6 AN APPROACH TO IDENTIFY OPTIMAL PHASES OF NPD PROCESSES TO INTEGRATE STAKEHOLDERS

Rafael Kirschner[*,a], **Andreas Kain**[*,b], **Udo Lindemann**[*,c], **Jennifer Gunkel**[†,d], **Ruth Klendauer**[†,e], **Michael Schneider**[†,f] **and Monika Wastian**[†,g]

[*] *Institute for Product Development, Technische Universitaet Muenchen, Munich, Germany.*
Tel: +49-(0)89-289 151 41, Fax: +49-(0)89-289 151 44.
E-mail: [a] kirschner@pe.mw.tum.de, [b] kain@pe.mw.tum.de, [c] lindemann@pe.mw.tum.de
[†] *Institute for Sociology, Technische Universitaet Muenchen, Munich, Germany. Tel: +49-(0)89-289-24320.*
E-mail: [d] gunkel@wi.tum.de, [e] klendauer@wi.tum.de, [f] schneider@wi.tum.de, [g] wastian@wi.tum.de

Not only users of technical products but also other stakeholders such as purchasers, technicians etc. have the knowledge and experience to support new product development processes and to increase the probability of successful innovation projects. This paper presents an approach to identify the pivotal process phases within the NPD process to integrate this kind of external information. The approach consists of a combined application of interview methods (time line technique), supporting hardware tools (AKINET whiteboard) and already existing mathematical modeling tools (design structure matrices and clustering algorithms). The approach has been applied to a number of past innovation projects in order to identify coherences between innovation network patterns and the optimal process phases to integrate stakeholders.

Keywords: Stakeholder Analysis, Innovation Networks, New Product Development (NPD) Process.

1. INTRODUCTION

1.1. General Topic Idea

Homburg and Gruner[2] proved in their studies that very successful innovation projects differed significantly from less successful projects in the degree of customer integration. Their studies furthermore show that this correlation declines while integrating the customer in later phases within the NPD process. The characteristics of the involved customers have a significant effect on new product success as well. As an example, Gruner[1] states that collaborating with financially attractive customers or customers exhibiting lead user characteristics increases new product success. Despite all promising results in the field of customer integration research, the actual active integration of customers and other stakeholders is underdeveloped, especially in the field of small and medium-sized enterprises. The research project AKINET (German acronym for Active Customer Integration in Innovation Networks) aims to reduce these deficiencies by analyzing three core questions: (1) Who should be integrated? (2) At which point of the NPD process is this integration reasonable? (3) How can the integration be supported by methods and tools? This research paper presents the ongoing work on the second question, while the first question is subject of another paper presented on the ICoRD 09.

1.2. Specific Problems of Interest and Organization of the Paper

Lead users are without any doubt the “useful peak” of the “user population” for product development processes. They display two characteristics: (1) Lead users face needs that will be general in a

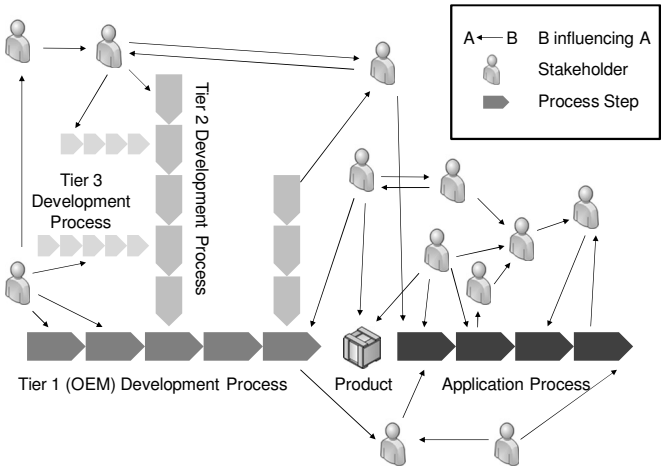

Figure 1. Branched NPD process leading into the application process with network of influencing stakeholders.

marketplace — but face them months or years before the bulk of that marketplace encounters them, and (2) Lead users are positioned to benefit significantly by obtaining a solution to those needs.[12] In order to expand the pool of possible carriers of knowledge, know-how and experience, the objective of the AKINET project is to identify them not only from the "user population" but also from other domains such as purchasers, involved technicians etc. In the further work they are characterized as "stakeholders", as they all have interests in the product, its application or the related development process. It is assumed that these so far non-involved stakeholders can increase the innovation degree in product development.

As mentioned before, the main focus of this paper is to identify the ideal point of time to involve these stakeholders in the NPD process. Figure 1 represents the conventional interaction between the branched NPD process on the left and the application process on the right hand side. The conglomeration of stakeholders — mostly users — around the application process with their interactions shows the contemporary approach: out of this pool the Lead Users are selected, even though they have strong links to the development process.

Chapter 2 gives a short summary of useful background information about innovation networks in general and the later on used Design Structure Matrices. As the ambition of the AKINET project is the expansion of the focus towards the combined process, a generic model for NPD processes is presented. In Chapter 3, the method to identify the ideal process steps within the NPD process is presented. The paper closes with first results in Chapter 4 and a discussion of these results in Chapter 5.

2. BACKGROUND

This chapter gives a short summary of background information and later on applied theories.

2.1. Innovation Networks and Stakeholders

Fischer[15] defines innovation networks an "an evolving mutual dependency system based on resource relationships in which their systematic character is the outcome of interactions, processes, procedures and institutionalization. Activities within such a network involve the creation, combination, exchange, transformation, absorption and exploitation of resources within a wide range of formal and informal relationships." According to Cliquet & Nguyen,[14] innovation networks are "powerful tools to foster innovation". In the context of the AKINET project, innovation networks extend to all entities that have any interest in the product, its application or its development — be it direct or indirect interests.

2.2. Design Structure Matrices (DSM's)

The DSM is a formalized approach to manage complexity by analyzing interdependencies and information flows within and between different domains. In this paper, the DSM is the selected tool to model and to analyze the complex network between the stakeholders, the NPD process phases and the application process phases. Design structure matrices consist of a square matrix with m rows and columns, and n non-zero elements, where m is the number of nodes and n is the number of edges in a diagraph model that represents the system. In this early phase of the AKINET project, the use of binary matrices will be sufficient, i.e. they represent the presence or absence of a relationship between pairs of elements of the innovation network.

2.3. Generic Process Model

Innovative products can be defined as new and significantly different products. But the launch of a new product is not a sufficient condition for innovation; the product also has to be recognized, sold, and used (e.g. Refs. 8 and 9). There has been a considerable amount of theoretical approaches to stage-models of the innovation process (e.g. Refs. 7,9,10 and 13). A complete version of a stage-model, developed from the current state of research and incorporating the whole process from the recognition of requirements to application includes the following stages:

(1) Requirements
(2) Problem Analysis
(3) Idea generation
(4) Conception
(5) Realization
(6) Adaption
(7) Application

In the (1) requirements stage, information is gathered about the market situation, about chances and risks, or about the organizational context. The recognized requirements are prepared for problem analysis in the (2) analysis stage. In this stage, product characteristics, and relationships between people and the process are captured. In the (3) idea generation stage, specific solutions to the problem at hand are generated. These solutions are refined and prepared for implementation in the (4) conception stage. In the (5) realization stage, the solution is realized, and in the (6) adaption phase, the solution is implemented. Finally, in the (7) application phase, the product is applied by the end-user. In contrast to traditional models of the innovation process, these phases are not meant to emerge one after the other in a linear manner. Moreover, phases can be skipped, passed through several times or parallel to other phases, or returned to at a later point in time. Van de Ven, Angle, and Poole[11] were one of the first who suggested, or recognized, the nonlinear progression of innovation processes. Although it has been recognized that innovation processes seem to consist of different, nonlinear phases, little empirical research has explicitly taken this into account regarding the integration of customers or other stakeholders into the innovation process. In the context of the AKINET research project, the presented innovation model will help to standardize past innovation projects in order to identify the optimal process phases for stakeholder integration.

3. METHOD

The developed method presented in this paper consists of three phases:

(1) Interview phase: Knowledge about past innovation processes is obtained by interviewing project managers. For the interview, the time line technique[4,5] has been adapted as described in Chapter 3.1.

(2) Innovation network definition phase: By means of the AKINET whiteboard tool, the innovation network of the past project is defined as described in Chapter 3.2.
(3) Analysis phase: The obtained design structure matrices are analyzed to identify the optimal phases of NPD process for stakeholder integration.

3.1. The Time Line Technique in the Context of NPD Processes

To gather information about who was involved at which time in the innovation process and about the network of players in the different stages, a method allowing for a considerable amount of temporal und relational complexity is necessary. In step one of the conducted studies the aim is to reconstruct specific innovation projects retrospectively. The second step is a live observation of an ongoing innovation project. In this paper only the retrospective approach (step one) is referred to, as the live observation is still in progress. A quantitative method would not be appropriate as it cannot display this temporal and relational complexity. Thus, an interview-method, the timeline-technique,[4,5] was used. This method allows for getting started in a structured way but also for the interviewee to narrate the story of one specific project in a non-constrained, open manner. The technique is based on Rogers'[3] Person-Centered Conversation and Witzel's[6] Problem-Centered Interview Technique. It combines the advantages of focusing on one specific project and remembering the process and the relationships step by step without putting too much pressure on the interviewee. The conversation is similar to a chat. The interviewee is narrating "his" or "her" project, and the interviewer reinforces him/her whenever a crucial topic comes up ("Really? Oh, this is interesting!"), or respectively redirects him/her in an appreciating manner to more relevant issues ("If you don't mind me interrupting you, you just said that…This seems to be an interesting point?"). One specific feature of this method is the visualization of the project in question. The interviewee is supposed to draw milestones of the project onto a timeline on a sheet of paper (see Figure 2, upper part). These milestones are then described in greater detail. After this, a high-low-curve is drawn into the timeline by the interviewee. This is to depict the affective evaluation of the process. Following this curve, highs, lows, and turning points during the project are explored. The steps of the interview are as follows: 1. The interviewee describes a specific project. 2. He or she describes project milestones and assigns these to the timeline. 3. The interviewer mirrors back, paraphrases, and sums up. This helps to correct and add relevant information. 4. The interviewee draws the high-low curve along the timeline. 5. The interviewer explores highs, lows, and turning points. 6. Again, the interviewer mirrors back, paraphrases, and sums up. 7. Finally, specific questions which could not be solved by then are asked. Following these steps, the project narration takes several cycles, each in greater detail. This helps to get a deep understanding of how the project proceeded, which were the critical events, and who was involved in the process at which time.

3.2. AKINET Whiteboard

In order to analyze the obtained data, i.e. to identify the optimal phase to integrate stakeholders, this data has to be prepared in a further step. As described before, the optimal display of the information for this purpose is the design structure matrix. A first set of exploratory interviews in the context of the AKINET project proved that the time line technique is not appropriate to explore the influences between all stakeholders and process phases. Therefore, a new tool was developed to bridge the gap between the interview results and the complete design structure matrix — the AKINET whiteboard.

It consists of a foldable and magnetic board that is covered with a washable, synthetic lamination. Together with a set of different magnetic symbols (process phase arrows, stakeholder tabs and memo tabs), this tool is applied in the interview sessions after the application of the time line technique. During the interview, a second interviewer makes notes of process phases on the magnetic arrows and places them on the AKINET whiteboard. Additionally, he or she tries to identify all stakeholders mentioned during the interview and lists them on the stakeholder tabs, placing them below the process arrows. After having finished the interview with the time line technique, the interviewee is invited to complete and rearrange the process steps and the stakeholder tabs. Then, each process step is marked

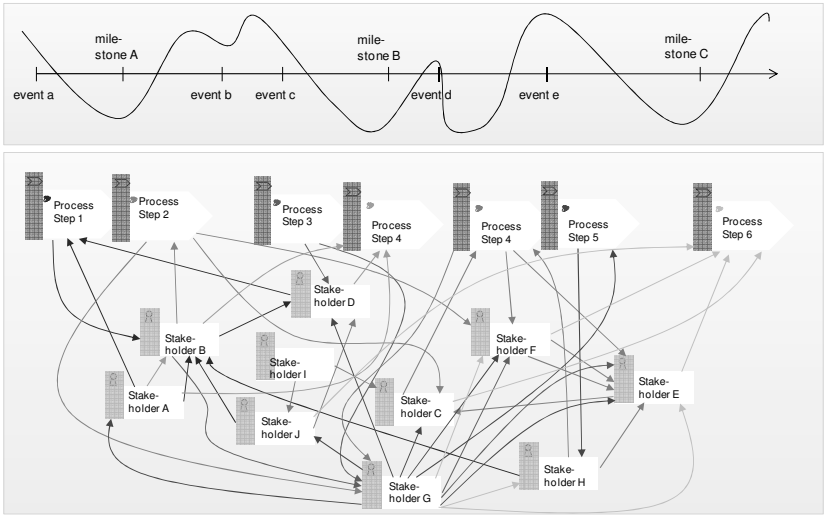

Figure 2. Exemplary result of time line technique (above) and the AKINET whiteboard (below).

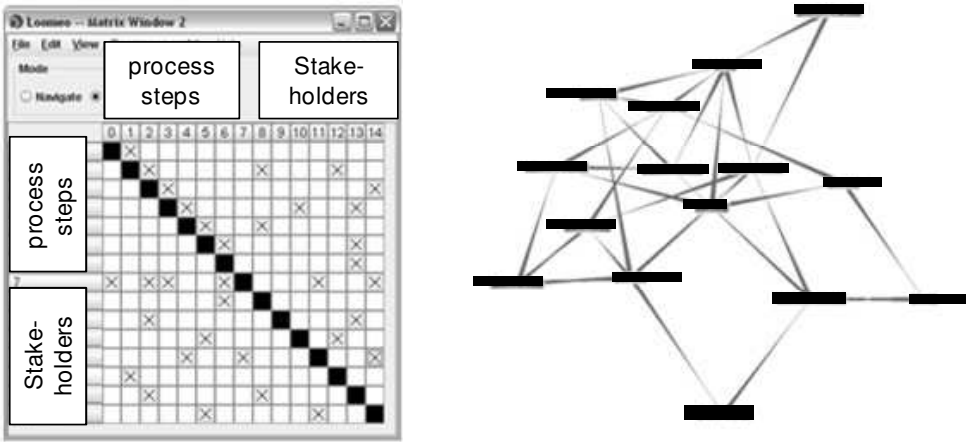

Figure 3. Gathered information in the form of a MDM the corresponding graph.

with a different color dot by using non-permanent overhead markers. The interviewee is now asked to draw the connections between stakeholders and process steps for each single process step using the respective color. Figure 2 shows an exemplary result in this state.

3.3. DSM Analysis

The innovation network information gathered with the time line technique and the AKINET whiteboard can be easily transferred to a DSM, as represented exemplary in Figure 3. By means of already existing software tools, such as LOOMEO, the identification of pivotal process phases in the context of the modeled innovation network leads to the desired result in the form of a generic NPD process phase as described in Chapter 2.3.

4. RESULT

The presented approach to identify optimal phases of NPD processes to integrate stakeholders bases mainly on shifting implicit and qualitative knowledge of the process involved entities towards a quantitative model and its analytical evaluation. This is achieved by means of the adaption, combination and development of existing and new methods. As a result of the tool supported analysis of the created DSM models, generic process phases are recommended for optimal stakeholder integration. Certainly, this information is provided too late for the optimization of the particular case. Nevertheless, by analyzing various past innovation processes, possible patterns of sensitive and non sensitive process phases can be recognized and thus be projected on running or even planned NPD projects.

5. DISCUSSION AND INTERPRETATION

5.1. Reflection of the Results

One main problem became obvious in the first evaluation examples of the approach: As every interview partner refers to a specific innovation project, the process phases obtained in the interview and the AKINET whiteboard application are different. Thus, by mapping these different phases to the seven generic innovation process phases, a loss of information and accuracy is inevitable. In contrast, the mapping of the recommended generic phase to the specific process phases does not cause problems.

In general, the quality of the results depends highly on the input data, i.e. the information given during the interview/whiteboard session. To get an idea of the accuracy of the information, two innovation projects were analyzed thoroughly by interviewing three involved persons respectively. Apart from small differences, the two innovation network models with their interrelations between the phases and stakeholders were highly consistent.

5.2. Future Work

The main work in the near future will be the application of the approach to various innovation projects in order to identify coherences between innovation network patterns and pivotal process phases for stakeholder integration. These projects will be stored in a database that enables the derivation of benchmark reports for the participating companies and their innovation networks. These reports will be an additional assistance to optimize or at least assess their own NPD processes.

As the AKINET project aim is the creation of a generic guideline, the implementation of a software tool for the automated analysis of the whiteboard results is aspired. In contrast, the application of the time line technique in the interview will hardly be automated.

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