Strategic Implementation of Open Innovation Methods in Small and Medium-Sized Enterprises

Sabine Schwab, Jessica Koch, Paul Flachskampf, Ingrid Isenhardt

Abstract Over the last decades, an increased appreciation of external contributors within the product development process can be noticed as a significant development within innovation management. This open form of innovation is summarised under the concept of Open Innovation. Yet, it is difficult to apply it to small and medium-sized enterprises (SME) as they struggle to implement these Open Innovation methods. It is therefore very important to develop appropriate organisational forms for these enterprises. In this context, the article describes both the environmental changes and the specific characteristics of SME as well as their impact when using Open Innovation in SMEs. The goal of this article is to develop a first concept for the implementation of Open Innovation methods into the innovation management of SME.

Key words: Open Innovation, H-O-T Approach, SME, Conceptual Framework

1 Introduction

The successful generation of innovation is one of a company's constant challenges, especially for the numerous technology-oriented SMEs in Germany [Sch05]. The reason is the rapid technical change and the shortened development periods of technical products. Enterprises must keep up with these changes. Otherwise they will not be able to create effective and efficient innovations and – with regard to this – be competitive, because strong innovation ability is the key for a company's success and the increase of the company's value [Sch05]. Furthermore, due to a lack of information and knowledge concerning the appropriate methods, many enterprises cannot bring their new product developments to the market [Fra07]. Over the last

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Originally published in "ICE'2011 – 17th International Conference on Current Enterprising", © FIR e.V. der RWTH Aachen 2011. Reprint by Springer-Verlag Berlin Heidelberg 2013, DOI 10.1007/978-3-642-33389-7_12

years, the increased appreciation of externals as contributors (customers, suppliers, researchers, and universities) to the innovation process has been a significant development within innovation management [Che03]. Due to the businesses' objective of generating innovations the development process is opened up to external contributors. These will be involved from generating the idea across developing a concept and the product, testing the product and the prototype to launching the final product [Che03].

Large enterprises with adequate resources, especially staff and other assets, can already flexibly organise their innovation management, adapting it to their dynamic environment and using Open Innovation. The question is whether SMEs with fewer resources and smaller user groups (often due to offering niche products) can adapt their organisation and adopt Open Innovation successfully.

Therefore, the Institute for Management Cybernetics e.V. (IfU) and the Technology and Innovation Management Group (TIM) at RWTH Aachen University work together on the research project "Invoice – Efficiency of Open Innovation for Small and Medium-sized Enterprises", promoted by the Consortium of Industrial Research Associations (Arbeitsgemeinschaft industrieller Forschungsvereinigungen, AiF). Within this project, the institutes develop a tool to control Open Innovation strategies in SME.

This paper focuses on one part of the mentioned tool, more precisely the process of selecting the adequate Open Innovation method(s). The structure is as follows: Sect. 2 describes the state of the art concerning the three aspects human, organisation and technology (the so called H-O-T approach), Open Innovation and its methods. Section 3 deals with a first conceptual framework for the implementation of Open Innovation methods supported by the mentioned H-O-T approach. The final section will give the conclusion and future prospects.

2 State of the Art

2.1 The H-O-T Approach

To clarify the importance of system-oriented thinking and acting as well as adapting the organisation to the changes with regard to the human and technology aspects, the so called H-O-T approach will be introduced.

The H-O-T approach emphasises the interdependency among the basic aspects of an enterprise: the humans, the organisation, in which they operate, and the technology which surrounds them. New production systems or rather functions promise success if they are meant to optimise the implementation of technology. This also includes the design of the organisation and the qualification of the employees which shows the importance of optimisation.

First of all, the human aspect has to be considered due to its influence on the organisational and technology aspects as well as its ability to control both. Within the

relationship between humans and technology, it is very important that technology is not regarded as a practical constraint but as a creative assignment. On this note, technology is meant to be a function as a tool for the human action [Har05]. The machine, for example, is considered as the extended arm of the human. In addition, the machine should be regarded as such in order to improve human abilities and competences.

The connection between the human and organisational aspects is characterised by two types of living systems. The alternating structurally interconnected development processes are the centre point of these two. Within the H-O-T approach, the organisation is understood as a living social system. Social systems consist of the individuals' communication which corresponds to their acting. Therefore, people are a very important factor for the success of the implementation of a new system. By means of the way they react to changes, they can encourage or deny changes [MTM08].

2.2 Open Innovation

For the purpose of this paper, Open Innovation is defined as "the formal discipline and practice of leveraging the discoveries of others as input for the innovation process through formal and informal relationships [RP09]". It is in contrast to a classical closed process in which enterprises only use ideas and technical competences which are available in their own domain. In addition, they only use competences of well-known partners who are integrated in their network [Che03].

The objective of Open Innovation is to receive information about need and the respective solution involving external users. Von Hippel describes need information as the way customers or other problem solvers show the enterprise which kind of product or service should be generated [Hip94]. The information, which shows the enterprises how to create new products or services, – also provided by the problem solvers – is called solution information [Hip94]. By implementing external knowledge, the enterprise employs a wider field to identify ideas and solutions [Pil03].

The main idea of Open Innovation is to collect needed information through active integration of customers and users into all phases of the innovation process, instead of the classic measurement of market research or trend scouting. In this context, needed information is the information about customer needs and market demands. Through the use of a network of external experts, the search for a solution is supposed to be optimised. Solution information forms the basis for activities of product engineers in the innovation process. This consolidation does not occur in the form of cooperation between research and development, but through an open appeal to an undefined network of contributors. Thus, they assist in the development of assignments. This effect is well known as interactive adding value or crowd sourcing [RP09, How06, Hip05].

Open Innovation concentrates on the enterprises' abilities in order to avoid market-oriented and technological uncertainties especially at the early stage of the innovation process. However, it is meant to identify and integrate knowledge in this

process still outside the entrepreneurial borders. In this context, Open Innovation should increase the effectiveness as well as the efficiency in the innovation process.

2.3 Methods to Implement Open Innovation

Several methods for the implementation of Open Innovation strategies have already been developed. Some of the existing methods will be described briefly in the following paragraphs and used for a first conceptual framework in Sect. 3.

The *Lead-User-Method* is a qualitative procedure. The method aims at the identification and active implementation of selected users in order to generate the innovation of new products and projects [Hip94]. Lead-User-Workshops promote the creative customer and operator potential through utilising peer effects [LHvH05].

Many Open Innovation approaches are based on *User-Innovation and Co-Design Toolkits* [FP04]. On the one hand, these Toolkits are production configurations which determine a customer tailored production specification in order to receive a high variant diversity (mass customisation). On the other hand, the Innovation-Toolkit's objective is to enable current and potential customers to bring new and creative products or product variants about. First of all, the objective of the Toolkit's implementation is to provide a tool to the user which helps to create own ideas and solutions. Yet, the main focus of this tool is to identify the users' needs.

Communities of Open Innovation argue that innovation is mostly the result of the cooperation among several contributors. They work to achieve the goal set as well as the creation of new ideas within a virtual community. In terms of a Commons-Based-Peer-Production [Ben06], online communities are particular successful in the field of Open Source software. Also, within the innovation process, existing virtual communities can be observed.

In terms of an *Idea-Competition*, the creativity and quality of the participants' contributions are supposed to be stimulated. In this context, a reward is an additional incentive to participate. The applicability of the Idea-Competition method is quite broad and ranges from a continuous introduction as an open platform to an individual assignment to solve specific technical problems [Ern04].

Another method has its origin in the *Not-invented-here-syndrome* (NIH) that deals with the disregard for already familiar knowledge but from another origin [KA82]. There may have been the chance to transfer solutions for their problem from other sections of the enterprise or from its external environment. But when enterprises are looking for familiar solutions, in most cases, they are looking for research fields in which they already operate. In research, the problem of the solely local search is named as *Local Search Bias* (LSB) [KA02]. Both NIH and LSB can be resolved through Open Innovation.

The identification and integration of external knowledge in the innovation process also provides many opportunities for SMEs. Furthermore, they are an important

strategic factor in terms of the high strategic meaning of innovation ability. For example, the reduction of *Time-to-Market* and *Cost-to-Market* are of particular importance [RP09]. The reduction of Time-to-Market means the shortening of the period from the beginning of the development phase to the market launch. The reduction of the Cost-to-Market refers to the product costs from the product development process to the market launch.

In summary, the focus of the investigations for the field of Open Innovation concentrates on conceptual and application areas. Within this research field, the bigger part of the investigation deals with large enterprises; SMEs have not received much attention as of now. Therefore, it is crucial to create an appropriate organisation form for SME which allows on the one hand for the incorporation of Open Innovation methods and on the other hand for the application of these strategies. The arrangement of proper enterprise structures can only be effected through a comprehensive consideration of the three aspects, human, organisation, and technology, which will be explained in the following section.

3 A First Conceptual Framework for the Implementation of Open Innovation Methods in SMEs Based on the H-O-T Approach

The first two sections showed that the Open Innovation methods, introduced by the changes in the technological and human aspects, will become an important way to generate new products and services and to achieve the enterprises' sustainable success also for SMEs.

Based on the H-O-T approach, the mentioned aspects influence one another and also the third one: the organisation. Therefore, this section will discuss how SMEs have to change their organisation, especially concerning their innovation management, and adapt it to the changes in the human and technology aspects. To relate the following aspects to the special conditions of SMEs, their characteristics are compiled and have to be analysed with regard to Open Innovation. It will then be possible to decide, whether organisational structures are compatible with the Open Innovation methods and if there is a chance to use it efficiently. As a first step, the characteristics which separate SMEs from large enterprises, will be identified and discussed.

In order to be able to comprehend the correlation between the characteristics and the three aspects of the H-O-T approach as well as the conceptual framework in Sect. 3.2 some basic information about the changes for each of the three aspects, human, organisation, and technology, is given:

Already at the end of the 1980s, Toffler introduced another term to describe a new generation of humans: the "prosumer" – the cross between customers and producers [Tof87]. The users of the online encyclopaedia *Wikipedia* for example consume and create knowledge. On the one hand they read the articles of other users; on the

other hand they create their own articles and share their knowledge. This "new" generation is characterised by digital networking und communication. The "prosumer" need not exist nor does he play a decisive role in every SME. But analysing and discussing this problem is beyond the scope of this paper.

These changes as well as the discussions of Open Innovation were brought forward by many technological innovations (e.g. [RP09]). Some examples are the continuous optimisation of computers and the opening of the internet for personal use. At the same time, technology is characterised by open applications of the Web 2.0, Wikis, Blogs, etc. These innovations have been causing a connected digital world which is accepted and used by the new generation (cf. the mentioned "prosumer").

To achieve their sustainable success, companies must respond to these changes and adapt their organisation to them.

3.1 The Characteristics of SMEs as Opportunities and Threats Concerning the Implementation of Open Innovation Strategies

There are several definitions in terms of quantitative classification [cf. e.g. European Commission]. These quantitative classifications allow for a first differentiation between SMEs and large enterprises. It is possible to take exact measurements of such economic data but the characteristics of an SME do not necessarily become evident. It is required to identify qualitative factors. In a second step, these qualitative factors have to be clarified by using the H-O-T approach. Especially the organisational and social factors are important to identify the SME's potentials concerning Open Innovation. The following paragraphs show and discuss some generally accepted qualitative factors of SME referring to innovation management, which were compiled from several references. All of the listed characteristics in the next subsection are extremes. In the reality, they do not necessarily all exist in parallel in one single SME although every SME combines many of them.

3.1.1 Human

The human is one of the most important elements in SMEs. Especially the central position of the entrepreneur has an effect – both positive and negative – on the implementation and success of Open Innovation. The unity of property, management, decision, risk, and control in conjunction with short information paths allows for fast reactions concerning external changes and also a flexible organisation [Das94]. This aspect shows a first connection between the human and the organisational aspect. Otherwise the entire success of the SME is impaired by potentially wrong decisions by the entrepreneur, for example declining the implementation of external knowledge (Not Invented Here-Syndrome, NIH [KA82]), or by wrong innovation methods [Mey06].

One of the problems concerning the implementation of Open Innovation in SME is the risk aversion of the entrepreneur, especially to the opening of the innovation process. This is caused and tightened by the difficult protection of the SME's "intellectual property" (e.g. [Wid10]). The entrepreneur has to decide, whether it is riskier to share the internal knowledge or to miss adapting to the external changes and requirements.

Both the entrepreneur's and his employees' knowledge is limited to a specific field. In addition to this, there is a lack of staff to develop manufacturing methods and strategies for successful launches [Lee10].

It is necessary to train the employees concerning the new ways to search for information. The implementation of Open Innovation causes new roles with specific requirements. Some of the new main tasks are to identify cooperation partners, use the offered external knowledge efficiently and separate important knowledge from irrelevant [Wid10].

The networking aspect – especially personal contact to the customers – is a very important requirement for the implementation of Open Innovation.

3.1.2 Organisation

Some SMEs are working with their customers already. The missing point is the implementation of external knowledge in the phase of commercialisation [Lee10].

Another important aspect concerning innovation activities in enterprises is project organisation [Sie97]. Because of the informal and personal communication between the management and the employees in SMEs, the coordination of the various departments is organised very efficiently [Mug98]. The organisation in SMEs is characterised by high flexibility. Hence, the structural changes inside the enterprise due to the implementation of Open Innovation could be managed without incurring high costs. One of the most important elements concerning the integration of external knowledge is to manage well-organised innovation processes [dVea09].

Using Web 2.0, enterprises have to create more self-organised and integrated structures [Lin09]. Because of lacking resources and factors like time, the use of modern communication media has to be well-structured. The balance between creating innovations and handling daily tasks is crucial [dVea09]. This is related to the changes to the human aspect.

Particularly, traditionally managed SMEs undergo a revolution by implementing the methods of Open Innovation. Hence the entrepreneur, who was successful by using closed innovation strategies for the last years, must be prepared to implement external knowledge. He must accept and use the changes of the enterprise's environment and the new technologies, e.g. Web 2.0, because they definitely will have an impact on the SME's future [Lin09].

All these aspects point out the connections between the three aspects human, organisation and technology.

3.1.3 Technology

The R&D department – if there is such a department – plans short-term and works intuitively. Thus, this constitutes another good point to integrate an open and co-operative innovation management in SMEs [GE05]. SMEs could use the external knowledge to receive more information about requirements and solutions as well as to expand their R&D activities.

Furthermore, using external knowledge gives SMEs a chance to overcome their handicap of limited resources concerning staff and capital (e.g. [Lin09]).

It is also possible to identify uncertainties concerning markets and technologies. This is accompanied by the fact that methods of acquiring knowledge (e.g. information and communication technologies) often only support the day-to-day business [Lin09].

3.2 A Concept for the Implementation of Open Innovation Methods

The next step is to develop a first concept for the implementation of Open Innovation methods into the innovation management of SMEs. In this process the characteristics mentioned (see Chap. 3.1) will be brought together with the H-O-T approach. Then, suggestions as to choosing the adequate Open Innovation method(s) depending on the respective characteristic values of the SME will be offered. The following Fig. 1 illustrates this idea.

In this paper, two examples for types of SMEs and the resulting suggestions concerning the implementation of Open Innovation methods will be described.

The first type of SME is a traditional managed enterprise. The entrepreneur is very risk averse and adheres to his traditional views and procedures. New technologies – like web 2.0 – are not used in his SME. According to the H-O-T approach the levels human and technology aspects inside the enterprise are not compatible with the changes outside the enterprise. Probably, the employees are not sensitive to the identification of useful external knowledge. Hence, it is not advisable to start an open appeal to an undefined network of contributors. Therefore, some kind of Lead-User-workshop would be advisable. The SME should invite some customers or suppliers and discuss a special product – existing or prospective.

The second type of SME is managed by an entrepreneur, who favours and exemplifies an open organisational culture. New technologies are used in all departments. His employees work in interdisciplinary teams and the communication between the teams is assisted for instance by periodical meetings. Due to the knowledge and use of new information and communication technologies it would be possible to implement a virtual community or an internet platform to start idea competitions. The open communication inside the SME will support the process of separating and implementing usable external knowledge.

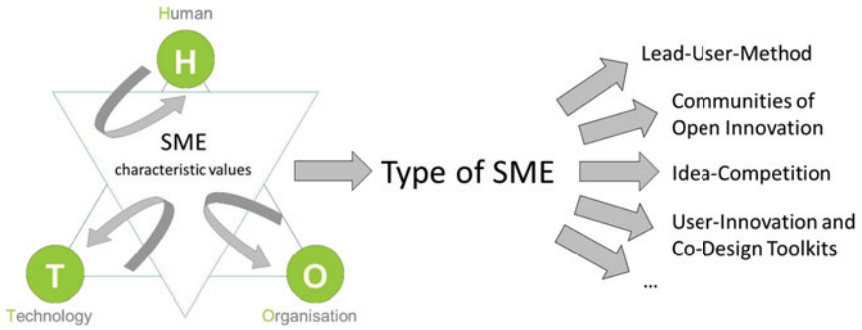

Fig. 1 Supported process of choosing Open Innovation adequate methods

These two types of SME are just examples. A lot of other aspects have to be considered. The type of customer contact is another important factor for a recommendation concerning the implementation of Open Innovation methods. It is also possible to use modifications of Open Innovation methods in some SME.

4 Conclusion and Outlook

In the face of globalisation, the pressure to be innovative has been increasing exponentially. Especially SMEs must prove a high innovation ability in order to be competitive. Open Innovation provides new methods and approaches to the innovation process. With Open Innovation, SME get better access to information about need and respective solutions. Given this fact, SMEs receive the chance to improve the efficiency and effectiveness within their innovation processes. Several research projects have already generated some methods for the implementation of Open Innovation methods. These methods generally focus on the human and technology aspects. But a method which supports the changing process of an SME's organisation – which includes the enterprises' structures and processes – is still missing. SME need to be prepared for a generation of younger people who accept technical innovations and operate in virtual worlds. Their point of view with regard to tradition and their adherence to standards do not represent the same anymore as they used to in traditionally led enterprises. Instead, SMEs receive an adaptable, highly capable of multi-tasking, collaboratively working type of human.

The conception of Sect. 3.2 is just one part of the tool to control Open Innovation in SMEs. Before matching the SME's characteristic values with the H-O-T approach and choosing the adequate method(s), the SME has to decide whether it should use Open Innovation or not. This part will be based on the use-oriented cost-effectiveness evaluation by Weydandt [Wey00]. Furthermore, a third part has to facilitate an ex-post target-performance comparison. These last ideas will have to be followed and put to practice in the next years.

Acknowledgements This work has been partly funded by the Consortium of Industrial Research Associations through the research project "*Invoice*" (16 684 N). The authors wish to acknowledge the Consortium for their support. We also wish to acknowledge our project partner, the Technology and Innovation Management Group at RWTH Aachen University, for the good teamwork within the current project.

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