

INFORMACIJSKA TEHNOLOGIJA IN MANAGEMENT ZNANJA PRI ODPRTEM INOVIRANJU

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Povzetek

Razvoj novih izdelkov se po novi "odprti" inovacijski paradigmi začne s kupcem in ne znotraj podjetja. Pri inovacijah so zgodnje faze, predvsem faza generiranja idej, kritične, zato k njej povabimo kupce, da nam pomagajo s svojimi željami, idejami in izkušnjami s produktom. Wiki kot konceptualna in tehnološka rešitev omogoča geografsko razpršenim sodelujočim ustrezno tehnološko podporo pri reševanju ad-hoc problemov, shranjevanje, organiziranje in dostavo obstoječega znanja, zato je primerna za uporabo v tem delu procesa razvoja novega produkta.

Abstract

INFORMATION TECHNOLOGY AND KNOWLEDGE MANAGEMENT FOR OPEN INNOVATION

Following the "open" innovation paradigm leading companies are increasingly integrating customers into their innovation processes as they are the wellsprings of ideas and knowledge about the products. This paper focuses on customer integration into innovation process and how IT can be used to support it. Wikis are described as effective conversational technology for ad-hoc problems with decentralized knowledge sources, meaning that they are one fitting information technology answer to the cooperative Fuzzy Front Ends of innovation processes, particularly their realization phases.

Ključne besede

New product development, knowledge management, fuzzy front end, WIKI

1. INTRODUCTION

One of the most important organizational capabilities is ability to innovate and create new products for their customers (Grant, 1996; Kogut, Zander, 1992; Nonaka, Takeuchi, 1995). A well managed invention-innovation chain can be seen as one of the most crucial organizational processes. First steps of this process are knowledge intensive as problems need to be recognized and ideas for new products generated. As these products will be consumed (or not!) by customers, and as customers get to know products and their own needs better than the organizations that produce them, they should be one of the central sources of knowledge in innovation process. Ideas, thoughts and information about current products and services, customer trends and future needs, such as *knowledge from customer* represent ideas for product innovation. An organization must actively seek out such knowledge and enrich it using capabilities of its employees (Baloh, Desouza, 2006; Desouza, Awazu, 2005).

Organizations have realized the need to open up the innovation process by involving customers and even business partners in all facets of innovation. However, they continue to struggle with the lack of effectiveness and efficiency in the innovation cycles. Customers can never properly articulate their knowledge, and organizations are having difficulties introducing customers to product innovation process, querying their knowledge, codifying

that knowledge and capitalizing on actually acting upon it. In addition, the knowledge creation process in the front-end is difficult as it is impossible to envision all of the knowledge needs upfront or a priori. Requirements change over the time span of innovation development. Hence, one needs to be careful not to be too rigid in trying to design something, however, one cannot be too loose and unfocused – hence there is an innate fuzziness of the process, which is not easy to manage.

In order to innovate successfully, the innovation process must firstly be understood and effective decision on integrating customers in the process needs to be made. In addition, the innovation process needs to be supported effectively both by organizational and technology mechanisms.

2. INNOVATION PROCESS AND THE CUSTOMER INTEGRATION

Traditional (“closed”) innovation paradigm has been replaced by “open” innovation paradigm where there is a push to make the innovation process more open and collaborative (Chesbrough, 2003). External entities such as suppliers, customers, business partners, etc., are brought into the innovation process, as they can share knowledge about products and create new relevant knowledge in dialogue. The only possible competency today is co-creating products with customers (Prahalad, Ramaswamy, 2004).

This paper focuses on the first phase of problem recognition and idea generation often called **Fuzzy Front End (FFE)**. In order to successfully and fruitfully create new knowledge (i.e. start the innovation process) the integration of customers into the Fuzzy Front End (FFE) process needs to be well-planned and implemented¹.

Firstly, the decision to open the innovation process for external partners has to be made in accordance with the overall company and technology strategy. The expected customer contribution and the resulting specific customer roles are crucial for the execution/design of the whole process (Wecht, 2006). Open innovation is **initialized**.

Secondly, customers to be integrated need to be selected. The selection and engagement of fitting customers are important success factors (cf. e.g. Yoshingo, Rangan, 1995). The search for potential partners has to be systematic considering contextual factors like competition, market situation, and existing experiences. The probability of success regarding the above mentioned integration goals as well as a pre evaluation of strategic and cultural fit have to be taken into account. Especially relevant is consulting »lead user« segment of customers (von Hippel, 1986). Research has shown that the pressing needs of lead users will eventually become requirements for other users in the marketplace.

Finally, in the **realization phase**, the actual value creation takes place. The necessary steps are to shape the cooperation considering the respective customer role and to realize the integration on an operational level. In the remainder of the paper we focus on realization phase, as it is the most important of the three to gain *knowledge from customers*. Managers are faced with the challenge of identifying and selecting those activities that enable the organization to tap into customers’ knowledge and therewith create new organizational

¹ The necessary process steps are derived from both theory – drawing from the field of cooperations in general and R&D cooperations in particular – and practice – numerous interviews and case studies in Europe and the US.

knowledge. Geographical dispersion of customers additionally adds to complexity and fuzziness of the FFE process.

In next two sections, based on characteristics of each phase, necessary activities for knowledge creation in mixed teams will be identified. Special attention will be paid to **1) looking at contributions from integrated customers** and **2) IT-support for the process**.

3. KNOWLEDGE CREATION WITH INTEGRATED CUSTOMERS

According to (Nonaka, Takeuchi, 1995), knowledge creation is a dynamic process. Knowledge is constantly constructed with help of information that elicits new beliefs (based on existing ones), upon which expertise is applied in follow-up action. Mutual generation of knowledge is based on social relations, which result from the personal interaction between the individual persons involved - here between representatives of the manufacturer and the customer (i.e. Adams et al., 1998; Kogut, Zander, 1992).

(Nonaka, Takeuchi, 1995) identified four fundamental kinds of knowledge conversion in their knowledge creation/developing »SECI« cycle - the socialization (tacit to tacit), the externalization (tacit to explicit), the combination (explicit to explicit) and the internalization (explicit to tacit). Regarding the focus of this work - to facilitate the exchange and the creation of product and application-oriented knowledge for a manufacturer and its customer - the **combination**, **externalization** and **socialization** are of particular importance. Customers can synthesize new knowledge (e.g. new product properties) from the combination of various (explicitly) externalized knowledge elements. Externalization is the key to knowledge creation as it creates new concepts from tacit knowledge. However, when tacit knowledge is difficult to express, **socialization** process should be pursued as well. Engaging in joint activities such as brainstorming camps, working together, and observing customers at using products, facilitates common understanding between people with different knowledge bases (Nonaka, Takeuchi, 1995), which customers vs. company employees often have. Knowledge is sensed and understood through social interaction in group setting, resulting in new tacit knowledge creation.

So that such innovation can occur, customers must be able to make various interpretations of a given product or a given technology as well as to exchange those with other members of the “mixed innovation team” (also other customers). A substantial focus is thus on the integration of tacit customers' knowledge (about a product and its application context) and its transformation into explicit knowledge for use within the innovation process of the manufacturer. A distributed perception system supports such interpretations and dialogues within the innovation team by the supply of richer forms of self reflection and communication. In this connection (Nonaka, Konno, 1998) speak of "interacting ba" in that individuals exchange their mental models but at the same time also reflect and analyze their own. Such processes can lead to innovative results, which rise above the common knowledge stock of the “mixed innovation team”.

Organizations have begun to host user workshops and conferences for the specific purpose of getting to know how their customers utilize their products and how they have customized or modified them to meet their needs. To address these issues, many organizations have deployed user toolkits that enable customers to innovate with products and services (von Hippel, Katz, 2002). They can directly modify and customize products to meet their peculiar needs and preferences.

The nature of knowledge acquisition and conversion varies, as marked before, with the customer roles during integration. Therefore the instruments to support the generation of knowledge must be selected and adapted by the manufacturer accordingly. Next section presents possible IT support for discussed “fuzzy front end” activities.

4. IT SUPPORT FOR FFE PHASES

4.1 Role of IT in FFE phases

In the **initialization stage** IT will have a low role, except for the fact that helps us manage knowledge *about* our customers. Here, we can use IT get a sense of how our customer use our products and services by examining demographic, usage, and other forms of collected information. At the **preparation stage**, once again, IT will play little role, expect for the fact that we can use our customer databases to engage in data mining and other forms of information segmentation to begin to see what customers we would like to target. In the **realization stage** the role of IT is paramount. Among other ways, the following types of support are plausible to satisfy the knowledge needs of knowledge creation and reuse:

- (1) we can think of the need of IT to help connect the customer with the organization, for example the creation of shared electronic workspaces, team meetings, etc.
- (2) IT can help in the distribution and integration of codified knowledge through the sharing of corporate repositories,
- (3) IT, in the form of yellow pages, can help organizations map out who are the experts on different topics, and hence when difficulties arise during the innovation process, the point person an be located,
- (4) IT in the form of listservs, discussion groups, etc can help in brainstorming for ideas, sharing solutions to problems, etc, and
- (5) IT can help in the product design and product development through the use of virtual studios, CAD diagram tools, etc.

Figure 1 summarizes IT role in each of the FFE phases.

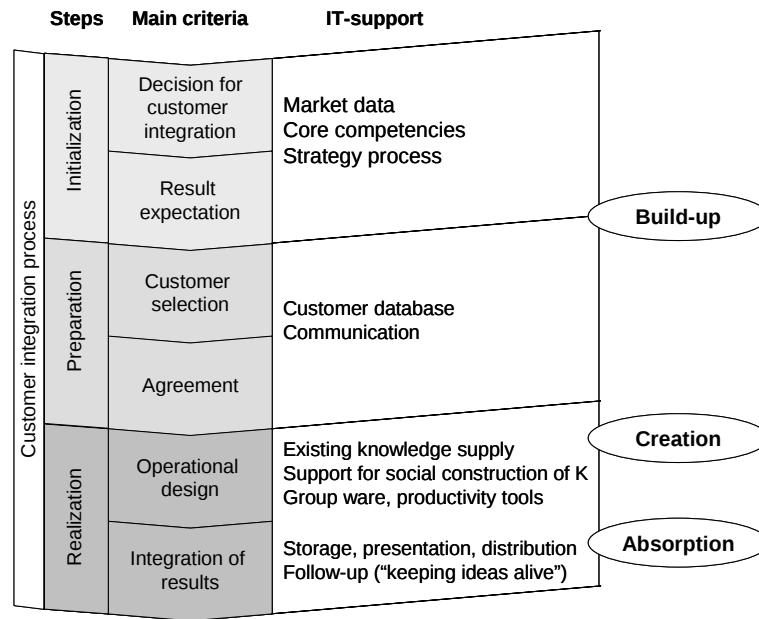


Figure 1: Application of IT in FFE

Possible operationalization of joint knowledge creation, distribution and storage in the operationalization phase is the use of Wikis, which functionalities cover many of the above mentioned types of support-functionalities.

4.2 Wikis in fuzzy front end product development

Knowledge creation in FFE should have a strong social-construction focus, being generated through dialogue and interactions. Traditional KMS applications (portals, expert reports, data minings, search engines) offer less ad-hoc knowledge creation capabilities as dialogue. Conversational technologies exist (i.e. Instant messaging, email, weblogs), however they had their limitations as well.

Wikis (from wikiwiki, meaning “fast” in Hawaiian) are a promising new technology that supports “conversational” knowledge creation and sharing. They enable many-to-many broadcast. More importantly, they come close to enabling social interaction as knowledge artefacts are edited rapidly (as in dialogue), and knowledge stored is changing until it reaches common understanding, belief, mental model. Then, it is also transferred in a central location, acting as a knowledge repository. At the same time, it stores indexed knowledge, which is not implemented in video / audio conferencing applications (such as Instant Messaging) or email applications (where only local knowledge is stored). Wikis enable collection / combination of knowledge of multiple experts seamlessly. Wikis offer fast knowledge creation (without need of editing, publishing, authorization by experts as is the case i.e. with FAQ's or portals), making it useful for environments where ad-hoc knowledge is required. It also offers knowledge creation tool to bring together knowledge of people from different locations to a centralized location, where it can be edited (created) by everyone. Wikis overcome the "same-time" issue (vs. scheduled chat, i.e.) as knowledge is stored around concepts.

How knowledge needs are supported by Wiki functionalities is shown in table below.

Table 1: Knowledge management needs, corresponding Wiki design principles, characteristics and features (Wagner, 2004)

User needs	Principles	Wiki Characteristics and Features
Ad-hoc knowledge	Incremental, Organic, Universal	Incremental knowledge creation as question answering; Power of N; Wiki editing features (speed of publication)
Finding knowledge	Unified, Precise, Incremental	Knowledge indexing and hyperlinking; Backlinking; Centralized, web-based resource
Filtering knowledge from noise	Unified, Precise, Convergent	Hyperlinking, Power of N; Removal of duplication
Quality of source	Open, Organic, Observable	Power of N; Record of history of changes with author information; Ability to comment on changes
Dynamically changing knowledge	Organic, Observable	Power of N, Wiki editing features (history and version management)
Distributed knowledge	Organic	Power of N
Errors and recovery	Open, Tolerant, Observable	Power if N; Wiki editing features (history and version management)
Publication overhead	Mundane, Universal, Overt	Wiki editing features; Wiki publication features

5. CONCLUSION

This paper focuses on the early phases of innovation process as they are important to start the innovation. Not that others are not important, on the contrary. Once those ideas are generated and developed, they need to be synthesized, crystallized, and implemented into a knowledge artefact which then has to be commercialized.

In the open innovation paradigm, external entities such as suppliers, customers, business partners, etc., are brought into the innovation process, as they can share knowledge about products and create new relevant knowledge in dialogue. Engaging such knowledge calls for a rich interaction between the source and recipients of the knowledge, so most organizations try to promote rich human-to-human interactions to get at such knowledge.

Wikis, however, come close to “real” conversational technology. They are most effective for ad-hoc problems with decentralized knowledge sources, meaning that Wikis is the right answer to Fuzzy Front End innovation process, realization phase in particular.

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