Conference Paper

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Action research in Swiss companies

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Publication Date:
2005

Permanent Link:
https://doi.org/10.3929/ethz-a-006721118

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IMPLEMENTATION OF INNOVATION PROCESS MODELS – ACTION RESEARCH IN SWISS COMPANIES

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ABSTRACT
Today, new products or services are launched at an increasing rate. Therefore, innovation management has gained in importance with the objective of enhancing the effectiveness and efficiency of new product development. For a technology-based enterprise, the absorption of technical knowledge from universities and research institutes is crucial. Studies indicate, that particularly in small and medium sized enterprises, insufficient skills in innovation management hamper the absorption of technical knowledge. High class innovation processes are regarded as a key success factor (Legler et al. 2001, p. 141) to overcome this issue.

Overall, it has been shown, that an innovation process plays an important role as a success factor in new product development. The literature presents numerous process models. To maximize the effectiveness of an innovation process, it has to be customized to the respective company. The question, how to do this, is neglected in literature.

The objective of this paper is to propose and to test an approach how to customize innovation process models to companies and how to implement them. Hence, our empirical approach can be classified as action research. A basic assumption underlying our approach is that there is no company without at least fragments of an innovation process: rules and practices (perhaps not written down) how innovation projects have been dealt with in the past.

We propose a four-step approach:
- Analysis of the company’s innovation system,
- Identification of improvement objectives,
- Detailed analysis of the company’s innovation process,
- Prioritization of improvement objectives and implementation of new process elements.

The approach is tested in five companies and is illustrated with one in-depth example.
INTRODUCTION: IMPLEMENTING INNOVATION PROCESS MODELS AS SUCCESS FACTOR
In practice as well as in management research, process models are an expatiated element of innovation management to standardize or describe innovation processes. The literature presents numerous process models which are difficult to overlook (see table 1/ innovation process models). The literature often provides multiphase models which break the new product development process into sequential tasks and is influenced strongly by Cooper's phased stage-gate-process derived from the NewProd studies. Innovation process models differ with regard to the objective, level of detail and the main focus chosen. The lower the level of detail, the higher the compliance with other models and with real new product development processes. On the other hand, models with a low level of detail may lack specificity. Explicit process models have a higher force of expression, although they may be confined to for instance special branches or types of firms (see Herstatt, Verworn 2004).

Empirical studies indicate that firms using an innovation process are more successful than firms without a standardized innovation process (see table 1/ success factor). Only a few authors give advice on the implementation of innovation processes in companies (e. g., Rosenau 1996, p. 84, O’Connor 1996, p. 101). Innovation processes, e. g a stage-gate approach, were and are used as a management tool by many large companies such as IBM, 3M, General Motors and Northern Telecom. In a benchmarking forum with companies using a stage-gate-process, O’Connor identified seven challenges to the implementation of a stage-gate-process in a company:

- “Process optimization and validation,
- Gaining top management commitment and involvement,
- Structured decision making,
- Developing NPD (new product development) leaders and high-performance teams,
- Training critical skills and knowledge,
- Portfolio optimization, and
- Linking and positioning the process.” (O’Connor 1996, p. 192)

Additional hints can be found in the literature of business process reengineering (see table 1/ business process reengineering). Nevertheless, it must be taken into consideration that innovation processes differ from other business processes:
- They are more knowledge-intensive (it is not possible to include all the knowledge needed in a handbook of innovation – in addition, technical knowledge might be needed).
- They involve more functions of a company (in some cases all functions of a company are affected).
- They are more complex (even with a standardized process, each innovation project is different).
- They require continuous improvement (companies must adopt their innovation process to new requirements and challenges).

A detailed approach how to implement an innovation process which proved to be useful in several companies is missing. This paper tries to fulfill this gap by taking an action research perspective.
**Table 1: Literature Overview (selection)**

<table>
<thead>
<tr>
<th>Area</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success factor: innovation process</td>
<td>Empirical studies indicate that firms using an innovation process are more successful than firms without a standardized innovation process.</td>
<td>Cooper et al. 1990, p. 44, Cooper et al. 1991, p. 139, Legler et al. 2001, p. 141, Whiteley et al. 1998, p. 16</td>
</tr>
</tbody>
</table>
GUIDELINE FOR THE IMPLEMENTATION OF INNOVATION PROCESS MODELS

Research Methodology: action research
The objective of this paper is to propose and to test an approach for the implementation of innovation process models in practice. One basic assumption is, that there is no company without at least fragments of an innovation process: rules and practices (perhaps not written down) how innovation projects have been dealt with in the past. Therefore, we follow the approach of action research. Action research can be described as a family of research methodologies which pursue action (or change) and research (or understanding) at the same time. In most of its forms it does this by using a cyclic or spiral process which alternates between action and critical reflection and in the later cycles, continuously refining methods, data and interpretation in the light of the understanding developed in the earlier cycles. It is thus an emergent process which takes shape as understanding increases; it is an iterative process which converges towards a better understanding of what happens. In most of its forms it is also participative (among other reasons, change is usually easier to achieve when those affected by the change are involved) and qualitative (Reason 2004). In our case, researchers are actively involved in designing and implementing innovation process models in five Swiss companies.

Our focus is on manufacturing companies which produce physical products in some cases supplemented by additional services. The four-step approach suggested in figure 1 will be worked out in more detail and improved iteratively in future projects.

**Figure 1: Implementation of innovation process models, Source: Own depiction**

**Step 1 – Analysis of the company’s innovation system:**
For the analysis of the innovation system of the company, we use a reference model of the innovation system, e.g. the ZPE innovation assessment described in Kobe et. al. 2003. It covers the dimensions strategy, resources, processes, methods, tools, organization, and culture (see figure 2).

Outcomes of step 1:
- Differences of actual and potential implementation levels of different aspect of the companies innovation system,
- Ideas for improvement.

**Step 2 – Identification of improvement objectives:**
The implementation of the innovation process is only a means to an end: the improvement of the innovation success of the company, resulting from an increase of the efficiency and effectiveness of innovation in the company.
1. Strategy
- Product and innovation strategy
- Fit between strategy and project portfolio

2. Resources
- Innovation resources (financial)
- Fit of projects and resources
- Training
- Development resources
- Sales and service resources
- Technology resources
- Production resources

3. Organization
- Innovation teams
- Functional Integration
- Intra and inter disciplinary collaboration and networks

4. Culture
- Innovation culture (in general)
- Communication
- Leadership
- Incentives

5. Processes
- Innovation pipeline
- Innovation process
- Innovation selection
- Product management
- Planning of market launch
- Planning of production
- Technology intelligence

6. Methods
- Project management
- Design methods
- Internal communication
- External communication
- Product and market analysis
- Technology analysis

7. Tools
- Design tools
- Data Integration
- Engineering tools
- Communications tools

Figure 2: Dimensions of the innovation assessment, Source: Center for Product Design, ETH Zürich

E.g., possible improvement objectives could be:
- Reduction of time to market,
- Enabling innovations with a higher degree of newness,
- Improvement of the balance of the project portfolio,
- Enhancement of the integration of the employees into the innovation process,
- Increase of the diversity of innovation ideas and projects.

Outcomes of step 2:
- Improvement objectives.

Step 3 – Detailed analysis of the company’s innovation process:
For the detailed analysis of the company’s innovation process, we compare current practice of a company with an innovation process reference model. For example, we use the process reference model developed at the Center for Product Design of the ETH Zurich (see figure 3). Depending on the industry sector and size of the companies other innovation process model could be used alternatively.

To analyze the process, several questions have to be asked:
- How have the activities represented in the process model have been accomplished so far in the company?
- Are they institutionalized? Is a certain proceeding prescribed?
- Who is responsible for the tasks?
- Are there any decision respective selection rules?
- Which methods and tools are used?
- How is it ensured, that innovative ideas and/ or projects proceed into the innovation process (i.e. to be worked out or to be consciously aborted or to be redefined)?

Outcomes of step 3:
- Difference between the potential and actual level of implementation of the innovation process,
- Ideas for improvement.
Step 4 – Prioritization and implementation:
The ideas for improvement generated in step 1 and 3 are normally too numerous to be implemented all at once. It is necessary to prioritize and select which improvements should be implemented and in which order.

For this selection process following aspects have to be considered:
- Dependencies between the improvements,
- Improvement objectives (defined in step 2),
- Available resources for implementation,
- Current innovation projects which could be reference projects for the “new” innovation process,
- Culture and attitudes in the company.

Outcomes of step 4:
Selected improvement activities, including:
- Timeframe,
- Benchmarks and good practice examples,
- A communication concept,
- Plans for workshops and training,
- New organizational and decision rules,
- Documentation for the quality or innovation handbook.

CASES
The proposed guideline is tested and refined in five in-depth cases. The authors play an active role in these case studies, doing the analysis and implementation in cooperation with the representatives of the companies. Thus, on the one hand, it cannot be proven, that the guideline is suitable for other companies. On the other hand, our approach allows for adoption of the guideline during the implementation process where it seems suitable and is improved iteratively.

In the following, we give an overview of five cases and their implications for the guideline and describe one case study in more detail.
Overview of cases and key findings concerning guideline
We tested our approach together with five different companies. The intensity of collaboration between the universities and the company as well as the available resources and budget varied in the five cases. Table 2 shows the most important findings from the cases and most important challenges of the challenges proposed by O’Connor 1996 (see introduction).

Table 2: Findings from the cases

<table>
<thead>
<tr>
<th>Company type</th>
<th>Intensity of guideline testing</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Technical investment goods, internal production</td>
<td>&gt; 10 workshops, including - Analysis and redefinition of innovation process and - Coaching of one concrete innovation project</td>
<td>- Difference between “having” a process and “living” a process - Portfolio optimization</td>
</tr>
<tr>
<td>B Technical investment goods, internal production</td>
<td>1 workshop</td>
<td>Based on the assessment and the process model it is possible for the company to enhance the efficiency and effectiveness of their innovation process with minimum external support.</td>
</tr>
<tr>
<td>C Consumer goods, external production, one product internal production</td>
<td>&gt; 10 workshops including - Analysis and redefinition of innovation process - Creativity and strategy workshops - Collaboration between ETH and company for one product development project</td>
<td>Success factors: - Thorough analysis - Building a common understanding - Raise hope - Having fun doing innovation - Make success visible</td>
</tr>
<tr>
<td>D Technical investment goods, internal production</td>
<td>3 workshops</td>
<td>- Innovation systems and innovation processes depend on the environment. If the business environment changes, the innovation system has to be adapted. - Gaining top management commitment and involvement</td>
</tr>
<tr>
<td>E Consumer goods, internal production</td>
<td>2 workshops</td>
<td>- How to encourage machine operators to innovate? They believe that innovations threaten their jobs. - Structured decision making</td>
</tr>
</tbody>
</table>
We integrated the findings into our approach and formulated additional instructions added to the guideline:

**Step 1 – Analysis of the company’s innovation system**
Have there been or will there be changes in the business environment which might make it necessary to also change the innovation system of the company?

**Step 2 – Identification of improvement objectives**
Which are the most important strategic targets of the company (like enhancing efficiency or developing new markets or …)? The improvement objectives of the innovation system have to correspond with these targets.

**Step 3 – Detailed analysis of the company’s innovation process**
Do not only analyze the process elements documented in process models and quality handbooks – but include success and failures of former innovation projects. This helps to build up a common understanding of innovation-specific vocabulary – and the need to refine the innovation process.

**Step 4 – Prioritization and implementation**
To implement a new process, start with one innovation project which follows the approach – and the employees will experience, whether the new process is applicable and whether top management is willing to allocate the required resources.

The approach suggested in this paper has to be customized to the respective company and environment. A key to success is to integrate the employees and in some cases to integrate external consultants.

**Integration of employees affected by the new innovation process**
As new innovation processes have to be accepted by all employees affected by them, they should be integrated early in the change process. External consultants can only provide examples and suggestions; decisions must be made by company representatives. All functions should participate in the decision process to ensure that all points of view are taken into consideration.

**Integration of external consultants:**
Even if like in our case there is a detailed questionnaire to self-assess the innovation system and process, external consultants and coaches may contribute to the innovation assessment by presenting examples and benchmarks. The literature presents numerous process models. External consultants may assist company representatives by choosing the best fitting model and working it out in more detail. In our case, we used the process model presented in figure 3 in all five cases, customized it to the respective company and provided the company with a detailed description of the tasks. We are currently constructing a database with examples for the different elements of the innovation assessment and tasks of the innovation process. This database may enable companies to enhance their innovation processes without external support.
Key findings concerning innovation process
All companies had innovation processes, which worked well for a specific, rather incremental type of innovation. The existing processes element could be matched with the reference innovations process model (figure 3). A predominant part of improvement objectives in all cases was to enable other innovation levels (table 3).

Table 3: Additional innovation levels

<table>
<thead>
<tr>
<th>Innovation level supported by old innovation process</th>
<th>Additional innovation levels supported by the new innovation process</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Incremental improvements triggered by after-sales-service and sales</td>
<td>“release management” including new features for new markets New materials, new production technologies (adapted from other industries)</td>
</tr>
<tr>
<td>C Product innovation process: new colors, new cuts, new features Business innovation process: new brands, new products, new markets</td>
<td></td>
</tr>
<tr>
<td>D New product lines, new technologies, new production technologies – but all triggered by existing customers</td>
<td>Innovations you can offer to the existing before they ask for it, cost-saving innovations, new business innovations (technology and market close to existing technology and market)</td>
</tr>
<tr>
<td>E Design innovations, marketing innovations</td>
<td>Production technology innovation to enable totally new or cost-saving designs New businesses, radical technology change as an unlikely but possible event.</td>
</tr>
</tbody>
</table>

All innovation types mentioned in table 3 can be positioned in the classification of innovation types by Lynn and Akgun 1998 (see figure 4 and figure 5). You can see that all companies wanted to increase the average level of their innovation – but that does not mean that they wanted to develop radical innovations. To enable additional innovation types in the case-study-companies we did not add new, separate innovation processes but new innovation process elements were integrated into the existing processes.

Figure 4: Types of innovation with regards to the degree of newness, Source: according to Lynn and Akgun 1998 modified by the authors
Typical process elements implemented to increase the level of innovation were:
- Definition of additional observation areas (including observation methods and responsibilities),
- Idea workshops or other routines to create ideas for more innovative projects,

Additional projects need additional resources. The resources available for more innovative projects were raised in two ways. The quantity of available resources was raised through:
- (rules and routines for) clear decisions, which project to invest in and which projects to stop, like innovation strategy and portfolio management,
- Decision to spend more money for innovation,
- Try to increase the efficiency of the innovation process.

The quality of available resources was raised through:
- Collaboration of external partners like universities,
- Education of employees in areas like innovation methods but also technical areas like new materials.

**In-depth example: Mammut Sports Group**

To illustrate our approach, we describe one case - the Mammut Sports Group - in more detail. This example is chosen for two reasons: Firstly, we accompany the Mammut Sports Group for a longer time period and are therefore able to monitor the change process in the company. Secondly, the Mammut Sports Group agreed to publish their case.

The project of the Mammut Sports Group together with the Center for Product Design of the ETH Zurich and the Institute for Technology Management of the University of St. Gallen is part of an integrative approach to enhance the innovative capability of the Mammut Sports Group.
Starting point
The Mammut Sports Group offers clothing and equipment for sports in the mountains. Their major brands which are also their major assets are Mammut, Toko, Raichle and Ajungilak. With 300 employees the Mammut Sports Group achieves annual sales of app. 125 mio €. With a strong commitment to innovation the Mammut Sports Group managed to grow in a very competitive environment.

It is a challenge for the company to develop innovations with different degrees of newness. The Mammut Sports group introduces two collections per year into the market. Each collection integrates new colors and cuts as well as improved or new features. Overall, the innovations introduces with the collections can be classified as rather incremental (see figure 4).

Research project
The project with the target to enhance the innovation capability of the Mammut Sports Group started in 2004. Besides training, process analysis and improvement it covers product innovation projects.

One objective is to enable more radical innovations, like the integration of new materials or new production processes which are more risky and time consuming and hence need another process than the routine introduction of new collections. As the costs for the in-house development of new materials or new production processes are too high, materials and technologies used in other industry sectors are adopted to the requirements of outdoor clothing and equipment. To develop these market innovations, additional resources and a long-term development are needed.

Table 4 describes the action research project together with the Mammut Sports Group.

**Table 4: Improving the innovation process at the Mammut Sports Group**

<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>Who</th>
<th>Methods and documents</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews for analysis of innovation system and innovation process</td>
<td>March 2004</td>
<td>Product managers, brand managers, manager business development, CEO</td>
<td>Semi-standardized questionnaire (about innovation system and innovation process)</td>
<td>Broad picture of innovation system and innovation process, improvement needs and mood</td>
</tr>
<tr>
<td>Presentation of interview results and plans for the workshop in June</td>
<td>April 2004</td>
<td>Product managers, brand managers, manager business development, CEO</td>
<td>Interview results and agenda for innovation workshop in June</td>
<td>Common understanding of situation and targets of the next innovation workshop</td>
</tr>
<tr>
<td>Three-day-workshop: Course of innovation methods and innovation processes, application of these methods</td>
<td>June 2004</td>
<td>Product managers, brand managers, manager business development, CEO</td>
<td>Examples of innovation processes of other companies, creativity, idea generation and strategic methods, which can be used in the front end of the innovation process</td>
<td>Knowledge about innovation processes and methods, ideas for innovation projects</td>
</tr>
<tr>
<td>What</td>
<td>When</td>
<td>Who</td>
<td>Methods and documents</td>
<td>Results</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---------------</td>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Innovation assessment</td>
<td>July 2004</td>
<td>Manager business development</td>
<td>Questionnaire for innovation assessment</td>
<td>Evaluation of innovation system</td>
</tr>
<tr>
<td>Prioritization, decision</td>
<td>July 2004</td>
<td>Manager business development</td>
<td>Results of innovation assessment</td>
<td>Priorities</td>
</tr>
<tr>
<td>Detailed analysis of innovation process</td>
<td>July 2004</td>
<td>Manager business development</td>
<td>Reference model of innovation process, examples of other companies’ innovation processes</td>
<td>Ideas for improvement</td>
</tr>
<tr>
<td>Elaboration of process improvements</td>
<td>August 2004</td>
<td>Manager business development</td>
<td>Reference model of innovation process, examples of other companies’ innovation processes</td>
<td>Quality handbook documents</td>
</tr>
<tr>
<td>Two workshops with presentation and discussion of new process elements (documentation, responsibilities, resources, etc.)</td>
<td>September 2004</td>
<td>Product managers, brand managers, manager business development, CEO, logistic manager, purchase manager</td>
<td>Results of preceding steps</td>
<td>New process elements partly accepted, partly rejected for revision</td>
</tr>
<tr>
<td>Employment of new process elements and new resources</td>
<td>September 2004 – January 2005</td>
<td>Whole organization</td>
<td>Accepted process elements</td>
<td>Success stories</td>
</tr>
<tr>
<td>Revision of process elements</td>
<td>September 2004 – January 2005</td>
<td>Manager business development</td>
<td>Reference model of innovation process, examples of other companies’ innovation processes</td>
<td>Quality handbook documents</td>
</tr>
<tr>
<td>Final workshop: presentation of revised process elements, exchange of success stories</td>
<td>January 2005</td>
<td>Product managers, brand managers, manager business development, CEO, logistic manager, purchase manager</td>
<td>Results of preceding steps, examples of product innovation projects</td>
<td>All new process elements accepted</td>
</tr>
<tr>
<td>Information and training</td>
<td>Spring 2005</td>
<td>Whole company</td>
<td>Results of preceding steps</td>
<td>All new process elements noticed and accepted throughout the whole company</td>
</tr>
</tbody>
</table>
**Results and next steps**

An in-depth analysis of the innovation process of the Mammut Sports Group identified further valuable elements to be implemented. The extensive and iterative approach described in table 4 ensured the acceptance of the new elements throughout the whole company.

To ensure the fit of the innovation process to the environment of the Mammut Sports Group, the innovation assessment and innovation workshop will be repeated in 2005. In addition, further improvements may result from the assessment and new employees may be trained and integrated into the innovation process of the company.

**MANAGERIAL IMPLICATIONS**

Innovation processes play an important role as a success factor in new product development. The literature presents numerous process models. For many companies, the knowledge about process models is not sufficient to enhance the effectiveness and efficiency of the company’s innovation process. This paper tries to develop an approach how to customize innovation process models to a company and its environment and presents a four-step approach for process implementation.

The approach addresses companies which:
- Develop new products or services for the first time,
- Target at developing new kinds of innovations,
- Target at higher degrees of newness of their products,
- Want to enhance the effectiveness and efficiency of their innovation process.

Further information about our innovation assessment and the innovation process model presented in this paper can be found at www.zpe.ethz.ch. This is an ongoing action research project. A database which covers the five cases presented in this paper and further examples is under construction. In addition to collecting further examples, we will monitor the long-term effects of the changes implemented in the five companies described in this paper.
References


