

Software Based Support for Innovation Processes

Stefan Vorbach

(Institute of Innovation and Environmental Management
Karl Franzens University, Graz, Austria
stefan.vorbach@uni-graz.at)

Elke Perl

(Institute of Innovation and Environmental Management
Karl Franzens University, Graz, Austria
elke.perl@uni-graz.at)

Abstract: Innovation and the management of innovation in companies is seen as a very complex, collective and interactive process that often implies a change in the way of working in a company. Therefore, strategic management to properly handle the innovation and the whole process is essential. In that case appropriate software can provide support in the management of the complexities and the procedures that arise during the innovation process. However, an extensive investigation of software systems to support innovation processes shows that nearly no comprehensive software system exists, that can help with structuring and planning the process or that is able support all phases of the innovation process or similarly provide solutions to methodical questions. This paper gives an evaluation of present software systems and furthermore presents the project INNOWARE. The concept and development of the software system INNOWARE is pioneered as a tool to overcome barriers within the innovation process and to provide support particularly relevant for small and medium sized companies.

Keywords: innovation process, process model, software support, innovation software

Categories: D.0, D.2.1, D.2.9

1 Introduction

The management of innovation in companies is a complex, insecure process fraught with risk, which often entails dramatic changes within the company [Preissl and Solimene 2003]. Companies are faced with a multitude of challenges; on the one hand dynamic markets are seen as the pulling force in the innovation process, demanding new and improved products, whereas on the other hand technological developments and rival inventions act as driving forces. [Vorbach, 03], [Perl, 03].

To deal with this complexity, software is often seen as a solution for supporting the innovation process. Nevertheless, a more detailed look into the market of software solutions reveals a different picture. There exists a vast number of software to support specific and isolated parts of the innovation process. When looking toward software to support the whole innovation process the software market is still regarded to be in its infancy, whether this is from the development of strategy and problem analysis to the idea generating phase, or the development and manufacturing of the product/service or even ultimately to the implementation of the product in the market.

As a result of a thorough investigation into the software market, it is evident that despite the existence of numerous software products to support change and innovation, a detailed overview or guidelines of their implementation is lacking. [Huemer and Pfarrkirchner, 03]. In addition, commercial software products are not able to fulfil every demand concerning a company's innovation process, either because they concentrate on just a small segment of the process or the software solutions focus on specific themes, methods or are relevant to a particular company size.

Consequently, the Austrian Federal Ministry for Education, Science and Culture initiated a research project named INNOWARE. Research partners in the 22 month old project are the Institute of Innovation and Environmental Management at the Karl Franzens University in Graz, the Profactor Research Institute in Steyr, Upper Austria, and the ARC Systems Research, located at the University of Mining, Metallurgy and Materials in Leoben, Styria. Eight industry partners from Styria, Upper Austria and Lower Austria complemented the project team to assure its practical relevance. The final outcome of the project will be a software providing support to all phases of the innovation process especially suitable for small and medium sized companies.

The aim of this paper is to discuss the concept and innovation process model for the software. To take existing software solutions, concepts and guidelines into consideration, a detailed overview of present innovation software and guidelines will be given, creating the basis for the development of the concept. Furthermore, the needs and demands from companies concerning the innovation process will be included in the design of the system, to create a programme for a software tool suitable for the whole process.

2 Market analysis

The market analysis demonstrates that thorough research in electronic support in the innovation process was undertaken. The investigation included an extensive search in the internet and in specific software databases [SWB, 04], [Managementsoftware, 04], [Softguide, 04] for keywords such as "innovation management", "collection of ideas", "innovation process", "problem solving", "innovation tools", "brainstorming". Within this exhaustive investigation both software to support manufacturing and tradable services are included. Software for project and document management was excluded.

Due to the fact that a vast number and variety of guidelines and software products were identified in the research process a more comprehensive assessment of the individual products was carried out. For this reason the practical decision to make a pre-selection of the software systems reduced the number of software systems. Additionally, differences in the aims of the software products could be identified. Therefore the selected software was divided into three categories:

- Type A: Software as well as guidelines to support all phases of the innovation process are included in this category. The aim of these software products and guidelines is to structure and sustain the whole innovation process from the beginning to the end, firstly by defining the initial problem to ultimately launching the end product.

- Type B: In contrast to products listed in Type A, the Type B category excludes guidelines and only software solutions are taken into account. Furthermore, software products categorised as Type B only support one or a few phases in the innovation process. Such models are software for idea generating, evaluating projects or general idea management, just to name a few examples.
- Type C: Software products included in this category only support specific methods within the process from idea generation to market access. Software products to support specific methods for example at the stage of idea generating such as brainstorming, mind-mapping or TRIZ are examples of this. At the evaluation phase of ideas particular software to support scoring methods and portfolios are specific examples of this. All in all software products within this category do not consider the innovation process as whole but rather offer precise methods to support the individual phases in the innovation process.

The results of this market survey and the clustering of the products into three types of software support is shown in table 1.

Type A	Type B	Type C
Guideline "Erfolgreich Produkte entwickeln" & Guideline "Von der Produktidee zum Markt" www.uni-graz.at/inmwww/guidelines/	AAGidea www.aagen.de	ASIT www.start2think.com
	Ameli www.ameli.wohland.de	Aplan A www.strategy4u.de
	eIMS www.imconet.de	AXON Idea Prozessor www.web.singent.com.sg
	HLP www.hlp.de	BrainStorm www.brainstormsw.com
	Hypeimt www.hypeimt.de	Brainstormer www.jpbc.com
	Ibykus www.ibykus.com	Brainstorming Toolbox www.infinn.com
	Ideemanagement	Celsieval www.celci.com
	mySAP www.target-soft.com	Concept Draw Mindmap www.conceptdraw.com
	iNETforum www.scsforum.de	Creax Innovation Suite www.creax.com
	Innoguide www.innoguide.de	Easy mapping tool www.cognitive-tools.de
Tool Box "Vom Markt zum Markt" University Karlsruhe www.vommarkt.zummarkt.de	Innoplan www.innoplan.de	GloBrain www.globrain-ag.de
	iNORIS Improve www.noris-ib.de	i2Brain www.i2brain.com
	IQXpert www.iqxpert.de	Idea Fisher www.ideafisher.com
	Koblank	Ilsa-Seb www.ilsa.de
	Ideenmanagement www.koblank.de	Imagination Engineering www.cul.co.uk
	PERSIS IDM www.persis.de	INKA www.geschka.de
	Problemsolver www.problemsolver.de	KnowBrainer www.solutionpeople.com
	Prozess Engine www.egip.com	Kok'n.fizZ www.cyberwise.no
	Smartidee www.smartidee.de	MindGenius www.windgenius.com
	Topinfo www.ff-muenchen.de	Mindmanager www.mindjet.com
Assisting Business Competitiveness - Innovate Now! www.abcinnovation.com	Teamspace www.teamspace.de	MOSEL www.geschka.de
	WCMsystems KVP www.wcm-systems.at	Namebuilder www.marcoworks.com
		Openmind www.res-software.ch
		PRUV www.geschka.de
		PinkKing www.pinking.de
		QFD www.noveco.com
		Sensei www.senseisays.com
		Trisolver www.trisolver.de
		Visual mind www.visual-mind.com

Table 1: Results of market analysis of innovation software programmes

In an evaluation phase, the software and guidelines from Type A were described in more detail and a comparison of the three products was made.

Software from Type B was evaluated according to a scoring model using the following criteria [see for software criteria also Ortega et. al., 03]:

- Number of phases support in the innovation process
- Usability for SMEs
- Training and instruction
- Customizing
- User friendliness (evaluated by the factors clarity and comprehensive configuration)
- Costs (divided into acquisition costs and operating expenses)
- Implementation process (interfaces to other programs, compatibility with operating system and network)
- Integrated communication system (possibility to generate emails and to enable chat function)

Finally, software of Type C was evaluated by analysing which method per se is supported by the software product.

An overall evaluation of the different software products was insufficient, because evaluating software applications is difficult without hands-on experience. The characteristics claimed by many authors such as user-friendliness or low susceptibility to error etc. [Ortega et. al., 03] cannot realistically be assessed without actually running the product in a company. Even a survey of users is quite ambiguous as the specific circumstances and conditions unique to a particular time often determine the success or failure of such a system. Therefore the project team decided not to focus too heavily on an evaluation of all software products supporting more or less the innovation process [Ardilio and Auernhammer, 04].

The results of the overall market analysis show, that guidelines to support the whole innovation process partly exist, as it is described in Type A. It is evident that there is a lack of software that encompasses the complete innovation process. Nevertheless, many isolated software solutions for specific problems and phases of the innovation process are present. However, even at the onset problems can appear for the user, as specific knowledge of methods suitable for a particular innovation process may be required. As different studies and the literature reveal, this specific knowledge of methods hardly exists in SMEs [Gelbmann et. al., 04]. Therefore, the application of software products of Type C in SMEs can lead to conflict. To successfully use software products of Type C, the user firstly has to know in detail his needs and demands regarding the innovation process, therefore he has to structure and analyse the initial problem. Secondly a comprehensive overview of software solutions for his problems (here Type C) is needed, which when given the criteria listed above is evidently lacking at present. [Huemer and Pfarrkirchner, 03]. Finally the user can chose one of the software products offered on the market.

Moreover, due to the proliferation of so many Type C products and just a few products of Type A further vital considerations are apparent. If a company needs overall support within its innovation process by only using software of Type C, the application of many different software products will be required. As a consequence, simultaneous, nearly similar work packages for each software product (such as data input) may be necessary. Furthermore, problems with software stability can occur

when using too many software programs for the same problem. Therefore the usage of an “all-in-one” system is preferred. This latter problem is also seen in software products of Type B.

Thus the vast number of existing software solutions are not fully capable of substituting management, for instance the barriers and disadvantages such as lack of creativity and missing competence to solve problems cannot be fully resolved. Hence, these barriers in the implementation of software must not be overlooked.

Consequently, the development of a new concept of an innovation process model that structures the necessary activities within the innovation process and gives support to the innovator is needed.

3 Development of a software concept

The above mentioned market analysis forms the basis for the development of a new concept for a software tool to support the complete innovation process in small and medium sized companies.

In the development of the concept for the innovation support software, a two-step procedure was chosen, this comprised of a top down development from analysing literature and theory, together with a bottom up process deriving from the status quo of individual company processes in the project team.

Within the top down process, approximately 40 innovation process models [see for example; Vahs and Burmester, 02; Vorbach 05; Friesenbichler et. al., 04; Gelbmann et. al., 03] were analysed with regard to specific criteria such as compatibility within SMEs, simplicity, appliance in the companies to name a few. As a result of this analysis, an ideal innovation process suitable for SMEs, but also for larger companies, was developed. This process model represents a clear structure through the whole innovation process and thus helps the companies to structure and coordinate their activities.

Subsequently, the needs and demands of the companies were taken into account. Eight companies of different branches and sizes, from 30 up to more than 500 employees, have been intensively analysed. This analysis took place in the companies by conducting interviews and workshops with people directly involved in the innovation process. By doing this, the current situation in the companies was surveyed by enlisting strengths and weaknesses within the innovation process, in the actual software support and for a successful development of the innovation support software. In addition, the companies had the opportunity to put forward their experiences with innovation into the investigation.

The ideal process model developed in the project INNOWARE in cooperation with eight SMEs starts at the roots with problem definition and the initiative for new innovations [Schröder and Jetter, 03] (see figure 1). This is followed by the next general phase of idea generating, involving the specific steps of idea collecting and generating, followed by a rough classification of the ideas. All ideas classified as innovations for the companies (in contrast to CIP-continuous improvement process – ideas) are then roughly assessed to determine whether they go along with the strategic concepts of the company. This forms the second overall phase including a detailed assessment of the idea. All ideas considered appropriate for the company are then ranked, (this is due to the fact that companies often have too many ideas that cannot

all be realised). A feasibility study on the most appealing ideas is then carried out to clarify important key aspects, factors, economic key figures and technical considerations etc. On the basis of the feasibility study the final decision can be reached on whether the idea will be realised or not and the realisation phase can start.

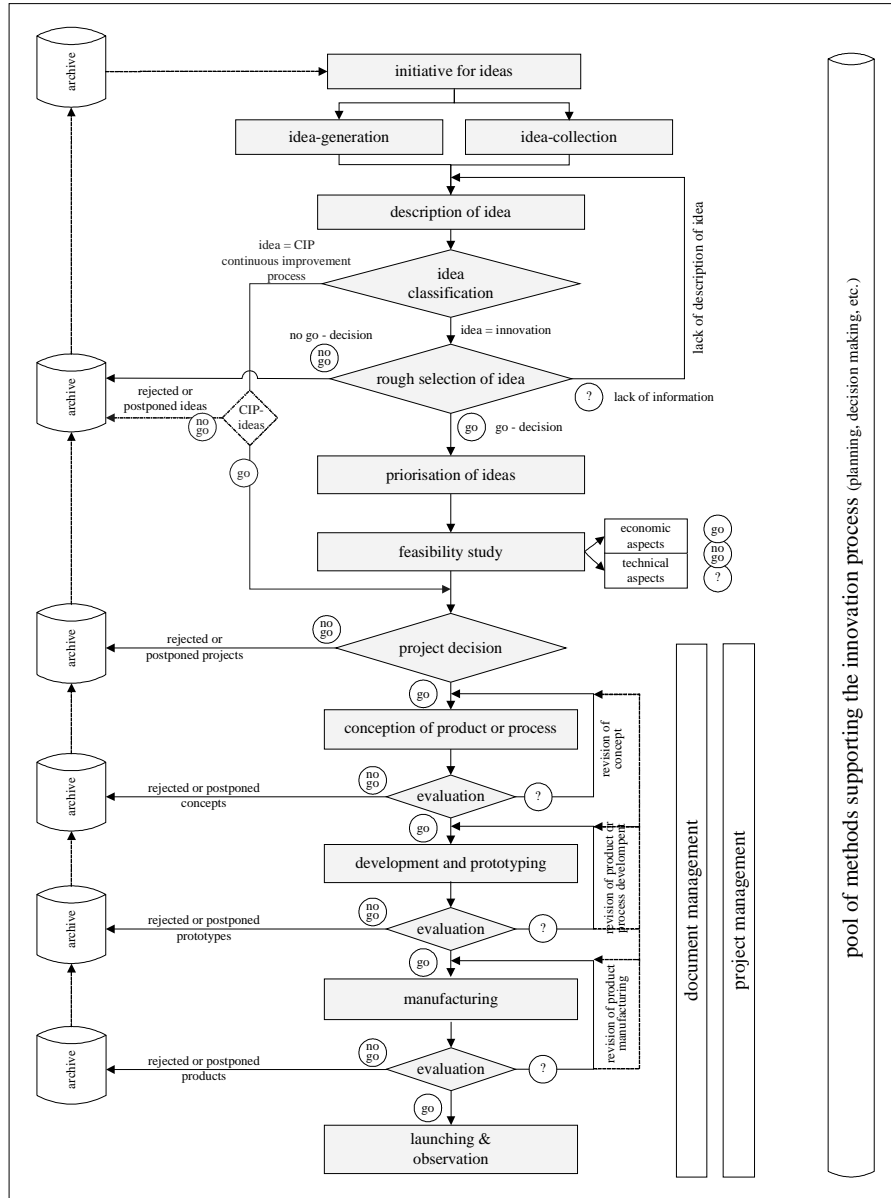


Figure 1: Ideal process model

On the bases of the investigation results within the individual companies, the ideal process model and the software concept seen in figure 1 can be developed. As a consequence of this development the software should act as a guideline through the entire innovation process. Thus, it should administer and save ideas, reinforce the assessment of ideas, link documents to the specific phases of the process, support the innovation process with tools and methods, such as mind maps, creativity tools and scoring models and finally it should save and administer experiences of the company and its employees. To guarantee this, the software is built in a modular way where the process as a whole can be adapted to the specific needs and demands and to the current company conditions. So it is not the intention of the software to rebuild the processes within the companies but to support existing workflows. As the software INNOWARE is configured in a very modular way it can be easily adapted to the specific situation in the companies through its modular and flexible structure concerning the stages of the process.

Furthermore, not all phases have to be passed through with all details. A system similar to traffic lights will be developed to indicate whether a specific phase in the innovation process is passed properly (green, go), some details in the phase are missing (yellow, question mark) or whether one phase was not executed at all (red, no go). So with this "traffic light system" the working progress of an innovation within the innovation process will be illustrated in a more graphical way.

The criteria for the assessment of the ideas and innovations as well as the different forms and sheets to describe the idea, to undertake the feasibility studies etc. can also be modified according to the needs and demands within the companies. Nevertheless, the software can provide information to show which criteria is appropriate and suitable for SMEs, or appropriate for specific branches.

Databases of ideas, methods and experiences are one of the most important advantages of the software. Such databases can satisfy a fundamental demand for many companies by ensuring that no information goes astray or that no ideas get lost. Furthermore, the database can enhance the transparency within the company because the employees can have access to already existing ideas and their core aspects.

Another advantage of the software is the methodical support for the companies in the innovation process. For each step specific methods will be provided. Beside a detailed description of each method, the core features and main aspects of how to use the method and the existing strengths and weaknesses of the methods are given. Furthermore, to simplify the choice of appropriate methods for the specific steps in the innovation process, a detailed list of key criteria of the methods such as complexity, group size, length of time, specific knowledge, the need for a moderator and documentation requirements is provided. Last but not least, the software will support the use of the method automatically if this is possible regarding methodical aspects. As a result this should also enable easy data transfer from the original innovation process with its data to the methods as inputs and the transfer of the data and results of the methods back to the innovation process and its database.

To conclude, the software INNOWARE, which will be developed in the project together with eight small- and medium-sized companies should represent a clear structure through the whole innovation process and thus represent a software model characterised as Type A in chapter 2. However, it should not only guide and help the companies through their own processes but also provide suitable help by using

methods. Consequently, the software should ultimately be an integrated system with the core component of Type A as a guideline in combination with methodical help for a couple of methods as it is represented as Type C in the previous chapter.

The software is expected to be finished in the second half of 2005 and will then be implemented in the eight companies. After its implementation an evaluation phase will continue and, if necessary and demanded by the eight companies, an adaptation of the system will ensue. Eventually the software should be available on the commercial market.

4 Conclusions

In this paper the results of a market analysis concerning guidance for innovation activities are presented. There are a vast number of isolated software solutions dealing with specific tools and methods. Nonetheless a lack of an integrated process model covering all the phases necessary for new product development is evident.

In response to these results, the development of an innovation process model, suitable especially for the needs and demands of small and medium sized enterprises, is vital. The paper describes the key elements and the results of the working progress of the project INNOWARE, taking into account the barriers of effectively implementing software to support the complex process of innovation in companies. Nevertheless, sociological and psychological barriers within the innovation process should not be neglected. However, the software described cannot provide appropriate support in this field.

Acknowledgements

The Institute of Innovation and Environmental Management at the Karl Franzens University Graz has been involved in the research of innovation management since 1990. In recent years investigation into the innovation process and the development of guidelines to support this process continues to be one of the key research fields of the institute.

References

- [Ardilio and Auerhammer, 04] A. Ardilio, K. Auernhammer, "Innovationssysteme – IT-Unterstützung im Innovationsmanagement", Stuttgart (2004)
- [Friesenbichler et al., 04] M. Friesenbichler, W. Leitner, M. Ninaus, E. Perl, K. Ritsch, F. Seebacher, S. Vorbach, R. Winkler, "Innovationsleitfaden: Ideen systematisch umsetzen", Graz (2004)
- [Gelbmann et al., 03] U. Gelbmann, W. Leitner, E. Perl, A. Primus, K. Ritsch, F. Seebacher, J. Tupping, S. Vorbach, "Innovationsleitfaden: Der Weg zu neuen Produkten", Graz (2003)
- [Gelbmann et al., 04] U. Gelbmann, S. Vorbach, K. Zotter, "Konzepte für das Innovationsmanagement in Klein- und Mittelunternehmen", in: E.J. Schwarz (Ed.), *Nachhaltiges Innovationsmanagement*, Wiesbaden (2004), 247-273

- [Huemer and Pfarrkirchner, 03] H. Huemer, H-C. Pfarrkirchner, "Marktstudie: Softwaretools im Innovationsmanagement, Werkzeuge des Innovationsmanagements zur technologischen Unterstützung", Steyr (2003)
- [Managementsoftware, 04] "Managementsoftware", 2004, <http://www.managementsoftware.de>
- [Ortega et. al., 03] M. Ortega, M. Perez, T. Rojas, "Construction of a systemic quality model for evaluating software products", *Software Quality Journal*, 11, 2003, 219-242
- [Perl, 03] E. Perl, "Grundlagen des Innovations- und Technologiemanagements", in: H. Strebel (Ed.), *Innovations- und Technologiemanagement*, Wien (2003), 15-48
- [Preissl and Solimene, 03] B. Preissl, L. Solimene, "The dynamics of clusters and innovation: beyond systems and networks", Heidelberg (2003)
- [Schröder and Jetter, 03] H.H. Schröder, A.J.M. Jetter, "Integrating market and technological knowledge in the fuzzy front end: an FCM-based action support system", *Int. Journal of Technology Management*, Vol. 26, Nos. 5/6, 2003, 517-539
- [Softguide, 04] "Softguide", 2004, <http://www.softguide.de>
- [SWB, 04] "Softwareboerse", 2004, <http://www.swb.at>
- [Vahs and Burmester, 02] D. Vahs, R. Burmester, "Innovationsmanagement", Stuttgart (2002)
- [Vorbach, 03] S. Vorbach, "Instrumente in der Produkt- und Prozessentwicklung", in: H. Strebel (Ed.), *Innovations- und Technologiemanagement*, Wien (2003), 325-345
- [Vorbach, 05] S. Vorbach, "Technik und Technologie in innovativen Entscheidungsprozessen", Graz (2005)