

Information and Knowledge Sharing: Involving Customers in Developing Services

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Abstract— Understanding customer needs is a critical success factor in development of products and services. In most enterprises there are several people interfacing with customers, throughout the organization in different units and functions. The result is that information on customer needs and requirements exists, but it remains scattered and unorganized. Another issue is that those who are interacting with customers are not necessarily involved with development of products and services. Here the challenge is to integrate information and knowledge from customer needs to the R&D process. Theoretically, there are mechanisms for sharing information and knowledge. Using different knowledge sharing mechanisms becomes especially important in large organizations which operate in multiple locations. These call for infrastructures, rules and procedures so that sharing of information would be possible. In this research, we study mechanisms that empower the sharing of knowledge and information on customer requirements, so that it could be effectively used in the R&D process

Keywords- *knowledge sharing, R&D, customer needs, customer requirements, absorptive capacity, development*

I. INTRODUCTION

Information and knowledge sharing is important in all types of organizations. This means that there is a need to access and capture information, and shared it between units, teams and individuals throughout the organization. Zahra and George [17] use in this context the term absorptive capacity. It is defined as organizational processes and routines that are used in capturing, integrating and using information in developing dynamic capabilities in the organization. Absorptive capacity is here connected to the challenge of understanding customer, which involves sharing information and knowledge on customer needs.

Information and knowledge sharing is facing challenges which depend on the type of information that is intended to be shared. In operative activities knowing what, why and when is needed in order to have things done. This type of information is often numeric and manageable, in a way that it can be captured, stored or generated from processes. In contrast, information that is needed in business processes and strategic management of the enterprise calls for information which is not as straightforward to express in written form, and thus managing and sharing of this type of information is more challenging.

In this research we look at challenges in understanding customer information, in capturing and sharing knowledge on customer needs. The research is based on frameworks of absorptive capacity and classification of different knowledge-sharing mechanisms which will be used in studying different knowledge sharing practices found in case organizations. The empirical part of the research relies on interviews with selected persons in R&D and marketing departments. We also gave key customers a questionnaire so that the information sharing interfaces and mechanisms could be mapped. We approached altogether 9 large case organizations which all share an interest in developing services based on customer needs. Most of the case organizations operate in the industry, have manufacturing sites and units in different countries and customers worldwide.

The structure of the paper is following: first we look at different types of information and knowledge. Depending on the type of information the mechanisms and methods of sharing it vary; this is an issue that is being discussed in next chapter. Involving technology and information systems is a delicate issue, in some cases personal approach is more appropriate. In the conclusion we argue that there are several methods in listening, engaging and empowering people who are involved in sharing information on customer needs.

II. MANAGING INFORMATION AND KNOWLEDGE

Information and knowledge is a multifaceted concept. Polanyi [14] differentiates between tacit and explicit types of knowledge. The taxonomy is based on the ease of articulating and communicating knowledge to others. Another viewpoint is whether information and knowledge is individual or collective, or the extent to which knowledge is being held by one individual or embedded in the interaction of a group of people [3], [12].

In this research information and knowledge are studied in business context. Shortly, successful companies understand customer needs. This involves focusing on customers and working together with the clients in order to integrate customer-related information in to the development process. Customers have experience-based knowledge of products and services, therefore it would be important to better connect customers to development process [16], [4]. Managing customer related information includes capturing and sharing external customer information available from the

customer himself or herself, for example ideas from a meeting with the customer. It also involves internal information; capturing and managing information on customer purchases, profitability etc. which are result of operations and obtainable from within the enterprise that is dealing with the customer.

Information management is here connected to the concept of absorptive capacity. It is a combination of processes and routines that are used in the organization in capturing, integrating and using information in developing dynamic capabilities. These capabilities give the organization potential to develop competitive advantage in the market [10]. Methods, processes and practices vary from organization to another, they may not be easily copied from one setting to another. The role of contextual elements – fit of people, information sharing methods and platforms to a certain situation – is what makes managing customer related information effective.

Managing information and knowledge is here defined as management of information, and sharing this information with others so that it adds value. This requires understanding what information is about, contextual factors are important so that information can be used wisely. Knowing what to do with information, how it has been generated etc. are examples of context-related issues. It is understanding the contextual factors that separates knowledge from information [1].

In this paper we look at information and knowledge that is needed in developing business further. Understanding the needs of the customer is cornerstone of business operations, therefore we study customer-related information. As noted by Hou [10] besides customers are other sources of external information as well which should be managed – like information from competitors and what they are doing, information on technological advancements. In addition, political and economical changes need to be taken into account.

III. INFORMATION AND KNOWLEDGE SHARING

The term knowledge-sharing mechanism refers to formal and informal mechanisms which are used in organizations for sharing information and knowledge. The focus is on sharing information and knowledge that is embedded in individuals or groups so that it can be used in work-related processes and activities [2], [3], [12].

Information and knowledge that should be shared may not always be easily shareable. Information sharing involves mapping the persons who are sharing information, defining the information itself and passing it on in an understandable format. When the information is complex this is not easy, sharing it with others may require prior knowledge of the subject area, and call for further clarification. If there is person-to-person interaction between humans the interaction itself is one component in the process. Here for example how information is presented and how reliable the source of information is considered affect the knowledge sharing process.

Aggregation of knowledge is a key concept in understanding information and knowledge sharing [3], [13].

It refers to the degree of aggregation which varies from personal and individual to collective knowledge. Personal knowledge is by definition individual, collected and stored for private use whereas collective knowledge is – ideally – generated, gathered and stored in a way that it is shareable and available for colleagues. Collective information and knowledge may be seen as integrated, embedded and institutionalized part of structures and routines of the organization. It must be noted that in organizations there is also “personal” information which is intended for personal use. Often this type of information is stored in the memory aids that people create for themselves. For example, notes that people write with their portable devices in a meeting. However, this knowledge and information might also be shareable and accessible to others, and it might be valuable to colleagues when shared. This highlights the fact that people are in the core of all knowledge sharing mechanisms – sharing information and knowledge is not technology alone even though there are all kinds of technical solutions available.

The degree of articulation is another key concept in this context. Degree of articulation is classified into explicit and tacit knowledge [14]. Typically, some information is relatively straightforward, easy to convert into oral or written format and thus can be made known – explicit - to others. Tacit knowledge cannot be shared as easily: tacit knowledge is often based on expertise and experience, and may not be explained or expressed in words [12].

Typically, in organizations there is plenty of data which is generated through organizational processes and directly stored into digital format. This type of information can easily be accessed, combined and transferred from one location to another. As an example, data on production and sales volumes is typically stored to information systems which are used in these functions. The related question could be

“How many units of product A have been manufactured in line X on last Tuesday?”

This kind of information is result of the manufacturing process, and data can be retrieved from the manufacturing information system so that the question can be answered. The answer is a number, straightforward to understand and can be easily shared with others. However, all questions may not be answered by retrieving the correct answer from the database. Many answers contain knowledge which is more difficult to articulate, often because it deals with issues which are not clear. Consider following question

“Why have the manufacturing volumes of line X been dropping?”

These manufacturing-related questions indicate the challenges of articulation. The first question can be answered by simply checking the production numbers. The prerequisite is that the company has a system for storing, browsing and retrieving manufacturing information. Usually this is the case so there is no problem here. The second question– why have manufacturing volumes been dropping - can be connected to several “issues” which have their roots either inside the company or in its environment. The volumes may have gone down because of problems with raw-material delivery, or there is not enough demand on

products, for example. The explanation may require combining different facts and issues. Answering the question calls for understanding the overall setting, taking into account several factors that affect manufacturing is needed in order to answer the question thoroughly. This kind of expertise is referred to as tacit knowledge [12].

A. Mechanisms in information and knowledge sharing

Information and knowledge sharing is based on two main mechanisms (Table 1): knowledge may be shared from person-to-person which is referred to as personalization, or using technology and information systems to store, manage and share information that is codified to a format that allows this. When knowledge and information can be expressed in words and numbers it can be codified and shared, transmitted and stored in electronic format which allows browsing, retrieving and combining information. On the other hand, mechanisms for sharing experience-based, unclear, intuition-based or non-verbal information with others - tacit knowledge - cannot take advantage of technology and computers, not at least as directly as in the case where information is originally alphabetical, created and managed with information systems.

TABLE 1. MECHANISMS FOR SHARING KNOWLEDGE

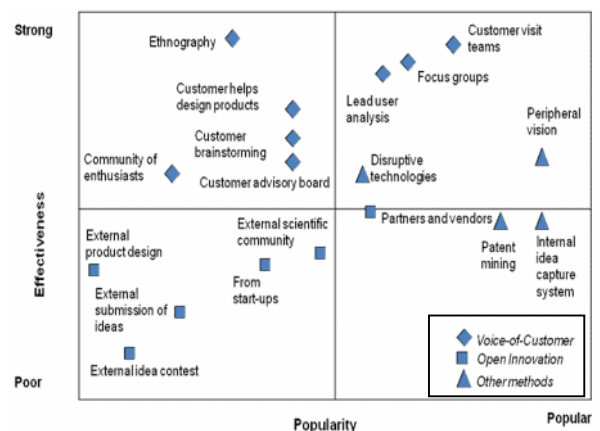
	Individual	Collective
Tacit - Personalization	Social Networking	Facilitating person-to- person knowledge sharing
Explicit - Codification	Sharing personal memos, working papers etc.	Knowledge management applica- tions

The mechanisms for sharing knowledge (Table 1) combine the two dimensions of information and knowledge. As a result, sharing knowledge and information is classified into individual-explicit, individual tacit, collective-explicit and collective-tacit classes. The degree of articulation is shown on the vertical axis explicit – tacit, and the level of aggregation - individualization and collectivism - is on the horizontal level. Depending on the degree of individualization and collectivism and the type of knowledge are the knowledge sharing mechanisms more person-to-person oriented or rely on sharing codified information, often using information technology. Classifying information and knowledge into one of the four segments helps in understanding mechanisms and methods in collecting, storing and sharing information, and the roles of information

technology vs. person-to-person interaction. For example, when information is explicit, and/or collective by nature storing, retrieving and transferring it is relatively easy by using information technology (down-right corner in Table 1). [3], [7].

Information technology has an increasingly important role in knowledge sharing, but it is not the only thing that is needed here. Information that is individual and tacit is considerably more challenging to share (the opposite corner in Table 1). Boh [2] argues that when the complexity of information increases more personal interaction is needed in understanding it. Often sharing information calls for discussion and clarification so that there will become mutual understanding of phenomena. This highlights the importance of personal interaction, especially when the information is tacit.

In real life there are several practices for sharing information and knowledge in organizations. Factors like organizational size, geographical distances and industry explain the variety of different knowledge sharing methods. Typically, when the organizational size increases the challenges in managing dispersed locations, units and teams require more integration than in a smaller company. The challenging issue of interest is finding the best methods in sharing information and knowledge throughout the organization. Practices in one organization may not fit other, and even between units in one enterprise there are differences in the way information sharing among people is done. Typically, there is a built-in process of adjusting and developing process to address the needs of the people involved [2].



Source: Cooper & Edgett 2008

Figure 1. Methods in sharing information with customers

In this context understanding customer needs and sharing customer-originated requirements is of special interest. The taxonomy of methods in sharing information with customers (Figure 1) is a summary of results from a research which included over 160 companies. In this research Cooper and Edgett [6] studied the methods of capturing and sharing customer information on customer needs, in connection with

idea generation and R&D development. Here the objective is to determine how extensively each method is used (popularity), and to gauge management's perception of the value of the method (effectiveness on the vertical axis) in generating high-value new product ideas.

The findings of Cooper and Edgett [6] indicate that most effective results can be achieved by working together with customer (methods above the horizontal middle line). Examples of these methods are customer visit teams, focus groups and lead user analysis. Also describing the relation from an ethnographic viewpoint and involving the customer in helping to design products, brainstorming, customer advisory board and building a community of enthusiasts were considered effective.

The most popular methods include internal idea capturing system, which usually involves staff soliciting new product ideas (often using internal Web pages), and then screening and managing these ideas with a structured process. Peripheral vision and patent mining were also very popular, and like internal idea capturing system these are methods that are based on organizations internal ideas, and do not directly involve customers in idea generation. Peripheral vision refers to assessing the external world to identify trends and threats and, through this process define potential new products. Patent mining involves mapping or mining others' patents and seeking technical and competitive ideas. However, this method does not directly generate new product ideas as such. The common element of these methods is that they do not involve customer in idea generation.

Discussions and changing ideas with the customer is a key issue. Relying on ideas submitted to competitions is not very effective (lower left-corner). It is still possible to take advantage of technology also in this context. Making notes with computers and PDA's, sharing memos with email, using CRM-systems to record ideas are examples on how technology can support capturing and sharing information and knowledge – once it has been codified to written format.

How is information being shared with the above methods? The mechanisms for sharing information and knowledge are mostly person-to-person, there are few exceptions like external submission of ideas that rely directly on technology in capturing ideas. The information in product and service development is mostly complex, unclear and tacit. When new innovations are being developed sharing ideas, discussing and brainstorming together rely heavily on personal interaction with others. In most cases ideas, comments and advice from the customer come through discussions, meetings, workshops and alike.

B. Personal interaction or information technology

Let us look at knowledge codification. It refers to a knowledge-sharing mechanism which aims to capture knowledge into systems that are accessible to others in the company. Usually knowledge-sharing mechanisms that rely on codification take advantage of information technology, computer networks and knowledge management applications. The mechanism should capture knowledge that

is individual or collective in nature and make it wider property of the organization [8]. Hence, there should be an underlying technical infrastructure for sharing codified knowledge which has to be implemented, in operation and continuously developed in order to create a robust platform for sharing codified knowledge.

Information that is tacit cannot take advantage of information technology as directly: experience-based knowledge may need to be interpreted in order to be understood. Also in this case organizations have to develop platforms for sharing knowledge and information, there is a need for facilitating person-to-person knowledge-sharing – personalization - which is the primary mechanism for sharing tacit information. Here social networking is important [9].

It is argued that knowledge sharing mechanisms that are based on personalization are rather 'ad hoc' and informal because they are result of interaction between humans. On the other hand, the advantage of personal interaction is flexibility and the possibility to transmit and share tacit knowledge. In contrast, sharing codified information is assumed to be more formal and incorporate electronic databases in knowledge sharing [5].

Information technology allows connecting to information anywhere and at any time. However, this is not the case with person-to-person knowledge sharing. It has relatively poor geographical reach and also the number of people who can share information in this way is limited [18]. Whereas codified information can be coded, stored, browsed and retrieved with computer technology, requires personalization a more 'personal' approach. The knowledge seeker has to get into touch with the potential knowledge provider, and the knowledge provider should be willing to share information and knowledge with the knowledge seeker. Knowledge sharing via personalization means that the person who seeks knowledge is aware of what information others have, and knows where to find memos, working papers etc. Asking from colleagues may also lead to other concerns; seeking information from others in the company may be considered as a weakness or ignorance on a given issue [11].

The most significant benefit of personalization is flexibility in sharing information as personal interaction allows clarifications, argumentation and discussion, thus making it possible to share ideas and get feedback, build "consensus" in a way that it becomes clear that both the sender and receiver of information understand the issues and phenomena that are being shared. Furthermore, discussions and sharing different viewpoints can also generate new knowledge [15]. Promoting personal interaction and personalization should therefore be emphasized throughout the organization.

IV. DISCUSSION

It is important to notice that some knowledge and information is created as result of cooperative action while other is result of personal reflection, intuition and understanding. In both cases the importance of human element in sharing knowledge is significant. Dealing with individual and/or tacit information is more challenging than

sharing straightforward data [2], [7], [12]. Furthermore, the greater the complexity of the information the more is personal interaction needed in understanding it [2]. Often both technological solutions and person-to-person interaction mechanisms are used as these tend to complement each others in knowledge sharing [2]. This notion gives us an additional dimension to the framework for sharing knowledge.

The use of different knowledge sharing mechanisms in product and service development was studied empirically in a group of case organizations. The goal was to identify and evaluate methods in capturing customer requirements in product and service development. Here we study the mechanisms that have been developed and are being used in gathering, storing and sharing information on customer needs, and then integrating this information into product and service development process. As a result, the question of interest was how customers are connected into the development of products and services. We also studied how information technology is being used here, and what is the role of person-to-person information sharing.

The case companies were relative product-oriented, but they share a need for developing integrated services to the customers. This involves integrating existing products and services together, and moving from time-based pricing towards new pricing methods. Here issues like smooth operations, maintaining quality and avoiding interruptions are key issues, not the price of service-staff making a visit.

In developing products and services, a key issue is understanding customer needs. This research shows that there are several possible methods in listening to users, engaging and empowering the developers involved. Sharing information on customer needs, and making this more widely known among the co-workers is usually challenging. In the case organizations this issue was acknowledged and there were practices for sharing information on customer needs. These range from methods like working together with customers in development to internal infrastructures (such as workgroup and team-meetings, unit and company-level meetings gathering periodically or when needed). Clearly, the range of methods is an organization-dependent issue. These methods may also be extended beyond sharing customer information to a variety of other information sharing needs within the organization.

It seems that the more customer is involved in the development the better the solutions meet customer needs. It is still noteworthy that high customer involvement is only part of the formula; it is equally important to develop platforms and infrastructures for teams, units and functions that so that sharing customer-related information throughout

the organization would become possible. Ultimately, knowledge sharing depends on human motivation and dedication - these should be empowered in this context.

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