Opportunity Maximization: Towards a Paradigm Shift in Innovation Management

Kurt Gaubinger [a], Michael Rabl [a], K. Scott Swan [b],
Alexander Petutschnigg [c], Michael Ebner [c]

[a] University of Applied Sciences Upper Austria, School of Engineering and Environmental Sciences, Stelzhamerstraße 23, 4600 Wels, AUSTRIA
[b] The college of William & Mary, Raymond A. Mason School of Business, Williamsburg, VA, USA
[c] University of Applied Sciences Salzburg, Campus Kuchl, Markt 136a, 5431 Kuchl, AUSTRIA

KURZFASSUNG/ABSTRACT:
In this paper the results of a qualitative study are presented which serve as a first foundation for the conception of a new holistic innovation management model with a focus on opportunity maximization instead of risk reduction. As theoretical fundament the context between innovation management and uncertainty as well as the potential for better innovation performance through a consequent opportunity orientation in innovation projects are presented. This approach is unique and represents a paradigm shift in innovation management. Within an explorative study, where wood friction welding for the furniture industry was chosen as subject of the analysis, challenges and needs for subsequent modification of the core elements of innovation management as a basis for the determination of an *innovation management continuum* were risk reduction is placed at one end of the continuum and opportunity maximization at the other end.

1 INTRODUCTION

The increasing complexity and dynamics of today's marketplace create an environment in which it is difficult for companies to produce innovations and market them successfully. Moreover, this environment dramatically increases the uncertainty of innovation activities. In this context many scholars and practitioners consider uncertainty reduction as a central task of innovation management. However if the focus is solely on reducing risk, while overlooking the opportunities in the uncertainty, companies may fail to exploit a significant potential for project value generation. That means that there is a huge potential for better project performance through exploiting the opportunities hidden in the nature of uncertainty. This is contrary to the traditional view in the risk management literature that focuses mostly on risk as a threat. We argue that effective innovation strategies and measures should focus on maximizing opportunities instead of what limits the space of actions respectively to achieve a balance between exploiting opportunities and controlling the involved risks. The question to answer is only "How can companies systematically maximize the opportunities while simultaneously minimize the risks?" Based on a theoretical foundation this research paper tries to give an answer and represents the results of a qualitative study, which serves as a first foundation for the development of an "innovation management continuum". *Risk minimization* is placed at one end of the continuum. Here the general focus of innovation management is solely on reducing risks within every innovation activity. At the other end of the continuum *is opportunity maximization* where the focus of innovation management is on exploiting opportunities to the fullest extent.

2 CURRENT UNDERSTANDING

To develop a holistic innovation management framework which focuses on opportunity maximization we first have to understand the context between innovation management and uncertainty. *Uncertainty* has been a frequent issue in organization theory over the past decades. In literature, there is a broad consensus that most organizational decisions are made in uncertainty, mainly because of missing information and knowledge about the company environment or due

to a lack of stability and consistency. This is even more true in innovation management, where the need for systematically dealing with uncertainties is particularly high and where corporate foresight represents a key element [1–4]. The dimensions and effects of uncertainty in innovation management have been frequently discussed in scientific literature. Using a systematic approach to reviewing more than 100 scientific articles, Jalonen [5] identified various factors, which create uncertainty in processes of innovation. Table 1 summarizes these sources.

Table 1. Various sources of uncertainty in innovation (Based on [5]).

Technology uncertainty	Technical uncertainty	Market uncertainty
Commercial uncertainty	Competitive uncertainty	Consumer uncertainty
Environmental uncertainty	Regulatory uncertainty	Legal uncertainty
Societal uncertainty	Political uncertainty	Economic uncertainty
Organizational uncertainty	Resource uncertainty	Decision-making uncertainty
Acceptance uncertainty	Task uncertainty	Behavioral uncertainty

In an attempt at reducing this vast number of factors, he identified the eight most common sources of uncertainty, which are *technology uncertainty* (in 27 studies), *market uncertainty* (in 24 studies), *acceptance/legitimacy uncertainty* (in 19 studies), *consequence uncertainty* (in 19 studies), *managerial uncertainty* (in 18 studies), *regulatory/institutional uncertainty* (in 16 studies), *social/political uncertainty* (in 16 studies), and *timing uncertainty* (in 16 studies) [5]. These results are in line with other studies. Souder/Moenaert [6] state that the four main sources of uncertainty are *customer needs*, *technological environments*, *competitive environments*, and *organizational resources*, whereas the first three factors are often referred to as the *external environment*. Other influential studies have converged in stating the following three sources of uncertainty: the *external environment*, the *internal environment* and *task characteristics* [2,7]. More specifically, Freeman/Soete [8] associate *technology uncertainty*, *market uncertainty* and *business uncertainty* (containing general political and economic uncertainty) with innovation.

In general, opportunities are seen as uncertain outcomes representing a huge potential for extraordinary value through exploiting the *opportunities* hidden in the nature of uncertainty, i.e., by explicitly taking both negative and positive outcomes into account. This is contrary to the traditional view in the risk management literature that focuses mostly on risk as a threat. Opportunities emerge from a complex pattern of changing conditions— changes in technology, economic, political, social, and demographic conditions [9]. They come into existence at a given point in time because of a juxtaposition or confluence of conditions that did not exist previously. Once a situation of uncertainty is identified, opportunities should be created or discovered leading to an increased value proposition for the project and the enterprise.

We argue that effective innovation strategies and measures should focus on maximizing opportunities instead of what limits the space of actions [10]. Of course, there is no such thing as a riskless strategy. Innovation strategy will always involve both opportunity and risk. A first step to recognize opportunities is the identification of potential sources of uncertainty. Once a situation of uncertainty is identified, opportunities should be created or discovered leading to an increased value proposition for the project and the enterprise. The discovery and development of opportunities is not an obvious process. It requires creativity and the analysis of potential solutions beyond a project's constraints. Thereby it is crucial to refocus the management perspective from goal adherence to value creation [11]. The identification of an opportunity connects a breakthrough idea to the initial innovation evaluation process. Especially opportunity recognition for radical inventions is highly dependent on individual initiative and capacity, rather than routine practices and procedures of the firm. Opportunity recognizers are individuals, who are alert and ready to react to ideas and information that have the potential to become an opportunity. On the

other hand, through their own initiative or due a challenge from a superior, they may take on the responsibility of searching through the organization for ideas that can be develop into opportunities for significant new products or businesses [12].

3 RESEARCH DESIGN

To develop an “innovation management continuum” which spreads out the range between risk minimization and opportunity maximization it first is necessary to identify differences in all dimensions of innovation management (strategy, process, culture, organization) resulting from this paradigm shift. Especially radical innovations have been described as a risky, uncertain, disruptive, and costly undertaking. In general, radical innovation involves the application of significant new technologies or significant new combinations of technologies to new market opportunities. Literature has revealed that the major problem for established firms lies not only in the creation of radical inventions, but particularly in exploiting these technologies toward commercialization [13]. In their research, Rice et al. show that companies that discovered or applied radical inventions did not have the experience and knowledge to exploit the potential value [14]. Based on these findings we chose a radical technological invention (wood friction welding) as the basis for our qualitative study to illustrate clearly how to maximize business opportunities applying innovation management knowledge and methods. In wood friction welding friction and plastic deformation is used to heat, soften and build a coalesced joint between two wood pieces. It enables the connection of two wooden parts without screws, nails or glue and thus to produce “mono-material” furniture. Despite the high potential of wood welding based on the findings in recent research, the importance of wood welding in industrial applications is rather small and therefore the technological as well as the market uncertainty of this technology can be considered as high [15].

The used study follows a multiple research design. A literature review was used as basis for the development of an interview guideline to collect the empirical data and to assist the data analysis. An explorative study (semi-structured interviews) was conducted to identify challenges and appropriate management tools in all dimensions of innovation management, which focuses not only on uncertainty reduction but also on opportunity maximization. As already mentioned *wood friction welding* was used as an example for a radical technological invention with extraordinary degree of novelty mentioned to get comparable results. Respondents were selected in a two-step processes using purposive sampling. First, an *appropriate industry* was selected by researching criteria such as potential for application of the radical invention, awards for innovativeness of products as well as reputation. Due to this approach we selected leading Austrian furniture manufacturers that have positioned themselves as producers of environmentally friendly and sustainable furniture. Wood welding offers these companies to strengthen their competitiveness in their markets because mono-material furniture meets exactly the central needs of ecology oriented customers. The reason for selecting such leading-edge companies was to gather information-rich cases.

In a second step, these companies were approached and the right informant was reconnoitered and contacted, which in general were heads of product. Based on this process, three companies were selected and the data collection was realized through qualitative research methods using a semi-structured interview approach. The interviews were recorded and transcribed, and afterwards content analysis was used to analyze the data and draw generalizing conclusions.

4 FINDINGS

Through cross-case analysis we identified a range of activities or methods applied in innovation projects in order to simultaneous minimize risk and maximize opportunities. These aspects form the basis for the preparation of an “innovation management continuum” which spread out the range between risk minimization and opportunity maximization.

All respondents declared that opportunity maximization requires a fundamental adaption of strategic and operational innovation management methods tools compared to risk reduction. With regard to ***innovation strategy*** opportunity maximization requires a stronger *environmental oriented* strategy instead of a solely internal or resource based oriented strategy. When choosing appropriate *target markets*, a company has to analyze which market segments would receive the highest value due to the application of the new technology. In our cases all companies agreed that customers whose essential needs are wooden furniture without any secondary material as for example glue or metal connections, are the target market for wood welded products. To minimize the technological risk on the one side and to maximize the potential of the new technology on the other side, the interviewees emphasized that they would recommend a *gradual outsourcing* strategy. That means that they would outsource the production of the first wood welded product range to an external partner. After the new technology has been approved the firms would insource the technology to their own production to exploit the full potential of the technology with regard to improve the efficiency and quality of the own production process. Furthermore opportunity maximizers proactively take the opportunity of new forms of financing like *crowd funding*.

At the beginning of the ***idea stage*** of the innovation process, search fields constitute the link between strategic innovation planning and gathering ideas. According to the process of selecting the target market segments, *search fields* should be defined in a two-step procedure. As part of a micro-segmentation, the company should ask first: “Among which customers creates the new technology significant value?” In a second step the search field should be defined with this question: “In which segment-specific products is the risk of application of the new technology the lowest?”. The resulting search fields help managers to focus the following *idea generation* stage. To take advantage of the full potential of this phase, *lead users*, progressive customers and experts from analogous industries should be integrated in this early phase of the innovation process. Subsequently all generated ideas need to be *evaluated* not only but with regard to the gain of value for the customers as well as for the firm.

All of the interviewed firms attested that they perform *design competitions* within the ***concept stage*** to maximize opportunities that are linked with radical innovation project. Thereby designers and other external experts will be invited to develop and refine concepts. Within the idea and concept stages *design thinking* helps to explore alternative solutions simultaneously and therefore maximize opportunities. During the ***development*** and *testing stage interdisciplinary* development teams, *spiral development* routines with ongoing feedback loops as well as *rapid* and *virtual prototyping* methods help the analyzed firms to achieve a balance between exploiting opportunities and controlling the involved risks.

Furthermore, we identified some **organization** specific conditions that help raising the odds of opportunity maximization while simultaneously minimizing the risks. All interviewees emphasized that a stronger focus on opportunity maximization requires a special mindset and ***culture*** in the company. An *open innovation* culture, entrepreneurial climate, mutual trust within the company and a culture of *constructive criticism* are essential factors for opportunity oriented firms. To exploit all potential opportunities especially of radical ideas the interviewees suggest a *scalable innovation system* where radical ideas are processed differently than incremental ideas. All of the interviewed experts agreed that a *matrix structure* of the company helps to achieve a high success rate of innovation projects. Based on these findings Fig. 1 exhibits the *innovation management continuum*. Thereby risk minimization is placed at one end of the continuum and the general focus of innovation management is solely on reducing risks within every innovation activity. At the other end of the continuum is opportunity maximization where the focus of innovation management is on exploiting opportunities to the fullest extent.

Innovation Management Continuum	risk minimization ⟷ opportunity maximization	
Innovation Strategy	Resource and/or competition oriented strategy	Enterprise environment oriented strategy
	Resource based selection of target market	Value oriented selection of target market
	Comprehensive outsourcing strategy	Gradual outsourcing strategy
	Government subsidy programs for financing radical innovations	Crowd funding (e.g. value customers as external loaners for financing radical innovations
Idea	Risk based idea evaluation	Two-stage selection of search fields
	Integration of current customers and internal experts	Open Innovation (integration of lead users, potential customers, external experts)
	Comprehensive risk oriented idea evaluation	Comprehensive value based idea evaluation (internal & external value)
Concept	Internal concept definition	Specific concept- / design competition
	Securing concept through patents	Design thinking
Development & Test	Optimization by simulation	Interdisciplinary development
	Comprehensive technical tests	Spiral development (feedback loops)
		Rapid prototyping
Innovation culture	"All the smart people work for us" (closed enterprise)	"Not all the smart people work for us" (open enterprise)
	"Knowledge is power" culture	Open communication within company
	Avoiding mistakes is highest premise	Management tolerates mistakes
	Top management focuses on short term financial criteria	Top management focuses on long term success criteria
Innovation organization	Innovation process adapted to incremental innovations / continuous improvements	Innovation process is scalable depending on degree of innovation
	Uniplanar organization	Matrix organization
	Functional organization	Cross functional teams
		Ambidextrous Organization

Figure 1. Innovation Management Continuum.

5 CONTRIBUTION AND LIMITATIONS

The findings presented in our paper may be understood as an initial starting point for adapting firm specific innovation systems towards a stronger focus on opportunity maximization since there is a huge potential for better project performance through exploiting the opportunities hidden in the nature of uncertainty. Based on a thorough literature review and a qualitative study, innovation activities and methods but also organization-specific conditions are identified that can be applied in innovation projects in order to maximize opportunities while simultaneously minimizing the risks. In the past, researchers and scholars have paid little attention to effective innovation strategies and measures that focus on maximizing opportunities, instead the focus has been on what limits the space of actions. This work contributes to the theory in this respect and can be seen as a first cornerstone to a holistic innovation management framework. The study presented in this paper is not concerned with statistical generalization but with what is referred to as theoretical generalization. In this context we recognize several limitations that may be addressed in future research. First, our qualitative study is focused on companies within the furniture industry and therefore it only examines how firms within this industry dear with opportunities and risks. Second, the multi-case study is limited to a small sample size, and may leave out certain aspects of the theory. For this reason, future studies should include a bigger sample size to obtain valid results. Third, the findings of the study reflect the interviewees' opinion of the procedures and activities of Austrian firms only. Thus, it would be worthwhile to expand the view to other countries. Furthermore, it is acknowledged that the developed innovation management continuum is a first draft that needs to be adapted and specified to other industries and cultures in a broader scope to represent the foundation for further development of the theory.

REFERENCES

[1] Afuah A. (2003): Innovation management. Strategies, implementation and profits, 2nd ed. Oxford University Press, New York.

[2] Galbraith J.R. (1973): Designing complex organizations. Addison-Wesley series on organization development. Addison-Wesley Pub. Co, Reading, Mass.

[3] Burns, T., Stalker, G.M. (1961): The management of innovation. Tavistock Publications, London.

[4] Duncan, R.B. (1972): Characteristics of organizational environments and perceived environmental uncertainty. Administrative science quarterly 17(3).

[5] Jalonen, H. (2012): The Uncertainty of Innovation: A Systematic Review of the Literature, Journal of Management Research, 4(1), pp. 1-47.

[6] Souder, W. E, Moenaert, R.K. (1992): Integrating marketing and r&d project personnel within innovation projects: An information uncertainty model, Journal of Management Studies, 29(4), pp. 485-512.

[7] Tushman, M. L., Nadler, D.A. (1978): Information Processing as an Integrating Concept in Organizational Design, Academy of Management Review, 3(3), pp. 613-624.

[8] Freeman, C., Soete, L. (1997): The economics of industrial innovation (3rd ed.), Cambridge.

[9] Baron, R. A. (2006): Opportunity Recognition as Pattern Recognition : How Entrepreneurs "Connect the Dots" to Identify New Business Opportunities. Academy of Management Perspectives, 20(1), pp. 104–120.

[10] Kolltveit, B., Karlsen, J., & Grønhaug, K. (2004): Exploiting opportunities in uncertainty during the early project phase. Journal of Management in Engineering, (October 2004), pp. 134–141.

[11] Lechler, T., Edington, B., & Gao, T. (2012): Challenging classic project management: Turning project uncertainties into business opportunities. Project Management Journal, (December 2012), pp. 59–70.

[12] O'Connor, G. C., Rice, M. P. (2001): Opportunity Recognition and Breakthrough Innovation in Large Established Firms. California Management Review, 43(2), pp. 95–116.

[13] Christensen, C. M., & Bower, J. L. (1996): Customer Power, Strategic Investment, and the Failure of Leading Firms. Strategic Management Journal, 17, pp. 197–218.

[14] Rice, M., Kelley, D., Peters, L., & Colarelli O'Connor, G. (2001): Radical innovation: triggering initiation of opportunity recognition and evaluation. R&D Management, 31, pp. 409–420.

[15] Ebner M., Petutschnigg A., Schnabel T., Sternad B., Huskic A., Gaubinger K. (2014): Development of an automated wood welding process. Journal of Adhesion Science and Technology. 28/ 18. pp. 1783-1791.