual state deviations have to be analysed, potential measures, if needed, have to be consequently derived and rated. Thus, appropriate measures have to be selected and realized. The behaviour of the network has to be then observed over time, in order to be able to eventually evaluate the implemented measures.

4.6 Termination (of Service)

When, for whatever reason, the network terminates to operate or the network management decides not to make use of the offered services anymore, the Service Provider will terminate the service. After the official termination of the service, a series of debriefings with the involved key players will be conducted; hence, the gained „lessons learned“ will be evaluated. If necessary, the methodology (description and procedure models) will be updated, according to the gained inputs. The same applies to a possible update of the methods map and of the KM toolbox. Eventually, a final documentation will conclude the project.

5. INTERRELATION BETWEEN DESCRIPTION AND PROCEDURE MODEL

In order to be able to make use of the methodology, the Service Provider needs a further instrument, that shows which view of the description model (KM-tasks, Network, Design Areas, KM-Methods and Instruments) as well other potentially relevant views (e.g. Objective Model or Evaluation Model) has to be used in a specific phase of the procedure model (Initialisation, Analysis, Conceptual Design, Implementation, Operational Management, and Termination).

Figure 5 shows the basic idea of the interrelation between the two models. Clearly, the extent of such an interrelation has to be specified with the needed detail.

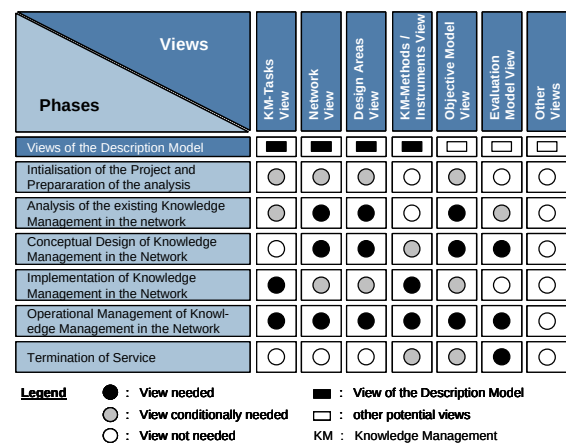


Figure 5: Interrelations between the models

6. CASE STUDY: KM IN AN INTER-ORGANISATIONAL NETWORK

In the following a case study of an inter-organisational network, in which the presented methodology is currently being applied, will be presented. The considered case involves the VIA-Network, a regional inter-organisational network of 20 small and medium enterprises (SME) in the automotive industry located in the German Federal State North Rhine-Westphalia (NRW). In this case study, the role of the service provider is deployed by the VIA-Consult GmbH, one of the network companies, that was founded by other network companies as a consultancy firm for the network.

During the *initialisation phase*, a series of workshops with five selected companies¹ of the VIA-network was conducted. Within this phase, the different expectations of all stakeholders were collected and a common understanding of KM was established. Since, until that moment, no Knowledge Management projects had been

¹ Fischer & Kaufmann GmbH & Co. KG, Kirchhoff Kutsch GmbH, Heinrichs GmbH & Co. KG, Heinrich Huhn GmbH & Co. KG, Krah RWI GmbH. VIA Consult GmbH & Co. KG acted as intermediary between the research institutes and the network companies and carried out the data collection to a large extent.

conducted, no specific problems could be identified in the field.

Hence, in the following phase, a detailed *analysis* of the existing network knowledge was carried out. The objectives of co-operation within the VIA-network are, among others, combined sourcing, know-how-exchange in working groups, joint projects and joint ventures. Since no specific area of cooperation or business processes could be specified for a support by KM beforehand, the main goal of the analysis of the network knowledge was the identification of potentials for knowledge transfer. Furthermore the collected data were also used for the development of a detailed map of the network knowledge in order to assist network partners in finding sources of knowledge for specific topics within the network.

The overall goal of the following phase, the *conceptual design*, was to select appropriate KM approaches for the support of inter-organisational business processes. From the data gained within the analysis, several potential areas for knowledge exchange could be identified. Work tasks that appeared to be suitable for an exchange of knowledge could be found mostly in non-productive areas. In the productive areas, mainly organisational topics were identified. Examples for the identified areas of potential knowledge sharing are: organisational concepts for the flow of goods within the firm, organisational concepts for reducing interfaces within job processing, analysis of customer satisfaction, and establishment of performance figures. As far as work tasks in the productive areas are concerned, the sharing of knowledge used in comparable technical processes should offer advantages. In the study at hand however, the network companies involved appeared to focus on the potentials in non-productive and organisational topics. Several possible explanations for this were identified: on the one hand in spite of technical work tasks, which appear to be similar on the level of abstraction analysed in the study, the companies manufacture specific products, so that they are not directly comparable. On the other hand the companies' core competencies are concentrated in the productive areas. This implies that the exchange of knowledge concerning these areas is more likely to be regarded as critical. A further explanation lies within the fact that the companies' core competencies are considered highly developed so that an exchange of knowledge and experience is sought in other areas.

During the following phase, the *implementation*, based upon the identified potentials for knowledge exchange and the results of the analysis and conceptual design, appropriate KM-measures as well as pilot areas for their implementation were chosen. The objective of such pilots was to initiate and support the transfer of knowledge and to generate best practices for the whole VIA-network. With the help of the method map developed within the project, the following

KM-measures were chosen: thematic working groups, Communities of Practice, as well as Yellow Pages and database-solutions. The areas in which such measures are going to be implemented are: remuneration, emergency planning, treatment of surface, performance figures/ controlling, analysis of customer satisfaction, and total productivity management.

At the current stage, the thematic working groups and the Communities of Practice are being initiated, while the technical solutions for the Yellow Pages and the databases are being selected.

7. CONCLUSIONS AND FURTHER NEED FOR ACTION

The methodology presented in this paper provides a framework for the analysis, conceptual design, implementation and operational management of KM within inter-organisational networks. The methodology consists of a description model, in which all the relevant elements (i.e. KM-Tasks, the network itself, KM Design Areas, KM Methods and Instruments) of KM within networked organisations are included, as well as a procedure model, in which the different phases of the KM life cycle in the network are introduced.

The application of the methodology in the VIA-network was also presented; in particular the phases of initialisation, analysis, conceptual design, and implementation were discussed. The next step will be the operational management over time of the selected KM-measures. In a final step the implemented KM-measures will be evaluated in the VIA-network and hence extended to the other 15 enterprises of the network.

As far as the theoretical framework is concerned, the current research issues are a deeper analysis of the interrelations between the elements of the design areas, since within the case study potentials could be highlighted; eventually, the development of an appropriate set of performance figures to evaluate the effects of KM-measures in the above-mentioned areas is also striven.

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