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Integrating value-adding mobile services into an emergency management system for tourist destinations

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SLACK-ENABLED INNOVATION VERSUS PROBLEMISTIC SEARCH: FINDINGS FROM CASE STUDIES AMONG SMES

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Abstract

Innovations are important for the development of firms and whole economies. Several theoretic approaches are therefore dealing with innovation and the motivation of firms to motivate. The Resource-based View of the Firm views innovations to be motivated by the use of slack resources while the Behavioral Theory of the Firm predicts problemistic search as an important motivation for innovative maneuvers. Recently, Pitelis proposes an integration of both theories to better explaining the motivation for innovation. This paper empirically tests the predictions from these theories using multiple case studies among small and medium enterprises. The results show that firms' motivation to innovate is best explained using a combination of both theories.

Keywords: Slack Resources, Problemistic Search, Innovation.

1 INTRODUCTION

Innovations are an important driving force for the prosperity of economies and firms alike. Rapid technological change, increasing globalization, and shorter product cycles render the ability to innovate crucial for firms competing at the global marketplace. Therefore lots of studies are engaged in innovation research for many years. Within this strand of research several seminal contributions found problemistic search and use of slack resources as basic motivations for innovations.

The Austrian School of Economics (Schumpeter 1934) provides the central idea of the exploitation of opportunities by creating and adopting innovations that make a competitor's position obsolete. Superior firm performance, in turn, can only be achieved by continuous innovation. Building on that the Resource-based view of the firm (RBV) (Penrose 1959) proposes the achievement of a sustained competitive advantage by employing novel services of resources controlled by a firm. Thus using organizational slack to innovate and employing novel services of resources is a key consideration of the RBV. In contrast, the behavioral theory of the firm (BTF) (Cyert & March 1992) is engaged in innovations and focuses on problemistic search as the driving force behind the creation of innovative solutions.

Pitelis (2007) in a recent article discusses the approaches of the RBV and the BTF in terms of their assumptions and predictions regarding the motivation for innovation and the followed-upon search strategies for innovation. RBV and BTF provide quite different explanations for innovations while Pitelis proposes an integration of both theories. He calls for the test of the theoretical predictions, among others, with case studies to provide more insights. We follow this call and ask the following research question:

- How to explain different search strategies for innovations and which theory or combination of theories best explains the emergence of innovations?

To address this question, we used case studies among small and medium-sized enterprises (SMEs) that are known as very innovative and successful in their markets.

The remainder of the paper is structured as follows: Section 2 deals with the theoretical foundation that is followed by section 3 explaining the used methodology. In section 4 the case study environment and the case study sample is described. Section 5 presents the case study results. Key findings, limitations and future research are summarized and critically discussed within section 6.

2 THEORETICAL FOUNDATION

This section first introduces the Behavioral Theory of the Firm, then the Resource-based View and finally the derived propositions.

2.1 Behavioral theory of the firm (BTF)

The classic work of organizational theory ,A Behavioral Theory of the Firm' of Cyert and March (1992) aims to reveal the perception of the business firm being a so-called black box. They seek to provide insight within the internal processes of economic decision making of contemporary organizations as a unit faced with an ever-changing environment (Prietula & Watson 2000).

Cyert and March assume that search within organizations is mainly stimulated by a certain problem. Thus it is strongly related to their concept of problemistic search (Pitelis 2007). Problems are either identified by failure to achieve a certain goal or by the threat of failure in the upcoming future. As long as a specific problem is not solved, an organization will continue to search for a satisfying answer as the declared goal. Thus problemistic search is undertaken as long as the actual performance is below a certain aspiration level. This so called negative attainment discrepancy induces problemistic search

(Lant 1992; Greve 2003b). Thus problemistic search can be defined as search that is motivated by a certain problem internal or external of an organization and aims at finding an appropriate solution. The concept of problemistic search implies that firms that have not been successful in the past generate more innovations than more prosperous ones. This assumption could not be verified concerning important technological improvements in particular. Therefore organizational slack resources were included in the attempt to predict innovation decisions as these have proven to result in major technological changes and are in many cases available in successful firms that do not suffer from shortness (Cyert & March 1992, p. 189). Thus slack resources provide a source of excess funds enabling search for innovations that would not be realized in times of shortness.

As a consequence the authors distinguish between two types of innovation. The problem-oriented innovation, developed due to short-run problems and those that are designed to solve major organizational problems on a long term basis out of slack resources. In conclusion, both, successful as well as lesser successful firms are innovating (Cyert & March 1992, p. 189). In both cases (problemistic search and slack search) the existence of a problem (i.e. performance below aspiration level) is the engine that drives innovation. This is also indicated by the theoretical model forwarded by Greve (2003a, p. 686) who puts “performance minus aspiration level” as explanans for problemistic search and in a “dotted line” connection also for slack search. The latter also points to the fact that slack search was introduced into the BTF in a further step to better predict innovation decisions and as such sometimes appears as sort of an exogenous variable that is not readily explained by the existence of a problem. In contrast organizational slack is a central tenet of the RBV depicted in the following section.

2.2 Resource-based view of the firm (RBV)

The starting point for RBV is the assumption of the heterogeneity of resource endowments across firms that explain performance variations (Peteraf 1993). Thus, a firm’s competitive position results from bundles of unique resources (Rumelt 1984) that are not perfectly mobile (Spanos & Lioukas 2001). The RBV, therefore, explains sustainable competitive advantage (SCA) by means of the resources controlled by a firm. The firm itself is viewed as a collection of productive resources guided by the administrative function (Penrose, 1959) required for market competition. These resource bundles are found to be immobile, firm-specific, and are developed in a path-dependent way (Teece 1993). The growth of a firm depends on exploiting existing resources and developing new ones (Penrose 1959; Wernerfelt 1984). “Resources are defined as those tangible (or intangible) assets that are tied semi-permanently to the firm” (Spanos & Lioukas 2001, p. 909) where “the subdivision of resources may proceed as far as is useful for the problem at hand” (Penrose 1959, p. 74).

Regarding the core concept “resource”, a basic idea of Penrose (1959, p. 67) is that the same resource can render many different services. Although important, it is not the resource per se but its use in productive processes that leads to eventual value. With subsequent operations knowledge of the services a resource can render is accumulated. With this knowledge the exploitable opportunity set of the firm is enhanced and excess resources can be put into different services (Penrose 1959). These slack resources, then, enable innovation and even motivate its use for innovative purposes as long as the management pursues profit maximization and excess resources can be put into service at no extra cost (Pitelis 2007) which is a different engine driving innovation than depicted by the BTF.

2.3 Propositions

Pitelis (2007) in his effort to combine BTF and RBV identified several similarities as well as differences between both theories. The BTF starts from the observation that intrafirm conflict is paramount (Pitelis 2007, p. 478 f.). This leads to search activities to resolve the conflict. This problemistic search, then, leads to the discovery and implementation of innovative solutions. Therefore it can be hypothesized that relatively unsuccessful firms are more likely to innovate (Pitelis

2007; Cyert & March 1992). Innovation takes place both in case of immediate problems to be solved and as a means to alleviate conflict in other cases (Pitelis 2007, p. 483). Therefore we formulate:

Proposition 1: Both intrafirm conflicts and the presence of immediate problems lead to innovations to resolve the problem or conflict, respectively.

In the RBV intrafirm conflict is not in focus, and innovations are enabled by slack resources through newly discovered and exploited services rendered possible by the resources of a firm (Penrose 1959). That points to the importance of intrafirm learning for the RBV. Through learning new uses of resources are discovered and exploited. Thus, in growing firms, excess resources are present leading to perennial search for innovation (Pitelis 2007, p. 483). In contrast BTF predicts the use of slack resources to solve major organizational problems on a long term basis (Cyert & March 1992, p. 189). Following the argumentation of Penrose and Pitelis we state:

Proposition 2: There is a continuous search for innovative solutions through learning new uses of resources.

The integrated view of Pitelis (2007, p. 479) “predicts excess resources/slack-motivated and problemistic search-induced innovation, depending, however, on moderating factors such as the immediacy of the problem faced, the degree of maturity of the line of business, and the firm’s productive opportunity”. Thus we formulate:

Proposition 3: Both problemistic search and continuous search for innovations can be observed simultaneously.

3 METHODOLOGY

One form of empirical studies is case studies which are suited for an in-depth investigation of a phenomenon and thus ask how- and why-questions (Yin 2003). In the following sections, case studies carried out among small and medium-sized enterprises (SME) are presented, focusing on the emergence of innovations. Case studies have to be prepared and carried out thoroughly in order to achieve the necessary rigor. During design and preparation it is important to make the research question, propositions and unit of analysis explicit (Yin 2003; Dubé & Paré 2003). The research question employed for this research is: How to explain different search strategies for innovations and which theory or combination of theories best explains the emergence of innovations? How and why questions are considered appropriate for case studies (Yin 2003). The propositions used in the cases are theoretically grounded as depicted in the previous section.

After the definition phase the case study partners were identified by using the assessment of the general managers of two local investment promotion agencies of the most innovative SMEs of their area of discretion of Heilbronn-Franconia. In order to carry out a case study we developed case and interview protocols, and discussed the approach within the research community prior to the actual interviews. Afterwards, the adapted documents are used for the case studies (Yin 2003; Eisenhardt 1989). After this preparation phase the contact phase was commenced. This phase started with calling the identified companies by phone to verify the contact information, to provide preliminary information regarding the objectives of the planned case studies, and to schedule an appointment.

After scheduling the meetings in each case two researchers visited the firm and performed the interviews. The procedure was as follows:

- The objective and the procedure of the case study were explained.
- The semi-structured questionnaire was applied to cover a wide variety of contextual variables.
- The interview was tape-recorded.
- Data was complemented by company reports and academic literature.
- Performing a wrap-up session among the researchers to summarize the essential items.
- Transcription of the tape-recorded interviews.

The interviews lasted in average two hours. The transcripts of the cases were compiled into a case protocol comprising 61,563 words in total. The unit of analysis is the firm, its resources and the approach towards innovation. Therefore the Chief Executive Officers of the firms were interviewed. To evaluate the transcribed interviews NVivo was applied. NVivo is software designed to support qualitative data analysis and simplifies rich text handling through facilitating sorting, arranging and classifying information. A main feature of the software that was utilized in the actual cases is the creation of specific categories, so-called tree nodes. NVivo allows to directly attributing phrases or paragraphs abstracted from the transcriptions to those nodes, following a certain rule for codification developed in advance. This functionality makes it easier to compare answers to specific questions across the case study partners and to trace back constructs and hypotheses to individual answers. After finishing the case studies a final presentation was created and both sent by e-mail to the contact partners and presented within a workshop.

In the following paragraph, the case studies presented are discussed in terms of the requirements of a positivist method. According to Yin (2003) construct validity can be improved by several tactics. The first is the use of multiple sources of evidence, which provides multiple measures for the same phenomenon. In our case studies we carried out interviews in five different firms using top manager as key informants who represent the firm and who's perceptions can be assumed to be closely related to objective measures (Tallon & Kraemer 2007). In addition, we had access to several documents related to company background. Lastly, Yin recommends maintaining a chain of evidence. This was done by deriving constructs and hypotheses from literature, and employing NVivo which allows us to trace back from conclusions to initial research questions. Internal validity means that a relationship between two variables may be inferred as causal or not. To ensure internal validity, pattern matching may be used (Yin 2003), which involves qualitative but logical deduction (Lee 1989). In our case studies we compared the statements collected with propositions derived from literature in order to detect support or non-support for theoretical propositions. External validity means the generalizability of the findings. Case studies can be used to test a theory. A case study can confirm, challenge or extend a well-articulated theory and is similar to the use of an experiment, because one instance of both methods is sufficient to reject propositions (Lee 1989; Yin 2003). To support a theory several instances are needed. Reliability means the consistency and stability of the study across researchers and time. Yin proposes a case study protocol and a case study database to ensure reliability. A protocol is needed to guide the researcher in a standardized manner. In our case studies this protocol consisted of a proposal containing focus areas, research questions and propositions derived from literature. Furthermore, it consisted of a semi-structured questionnaire, and a set of slides covering research objective, motivation, research model, unit of analysis, and methodology. Besides the protocol, NVivo was used to cover the interview transcripts which allow easy checking for cross-references to other interviews.

4 CASE STUDY DESCRIPTION

4.1 Case study environment

In total we conducted five case studies with interviewees of small and medium-sized enterprises that operate within different classic industries (see Table 1). All five companies of the sample are located within the region of Heilbronn-Franconia, a part of Germany's third biggest federal state Baden-Wuerttemberg down south. Heilbronn-Franconia measures 4,765 square kilometers and is home to about 900,000 inhabitants. Baden-Wuerttemberg as a whole hosts a well-diversified domestic industry, even though two emphases can be noticed measured by the number of employees: the process engineering sector and the automotive sector. SMEs dominate the overall corporate landscape. On average around 99 per cent of all companies within Baden-Wuerttemberg (and Heilbronn-Franconia as well) can be attributed to this category. SMEs generate about 40 per cent of the volume of sales and provide 50 per cent of the jobs within Baden-Wuerttemberg (Brenner 2008).

An extraordinary feature of Heilbronn-Franconia is a remarkable density of world niche market leading companies. In Kuenzelsau, a town with a population of about 15.000 people situated within the area, the highest concentration of this type of firms in relation to the number of inhabitants within Germany could be identified by a recent survey of a German manager magazine (WirtschaftsWoche, 2008, 19: 53-83). The largest town of the Heilbronn-Franconia district is Heilbronn with about 120,000 people living there. Although being rural and agrarian-oriented Heilbronn-Franconia features good transport connections as being part of the Stuttgart metropolitan area.

4.2 Case study sample

Table 1 summarizes some characteristics of the sampled firms. While TransDrive, InVitro and ProtoType were proposed interview partners of the local investment agency working within the wider Heilbronn area, SafeEx and TechDat were suggested by the agency responsible for the northern part of the region investigated. The managing directors of both agencies were asked to rank their selected firms based on their subjective impression on the innovativeness of the firms considered. Although TransDrive and SafeEx exceed the upper boundary for SMEs in terms of employees as defined by the European Union (i.e. 250), these firms are considered as SMEs by their CEOs because still operated in a family tradition with strong local roots. All figures relate to the headquarters of the firms investigated located within the region Heilbronn-Franconia.

Characteristic	TransDrive	InVitro	ProtoType	SafeEx	TechDat
Branch	transmission and drive train systems	laboratory equipment	construction models and prototypes	safety engineering	technical data information systems
Established	1935	1964	1964	1975	2004
size (workforce) 2007	740	110	12	300	80
Type	LLC	LLC	LLC	LLC	Inc.
shift in sales ('03-'05)	+ 128%	n.a.	+/- 0%	+ 17,7%	n.a.
Interviewee	managing director	managing director	managing director	divisional director	CEO
ranking by MD of local investment agency	1	2	3	1	2

Table 1. Case study sample

5 CASE STUDY RESULTS

5.1 Problemistic search

“Problemistic search occurs as a response to an organizational problem” (Greve 2003b, p. 54) so that “an innovation is a solution that will be implemented if it is matched with an organizational problem” (Greve 2003b, p. 96) in both cases: immediate problems and intrafirm conflicts (Pitelis 2007).

Proposition 1 state that according to the BTF both intrafirm conflicts and the presence of immediate problems lead to innovations to resolve the problem. An example for immediate problems being a driver for a firm’s innovative activity is SafeEx, a provider for high-quality industrial safety technology for applications in explosion-hazardous areas. With Airbus as an important customer SafeEx strives to meet the special requirements of the aviation industry. When Airbus urgently needed to have a possibility to connect cables in a way that guarantees watertightness even at temperatures at

around minus 60 degree Celsius, the engineers of SafeEx managed to combine well-known materials and technologies in an entirely new way. The result was a cable connection system designed to meet the demands put on the material by the conditions occurring at maximum heights. The related quote from SafeEx is presented in Table 2. Additionally quotes of the managing directors of InVitro and ProtoType on proposition 1 are listed:

Case	Exemplified quotes	Remark
SafeEx	“The challenge to meet was to modify the material of the cable for the specifications of Airbus [...] We have managed to combine materials that are normally impossible to combine.”	External event: Customer request
InVitro	“Some customers wanted to have transparent ones (= bottle top dispensers, the authors) so that they could see the interiority. We developed them as a sampling but in the end the material wasn’t chemically resistant.”	External event: Customer request
InVitro	“Between the manager of R&D and the operations manager an increased tension could be noticed. [...] This got out of control leaving me highly dissatisfied. [...] As a consequence we have redesigned the organization chart.”	Internal event: Intrafirm conflict
InVitro	“Sometimes we are forced by external suppliers. [...] The electronics is already 10 years old and out-dated and we can’t buy it anymore. Because of that we have bought ahead enough components for our restage. [...] And now we have to figure out if our product (= electronic pipette, the authors) needs to be up-dated.”	External event: Environmental change
ProtoType	“Pricing pressure has never been a driver of innovation. By experience I know that it’s different. [...] you notice a question or a problem e.g. raised from production and then you reflect about a possible solution.”	Internal event: Problem detection

Table 2. Immediate Problems

The statements of our case study partners show, that an important driver of a firm’s innovative activity is the pressing need to search for solutions for internal and/or external problems. Being faced with a certain problem all forces are concentrated on turning a deficiency fastest possible into a benefit for the organization, it’s customers, and/or further stakeholders. We could detect four types of “immediate problems”.

(1) External event – customer request:

External problems can be formulated in the sense of a typically urgent customer-specific order that involves finding solutions for specific requirements. This is termed “customer project” and is an externally initiated impulse to search for innovation. It is categorized as an immediate problem because the formulation and acceptance of customer-specific orders almost always comprises a short timeline, because the customer presses to get e.g. the product as fast as possible. In particular, if the customer is an important one, failing to find a solution jeopardizes e.g. market shares and sales of a firm imposing a major problem.

(2) External event – environmental change:

Also externally stimulated are changes in the market or technological environment of the firm causing immediate problems to be solved. Typical examples are shortages in specific raw materials or components due to sudden increases of demand exceeding supply, technological progress rendering obsolete specific components that are no longer produced, technological progress pressing for reorganize the implemented production technology, and market exit or severe production problems of key suppliers without having direct substitutes. In some cases, in particular regarding technological progress, the problem becomes an immediate one, because a firm did not react in time and now faces an immediate problem. All this requires immediate action to replace e.g. a certain technology by another within a short timeframe to not disrupt production.

(3) Internal event – conflict:

Internally stimulated are immediate problems caused by conflict situations. Similar to the statement regarding technological progress mentioned above, the situation might become critical because there was no appropriate reaction in time and then suddenly must be resolved. The conflict situation in our case was resolved by changing the organizational design which in contrast to the other cases described is not primarily directed towards the innovation of a product.

(4) Internal event – problem detection:

In some cases problems along the business process are detected by firm-internal stakeholders. These are immediate problems if they cause a disruption of the process and thus jeopardizing its outcome. In contrast to simply “repair” a situation by restoring it to the previous state and thus do not change anything, an innovation comes up if the immediate problem is resolved not by “repair” but by coming up with an alternative solution.

The motivation to innovate by resolving immediate problems in any of the above mentioned types of immediate problems is based on negative attainment discrepancy as described in section 2. Furthermore those problems are “immediate” in a sense that they will cause negative effects on performance if unresolved in time. Intrafirm conflict as stated by BTF is one type of immediate problems but not the only one, and externally as well as internally motivated events could be revealed.

5.2 Continuous search for innovation

Superior firm performance can be achieved by continuous search for innovation (Schumpeter 1934) that builds on using organizational slack to innovate by employing novel services of resources (Penrose 1959) through learning. This is expressed in proposition 2 (“There is a continuous search for innovative solutions through learning new uses of resources”). An example for proposition 2 is TechDat, a firm providing data base services for technical data for the automobile industry. One idea of TechDat was not just to check incoming invoices by an information system for the management of vehicle fleets, but to add additional functions to this already available system. Building on both the knowledge of the information system including possible extensions and on market knowledge already available, these additional functions were laid out to streamline the process of car maintenance by avoiding the print-out of different forms at each maintenance step, automatically listing recommended maintenance measures according to the specifics of the car, and to provide a report covering the complete maintenance process. Thus TechDat developed an online tool for managing all maintenance procedures of a fleet without any printing required. This includes the registration of a certain vehicle at a garage, plausibility checking according to the car’s manufacturer’s specifications as well as the approval. At the end of the process the fleet manager can generate a detailed report for a review if needed.

The following table depicts specific quotes from TechDat and other cases centering on the search for innovative uses and therefore referring to proposition 2:

Case	Exemplified quotes	Remark
TechDat	“We asked ourselves, how the printing of an invoice could be avoided. We’ve called up the warranty systems of motor vehicle manufacturers where everything works well without any bills.”	Internally initiated search for improvement
TechDat	“Information on accredited tires or wheels is not recorded within the registration certificates of new vehicles anymore. Car mechanics nowadays do not even know about the permitted tire-size for a specific car model. [...] We have integrated the information the legislator has removed from the registration certificate into software and sell this product to garages.”	Internally initiated search for improvement
SafeEx	“Around already developed key components we build a product portfolio in order to provide new solutions for our customer.”	Internally initiated search for improvement
ProtoType	“Related to our business innovation is the utilization of well-known techniques and material in a new way. E.g. things always being made out of aluminum we create out of plastics as a new variant with different properties.”	Internally initiated search for improvement
TransDrive	“We are already today thinking about what sort of products we could offer in about 10 to 15 years. These products are often beyond the scope of transmission systems.”	Internally initiated search for improvement

Table 3. Search for innovative uses

At first look the data collected from the cases revealed that most firms, independent from the specific industry, looked for new combinations of their resources in order to better serve their markets. However, reading the transcriptions thoroughly shows that this search for innovative uses was not always rigorously and formally applied. Rather the search for innovative uses was internally initiated and based on ideas derived from recognizing potential for optimization of current practices, for example.

Furthermore the observed innovations are all incremental in nature. Depending on the degree of newness and the pace innovations can be classified as either being incremental or as radical if achieving noticeable breakthroughs. Whilst the term incremental relates to only slight changes such as simple product improvements breakthrough innovations can be defined as novel and unique advancements that have the potency to substantially shift the patterns of a market or even create a new one (Zhou & Yim & Tse 2005). However, the innovations mentioned by the interview partners of the sampled companies were incremental in that the firms exploit their deep knowledge in certain technologies and markets to create improvements. This is close to Penrose’s assumption that novel services of already available resources are implemented and thus innovations are created.

All firms in the sample follow a long-term strategy of growth that favors benefits in the long run over short-term profits. This does not mean that short-term profits are not important but they do not play an outstanding and dominant role.

To sum up, in the cases reported above learning about new uses and extending products and services to new application fields without having an immediate problem or conflict is the main driving force of the innovations as predicted by the RBV. Thus proposition 2 is supported.

5.3 Both problemistic search and continuous search for innovations are present

The third proposition deals with both problemistic search and continuous search for innovations which can be observed simultaneously. The term “simultaneously” can be understood twofold:

- (1) As simultaneously occurring within the same firm which will be addressed in the next section and
- (2) as simultaneously occurring regarding one innovation which will be addressed in this section.

An example for simultaneous problemistic and continuous search is InVitro, the producer of laboratory equipment. It was one of the first firms offering a battery operated pipetting aid for all pipettes from 0.1ml to 200ml. Instead of pipetting manually laboratory technicians now attach glass made pipettes directly to this innovative device. The product features a 5-stage speed key for the selection of the ideal pipetting speed as well as an easily readable color display. It resembles a bit like a pistol nowadays. When it was introduced to the market the shape was similar but much more angular and unhandy. Nevertheless the product was quite successful on the market. Every once in a while users mentioned that the shape of the instrument is not beneficial to fit all different sizes of hands. However stimulated by a certain problem but without high pressure of time the developers of InVitro reassessed the design of the pipetting aid within a slack period in order to provide a better fit for all laboratory technicians. The developers of InVitro conducted several ergonomic studies to find out, how to change the shape of the instrument in order to make pipetting more convenient. Finally they managed to improve the design of the device for a faster, safer and absolutely precise pipetting. The new product shape was even awarded a prize for its exceptional design.

Table 4 contains some quotes on the topic of the combination of problemistic and continuous search for innovation within the development process of the sampled firms.

Case	Exemplified quotes	Remarks
InVitro	“In the past it (= the pipetting aid, the authors) was an angular shaped part, a bit like a pistol. [...] We have conducted a few ergonomics studies. Now it fits both female as well as male hands, small and big hands.”	Internal initiative triggered by external sensing
SafeEx	“Our task is to strategically develop the product portfolio initiated by suggestions from the customers. [...] it has to become more and more complete. There are quite a few useful components that do not exist yet.”	Internal initiative triggered by external sensing
ProtoType	“We redesign our internal development process on a systematic basis when we detect an error occurring repeatedly at the same stage. Then we think about how to stop this problem. That is one way how an innovation can come up.”	Internal initiative triggered by internal sensing
TransDrive	“Our customers force us to innovation by asking for lower costs or the like.”	Internal initiative triggered by external sensing

Table 4. Simultaneous search

The data showed, that in some cases both, problemistic search as well as continuous search for innovations, is present. All the cases present internally initiated innovative activities that refer to detected problems either externally occurring such as usage problems, or internally occurring such as repeated errors e.g. in development or production. The difference to the innovations mentioned in section 5.1 is that these problems are not immediate in a sense that they have to be resolved within a

short time to avoid performance problems. The difference to the innovations mentioned in section 5.2 is that innovations of this section are problem-induced, either internally or externally articulated.

6 CONCLUSION AND FURTHER RESEARCH

Before concluding we discuss the limitations of our study. First, we employed the theoretical lenses of BTF and RBV thereby acknowledging that those aspects of innovation addressed by these theories are visible to us while other aspects are faded out. Second, we used the abstract definition of innovation offered by Schumpeter to allow for a cross-sectional investigation, thus neglecting the more micro-level of innovation with its manifold characteristics and complementarities.

From the cases presented in the previous section we have found support for the propositions to several degrees.

While all firms of our sample used slack resources to innovate either on a continuous basis or triggered by a detected problem, there is no firm in the sample that exclusively used problemistic search to resolve immediate problems.

We have found two firms that are ProtoType and SafeEx, reacting to immediate problems, using slack resources for innovations and combining both approaches. Thus these firms cover the whole bandwidth of motivations and for explaining this behavior both RBV and BTF arguments are needed.

For TransDrive we did not find evidence for problemistic search in case of immediate problems but the use of slack resources for continuous innovation and the combined motivation (see section 5.3).

In contrast, at InVitro we found the combined motivation (see section 5.3) plus the problemistic search in case of immediate problems.

Finally, TechDat was found to only make use of slack resources for continuous innovation.

These findings point to the argument of Pitelis that a combination of RBV and BTF approaches to explain innovation is best suited to analyze the innovation behavior of firms. Only applying BTF or RBV arguments, respectively, are not sufficient.

Nevertheless, all firms of our sample economize on their long-year experiences with certain technologies whether they resolve immediate problems, searching for new applications, or looking for innovations triggered by usage problems, for example. That is, according to Penrose, firms look for novel services of their resources regardless what the original motivation was.

Although a statistical generalization is not possible when using case studies our cases provide evidence for Pitelis' argument to combine both approaches. The following table summarizes the results.

Research question	Indication
How to explain different search strategies for innovations and which theory or combination of theories best explains the emergence of innovations	<p>a) Immediate problems have to be resolved regardless of the context to minimize the negative attainment discrepancy and to avoid severe performance losses</p> <p>b) Use of slack resources whether continuously investigated or triggered by concrete challenges is a response to expected mid- and long-term requirements and seem to be positively influenced and motivated by the long-term orientation and strategy of the firms.</p> <p>c) As proposed by Pitelis a combination of BTF and RBV best explains the emergence of innovations</p>

Table 5. Summary

For this study we decided to select the top performing firms based on their perceived innovativeness (see section 4) rather than to restrict the sample to only IT innovators to test the general arguments of the theories involved. The next step in research will apply the insights of this study to a sample of IT innovators to test for possible differences in the explanation of search strategies. In this context more in-depth studies are needed to better understand in which situations and under which conditions firms use problemistic search, slack resources, or both. In particular, the time horizon of strategies and also the ownership structure is a promising field of future research to further clarify the call of Pitelis to investigate the contexts and motivations of innovation.

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