

Technology-related Diversification of Companies with Narrow Market Scope

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core competence
fuzzy front end of innovation
lead user
strategy workshops

Abstract*Background*

Many technology-driven companies are highly specialised and often focused on only one business segment. Therefore, they are faced with a narrow market scope and have to ask themselves, how to develop new profit potential in the future (Kim/Mauborgne, 2005; Zook/Seidensticker, 2004).

Technology-related diversification and the Lead User Method

With technology companies especially, the idea creation process of the diversification is technology-driven. Involving lead users (von Hippel, 1986; Eisenberg 2011; Lilien et al., 2002) very early in the diversification process, might help to meet potential customer needs, and thus, market acceptance.

Research questions

Therefore, the aim of this project is to answer two questions:

1. How can technology-intensive companies, based on their core competencies, identify and select appropriate new target markets and customer segments in line with their diversification strategies (objectives)? Moreover, what is needed to overcome related barriers?
2. In which way can lead users be integrated into the innovation process, to ensure future product-market combinations with a perceptible comparative advantage for all customers in the target market?

Methodology

This study followed a mixed-method approach, combining qualitative multi-case study with action research. Four industrial partners were selected to explore the diversification and lead user process. The entire research process lasted over two years and was funded by the Swiss government (Commission for Technology and Innovation CTI).

Findings

The tools employed in the process proved to be useful for all companies. In all four cases, working with lead users was a premiere. Feedback from all four firms suggests, that the value of engaging lead users has been highly appreciated and that outlook of the diversification project's future looks much more promising compared to diversification attempts taken in the past. In sum, a clear competence based search for new business fields, combined with the lead user engagement, offer a very promising path to technology-related diversification for SMEs. However, it's very important that the decision makers have the power of authority to invest in the new market and to release resources for the project.

Contribution and implication for theory and practice

The research project shows three main contributions:

- first, it offers insights into the identification of core competencies as a starting point in the search for diversification fields (via the "job-to-be-done" perspective);
- second, it clarifies the early stage of the diversification process by integrating the lead user method into the "fuzzy front end of innovation" (Gassmann/Schweitzer, 2014; Cooper, 2001); and
- third, it delivers an empirically and practically approved process (with tools and instruments) that can be used by more or less experienced SMEs and consulting firms.

BACKGROUND

Many technology-driven companies are highly specialized and often focused on only one business segment. Specialising in a narrow market, along with a deep product offering, customer proximity and high innovativeness to satisfy the increasingly demanding needs of existing customers have shown to be a formula for success, as the research on so-called "hidden champions" in the German speaking part of Europe indicates (Simon, 2012). However, these highly-specialised companies may fall victim to the "strategy paradox". High resources commitments to the target market enable strong competitive positions relative to less focused firms. While this offers promising returns, it also makes firms vulnerable to changing environmental conditions (such as saturated markets, increasing competition from BRICS-countries, dependency on fluctuation in demand etc.) and, due to the specificity of their competencies, hampers strategic adjustments (Raynor, 2007). This explains why in the aftermath of the financial crisis (2008/2009) many technology-driven European firms, especially SMEs, faced a significant breakdown in turnover and returns. This made them painfully realise how dependent they were on a single industry, or even customer, and forced them to think beyond typical product innovation to look for related diversification into new business segments.

Therefore, firms focusing on a narrow market scope have to ask themselves how to develop new profit potential in the future (Kim/Mauborgne, 2005; Zook/Seidensticker, 2004) in order to reduce their dependency on a narrow and increasingly turbulent market and to secure the viability of their business. Technology-driven companies have to especially consider diversifying into (or developing) new markets with new products/services. Using related diversification, ideas and innovations are developed based on the existing core competencies of the company (Pümpin, 1986; Hamel/Prahalad 1997; Ziltener, 2011a), but still need to be positioned in a completely new or unfamiliar target market.

Studies on diversification have concentrated either on the end result with questions such as "do diversified companies outperform non-diversified ones?" or "do related diversifications outperform non-related ones?" (Müller-Stewens/Brauer, 2009; Lehmann, 1993; Erdorf et al., 2013); or on the product innovation process within a pre-defined business segment with typical questions such as "what are the key success factors in developing new products and/or services?" (Cooper/Kleinschmidt, 1987, 2007). However, the question of how firms define new business segments in combination with new promising product or service offerings *in the first place* is not covered well in the literature.

Even though a firm's corporate strategy should define the direction for diversification based on the identification of existing core competencies and industries of interest, most organisations lack these preconditions for a systematic diversification process. "Many companies do not know how to detect future growth markets or even do not know where to start from in order to generate growth opportunities." (Lichtenthaler, 2005: 697) Many organisations even struggle to systematically identify their core competencies and key technologies as a first step in the diversification process.

As already mentioned, this knowledge gap is not solely a practical but also a theoretical problem. The question as to how a firm can systematically identify and assess diversification opportunities is hardly treated in management literature. Similarly, prior research does not operationalise the process by which a firm's competencies can be leveraged for related diversification (Lichtenthaler, 2005; Liu/Liu 2011; Müller-Stewens/Lechner, 2016).

One reason for this research gap might be due to the typical blind spot of *strategy* researchers on one hand (focusing on the result of diversification) and *innovation* researchers on the other (focusing mainly on the product/service development process). A study which combines these two related but different disciplines, by looking at both the market definition as well as the idea creation process for new products/services, is lacking (Ziltener, 2011b).

With technology companies especially, the idea creation process of the diversification is technology-driven. So, while a new product idea might be based on existing technological competences, the question of market acceptance and the necessity of acquiring further technological and other (e.g. market or management) capabilities is often neglected in such technology-push approaches (Gassmann/Schweitzer, 2014). Involving lead users (von Hippel, 1986; Eisenberg 2011; Lilien et al., 2002) who help to define potential customer needs very early in the diversification process can help to direct the product/service development process in the right direction as well as to uncover major competence gaps in a newly defined market segment. The identification and role of such lead users in this early step of the diversification process (i.e. in the idea generation for newly targeted markets) has not been studied so far.

LITERATURE

In the literature, diversifications are differentiated in numerous ways, such as e.g. concentric, horizontal, and conglomerate as well as related or non-related (Gessinger, 2009; Fey, 2000; Volberda et al. 2010). The product-market growth matrix of Harry Igor Ansoff (1958) defines diversification as the riskiest of the four growth strategies. There exists a huge volume of diversification research, often with contradicting results. The meta-analysis by Palich et al. (2000) suggests that, generally, diversifications with a certain degree of market or competence relatedness offer the most promising results under many different circumstances, mitigating some of the risks involved.

Leveraging technology and knowledge assets into new markets enables the firm to conserve and expand the value of its existing core competence basis by extending it to other, new or unfamiliar markets of the firm (Prahalad/Hamel, 1990). In many studies, such competence-related diversifications have shown to produce better performance than other forms of diversifications (Teece et al., 1994; Robins/Wiersema, 1995; Müller-Stewens/Brauer, 2009; Volberda et al., 2010; Lombriser/Abplanalp, 2015).

While core competencies are “complex combinations of tangible and intangible assets, people, and processes that organizations use to transform inputs into outputs” (Collis/Montgomery, 1998), in our study we specifically focus on firms in which *key technologies* make up the main part of the core competence and build the starting point for new business development. **Figure 1** is an adaptation of Ansoff's (1958) original growth matrix and locates the technology-driven diversification approach as a function of newness and familiarity of the underlying competencies (technology, knowledge) and of the addressed needs/markets in the diversification project.

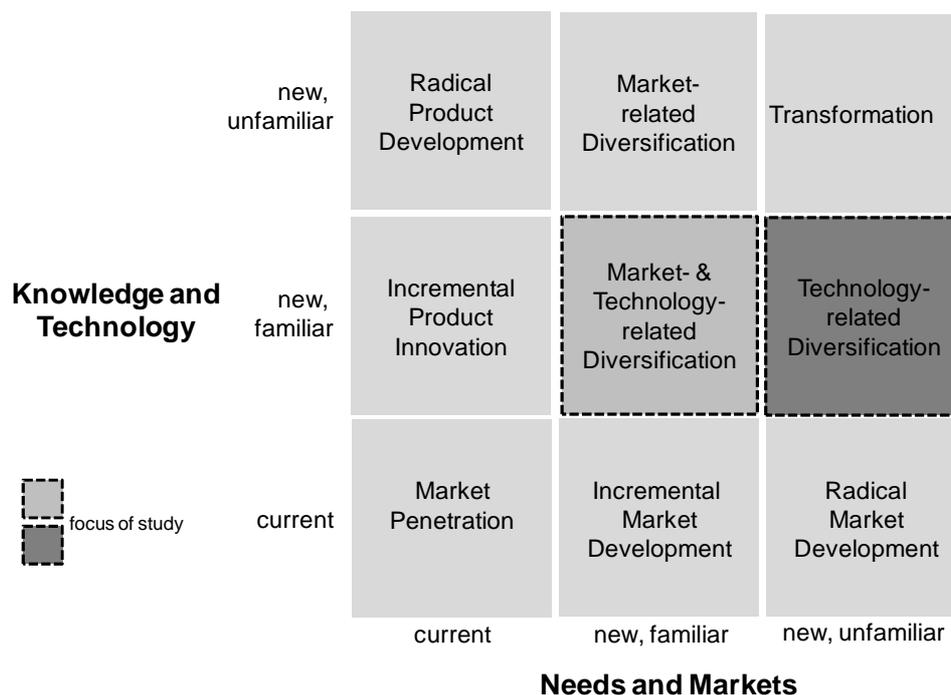


Figure 1: Competence-based diversification (based on Gessinger, 2009; Ziltener, 2011a)

The research problem stated in the first section highlights three connected tasks in the beginning of a competence-related diversification process: (1) identification of *core competencies* based on existing technological capabilities, (2) identification, assessment and selection of *potential new business segments/markets*, and (3) involving *lead-users in the idea creation process* for selected new product/market combinations. Since leveraging (and adapting) technology to new markets requires innovation activities by the firm that are characterised by a high degree of novelty and uncertainty, these three tasks make up the “fuzzy front end of innovation” (Gassmann/Schweitzer, 2014; Cooper, 2001). They cover *the* critical part of innovation and of creating competitive advantage. Performing this “homework” (i.e. up-front or pre-development activities such as initial screening, preliminary market

and technical assessments, concept development, market studies, and business analysis) has been found to be a critical success factor in new product ventures (Cooper/Kleinschmidt, 2000: 21). Khurana/Rosenthal (1997: 105) locate these initial homework tasks at the beginning of their three-phase front end model (calling it "pre-phase Zero") and, based on a study of eleven companies, conclude that increased formality and integration activities can help the firm to get through the fuzzy front end.

"Yet, the front end is poorly understood, and managers experience a lack of knowledge on how to best organize the front end. Ideas about the intensity with which certain activities are to be carried out and the tools that assist their professional execution are vague, and the allocation of resources and top management attention are still ancillary in many companies as compared to other phases of the innovation process" (Gassmann/Schweitzer, 2014: vi).

(1) Identification of core competencies as basis for diversification

Prahalad/Hamel (1990) introduced the term "core competencies" in the management literature more than 25 years ago. Since then, many firms have started to use this concept in their strategic management activities. However, the variety of forms in which the concept has been used in practice and in theory, as well as the inherent challenge of defining a firm's core competencies (due to its complex combinations of tangible and intangible factors and its social ambiguity), has often resulted in confusion and dilution of the term (Lahti, 1999). "It is a complex and challenging concept: it is difficult to specify theoretically, to identify empirically as a phenomenon, and to apply in practice" (Ljungquist, 2007: 393).

Nevertheless, a good starting point for the identification of a firm's core competence is to consider the three main criteria that characterise it (Hamel/Prahalad, 1997): a core competence (1) must significantly contribute to the customer benefit, (2) it should be competitively unique and difficult for competitors to imitate or substitute, and (3) it should provide the basis for the expansion into new markets. So, a practical identification of core competencies in this research project would have to start from the firm's existing competitive advantages (i.e. the of *relative* customer benefits it offers), then looking at the intangible and tangible components that lead to that competitive advantage. Finally, combining these elements into a coherent definition of core competences requires analytical as well as intuitive-creative thinking (Raynor, 2007; Lombriser/Abplanalp, 2015), which has proven to be most effective by involving experienced top managers of the firm and applying visual methods such as mind mapping and network diagrams (Eppler et al. 2014).

(2) Identification, assessment and selection of potential new business segments/markets

There are many studies and several proven concepts for the expansion into new markets (i.e. O'Connor, 2005). However, most studies and tools focus mainly on entry barriers and how to overcome them, but less on the crucial step before, i.e. the identification and selection of specific markets to enter (von der Oelsnitz, 2000).

The search for new business segments can take both an inside-out and an outside-in perspective (Lichtenthaler, 2005). *Inside-out* refers to a search where the firm looks at new opportunities through the lenses of existing competencies and markets broadly defined in the vision or corporate strategy of the company. Trying to leverage or use existing competencies and technologies more efficiently is a typical starting point for inside-out searches because it enables the firm to spread the entrepreneurial risks of the firm by addressing new markets while using (and potentially improving) existing competencies. *Outside-in* refers to a more undirected search, looking at all existing and future markets and competencies the firm might potentially pursue or develop. A typical starting point for a market-based outside-in search is to consider long-term global mega-trends (such as the aging population) or evolving new technologies (e.g. industry 4.0).

The search process for diversification opportunities usually follows in multiple stages (Lichtenthaler, 2005: 701): (1) definition of search field, (2) identification of business ideas, (3) validation of business ideas, (4) rough assessment of business ideas, and (5) detailed analysis of business ideas. This process ideally follows a path in which potential business opportunities are increasingly refined and unpromising ideas filtered out. While in the first two stages the ideas can be very vague and cover only either a technology or a possible market, in the later stages detailed internal and external assessments have to be made.

This search process for diversification opportunities can be an overwhelming knowledge generation process (Nonaka/Takeuchi, 1995) for many firms. While to some researchers the typical challenge in

this process is the *lack* of knowledge about possible new application fields of the firm's technologies beyond its existing markets (Schuh/Graw, 2013), to others the problem is quite the opposite: the availability of *too many options* in the beginning of the search process. Liu/Liu (2011: 200) call the latter the 'parking lot dilemma': "Imagine that you are trying to park your car in a parking lot. If there is only one parking space, we feel lucky and simply drive into that space without a second thought or choice. However, one day we are lucky and have so many parking spaces available that we become confused because we are not confident that we will choose the optimal parking space that will offer us the greatest convenience and safety. Very often it seems that our final choice was not the optimal one. Similarly, if the alternative uses of the current competence are many, the firm will find it difficult to decide among the options available."

In either case, a diversification project usually requires an extraordinary search effort, which for many SMEs often represents a hurdle to diversification which has to be considered while setting up a diversification workshop with the top management team. A useful approach to deal both with the lack as well as the abundance of ideas for the definition of possible diversification fields and business ideas is to start with the function (Lichtenthaler, 2005), also called "job-to-be-done" (Christensen/Raynor, 2003) that the identified core competencies of the firm fulfils for its existing customers, and then look for new or unfamiliar markets in which this "job-to-be-done" also has to (or could) be performed, resulting in the firm's competences being applied.

As practice has shown, leveraging a firm's core competencies in new markets usually requires refining existing and acquiring new complementary competencies. This makes competence leveraging even more challenging, since the necessity of new or refined technological and non-technological competencies very often is detected only in the latter stages of the search process, e.g. in the detailed analysis of the business ideas or even later, e.g. in the product development phase (Liu/Liu, 2011).

(3) Involving lead-users in the idea creation process for selected new product/market combinations

Over the past decades, based on the work of Cooper & Kleinschmidt (1987), numerous methods have been derived to develop new products and services. In addition, the Lead User Method was developed by Eric von Hippel (1986) as an approach to bridge the gap between technology-push and market-pull. "Lead users are users whose present strong needs will become general in the marketplace months or years in the future. Since lead users are familiar with conditions, which lie in the future for most others, they can serve as a need-forecasting laboratory for marketing research. Moreover, since lead users often attempt to fill the need they experience, they can provide a new product concept and design data as well." (von Hippel, 1986, p.791). Using this method, companies work closely together with the identified lead users, by asking them about their needs and potential solutions. New products and services will be developed in line with the lead user's experiences and requirements. Thereby, the method ought to ensure that new product-market combinations will match the future market requirements and provide a perceptible comparative advantage (Competitive Innovation Advantage).

However, in literature, a research gap concerning the implementation of this method is mentioned. There is still little known about its critical success factors (Lilien et al., 2002; Lüthje/Herstatt, 2004). Eisenberg (2011: 56-57) highlights some of the major challenges of the lead user method:

- finding and reaching the right lead users;
- getting the right people to answer the e-mail or phone call;
- remaining open-minded about problems and solutions; and
- allocating enough time for the process.

However, the identification, recruitment and involvement of lead users (especially in diversification processes) still needs further study (Lilien et al., 2002; Lüthje/Herstatt, 2004).

Research Questions

Therefore, the aim of this project is to answer two questions:

1. How can technology-intensive companies, based on their core competencies, identify and select appropriate new target markets and customer segments in line with their diversification strategies (objectives)? Moreover, what is needed to overcome related barriers?

2. In which way can lead users be integrated into the innovation process, to ensure future product-market combinations with a perceptible comparative advantage for all customers in the target market?

METHODOLOGY

This study followed a mixed-method approach, combining qualitative multi-case study with action research. The entire research process lasted over two years and was funded by the Swiss government (Commission for Technology and Innovation CTI).

Qualitative multi-case study

In order to contribute further insights to the success factors of the implementation of a technology-related diversification approach, a qualitative setting was chosen: the multi-case study research (Yin, 1994). For this purpose, a theoretical sampling was chosen by focusing on companies with technology-based competencies operating in a narrow market, with the intention to leverage their technological competencies into unknown or unfamiliar markets. Four industrial partners were selected to explore the diversification and lead user process on a case based level. In order to create insights applicable across different settings, the companies were chosen from different industries and settings (technology assets, size): aluminium packaging, polymer processing, software development, and textile machinery. Three of them are traditional manufacturers. The number of employees for the three SMEs varied between 17 and 30; to gain additional insight, a comparative case with a bigger company employing around 5000 people was also included in the study.

To analyse the cases, different methods were used: clustering, pattern recognition, paired comparison and traditional content analysis (Eisenhardt, 1989). It involved triangulation of multiple investigators and data sources. A team of five researchers alternated their roles as workshop moderators (see action research below) and workshop observers (investigators). Data sources included workshop results, observations, archives, company documents, as well as interviews with top management.

Within-case analysis was based on detailed workshop results (transcripts, flipcharts, templates, poster sessions etc.) as well as unstructured interviews with workshop participants during the entire first phase of the diversification process. Cross-case analysis was oriented towards identifying and examining similarities and differences across the four cases.

Action research: Workshop design

The introduction of the action research method in social science is usually attributed to Lewin (1946), who criticised the alienation between social-science theories and practice. According to Probst/Raub (1995), action research prevents both the often observed impracticality of positivist management research as well as the theoretical shortcomings of pure consulting. It combines and involves researchers and practitioners in a collective knowledge generation process. It is a method specifically suited for *applied* management research (Kocher et al., 2011).

This study fulfilled all of the core elements of action research (Probst/Raub, 1995): (1) combining science and practice by alternating intervention (via workshop moderation) and observation; (2) involving practitioners in the definition and solution of the problem; (3) using a multidisciplinary approach by combining researchers from both the innovation as well as strategy field; and by involving top and middle managers from all major functions of the firm; and (4) producing action-oriented results (e.g. by developing rough prototypes).

The main element of action research in this study was the preparation and execution of diversification workshops with top and middle managers from the case companies. Three day-long workshops were conducted with each firm individually; and two day-long multiple-company workshops were held in the second half of the project, which ensured cross-firm feedback and learning for practitioners as well as researchers. **Table 1** summarizes the workshop process and settings.

Phase	Objective of WS	Level	Participants	Method(s) used
Kick-off Workshop	instruction about entire process; clarifying motives for diversification	multi-company	1-2 top managers from each firm; research team: 1 moderator	slides
<i>Preparation for WS 1</i>	<i>draft of core competencies</i>	<i>each firm individually</i>	<i>1-3 firm executives from each firm</i>	<i>templates (KMU*STAR-strategy tool)</i>
Workshop 1	identification of core competencies; definition of diversification objectives	on-site at each firm individually	3 to 12 top and middle managers at each firm; research team: 1 moderator, 2 observers	templates (KMU*STAR-strategy tool), mind mapping, network analysis
<i>Preparation for WS 2</i>	<i>draft of inside-out and outside-in search fields</i>	<i>each firm individually</i>	<i>1-3 firm executives from each firm</i>	<i>templates; Gartner megatrends</i>
Workshop 2	outside-in and inside-out search of diversification fields; assessment; selection of top 2 fields (for lead user search)	on-site at each firm individually	5-12 top and middle managers from each firm; research team: 2 moderators, 3 observers	templates (slides); brainstorming, magazine shopping, 6-3-5 method, lotus blossom creative technique; utility analysis
<i>Preparation for WS 3</i>	<i>finding and recruiting 5-6 lead users for each firm</i>	<i>research institution</i>	<i>research team (4 researchers)</i>	<i>Pyramiding via phone calls, e-mails: determining a starting point and asking subjects for referrals; lead user screening (von Hippel et al. 2008)</i>
Workshop 3: Lead User Workshop	idea creation for new products (in new and/or unfamiliar markets)	<i>on-site at each firm individually</i>	2 to 8 top and middle managers from each firm; 5-6 lead users; research team: 1 moderator, 3-4 observers	brainstorming, brainwriting; templates for idea sketching
<i>Preparation for WS 4</i>	<i>assessment of entry barriers</i>	<i>each firm individually</i>	<i>1-3 firm executives from each firm</i>	<i>templates, spider diagrams</i>
Workshop 4	diversification model for most attractive idea	multi-company workshop	3-5 top managers from each firm; research team: 4 moderators in parallel, 1 observer	spider diagram, capability profiling; diversification canvas
<i>Preparation for WS 5</i>	<i>draft of road map and marketing mix</i>	<i>research institution</i>	<i>research team (4 researchers)</i>	<i>templates (slides)</i>
Workshop 5	entry strategy: road map and marketing mix	multi-company workshop	3-5 top managers from each firm; research team: 4 moderators in parallel, 2 observers	templates (slides)

Table 1: Overview of workshops (WS) in action research phase

In the end, the results of this study will be conveyed in toolboxes, checklists and guidelines for practitioners.

FINDINGS

We first focus on the four projects individually, looking at how each firm proceeded from the decision to diversify up to drafting an entry strategy for the chosen new product/market combination. Cases A to C represent small and medium-sized enterprises with a number of employees between 15 and 30, Case D represents a multinational corporation with staff of around 5'000.

Case A: SME in aluminium packaging

Firm A is focused on the production of aluminium trays (packaging) for the pet food industry. The firm has been able to grow continuously. However, its main customer still makes up around 50% of its revenues. The rest of the sales are generated abroad, but are concentrated on a few other customers from the pet food industry. This customer concentration, together with the dependence on aluminium material and the fact that plastic packaging (in which firm A lacks competence) is more and more replacing aluminium trays, has led to several diversification attempts in the past. Since they mostly followed a technology-push strategy, they however remained unsuccessful. The main objective of the diversification project, therefore, was to develop a new application of its metal (esp. aluminium) forming technology competence that would help the firm break out of the pet food niche as well as make it less dependent on aluminium suppliers.

In the preparation for workshop 1, the firm first struggled to define its core competencies. In its template draft as well as at the beginning of the workshop, it limited itself to quite generic competencies (such as "customer focus" or "delivery time"). The focus on "jobs-to-be-done" of A's customers, forced by the template prepared by the researchers, led to a more specific definition ("aluminium forming technology, combined with intelligent and efficient supply chain management"). The brainstorming and "magazine shopping" exercise (in which dozens of different illustrated magazines help to inspire the participants to come up with ideas from a totally different starting perspective) created a broad array of possible diversification fields (including pharmaceuticals or jewellery). A more detailed, but still quite rough assessment of the four most favoured ideas (by simple scoring) according to internal (competence oriented) and external (industry attractiveness) factors, resulted in the selection of "aluminium bottles for alcoholic and energy drinks" as the most promising field.

Regarding the search for lead users, 21 experts in the broad field of beverage packaging were contacted, who then were able to recommend another 21 potential lead users. After a rough ranking of each potential lead user, according to an assessment which estimated expected knowledge level and need for problem solution, the research team started to contact (via mail and phone calls) the first person on the list and then work down the list until 6 lead users agreed to participate in an already scheduled lead user workshop. The same procedure in finding lead users was followed again for the other three research cases.

At the end of the search phase, the firm decided to pursue the idea of "spouted pouches" (aluminium bags) for CO₂ sustainable alcoholic beverages, which could be used for special events like sport games, open air festivals and other big events where glass or aluminium cans were prohibited. This idea originated in the lead user workshop and was concretised in workshops 4 and 5. The next planned step was the implementation of the product concept with the employer of one of the lead users. Firm A planned to enter the market around 8-9 months thereafter.

Case B: SME in polymer processing

The firm specialises in the production of large-area plastic parts with customers from the automotive industry (campers). Its main customer makes up more than 70% of revenues. This heavy dependence and therefore strong risk concentration, together with a very widely fluctuating capacity utilization, led the firm to search for alternative business areas. Previously, the firm had made some effort in diversifying its businesses. However, the lack of management resources strongly limited this endeavour. The main objective of the diversification project, therefore, was to optimise the firm's capacity utilisation and to reduce its market risk by finding new applications of the firm's polymer competencies outside the camper industry.

The mind mapping and competence clustering method in the identification of core competences in the first workshop highlighted the importance of complementary capabilities beyond the technology of the vacuum thermoforming process, such as just-in-time and just-in-sequence delivery as well as rapid project realisation. In this first workshop, as well as in the following workshop 2 (search fields), the fi-

nally selected new business area for diversification was mentioned several times, but nevertheless on a still very abstract and vague level. Workshop 2 resulted in the decision to search for lead users from the public transportation field. 41 experts were contacted, who were able to refer 20 lead users, of which 6 participated in the lead user workshop. The idea of processing novel, complex foam boards was born in the lead user workshop, in which potential customers from different industries (rail vehicles, automotive, cableways, spinning machines) expressed their need for lightweight, yet robust and cheap components in small and medium quantities. Workshops 4 and 5 helped to refine the idea.

At the end of the search phase, the firm decided to diversify into producing complex components (based on a new "sandwich-technique") for the public transportation sector (buses, cableways, etc.) and later - if possible - into the machinery industry. Since the technical feasibility and limits were not yet well understood, a joint research project with a technical university was initiated as the next step. The progress of the project was hampered by several changes in the management team, which aggravated the lack of management resources, since the CEO was absorbed by recruiting tasks.

Case C: SME in software development

The firm was founded in the internet hype of 2000. In contrast to many other IT firms, it was able to survive the burst of the internet bubble in 2001 and successfully positioned itself as a software developer. In 2010, the firm added the development of mobile applications as a new business field. At the beginning of this research project, it faced two major challenges, which were caused by the specific sales structure of its software products and applications. Since the firm acquires most of its projects via advertising agencies, it was not able to reach the end customers directly. Thus, in its target markets the firm was not being perceived as a software and application developer by end customers. Another strategic challenge was the fact that its project orders required high product customisation for its clients. While this enabled the firm to differentiate its products, it also made it difficult to standardise and replicate important processes or software components. This led to very high development costs and hindered reaching synergies. A main part of firm C's business stemmed from a collection system for dentists, which is able to deal with a complex "triangle business structure" among patients, dentists and insurers. The main objective of the diversification project, therefore, was to develop a new business field, which mitigated the risks in the above mentioned software and application business segments. The firm sought to enter a new, scalable business based on its software and application competencies, as well as its experience in dealing with complex triangle relationships.

It was only in workshop 1 (identification of core competencies) that the ability to handle a multi-sided business relationship ("triangle structure") was identified as an important part of firm C's core competencies, along with its web-based software programming capabilities. In workshop 2 (search fields), this was picked up again, and the field of "applications for destination management by tourism organizations" was first selected as the field to find lead user experts. However, the following search process uncovered several drawbacks of this idea, which redirected the search for lead users to experts from shopping mall operators (which also had to deal with complex triangle structures). There, 21 experts were identified who referred 35 potential lead users, of whom 6 participated in the lead user workshop.

Eventually, the firm decided to develop an application for "location-based retail services" for shopping malls and outlet operators (providing shoppers with location based services and information). This idea was concretized in workshops 4 and 5. In a follow-up lead user workshop, a paper prototype was tested with three pilot customers, which then was further developed to a clickable prototype version (which will be tested again in the research institution's own service innovation lab). The product, at the end of the initial phase of diversification, offers the potential of being sold worldwide on a scalable basis.

Case D: MNC in textile machinery

The firm is a world leading developer and producer of spinning machines. It has a long and successful history in this field and a very broad product portfolio. It has two main businesses: machinery and equipment for spun yarn systems, and premium technology components (with a focus on technology components and services for spinning factories and machinery manufacturers). The firm has 18 production sites in 10 countries and employs around 5,000 people. The case serves as a special comparison (or "benchmark") to the three much smaller SMEs A, B and C.

Firm D has an obligation towards its shareholders to grow. This should be achieved both organically (via innovations) and through cooperation and acquisitions. Over the last years, the firm was not able

to reach its own growth targets; one reason for this being the fact that the increasing demand for garments (due to the rising world population) has been more than compensated for by the technological progress in spinning machines, which enabled drastic improvements in efficiency and therefore has reduced demand. As a reaction, the firm successfully diversified into the automotive business some years ago. However, the deteriorating conditions in the core business forced the firm to pursue further diversifications. These, however, were all unsuccessful, the main reason (according to the VP of corporate planning) being that none were competence-based. Firm D participated in the research project because it was the intention of top management to base future diversifications on its existing technological competencies. One major criterion for the search for new business opportunities was to reduce the firm's dependency on the cyclical nature of the cotton business (production of cotton and demand for cotton textiles), which in the past led to high fluctuation in demand for spinning machines and put much pressure on firm D's resources management.

The original diversification team was comprised of 12 people (two top managers and 10 middle managers) from different units and functions. It was led by the head of strategic planning. The identification of core competences in workshop 1 was a very complex task, since the firm operated in many different technology fields along the entire spinning machine value chain (blow room, card, draw frame, comber, roving, ring, winding, rotor, and air-jet). Again, the focus on the functions ("job-to-be-done") underlying these technologies helped to uncover some promising diversification fields, among them also the wide area of industry 4.0, for which 32 experts were contacted, who were able to refer 26 potential lead users, of whom 6 attended the lead user workshop. While the lead user workshop led to many different "industry 4.0" ideas, it also created the rather unexpected idea of "production capacity brokering". The latter idea was again picked up and concretised in workshop 4.

Case D was the only company in which the CEO of the firm did not participate in the process. Moreover, the CEO who originally supported the diversification attempt was replaced during the research project. The firm's new strategic direction under the new top management team was to refocus on its traditional core business, coupled with downsizing measures. This new constellation was also felt in the original diversification team. The head of strategic planning, together with most others of the team, left the firm in the aftermath of this change.

Nevertheless, the original idea of "industry 4.0" was picked up again and further developed, due to the fact that this initiative was already independently being pursued in different parts of the firm. At the end of this research project, the firm had developed a mobile "industry 4.0 alert app" that enables predictive maintenance with remote-access. This growth path, however, does not represent a real diversification per se but rather a product development initiative for its existing customer base. The more radical idea of diversifying into a worldwide cotton and garment trading platform (born out of workshop 3 and 4) was discarded due to turnover in the firm's management team, to whom the idea was too far away from the firm's core business (and supposedly its competencies). The app was presented at a major trade show one year after the project start.

Even though the diversification project team was dissolved during this research, one often cited benefit of the project was that, for the first time, the firm engaged in a cross-unit and cross-functional project. It was planned to use this approach more often in the future for innovative problem solutions.

Cross-case analysis

Unsurprisingly, the cross-case comparison first highlights major differences between the three SME cases on one hand, and the diversification process of the much bigger MNC on the other. Holding diversification workshops with the MNC puts greater demands on the moderator, due to a higher number of participants (in case D 12 top and middle managers participated as opposed to usually two to five from the SMEs), but also because the business was much more complex. The main difference, however, was observed in the "ownership" of the process. While in the three SMEs the process was clearly led and driven by the owner-managers, the process in D (MNC) was first not actively supported by the CEO, and - even worse - after his replacement, followed by almost a year long period with much uncertainty and a lack of clear responsibilities, it finally was abandoned all together. This led to considerable frustration and disappointment in the diversification project team.

While during the search process both inside-out and outside-in methods (Lichtenthaler, 2005) were used, in the end all of the four cases pursued an idea that originally stemmed from the inside-out perspective. This highlights the importance (or benefits) of the competence based approach. Nevertheless, the outside-in perspective helped to make sure important external trends relevant for the firm

were not being missed out and to make the top management team more confident in pursuing the once chosen path because other possible ideas have also been considered.

In all four cases, working with lead users was a premiere. Feedback from all four firms suggests, that the value of engaging lead users has been highly appreciated and that outlook of the diversification project's future looks much more promising compared to diversification attempts taken in the past. In sum, a clear competence based search for new business fields, combined with the lead user engagement, offer a very promising path to technology-related diversification for SMEs.

Further cross-case findings are the following:

- diversification motives of the participating companies vary. They can range from optimising the degree of capacity utilisation, to regaining independence from a special industry or customer or to meet shareholders' growth expectations.
- the goals of the diversification process depend on the motives; they are not related to the industry or company size.
- the tools employed to identify core competences, new possible diversification fields, to search for and recruit lead users and to create product/market ideas proved to be useful for all companies, even though more for the SMEs than for the MNC.
- while dividing the technology-related diversification process into different phases (workshops) and stretching over a period of almost two years might at first glance sound quite long, it has proved to be necessary. Some steps require creative work (divergence), others more structured work (convergence). A traditional stage-gate-process does not seem applicable for a typical diversification process.
- identifying suitable lead users is the most challenging and crucial part of the process. However, it seems to be generalisable with very detailed guidelines. Lead users were more willing to participate in the workshop than the research team originally expected. Offering a compelling reason, i.e. giving the opportunity to contribute to the development of innovative solutions for an important "job-to-be-done", can help to motivate even very busy experts to participate.
- whether the new technology-related product will be launched onto the new market or not is not dependent on the size of the company. However, it's very important that the decision makers have the power of authority to invest in the new market and to release resources for the project.

DISCUSSION

Comparing the results of this study with the low success rate found in most empirical studies on diversification (e.g. Andreou et al., 2016; Singh et al., 2010; Volberda et al., 2010) the four case studies look more promising, at least at the end of the initial phase of diversification. Even though one of the four diversification projects (case D) has been disbanded, it still offers the potential of market diversification (expanding the "industry 4.0 alert app" to other industries, e.g. SME customers in the machinery sector). Three possible reasons for this promising outlook at the end of our research project are:

- (1) they were all borne out of *strategic necessity* rather than of overambitious goal setting (which has often been found to be the main driver of failure in diversifications);
- (2) three of the diversification projects were *directly led by the owner-management team* with direct influence on all major decisions and as the driving force in the endeavour;
- (3) all of them started with the intention to *grow organically, based on existing competencies*, rather than via acquisitions.

Concerning the *identification of core competencies*, it became apparent in the project, that a holistic definition of core competencies is a challenging task. Prahalad/Hamel's (1990) and Collis/Montgomery's (1998) notion of core competencies as *complex combinations of tangible and intangible factors* is quite well understood on an abstract level, but much more difficult to realise in practice. In one of our cases, the concept was initially defined much too narrowly by the management team, in the three other cases it was defined much too generally. Thinking about the function (Lichtenthaler,

2005) or "job-to-be-done" underlying the core competence usually helped to refine and concretise the concept. In all four cases, however, the core competencies had to include not just technical but also further (e.g. organizational or market) capabilities. This was also very important for a more directed search of new fields, thus solving Liu/Liu's (2011) 'parking lot dilemma'.

As all four cases (most evidently case B) have shown, technology-related diversification usually cannot rely solely on already available competencies. This confirms the assertion in literature (Liu/Liu, 2011) that the necessity of *acquiring new complementary competencies* is the rule, not the exception.

Active ownership for diversification by SME top managers offers an important comparative strength over diversification processes in bigger corporations. On the other hand, the typical lack of resources faced by SMEs is also apparent in diversification projects. It is feasible to assume that without a written obligation by the SMEs to the government funded research project, not all of them might have put aside the necessary management time for the workshops.

In the beginning of the study, the research team was not at all sure whether it would succeed in *finding and recruiting the right lead users* for each case. However, this fear was unfounded. With one exception (which was due to an emergent family issue), all invited lead users attended the lead user workshops. This should also be a clear positive sign to all firms considering the use of lead users. However, what should not be underestimated is the time required to contact experts and potential lead users.

Concerning the action research methodology, the project highlighted the benefit and importance of combining intervention with observation. While the workshop moderator usually focused on moderation, on some occasions he also raised critical questions or offered constructive ideas, which led to new insights. In fact, in Case C (software) it was he who first draw the attention to critical competence in the handling of "triangle relationships", which also was the starting point for finding such similar constellations in shopping malls.

Future research

The lead user workshop for case D involved a very heterogeneous group of experts. This had the benefit of producing a very broad array of possible product/market combinations, but with the effect that the ideas still remained on a somewhat abstract level. This highlighted an important question: when and under what circumstances does a group of heterogeneous lead users from different industries create more promising ideas than a rather homogeneous group? When does a workshop with similar lead users having a comparable "jobs-to-be-done" deliver more specific and promising ideas?

A future study could investigate how the entire "fuzzy front end" phase followed in our project could be accelerated. In our study it lasted over two years, with the consequence that in two firms, the initial diversification team changed quite substantially. This made consistent thinking about the project over the entire phase very difficult. One approach to tackle this might be to apply a "discovery-driven planning" (McGrath/MacMillan, 2009) or "sprint" (Knapp et al., 2016) approach, in which short, quick sprints (e.g. rapid product or service prototypes, feasibility checks in new markets at a very early stage), could replace workshops 4 and 5 in our approach ("fail small, learn fast"). The benefit of such "sprints" could in fact be observed in a follow-up project conducted by one of the research partners with an SME, in which the CEO (who assumed full responsibility for the project) himself performed some of the feasibility checks born out of workshops 1 and 2. But the question of how and when (e.g. prior to or after a lead user workshop?) such "sprints" could be performed in a diversification project remains to be investigated.

While the popular approach of "design thinking" (Liedtka et al., 2013; Anthony, 2014; Brown, 2009; Martin, 2009) is currently widely discussed in strategic management and innovation literature and its benefits are apparent, what is missing in the discussion of such strategic behaviour is the amount of time and human resources required for market experimentation and prototyping. A future study could investigate the relative advantages and disadvantages of workshops over quick, short experiments.

CONTRIBUTION

“While the stage-gate system has been researched in all aspects and implemented in many companies in every detail and variant, the early innovation phase has been much less explored by academia and much less addressed by companies.“ This is even truer for innovations in the context of diversification processes (Gassmann/Schweitzer, 2014).

Research discusses how synergies can be found in diversification, but it does not operationalise how existing competencies or the vision of the company can be used to identify new businesses (Müller-Stewens/Brauer 2009; Müller-Stewens/Lechner 2016; Markides/Williamson,1994; Teece/Pisano, 1994; Teece et al., 1997).

In response to these two statements, the research project shows **three main contributions**:

- first, it offers insights into the identification of core competencies as a starting point in the search for diversification fields (via the "job-to-be-done" perspective);
- second, it clarifies the early stage of the diversification process by integrating the lead user method into the "fuzzy front end of innovation" (Gassmann/Schweitzer, 2014; Cooper, 2001); and
- third, it delivers an empirically and practically approved process (with tools and instruments) that can be used by more or less experienced SMEs and consulting firms.

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