THE RELATIONSHIP BETWEEN ORGANISATIONAL FORESIGHT AND PRODUCT INNOVATION IN SMALL AND MEDIUM SIZED ENTERPRISES

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Conceptual Paper submitted to the 8th International Ph.D. School on National Systems of Innovation and Economic Development, Globelics Academy

ABSTRACT

The conceptual paper discusses the idea and the methodology of the ongoing PhD research. It proposes the theoretical framework for measuring the relationship between organisational foresight and product innovation in small and medium sized enterprises. In this research organisational foresight is considered as a horizon scanning or search capability which contributes positively to the process of exploratory learning and therefore to the innovation process. It is proposed that foresight methods capabilities and networking capabilities, especially involvement in weak tie networks, such as networks with research institutes, universities, etc., contribute to the horizon scanning capabilities of organisational foresight. Companies also need enabling organisational capabilities to transfer and exploit environmental information and future intelligence generated from various sources. Therefore it is proposed that absorptive capacity moderates the relationship between organisational foresight and innovation. The proposed model does not aim to explain all factors in the process of innovation development. It simply proposes that innovative companies are also more foresightful (and vice versa).

Keywords: organisational foresight, networks, innovation, absorptive capacity, small and medium sized enterprises, catching up countries.

1. INTRODUCTION

1.1. Problem discussion

The objective of this research is to gain a deeper understanding of organisational foresight (OF) and product innovation in small and medium enterprises (SMEs), particularly the relationship between OF and product innovation. The primary interest of this research rests in organisational (enterprise level) foresight as opposed to managerial foresight (level of individuals) and foresight at the policy (macro) level. OF aims at identifying discontinuities, technological trends, emerging technologies, and future business opportunities in promising areas of strategic research, to provide early warning about potential threats, to support planning and shape strategy (Martin,

1995; Reger, 2001). The research stream on corporate change provides the theoretical basis to understand the need for organisational foresight. The practical relevance for OF comes from the SMEs' inability to cope with discontinuous change. The dynamic view assumes that organisations need to constantly adapt to their environment to ensure long-term survival and economic success (Teece et al., 1997; Rohrbeck, 2010). As product cycles are getting increasingly shorter, companies need capabilities to detect and interpret changes in the environment, to see, for example, the weak signs of the technology and market paradigm shifts. Especially the innovation-oriented companies need to scan their environments continuously in order to see the long-term future threats and new promising technologies and use them to move into new business fields. Enterprises need capabilities to detect and interpret changes in the environment by creating an early-warning system for disruptions and a consistent forward view for their business environment.

Organisational foresight is believed to have a positive impact on triggering innovation, but empirical evidence on this relationship is lacking. In recent times scholars drawing on various case studies and the extant foresight literature have attempted to show empirically how the foresight practice (e.g. cultivation of scenario thinking) could lead to innovation (e.g. Andriopolous/Gotsi, 2006; Clemons, 1995; Drew, 2006; Gracht, 2010; Noori et al, 1999; Partidario/Vergragt, 2002; Ruff, 2006; Sarpong, 2010; Van der Duin and den Hartigh, 2009; Van der Duin, 2006). Especially, researchers often make commendable efforts to show how organisational foresight can contribute to the fostering of innovation by identifying various outcomes whose derived theoretical and managerial implications they argue lead to innovations (e.g. Magnus and Kalevi, 2006). While these studies have made an invaluable contribution to enriching our understanding of the relationship between OF and an organisations' ability to innovate, most of them simply make grand connections between OF or its specific methods and innovation but fail to show exactly how and when the practice may lead to the innovations they often report (Sarpong, 2010). The theoretical and empirical basis for such relationship is becoming more apparent and this study will attempt to embellish upon the limited platform of understanding in this area.

So far, empirical work on OF has been limited to large corporations; investigations in small and medium-sized enterprises rarely play a role (Reger, 2001; van der Duin, 2004), although several studies (e.g. Jannek and Burmeister, 2008) proved that SMEs also carry out foresight activities and are in substantial need for organisational foresight for competing. This is particularly true for innovation-oriented SMEs. When analysing how smaller enterprises could prevail against larger enterprises with richer resources, differences in resource effectiveness were noted that, as it has been argued, could not be accounted for by incremental discrepancies in operational efficiency or by factors like the cost of capital and labour (Amsteus, 2011). Looking across the behaviour of selected successful smaller enterprises, including behaviour related to innovation, a consistency has been noted that assumes a view about the future, and it has been argued that some enterprises are simply more foresightful than others (Hamel and Prahalad, 1994). Moreover, no research on OF was ever carried out in the catching up countries or latecomer

economies. Studies confirm substantial differences between so called frontier economies and latecomer or catching up economies. For example, companies in the catching up countries lack strategic and technological capabilities, they are more isolated from technological breakthroughs, actors in the innovation systems are not connected to each other in system-like manner, etc.

There remains a need to clarify the concept of organisational foresight. A number of related definitions of organisational foresight have been offered and the concept has been deployed to represent a collection of steps, exercises, studies, techniques or capabilities (Amsteus, 2011; Horton, 1999; Rohrbeck, 2010). Consequently, it has not always been clear if and when OF pertains to a process, a method, a property or competence (Major et al., 2001). It also remains unclear what organisational parameters, routines or capabilities contribute to the success of organisational foresight after the knowledge on weak signals has been collected. Only a few empirical studies have been carried out on the effectiveness of foresight; research is still driven by the aim to identify successful methods and processes. Most of authors have either researched OF as a process model (e.g.; Horton, 1999), or a method (e.g. Porter et al., 2004; Lichtenthaler, 2005; Chermack, 2005; Mietzner and Reger, 2005; Van der Heijden, 2005; among many others). This research builds on the work of Rohrbeck (2010) who suggested that effective OF depends on organisational *capabilities* such as culture, organisation (e.g. integration of foresight activities within processes of innovation or strategic management), method sophistication (e.g. integration capacity), information usage (e.g. sources and scope), people and networks.

The above outlined research gaps constitute points of departure for the proposed research study. In essence, more knowledge is needed regarding the meaning or definition of organisational foresight to allow it to be measured, and more knowledge is needed with regard to the proposed positive relationship between OF and innovation.

1.2. Purpose and research design

The research aim is to specify what defines organisational foresight and to assess the relationship between organisational foresight and innovation in Lithuanian SMEs. More specific objectives of the research are: (1) to establish the conceptual definition of organisational foresight and to reveal what are the key parameters of the OF construct in the SME context; (2) to propose the conceptual framework for the measurement of the OF and product innovation in the SME context; (3) to develop and validate an instrument to measure the relationship between OF and product innovation in SMEs; (4) to empirically test the conceptual framework and establish the relationship between OF and product innovation in SMEs; (5) to propose a final conceptual model of the relationship between OF and product innovation in SMEs and to provide conclusions and recommendations on how to employ OF for increased product innovation performance in SMEs. Particular focus is given to networking between SMEs and universities and research institutes as a route to OF and consequently – innovation.

Current knowledge in the field of organisational foresight and its link to innovation has taken the form of theoretical writings. Consequently, as the concept has already been addressed through lower constraint designs, the refinement of research questions to allow higher constraint was deemed central. A sequential mixed methods design is proposed. Using mixed qualitative and quantitative methods research provides a more complete understanding of the research problem than either approach alone. Firstly, the preliminary theoretical framework is developed and described, based on an in-depth review of existing body of knowledge. Secondly, the measurement instrument for validating the model will be proposed and validated via a pilot study on small sample of SMEs. Thirdly, a multivariate correlational survey will be carried out for testing the research hypotheses. The research setting is the manufacturing industry in Lithuania. List of 420 companies was retrieved from Credit-info company database based on criteria: (a) sector based on NACE (C section); (b) establishment date (minimum 3 years); (c) number of employees - from 10 to 250. Finally, in case of need (for example, the survey shows very low maturity of foresight and innovation), the exploratory study will be employed using all the required methods, such as in depth personal interviews, document analysis etc. in several selected companies.

2. THEORETICAL BACKGROUND

2.1. Theoretical lenses of the study

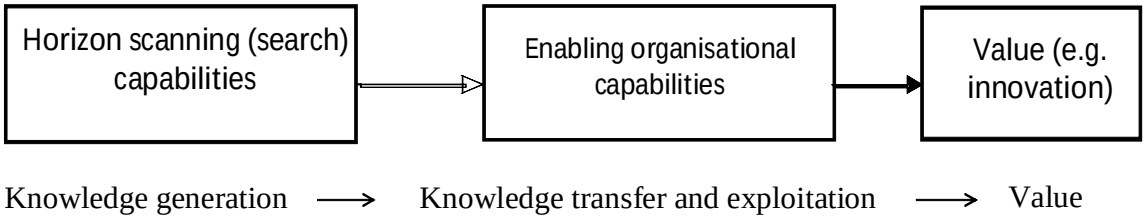
This research has its roots in the terms of *corporate (organisational) foresight*, which comes from the field of critical futures research and strategy research, and *innovation*. When examining the combination or the intersection of the two research streams, three mainly dominant theoretical lines appear in the literature: *evolutionary economics* (Nelson and Winter, 1982), *organisational learning* (March, 1991), and *systems theory or innovation systems* (Lundvall, 1985, 1992), all of which are based on the theoretical foundations outlined in a *behavioral theory of the enterprise* (Cyert and March, 1963). From an evolutionary perspective, OF has been referred to as ability to imagine or simulate the future (Amsteus, 2011). Analysis of the environment and the firm in terms of variation selection and retention, as well as the match or fit at as many levels as possible, across time, is central to foresight (Amsteus, 2011). From the applied theoretical perspective, the key assumptions are, firstly, that companies develop sets of capabilities and modify them over time. Secondly, they are holders of organisational and technological knowledge, and knowledge is also an outcome of the innovation process. Thirdly, processes of *search* for new knowledge, including on the long-term changes in the environment, weak signs on the technology and market paradigm shifts, is the basis for innovation. Search activities may be delineated as “activities that scan the external environment in order to find either alternatives to existing routines or completely new routines” (Saviotti and Mani, 1998). Finally, organisational foresight is considered as a *horizon scanning or search capability* which contributes to

the process of exploratory learning and therefore to the innovation process. The capabilities are used to assess the corporate foresight system concerning its strength to identify, interpret and react to discontinuous change.

2.2. Organisational foresight

The assumption of organisational foresight is that while the future is uncertain, some evolvements may be foreseen and options conceived, and therefore the future may be prepared for, or actively shaped (Cuhls, 2003). It has been noted how a fundamental purpose of foresight is to minimize uncertainties and risks (Uotila et al, 2005). Based on literature review, firstly, *OF can be regarded as a process of collecting, interpreting and assimilating future related environmental information derived from external sources* (e.g. Horton, 1999). Daheim and Uertz (2006) labelled organisational foresight a 'future intelligence gathering process', which is the consequence of a enterprises' business operation that inherently demands long-term orientation – in industries with long product cycles, such as the chemical and automotive industry. *Secondly, it is assumed that enterprises need certain enabling organisational capabilities to transfer and exploit environmental information and future intelligence generated from various sources.* The capabilities literature extends and complements the resource based view with the provision that in order to achieve value, the enterprise not only needs to secure relevant resources but also needs to develop corresponding capabilities (Helfat & Peteraf, 2003). Hence, in the preliminary framework, organisational foresight is visualised as a knowledge transfer and exploitation process, consisting of three steps (see Figure below).

Figure 1. Preliminary conceptual model



Horizon scanning (search capabilities)

Literature on OF suggests that companies use specific *methods* for horizon scanning (such as trend extrapolation, scenarios, roadmapping, etc.). Review of the empirical studies on organisational foresight activities helped to distil the list of methods most often applied for environmental scanning in enterprises. These methods are mentioned by studies reviewing OF practices in companies produced by Becker (2002); Daheim and Uertz (2006, 2008); Jannek and Burmeister (2007); Rohrbeck (2010), among others.

Knowledge on weak signs, unexpected trends in technology development or other important aspects can be also accessed unintentionally. The external knowledge is brought in, for instance, by joint work with external experts, or through participation in professional events or international congresses, or by collaboration with public

sector research institutions. Exploitation of external networks is also stressed by Rohrbeck (2010) in his future orientation maturity model, by Battistella and Toni (2010), and by Jannek & Burmeister (2007) who claimed that collaboration between enterprises and external stakeholders can be used to improve SMEs' foresight activities and to generate economies of scale.

The notion that SMEs' horizon scanning function can be enriched by networks is supported by the Granovetter's (1983) weak ties sociological theory. Granovetter proposed that weak rather than strong ties are appropriate for access to new information and weak signals. He associated strong (weak) ties with a dense (sparse) structure. In frequent and intense interaction between many actors, in a dense structure, much of the information circulating in the system is redundant. Several studies (Julien, et al, 2004; Tsai, 2001) proved that access to weak tie sources (weak tie networks) lead to innovation. Among *weak tie sources*, some are related more specifically to new technologies. Such sources are located principally in research and educational communities and government organisations. They are composed mainly of research centres and universities, scientific advisors and other related public organisations (Julien, et al, 2004). Generally speaking, the above-mentioned weak tie sources (networks) are entities with which the entrepreneur has little contact, because of their hermetic language and very different concerns, but they can nevertheless provide a lot of new information (Hansen, 2006). They facilitate the circulation of new ideas, precisely because of these personal differences. According to Battistella and Toni (2010), it is opportune to nurture every external sub-network in order to have more and different sources of information. The information and the external expertise are in fact fundamental in the foresight activities, which cannot be outsourced because they are strategically important.

In order to remain competitive, innovative small and medium enterprises are often involved in knowledge sourcing because they lack the capacity to perform internal R&D (Huggins et al., 2010). Hence is not just the knowledge possessed or created by a enterprise internally but knowledge from external sources that is regarded as one of the key factor is in the innovation process. Being better linked and thus participating in denser networks is related to increased innovation performance of enterprises (Fukugawa, 2006). Network partners may also be sources of inspiration, that is, enable opportunity identification, rather than capital deliveries for exploitation.

Past typologies of innovation are also consistent in distinguishing universities and other public research organisations as potential sources of innovation. Enterprise-university collaboration ventures represent a special type of organisational collaboration. Pavitt (1984) regarded some industries to be 'science-based', indicating that scientific knowledge is among the main sources of opportunity identification and exploitation (also mentioned in Evangelista, 2000). In this context, a vast and still growing literature stresses the importance of university linkages for innovation, also in small enterprises (e.g. Elfring & Hulsink, 2003). Other relevant network partners include advisors such as consultants and engineers, financial institutes, intermediaries such as industry associations, and government organisations that may act as a source of innovation subsidies or permits (Nelson, 1993; Freeman,

1995). These actors are included in typologies of the weak tie networks and we argue that they may well be relevant for small enterprises.

Absorptive capacity

Even though horizon scanning capabilities allow for the increase of the inflow of future oriented information, much of the potential benefit can be lost within internal decision making processes. Therefore, companies need certain organisational routines and capabilities to recognise the value of new, external information, assimilate it and apply it to commercial ends. In the organisational learning literature, this capability is named the absorptive capacity first introduced by Cohen and Levinthal in 1990. Absorptive capacity is probably the most prominent factor investigated in current empirical research on the innovative effect of collaborative and knowledge search activities. For example, Veugelers (1997) found that research collaboration has a significant positive effect on internal research; however, this relationship only holds if the enterprises have absorptive capacity in the form of a full-time, staffed research department, and the level of enterprises engaged in research collaborative efforts increases with internal research investments. Lane and Lubatkin (1998) argued that an enterprise's ability to learn from another enterprise depends on three points: the similarity of both enterprises' respective knowledge bases, their organisational structures and compensation policies, and the dominant logics. They show empirically that the similarity of the partners' basic knowledge, lower management formalization, research centralization, compensation practices, and research communities are positively related to inter-organisational learning. On the contrary, Sampson (2007) argues that the positive effect of networking on innovation performance depends on the level of technological diversity between the two partnering enterprises. Networking increases enterprises' innovative performance when technological diversity between partners is moderate (rather than low) or high.

Based on literature review, three main elements of absorpive capacity were found to be relevant in the case of relationship between horizon scanning or search activities in SMEs and innovation: a) management attitude towards openness to exteral sources, wider vision, longterm thinking and risk aversion. B) cultural capability of sharing and communication accross functions, diffusion of insights ad strength of internal network, and c) the knowledge base of the firm, meaning that the higher internal knowlege base, the more effectively individual employees regognise the value of new information and how it can be exploited.

2.3.Product innovation

Organisational foresight has been acknowledged as critical in managing the continuously changing environment (Andriopoulos and Gotsi, 2006; Tsoukas and Shepherd, 2004) and is believed to having a positive impact on innovation success (Brown and Eisenhardt, 1997). In general, a benefit is seen as soon as the results from the foresight activities are used for decision-making. Furthermore, the early warning provided and the created awareness of opportunities is a great benefit as such (Ashton, 1991). In recent times scholars drawing on various

case studies and the extant foresight literature have attempted to show empirically how the foresight practice could lead to innovation (e.g. Van der Duin and den Hartigh, 2009; Drew, 2006; Van der Duin, 2006; Sarpong, 2010; Gracht et al., 2010). Previous research suggested that organisational foresight can create value for enterprises by generating innovation. Gracht et al (2010) states that there are two situations where organisational foresight can contribute to the innovation process: before the idea is born and when the idea is already established. In the first situation, organisational foresight is applied as a concept to inspire and create new ideas for innovation (Van der Duin, 2004b). As von Reibnitz (1988) indicates, organisational foresight provides comprehensive insight into the future development of the environment, which in turn induces ideas for new products and services. In the second situation, OF can help to assess either the commercial and technological viability and/or to adjust or abandon the innovation process (Van der Duin, 2004b). In both situations, OF helps to cope with uncertainty (Rohrbeck, 2010).

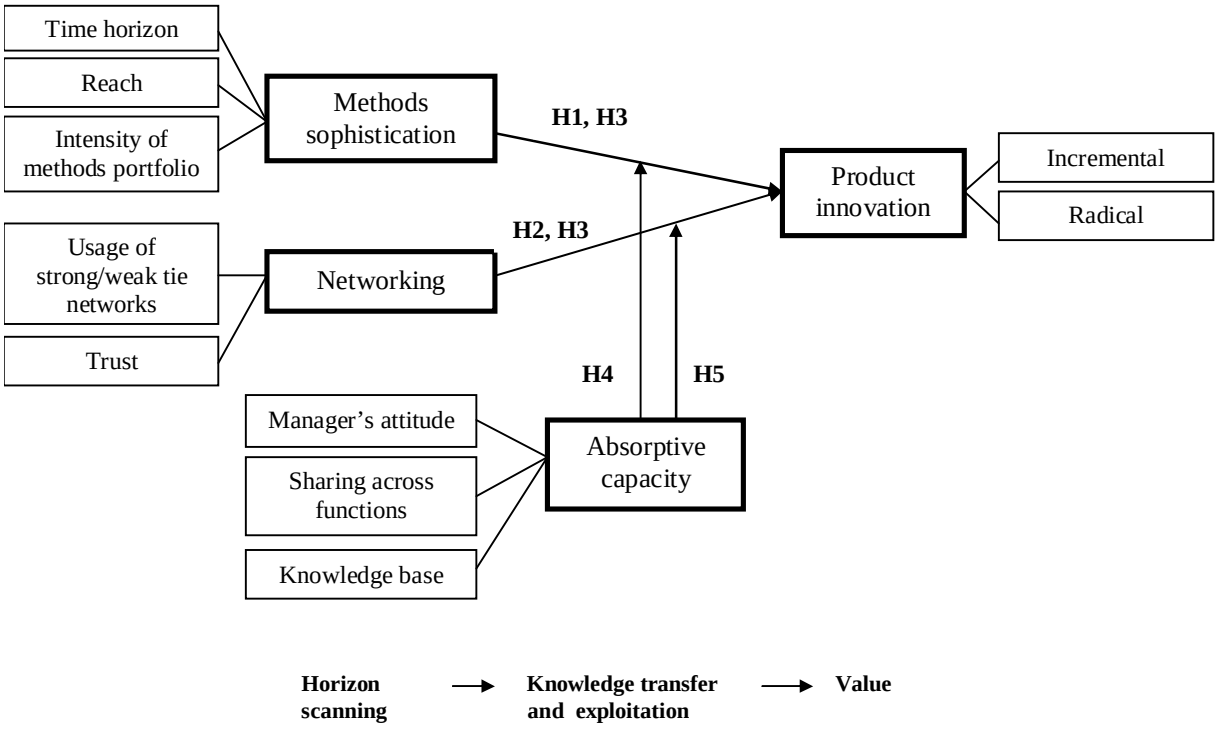
There are three major sources of innovation: imitative, acquisitive (licensing, acquisition or merger) and incubative (developing own innovations internally) (Van Dijk, 2002). Often SMEs are users of technology already invented and not creators of new technology (Bessant 1999). The acquisition of external knowledge may be an important source for innovation for SMEs. Also, SMEs may have a bigger role in imitative innovation (Eden et al. 1997). It can be presumed that innovation in an SME in a country with relatively new market economy context as Lithuania is largely an adoption of a product, process or method that have already been developed elsewhere. Therefore, in this research we adopt the definition of *innovation as the process by which enterprises master and implement the design and production of goods and services that are new to the enterprise, irrespective of whether they are new to their competitors, their sectors, their countries or the world* (based on Mytelka, 2000). According to this broad definition, product innovation activity might include introducing new products or services, new design, and improved quality of products or services.

A common distinction usually made in the literature on innovation is between radical and incremental innovations, depending on the breadth and depth of the changes introduced. Colarelli O'Connor (2005) views *radical innovation* as the ability of an organization to commercialise products and technologies that have a) high impact on the market in terms of offering wholly new benefits, and b) high impact on the firm in terms of their ability to spawn hole new lines of business. *Incremental innovations* are typically viewed as modifications of the existing products and/or processes. In fact, there is a paradox between the findings from the literature review that suggests highest impact of organisational foresight on the development of radical innovation and explorative learning routes, and the research setting of Lithuanian SMEs, which implies that innovation adoption and incremental improvements should be measured. Both radical and incremental product innovation typologies are included into the research in order to test what is the relationship between OF and different types of innovations.

3. CONCEPTUAL RESEARCH FRAMEWORK AND HYPOTHESES

The framework aims at explaining organisational foresight in SMEs and its relationship to product innovation. The approach proposed by this research rests on three methodological assumptions. Firstly, Rohrbeck et al (2010) proposed that effective OF can also be organised without a process model but with certain capabilities and activities. In this thesis it is proposed that this approach might be suitable for SMEs. Secondly, in this research it is proposed that networking is an alternative route for SMEs to generate future-related information needed to create value (such as weak signals). Finally, organisational learning process in OF system (from the stage when new insights and weak signals are identified by horizon/environmental scanning system and then transferred to organisation, decoded, used and disseminated) is similar to the one in process when new insights (weak signals, new information) is generated by SME's involvement in a weak ties network. By comparing both processes, it becomes clear that similar organisational capabilities required for successful usage of the generated insights. Therefore, it is proposed that traits of absorptive capacity should be analysed among other foresight-enabling organisational capabilities in the conceptual model.

Figure 2. Theoretical framework for analysis



The following hypotheses are proposed with respect to the relationships between the variables in the research model. The first hypothesis addresses the relationship between organisational foresight methods

capability and product innovation in SMEs. Gracht et al (2010) states that there are two situations where organisational foresight can contribute to the innovation process: before the idea is born and when the idea is already established. In the first situation, organisational foresight is applied as a concept to inspire and create new ideas for innovation (Van der Duin, 2004b). As von Reibnitz (1988) indicates, organisational foresight provides comprehensive insight into the future development of the environment, which in turn induces ideas for new products and services. In the second situation, organisational foresight can help to assess either the commercial and technological viability and/or to adjust or abandon the innovation process (Van der Duin, 2004b). In these situations, organisational foresight helps to cope with uncertainty (Rohrbeck, 2010) by preventing enterprises from investing time, money and other resources in ideas that might not prove to be successful innovations in the future (Van der Duin, 2004b). We expect this relationship to hold for SMEs as well and hypothesize that:

H1: Organisational foresight methods capability is positively related to product innovation in SMEs.

SMEs possess fewer resources than large companies; hence it can be assumed that formal foresight processes are less developed in SMEs. Disadvantages of scale dictate that SMEs must have easy and affordable access to external sources of aid and information to surmount inevitable shortfalls in internal resources and skills (Freel, 2003). SMEs are able to detect the information on the weak signals and forthcoming market changes, new technologies and other types of input necessary for innovation (Carson et al. 1995) through *knowledge networks* and are expected to respond to that intelligence. In reality, SMEs rarely scan for new technological opportunities or articulate their needs (Bessant 1999). Suppliers may take a more active role in stimulating innovation by trying to influence the SME's innovation decision. In Rogers' (1995) terminology such firms are called "change-agents." Change-agent contact stimulates the adoption of innovations, which offers support for the following hypothesis:

H2: Networking capability is positively related to product innovation in SMEs.

Literature review suggests highest impact of organisational foresight on the development of radical innovation and explorative learning routes; therefore the following hypothesis is formulated:

H3: Organisational foresight and product innovation relationship is stronger in the case of radical innovations.

Implementation of organisational foresight systems remains limited (Day & Schoemaker, 2005; Becker, 2002; Reger, 2001; Daheim and Uertz, 2008; Rohrbeck, 2010) as building an organisational structure that facilitates an effective response proves challenging. One explanation for this persistent gap between perceived importance and implementation is the lack of organisational characteristics and incentives that would foster the usage of anticipatory information for generating effective response (Rohrbeck, 2007, 2010). Absorptive capacity encompasses a set of organisational processes aimed at maximizing the added value of externally acquired knowledge. The concept of absorptive capacity was defined by Cohen and Levinthal (1990) as the ability of an enterprise to recognize the value of new, external information, assimilate it, and apply it to commercial ends

(Cohen, Levinthal, 1990). Absorptive capacity is seen as a promising explanation of innovation (Tsai, 2001), business performance (Tsai, 2001), intra-organisational transfer of knowledge (Gupta & Govindarajan, 2000), inter-organisational learning (Lane & Lubatkin, 1998). It is enterprises with higher absorptive capacities are more likely to establish linkages and gain the most from the external sources of knowledge. Therefore we hypothesise that:

H4: Higher absorptive capacity strengthens the relationship between OF methods capability and product innovation.

H4: Higher absorptive capacity strengthens the relationship between networking capability and product innovation.

Preliminary measures were developed to measure organisational foresight capabilities at the knowledge generation phase and the enabling organisational capabilities, as well as the items of the product innovation variable.

OF methods capability

The construct of *foresight methods capability* is formed of five variables: (1) reach (depth); (2) time horizon; (3) intensity of the overall methods portfolio; (4) communication capacity of the methods portfolio; (5) integration capacity of the methods portfolio.

Foresight methods capability is mostly related to the function of horizon scanning for weak signals. The list of methods includes methods which increase the communication and integration capacity of foresight results, and we apply measures proposed by Rohrbeck in his study on organisational future orientation maturity model (Rohrbeck, 2010). Communication capacity can be achieved with participation in the method, as is the case for example in roadmapping, and by producing results that can easily be communicated, as is the case with the scenario technique, which produced an alternative future that is transparent and easy to understand by outsiders and thus easy to communicate (Van der Heijden, 2005).

Table 8. Measures of the organisational foresight methods capability variable

Element	Description	Source
Time horizon	Describes the time horizon of environmental scanning: from near future to 30 years from now. Typically, it is considered that organisational foresight considers future developments that will become important at least in a medium term (3-5 years from now).	Becker (2003), Rohrbeck (2010), Amsteus (2011)
Reach (depth)	Describes the depth to which enterprises scan their environment. Elements: SMEs monitor developments in their markets and industries; scan markets and industries they are not competing in for new developments; monitor issues, trends and new technologies considered relevant for their business; scan environments for new issues, trends and technologies	Rohrbeck (2010)

Element	Description	Source
	whose relevance cannot yet be assessed.	
Intensity of the methods portfolio	Describes the capability of overall method portfolio. The methods include: trend analysis; media/publication analysis; scenarios; road-mapping; participatory/creative methods, e.g. brainstorming, idea mapping; simulations; Delphi surveys; cross-impact analysis; econometrics/ forecasting; expert interviews; patent/technology analysis.	Becker (2002); Daheim and Uertz (2006, 2008); Jannek, Burmeister (2007); Rohrbeck (2010)
Communication capacity of methods portfolio	From Weak to Strong (we utilise methods such as roadmapping and future conferences that trigger and facilitate an organisation-wide strategic discussion).	Rohrbeck (2010)
Integration capacity of the methods portfolio	From Weak to Strong (we utilise methods such as scenario analysis, which allow integrating weak signals from different environmental areas and time horizons).	Rohrbeck (2010)

Networking capability

The construct of *networking capability* is formed of two variables: (1) Intensity of involvement in weak and strong tie networks; (2) trust.

One of the main benefits of networks is access to information on market demand and innovation. Being better linked and thus participating in denser networks is related to increased innovation performance of enterprises (Fukugawa, 2006). Exploitation of external networks is also stressed by Rohrbeck (2010), Battistella and Toni (2010), and by Jannek & Burmeister (2007) who claimed that collaboration between enterprises and external stakeholders (e.g. Governmental studies, industrial associations, chambers of commerce, or technology platforms) can be used to improve SMEs' foresight activities and to generate economies of scale. The notion that SMEs' access to future intelligence can be enriched by networks is supported by the Granovetter's (1973, 1982) weak ties sociological theory. Granovetter proposed that weak rather than strong ties are appropriate for access to new information and weak signals. He associated strong (weak) ties with a dense (sparse) structure.

We, therefore, focus on this dimension of collaboration and define network capability as the sum of the number of organisations, especially the weak tie sources (universities and research centres, scientific/technology advisers, industry associations and others), as well as suppliers and other producers with whom the firm has collaboration on information and experience exchange.

It is not only the number of partners (size of network) but also the depth of the relationship and trust that is important for facilitating reliable information and innovation. Uzzi (1996) argues firms that had embedded relations with other business enjoyed advantage such as trust, flexibility and fine-grained information transfer. Trust and interpersonal relationships are often argued to play pivotal role when market institutions are weak or absent which is apparent in clusters of informal firms. Rousseau et al. (1998) distinguishes between three forms of trust:

deterrence-based, calculus or rational-based, and relational-based. In this study we focus on relational trust that arises from repeated interactions or emotional attachments. In this context we have introduced into the model another network related variable indicating the length of relationship with network partners, which captures acquired trust from long-term relationship.

Table 9. Measures of the networking capability variable

Element	Description	Source
Intensity of involvement in weak and strong tie networks	Describes the networking capability – usage of external networks (weak tie sources) for generation of future intelligence. Weak tie sources include: partnerships with universities and research centres; relationships with scientific/technology advisers; industry initiatives; collaboration with other actors of the supply chain; relationships with other enterprises for foresight projects; open innovation initiatives (blogs, etc.); customers involvement and collaboration labs.	Julien et al, 2004
Trust	Is measured by the average length of the relationship the SME has with its information exchange partners (from 1 to above 48).	Rousseau et al. (1998); Gebreeyesus and Mohnen (2011)

Absorptive capacity

The construct of *absorptive capacity* is formed of four variables: (1) manager's/ owner's attitude; (2) sharing across functions; (3) knowledge base of the firm. Absorptive capacity depends on internal mechanisms or organisational antecedents (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998), examples of which are structure of communication, character and distribution of expertise (Cohen & Levinthal, 1990). We draw on this body of literature and claim that SMEs will exchange knowledge depending mostly on the capacity of sharing across functions. Measures applied in the Rohrbeck's (2010) future orientation maturity model are applied.

In SMEs corporate culture largely depends on the personal characteristics of top manager / owner. Therefore, leadership qualities are proposed that foster the organisational culture open to wider vision, and traits induced by top management, such as 'willingness to test and challenge basic assumptions' or 'incentives to reward wider vision', are added to the model.

Finally, knowledge is embedded in individuals as specific skills or in fixed capital which are used in the production process (Maskel and Malmberg, 1999). In-house R&D activities and highly educated personnel are often perceived as the most effective ways to absorb external knowledge, thus, are often used as a measure of absorptive capacity (e.g. Oerlemans and Meeus, 2005). However, few SMEs in Lithuania have a separate R&D department or formally trained technicians/scientists. Skills are usually developed through job training and practical experience. That means the longer they work the more skill they obtain. We measure the number of skilled workers and months

of experience within a sector. According to previous studies regarding returns to education, we assume that the higher the degree of education the higher is their contribution to the economic returns of the enterprise. The variable of experience has been included as it represents the cognitive background of each of the abovementioned resources in temporal terms. Time is in fact at least indicative of the fact that accumulation of knowledge has occurred via learning by doing. More in detail, the variable is the result of a weighted mean of the months of work of each knowledge skilled worker in the country and abroad.

Table 10. Measurement of absorptive capacity variable

Item	Description	Source
Manager's/ owner's attitude	- Attitude towards openness to external sources: organisation can be closed (contacts to the outside are discouraged), or open (bringing external information into the enterprise and maintaining an external network is encouraged) - Attitude towards challenging underlying assumptions (opposite to risk-averse attitude). On the one hand, the basic assumptions can be neither known nor made transparent; on the other, basic assumptions can be explicit, much talked about and frequently challenged. - Attitude towards rewarding wider vision. Incentives may include recognition by senior management and financial rewards. - Top management encourages long-term thinking.	Day and Schoemaker, 2005; Rohrbeck, 2010
Sharing across functions	- Willingness of management to share across functions. Can be poor (information is ignored and hoarded), or excellent (on-going information sharing on multiple levels). - Formal diffusion of insights related to future orientation, e.g. emerging issues can be occasionally presented at dedicated meetings, or discussion of emerging issues can be part of routine meetings in all relevant units. - Strength of internal network, from Weak (some employees have formal and informal contacts to other units within the organisation) to Strong (every employee is expected to build and maintain formal and informal networks to other units)	Day and Schoemaker, 2005; Rohrbeck, 2010
Knowledge base of the firm	- Share of employment involved in R&D activities (%). - Share of personnel with a Master's or Doctor's degree (%). - Average number of years of staff experience within a sector.	Adapted from Cohen and Levinthal, 1990

Product innovation

Product innovation is the dependent variable in the theoretical framework. Innovation in a small and medium sized enterprise in the developing countries is largely an adoption of a product, process or method that have already been developed elsewhere (Van Dijk, 2002). It can be argued that this statement holds true for the Lithuanian context as well. In the context of mostly imitative innovation practices of SMEs in this research we adopt the definition of innovation as the process by which enterprises master and implement the design and production of

goods and services that are new to the enterprise, irrespective of whether they are new to their competitors, their sectors, their countries or the world (based on Mytelka, 2000). On the one hand, literature review suggests highest impact of organisational foresight on the development of radical innovation and explorative learning routes. On the other hand, the research setting of Lithuanian SMEs implies that innovation adoption and incremental improvements should be measured. Both radical and incremental product innovation typologies are included into the research in order to test what is the relationship between OF and different types of innovations.

To enable valid assessment of innovation characteristics as *„radical"* it is important to describe it in objective, unambiguous and measurable terms. Hence we define a radical innovation as an innovation that is viewed within its company to have the potential to offer unprecedented performance features or embody familiar features that offer the potential for five to tenfold improvements in performance or at least a 30% reduction in cost (O'Connor and Veryzer, 2001). This definition combines information on the underlying technology - unprecedented or familiar technological features - with information on the market value of the technology - a five to tenfold improvement in performance or at least a 30% reduction in cost. Additionally, we ask whether the radical innovation creates a new line of business for the inventing company and/or for the market. Hereby we considered a technological and a market perspective as well as a micro and a macro level perspective to assess the potential to radically innovate (Garcia and Calantone, 2002).

Incremental innovations are typically viewed as modifications of the existing products and/or processes. According to the adopted broad definition of product innovation, incremental innovation activity will include introducing modifications to products or services, new design, and improved quality of products or services.

Control variables

In the research model we control for enterprise size and age. *Size* is found to affect innovation capacity in several previous empirical studies, although the results are so far inconclusive; and size variable is directly related to the purpose of the study. We define size of the enterprise by the number of employees including the owner. Enterprise size (i.e. small vs medium sized enterprises) may be a proxy for the internal (OF and networking) capabilities, implying that size is associated with innovation networking behavior. Enterprise *age* is important to the model given that the dependent variable is product innovation intensity in the last three years prior to the survey. We therefore, only involve the small and medium sized enterprises established no later than 5 years ago.

Extent to which SMEs apply organisational foresight may also vary with industry types. As for industry types, we anticipate that there will be differences between manufacturing and services industries. The original Pavitt classification regarded services as 'supplier-dominated', implying a very specific pattern of innovation networking. Given the distinct nature of the offerings of manufacturers and services enterprises, differences in enterprise behaviour may be present.

In the Lithuanian context, extent to which companies are productive in innovation may also vary with access to financial funds in support of innovation/collaborative research.

4. EXPECTED IMPLICATIONS AND LIMITATIONS

It is expected that the proposed research will contribute to theory by providing theoretical background to the notion that organisational foresight can be explained by organisational learning and capabilities theories. Broadening the understanding of the OF by describing it as an organisational capabilities framework as opposed to OF only as a process model or a set of certain methods. By developing and validating the instrument for measuring OF in the SME context, the dissertation will advance OF into quantitatively measurable concept. SMEs could be assessed and compared in terms of OF capabilities. The research study will provide the empirical evidence on the influence of the OF capabilities on product innovation in SME and catching up economy context.

The proposed model can be used for advancing management practices and capabilities in SMEs by proposing ways to integrate OF into existing management functions and to enhance SMEs' abilities to survive. This model should help identifying those OF capabilities that enable the cultivation of product innovation in SMEs. Effective management of those capabilities could lead to the identification of novel opportunities for innovation and other dimensions of the OF value. The validated model and the proposed measurement instrument can be used by other scholars to identify the relationships between OF and product innovation in SMEs, and can be further advanced to include other parameters not tested in this research.

Although the research is expected to reach its aims, there may be several unavoidable theoretical and methodological limitations. Firstly, findings are limited to the SMEs' perspective. Body of knowledge on cognitive & behavioural characteristics, and other of individuals (e.g. managers' characteristics) is excluded from this study. Secondly, the research will focus only on manufacturing SMEs. Generalizability across all sectors in the economy has been considered troublesome to accomplish. Thirdly, foresight capabilities and innovation are assessed and limited to perceived OF / innovation as it will be reported by managers themselves. Fourthly, measurement of innovation is limited to product innovation outputs (as opposed to innovation process, process and managerial innovation, etc.). Fifthly, findings regarding relationship between OF and product innovation will be limited as they will be built on cross-sectional data (at one point in time). Finally, micro companies (up to 10 employees) are excluded from the study.

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