

# Inter- & Intradepartmental Knowledge Management Barriers when Offering Single Unit Solutions

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## ABSTRACT

The Business-to-Business market is increasingly characterized by customers asking for solutions fitting their infrastructure and functional requirements in a short timeframe. The high frequency of such *single unit solutions* and the unpredictable and often very specific customer requests challenge the supplier's knowledge management. This paper analyses knowledge management barriers hampering the acquisition and production process, in particular, due to misunderstandings between sales and engineering departments. Following a literature review with 162 papers and an empirical study with thirteen semi-structured interviews three measures are identified for overcoming these barriers and establishing a global culture of knowledge sharing.

## Keywords

Single Unit Solution, Inter/Intradepartmental (IT-based) Knowledge Management, Knowledge Management Barriers, Semantic Barriers, Standardized Processes.

## INTRODUCTION

"Today there is a clear trend towards customer specific solutions in terms of either customization or even the offer of single unit solutions". This statement by the director of a Fraunhofer Institute particularly concerns the Business-to-Business market. There, single unit solutions (SUS) increasingly gain importance, e.g. because pre-existing production facilities of the customer require that new products obey to the existing infrastructure while meeting the customer's functionality requirements (Weiber & Ferreira, 2015). To be competitive, suppliers must therefore be able to identify quickly the essential criteria to generate a fitting solution that optimally exploits available components and minimizes the adaptive work (Fließ, 2015). This process step is critical, as even minor variations of a contract may substantially increase the production effort, an effect that can typically only be controlled by high engineering expertise. Thus the communication between the sales and the engineering department constitutes a critical bottleneck. Correspondingly optimized knowledge management (KM) is a crucial challenge. According to the Senior Director Software Design of a globally operating manufacturing firm, SUS projects are particularly vulnerable to KM barriers (KMBs) as they are complex, require many stakeholders with different backgrounds and often have to

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obey tight time frames combined with unpredictable requirements. This together leads to high uncertainty. How critical the situation is becomes clear when realizing the impact of KM on top firms operating in less uncertain and responsive settings. Here, research estimates that due to KM failures accumulated losses to US Fortune 500 companies reach around \$31.5 billion yearly (Babcock, 2004). These failures result from firms struggling with many different KMBs, like e.g. hesitation to share knowledge, inadequate information technology, lack of time and resources. Therefore, good KM is a distinguishing factor that constitutes a major competitive advantage: knowledge is a highly valuable firm resource and its efficient and effective management difficult to accomplish (Ragab & Arisha, 2013; Argote & Ingram, 2000).

This paper addresses, to the author's knowledge for the first time, the impact of KMBs on SUS projects. It aims at identifying the relevant KMBs and their consequences, and reveals requirements for establishing a satisfactory corresponding KM strategy according to the following

**Research question:** *What are inter- & intradepartmental knowledge management barriers and their implications faced by large manufacturing firms when offering single unit solutions to other businesses?*

## Academic Relevance

The impact of KMBs on the efficiency and effectiveness of SUS project handling, an economically important research question, currently under-researched in the Business-to-Business market. As customer demand for rising flexibility is expected to grow in the future this research may initiate an entirely new line of research.

## Practical Relevance

This research practically impacts the identification of major KM bottlenecks that hamper SUS projects. By investigating internal KMBs it reveals ways to overcome them by aligning the sales, production, and maintenance processes. This misalignment has a strong impact on time and quality to market and total cost of ownership, making SUSs attractive when competing against mass customization offers. Therefore, the goal of the study is to prepare recommendations on how top-management can better address the KMBs and to identify key requirements for novel IT-based KM solutions.

## METHODS

The research approach follows Hevner's (2007) three cycle view of the design science research cycle, consisting of the relevance, design, and rigor cycles. The

environment was observed throughout the relevance cycle, identifying the need for better KM solutions that required to conduct research in the design cycle. Then in the rigor cycle the research was grounded with a literature review ensuring an understanding of KM and KMBs with support of state-of-the-art research. The quality and completeness of the findings were validated via empirical research at one large manufacturing firm when reconnecting the design and relevance cycle.

To ensure the quality of the literature review the Journal of Knowledge Management was chosen as backbone: it is ranked first considering the citation impact and expert survey for KM literature in 2013 (Serenko & Bontis, 2013). All papers published since 2012 were checked regarding their relevance for KM and KMB and 84 papers were selected. These findings were complemented via a keyword search on Google Scholar and Scopus with keywords like e.g. 'knowledge management' and 'knowledge management barriers' that yielded 78 papers.

The findings from the literature review address the KMBs potentially present in firms. As no literature was found that directly addresses the SUS context, it is the role of this empirical study to close this gap and narrow the general findings down to identify the KMBs in the specific SUS context. The empirical study comprises thirteen semi-structured in-depth interviews with representatives from the SUS context. Nine of them belong to the same globally operating manufacturing firm, whereas the other four belong to other firms/industries. The goal of these interviews is to highlight the SUS context and its KMBs from different angles, with interviewees operating in different positions, e.g. from the two main involved departments (sales and engineering). To gather the information of interest the interviews were conducted as guided conversations ensuring that each interview covered all topics of interest which always took over an hour. The interviewees were asked about their 1) working context (nine specific topics), 2) the existing internal KMBs (eleven specific topics), 3) their satisfaction with current internal processes (five specific topics) and 4) their proposed changes (nine specific topics). The outline for the interviews can be found in Steffen, 2016.

The procedural and personal reactivity bias could not be prevented, however they were limited as much as possible via e.g. a neutral interviewer standpoint, by asking open-ended questions, and allowing for sufficient time in each interview for the experts to make all their points. Still, the reliability and validity of the results are potentially reduced (Wilson & Sapsford, 2006).

## LITERATURE REVIEW

Riege (2005) identified three categories of KMBs, organizational barriers, technology barriers and individual barriers. Here, this categorization is complemented by the *semantic barriers* to emphasize an important difference when trying to overcome existing individual barriers: whereas it is possible to influence the employees' willingness to share via adequate incentive schemes or guarantees to eliminate fear, differences in cultural

background, education, and experience are much harder to bridge and therefore require a dedicated treatment.

The main literature review findings showed that KM cannot be effective if it is not well integrated in the firm's goal, strategy, culture, and structure (Riege, 2005; Kukko, 2013). Top-management must clearly communicate the value of knowledge sharing, stimulate a collaborative culture, offer a multi-space workspace environment, and integrate a well-functioning IT infrastructure (Sing & Kant, 2008; Riege, 2005). Otherwise, knowledge sharing is not effectively encouraged. Introducing these measures in combination with aligned HRM incentive schemes and allocation of additional time to actively participate in knowledge sharing activities are intended to guide, stimulate and motivate the individuals to engage in knowledge sharing (Ghobadi & Mathiassen, 2014; Williams, 2007). If the employees understand the value and benefits of knowledge sharing and are supported by workshops familiarizing them with the IT infrastructure they most likely will be motivated and committed to engage in knowledge sharing (Riege, 2005; Kukko, 2013). More complicated to address are the semantic barriers due to differences in the employees' absorptive capacity. This barrier cannot be overcome easily, however, e.g., the engagement in socialization activities encourages the development of a common understanding (Ghobadi & Mathiassen, 2014; Bloice & Burnett, 2016).

## EMPIRICAL STUDY

The interviewees emphasized that KM can only be successful if those who are in need of supportive knowledge find it, understand it and use it. This requires a firm-wide adoption of the KM approach, which is only possible if the KMBs of all four categories are overcome. Here, the severity of KMBs differs depending on the firm's KM maturity level (Oliva, 2014).

Currently, the project teams have to handle many SUS projects simultaneously with little time and resources they can devote to the individual project. "Due to this resource scarcity and constant stress the employees are only able to extinguish the fire, but there is no time to find and fight the cause which could prevent the same mistake or problem from happening again" as mentioned by the Senior Director Software Design. In this situation many things are only done in passing by, without having the time to sit down, discuss, and solve issues in detail.

Aggregating the findings reveals that all four KMB categories identified in the literature review impact the performance of SUS projects. Organizational KMBs play a key role and if they are adequately addressed by the top-management to encourage KM, this directly impacts the other three KMB categories, among which the semantic KMBs are particularly difficult to address. Smattering is a typical semantic KMB: a person (enthusiastically) engages in the discussion without being aware how partial the own knowledge is. A striking example of this, which typically affects highly motivated people, happened in a warehouse scheduling project concerning efficient loading and unloading of trucks as was explained by a Professor of

computer science and IT consultant. The client, a logistics expert, asked for a solution where the number of ramps doubles at noon. When asked how this can be, he said that, in average, the loading and unloading processes take half a day, which means that the trucks that arrived in the morning typically leave at noon and free their ramps for the second shift of trucks. He was proud to tell that to his knowledge scheduling systems are not able to directly deal with loading durations and the arrival and departures of trucks. Such misconceptions of IT limitations, which are typically based on certain experiences (perhaps with premature software systems), are not rare but hard to detect and to overcome, as the underlying strong belief of limitations and necessities is neither stated nor criticized.

This example clearly illustrates that a best effort to overcome a semantic hurdle may be very harmful. This KMB can only be overcome if employees are advised to concentrate on their expertise. Today, systems change too quickly for outsiders to follow the developments.

## RESULTS

The interviews revealed an important difference between the global (firm-wide) level and the local (project team) level concerning the individual KMBs. Whereas at the local level trust and willingness to cooperate and share are typically given, this is not the case at the global level, which is often perceived as uncertain and competitive. In fact, many of the problems at the local level are simply consequences of problems at the global level: missing guidance, too strong formalization, enforced indirect communication. A similar trend can be observed between inter- & intradepartmental KMBs where the former struggles more especially due to the stronger impact of the semantic barriers. Enterprise-wide enhancements of stimulating and facilitating collaboration are more effective than their decentralized counterparts at the departmental level (Lee et al., 2012), indicating that with appropriate changes at the global level it should be possible to establish IT-based support to overcome most of the identified KMBs.

It is important to note that the employees' behavior and perception highly depend on the given situation, directly impacting their willingness to contribute. This concerns in particular the IT infrastructure. The top-management needs to recognize that an unsatisfactory solution here is counterproductive, with uncontrollable costs in the long-term. The KM tools must be able to fit into the processes, provide an overview of the projects' status, of similar

projects and contracts and of product configurations at all times in order to allow more accurate estimations and an up-to-date overview. This includes the requirement that tools must be user friendly, e.g., provide the user with tailored views, and not require the employees to have to (precisely) know what to search for and where. Only this way it is possible to overcome the inherent semantic KMBs. More generally, a KM system should allow employees to directly interact with it at their level of expertise, without requiring any artificial encoding. This directness does not only reduce potential misconceptions but also lowers the entry hurdle for new employees.

Thus top-management needs to make KM a high priority and adapt the internal structures and culture to clear the way for a successful change. Here, it is important to guide the employees and free resources to carefully develop and introduce comprehensive support, e.g., via adequate role-specific views. Figure 1 illustrates the sales/engineering view distinction, which can internally be resolved by a KM tool to overcome the corresponding semantic hurdle.

## CONCLUSION AND DISCUSSION

This paper has analysed inter- & intradepartmental KMBs in the context of SUSs, which today constitute a major bottleneck when offering customer-specific solutions. In particular in the Business-to-Business market SUSs are gaining increasing importance as customers wish bespoke solutions fitting their needs and requirements. It is the high frequency of SUSs projects together with the unpredictable and often very specific customer requests which makes KM a challenge of highest importance. In fact, despite the comparatively high margins and the tighter customer relationship combined with a closer link to market trends, SUS projects are high risk because of unpredictability, as sometimes seemingly simple adaptations may require an unforeseen major effort which overthrows the entire project calculation. Such problems are typically rooted in miscommunication between the sales and the engineering department - the reason for this research to have mainly focused in its empirical study on KMBs between those two departments.

This paper has revealed interdependencies between (the four categories of) the KMBs and identified three measures for overcoming them in order to establish a culture of knowledge sharing, providing:

*Standardized processes* that guide and coordinate the employees from a global perspective. In particular, each employee should be guided to clearly conform to the own

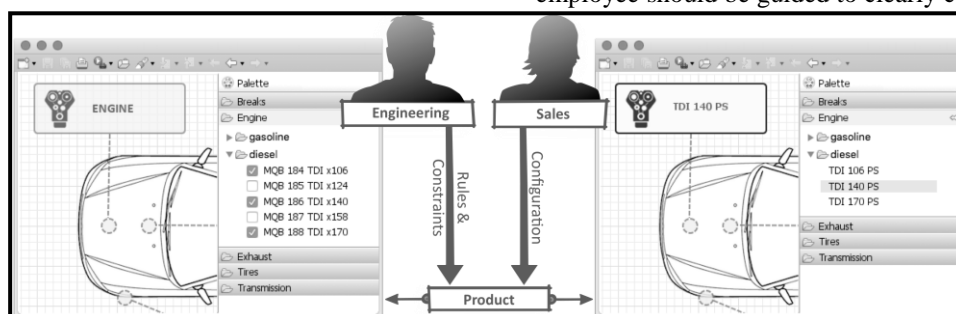


Figure 1: Role-specific views (Steffen et al., 2016)

level of expertise in order to avoid misconceptions.

*Transparent managerial communication and firm-oriented incentives* in order to establish a global culture of trust and common goals. This in particular, overcomes most individual KMBs and avoids uncertainty.

*IT-based KM* to provide up-to-date knowledge and bridge the semantic barriers, e.g. by providing role specific views and process-oriented guiding.

Addressing the employees in their 'language' is of major importance to avoid misunderstandings and to establish a smooth cross departmental dialogue. An adequate KM system has the potential to overcome the need for a human gatekeeper that is able to translate between, e.g., the sales and the engineering languages.

In fact, enabling the inter- & intradepartmental dialogue with such a KM system should automatically lead to a steep learning curve and a continuous improvement cycle, also overcoming problems like re-inventions of the wheel. This is a major competitive advantage, as it does not only accelerate the SUS project definition and development but also the maintenance.

Finally, from the scientific perspective, several important requirements were identified while emphasizing especially the key role of the global level. Without top-management support, overcoming the KMBs - even with the best IT tooling - will hardly work. Similarly, the requirements for a supporting IT system systematically derived from the interviews clearly indicate how the technology KMBs should be addressed. Particularly interesting in this context was the revealed importance of role-specific views. The paper introduced the notion of semantic KMBs to better address this identified need.

#### ROLE OF THE STUDENT

The research was triggered by a one year internship where the author investigated the change management perspective of introducing an overarching KM system. The more focused topic of the Bachelor thesis was defined with the supervisor. The actual results were independently achieved by the author.

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