The influence of Entrepreneurial Orientation on the Innovation Process:

An empirical research on manufacturing SMEs

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Master thesis – University of Twente

Title

The influence of Entrepreneurial Orientation on the Innovation Process: An empirical research on manufacturing SMEs

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Master thesis Business Administration, specialization track Innovation & Entrepreneurship
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Abstract

Many scholars have investigated the relationship between entrepreneurial orientation and organizational performance. However, the influence of entrepreneurial orientation on performance is not always immediately apparent. Some scholars have therefore introduced a mediating variable which causes entrepreneurial orientation to influence performance indirectly. Previous research has shown that one such variable is innovation performance. However, little is known about the underlying processes that link entrepreneurial orientation to innovation. Therefore, the focus of this research is to obtain a better understanding of how entrepreneurial orientation influences the innovation process. We have therefore conducted a quantitative research among 41 manufacturing SMEs in the Netherlands. Our findings suggest that when entrepreneurial orientation is considered as a unidimensional construct, it influences both the innovation process as a whole and all its individual steps. However, when we consider entrepreneurial orientation as a multidimensional construct, the only dimension that influences the innovation process and its steps is proactiveness.

Preface

This master thesis is the last assignment to complete my master Business Administration with specialization track innovation and entrepreneurship. I started with this assignment because it gave me the opportunity to apply my statistical skills in a quantitative research. I was able to participate in all the steps from collecting and processing the data to making the analysis that resulted in this thesis. Although I learned a lot from the whole process, at the beginning it was difficult to get good results because the response was lower than expected. This made some research plans that I actually had impossible to carry out. However, I am glad that I was able to carry out an analysis with some good results. This was not possible without the help of some persons, who I would like to thank here.

First of all Dries Faems, who gave me the opportunity to participate in this project and helped me through the first statistical steps that I had to take. My supervisors Michel Ehrenhard and Joris Heuven, for their help and support in the final stage of my thesis. We had some good discussions and they always gave me good comments and support in a constructive manner which really helped me to complete my thesis.

Last but not least I want to thank my family and friends for having interest in my project and supporting me when I needed it. Thank you very much!

Enschede, August 2011

Ian Bleeker

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1. Introduction

1.1 Entrepreneurial Orientation

Entrepreneurial orientation (EO) has its roots in strategy-making process literature (e.g. Mintzberg, 1973). The construct, as it is commonly defined today, is first discussed by Miller (1983) who described an entrepreneurial organization, a multidimensional concept, as one that "engages in product market innovation, undertakes somewhat risky ventures and is first to come up with `proactive' innovations, beating competitors to the punch" (1983, p. 771). According to Miller (1983) an organization only shows an EO when these three dimensions are simultaneously present within an organization.

Based on Miller's (1983) definition, Lumpkin and Dess (1996) have extended the EO construct with two dimensions, competitive aggressiveness and autonomy. They further emphasize that these dimensions may vary independently in a given context, which is confirmed by Hughes (2007) in a study on the effect of EO on performance of organizations in an embryonic growth stage. Lumpkin and Dess (1996) go on further to state that, "an EO refers to the processes, practices, and decision-making activities that lead to new entry" (p. 136).

Based on Miller's (1983) study, many scholars have examined entrepreneurial orientation in relation with performance (e.g. Wiklund and Shepherd, 2003; Rauch, 2009; Slater and Narver, 2000). Lumpkin and Dess (1996) have emphasized that the extent to which an organization shows an EO is dependent on the context in which it operates. They have therefore introduced a contingency framework in which the relationship is extended with environmental and organizational factors.

Based on an analysis of 53 samples from 51 studies, including 41,259 companies, Rauch (2009) indicated that EO has a medium effect on performance, namely a correlation coefficient of 0.242. The studies that were used in this article, examined different operationalizations of key constructs and different cultural contexts, which makes the EO-performance relationship robust.

1.2 Entrepreneurial Orientation and the Innovation Process

In the preceding paragraph we argued that there is a relationship between EO and organizational performance. Though, Covin et al. (2006, p. 58) emphasize that 'the effect of internal organizational processes on the relationship between a firm's EO and its performance is an underexplored topic within the EO research realm.' In addition to this, some scholars (e.g. Alegre and Chiva, 2009; Baker, 2009) suggest that EO does not have a direct effect on organizational performance and introduce therefore an extra variable to the relationship, innovation performance, which captures an indirect effect on organizational performance. Although Baker (2009) has shown that EO indirectly influences organizational performance via innovation performance, there is little known on the internal organizational processes that link EO to innovation (Harms et al., 2010). Investigating the underlying processes between EO and innovation will help to understand this relationship better.

Innovation is the process of growing good ideas in practical use. Therefore the basic idea underlying each definition of innovation is the need to complete the development of and exploitation aspects of new knowledge, not just its invention (Tidd and Bessant, 2009). Innovation refers therefore to a process. Tidd and Bessant (2009) describe the process of innovation by four steps: search, select, implement and capture. This research will focus on the relationship between EO and the innovation process and its steps.

To summarize, some scholars suggest that innovation performance has a mediating effect on the EO performance relationship. However, there is little known on the underlying processes between EO and innovation performance. The overall purpose of this study is hence to examine a part of the mediating effect, the relationship between EO and the innovation process and its steps. Most research on innovation management in manufacturing organizations has focused on large organizations, however manufacturing small and mid-sized enterprises (SMEs) make a significant contribution to economic growth (Terziovski, 2010). Therefore, we put a special focus on manufacturing SMEs.

1.3 Research objective and central question

From the preliminary sections can be derived that many scholars have focused the relationship between EO and performance. However, still little research is conducted on the link between organizational processes, EO and innovation. Therefore this research aims at investigating how EO influences the innovation process and its steps. First, we investigate to what extent EO and the innovation process and its steps have a relationship. Secondly, the strength of these relationships will be investigated. Thus, to what degree EO influences the presence of the innovation process (steps) in an organization. The following research objective is formulated:

To obtain a better understanding on the degree to which EO influences the innovation process and its steps in manufacturing SMEs.

This research objective leads to the following research question:

To what degree does entrepreneurial orientation influence the innovation process and its steps in manufacturing SMEs?

1.4 Research questions

To be able to answer the central question, some research questions are formulated.

1. To what extent does a relationship exist between EO and the innovation process?
2. Which innovation process steps are influenced by EO?
3. Which EO dimensions influence the innovation process?
4. Which EO dimensions influence the innovation process steps?

1.5 Research strategy

This research paper is structured as follows. Chapter Two describes the concept of entrepreneurial orientation as well as the concept of the innovation process. This description leads to a more thorough understanding of the concepts and will analyze which elements are relevant to investigate the relationship between both. To do so, we first describe each concept individually. Subsequently, the concepts are linked to each other. Chapter Three describes the methodology that is used for this study. It will emphasize on the sample that is used to measure the relationship, the operationalisation of both concepts and it will introduce control variables. In Chapter Four the empirical results of the analysis will be presented. Chapter Five discusses the results and will present conclusions and recommendations for further research.

2 Theoretical framework

This chapter gives a description of EO and the innovation process and it will link both constructs. First, EO, its dimensions, its place in the contingency framework and the dimensionality of the EO construct are described in paragraph 2.1. Second, the underlying idea of the innovation process and its steps are described in paragraph 2.2. Third, the relationship between EO and the innovation process is described in paragraph 2.3.

2.1 Entrepreneurial Orientation

Miller (1983) has introduced the EO construct and thereafter it is further developed by Covin and Slevin (1989, 1990) into a commonly accepted conceptualization of what it means for an organization to be 'entrepreneurial' (George and Marino, 2011). According to Miller (1983) an organization has an EO when it is simultaneously risk taking, innovative and proactive. Covin and Slevin (1988, p. 218) further refined Miller's definition by stating that, "the entrepreneurial orientation of a firm is demonstrated by the extent to which the top managers are inclined to take business-related risks (the risk-taking dimension), to favour change and innovation in order to obtain a competitive advantage for their firm (the innovation dimension), and to compete aggressively with other firms (the proactiveness dimension) (Miller, 1983)."

Many authors have adopted EO definitions similar to that of Miller (1983) and Covin and Slevin (1989, 1990), but others have made changes that alter the meaning of the construct. The most common deviations from Miller's (1983) conceptualization are the use of more or less dimensions or the application of the EO construct in a different context (George and Marino, 2011). For example, Merz and Sauber (1995) and Knight (1997) have limited the construct by focusing only on proactiveness and innovation and therefore exclude risk taking. Furthermore, Merz and Sauber (1995) only focus on the actions of business units and to innovations that result in new offerings, instead of for example process improvements. By contrast, Lumpkin and Dess (1996) have extended the construct by including two dimensions. The EO construct consists therefore of the dimensions innovativeness, risk taking, proactiveness, competitive aggressiveness and autonomy. Further, Lumpkin and Dess (1996) have extended the domain by suggesting that "an EO refers to the processes, practices and decision-making activities that lead to new-entry" (p. 136). This is in contrast with Covin and Slevin (1988) who suggest that EO is a strategic attitude reflecting the decisions and processes of the firm, but not explicitly limited to those that lead to new entry, but rather representative of an overall gestalt within an organization. Since Lumpkin and Dess' (1996) conceptualization there have been no significant or widely acknowledged adoptions to how the EO construct can or should be conceptualized (Covin and Wales, 2011).

Constructs, such as EO, are used to represent unobservable phenomena as a way of organizing knowledge and providing a framework for developing and testing theory. Key to this process is the consistent use of clearly defined focal concepts that are measured and tested with a high degree of construct validity in order to ensure the correspondence between the unobservable construct and our means of measuring the construct (Peter, 1981). To determine whether measures represent the theoretical constructs, we must understand what it is we are trying to measure. The heart of the construct validity lies in a clear definition of the focal construct. However, when each researcher defines the construct differently it is hard to enhance the knowledge base (George and Marino, 2011).

The EO construct has suffered from such a problem. As a result, a number of debates are found in literature with regard to the nature of the construct, its dimensionality (Knight, 1997; Lumpkin and Dess, 1996; Zahra, 1993), the interdependence of the dimensions (Dess, Lumpkin and McGee, 1999; Lumpkin and Dess, 1996) the nature of the dimensions (Morris and Paul, 1987) and the theoretical relationship between the construct and the its antecedent and consequent construct (George, 2011).

Although these problems exist in the EO research realm, we will adopt the EO construct and definition of Lumpkin and Dess (1996) because it focuses on new entry and is not context specific. Based on this definition, the following paragraphs are aimed at giving a thorough understanding of each dimension and their importance in the EO construct. It will conclude by giving a brief description of the contingency framework, as introduced by Lumpkin and Dess (1996) and the dimensionality of the EO construct.

2.1.1 Innovativeness

Innovativeness refers to a willingness to support creativity and experimentation to introduce new products or services, technological leadership and research and development in developing new processes (Lumpkin and Dess, 2001). Schumpeter (1942) was the first who linked innovation to entrepreneurship. He described an economic process of “creative destruction”, which refers to the creation of wealth by the introduction of new goods and services to the market which shifted the resources away from existing firms and caused other firms to grow. The factor that caused this introduction is entrepreneurship, described as the competitive entry of innovative new combinations. According to Lumpkin and Dess (1996) innovativeness is an important dimension of EO, because it describes an important means by which organizations pursue new opportunities.

2.1.2 Risk taking

Risk taking refers to a tendency to take bold actions, such as entering unknown new markets, committing a large portion of resources to ventures with uncertain outcomes or borrowing heavily (Lumpkin and Dess, 2001). Miller and Friesen (1978) described risk taking as part of the strategy making process of an organization. EO is a strategic attitude and therefore risk taking should be part of it. However, scholars are not able to find consistent patterns when investigating risk taking in relationship with entrepreneurship. Naldi et al. (2007) suggest therefore that the context in which the organization operates influences the amount of risk it takes. Furthermore most studies have focused individual risk taking on new entry instead of considering the firm level (Lumpkin and Dess, 1996).

2.1.3 Proactiveness

To capitalize a market opportunity it is important to be the first mover. This will usually result in high profits and the first mover will get a head start in establishing brand recognition. Therefore taking initiative in taking advantage of new markets and opportunities is associated with entrepreneurship (Lumpkin and Dess, 1996). This is referred to as proactiveness, it is an opportunity seeking, forward-looking perspective which involves the introduction of new products or services ahead of the competition and acting in anticipation of future demand to create change and shape the environment (Lumpkin and Dess, 2001).

Dess and Lumpkin (2005a) describe the importance of structural capital that is associated with proactiveness. Structural capital, such as structures and processes, enables organizations to create resources more quickly and at cheaper rates than competitors. Therefore, proactiveness enhances both the reception and operations that make organizations stay ahead of competitors.

2.1.4 Competitive aggressiveness

Covin and Covin (1990) have studied competitive aggressiveness, environmental context and small firm performance, and defined competitive aggressiveness as follows:

> "The current study viewed aggressiveness as a more general managerial disposition reflected in a firm's willingness to take on and desire to dominate competitors through a combination of proactive moves and innovative efforts. As conceptualized and operationalized here, firms are aggressive if they typically initiate actions to which competitors then respond; are often first to introduce new products, administrative techniques, operating technologies, etc.; and typically adopt a very competitive, "undo-the-competitors" posture. More passive firms, on the other hand, typically respond to actions which competitors initiate; are seldom first to introduce new products, administrative techniques, operating technologies, etc.; and typically seek to avoid competitive clashes, preferring a "live-and-let-live" posture." (Covin and Covin, 1990, p. 36).

This definition implies that competitive aggressiveness and proactiveness are two variables that cannot be separated. However, Lumpkin and Dess (2001) have shown that both dimensions are independent and make a unique contribution to performance. This distinction can be described on the hand of the resource based view which describes how firms create, acquire and leverage resources to achieve a sustainable advantage (Barney, 1991). According to Lumpkin and Dess (2001) the creation of resources refers to proactiveness, but when these resources are created organizations are more likely to defend them by a competitive aggressive attitude. Therefore Lumpkin and Dess (2001) define competitive aggressiveness as the intensity of a firm's efforts to outperform industry rivals, characterized by a combative attitude and a forceful response to competitor's actions.

To endorse the importance of competitive aggressiveness as an EO dimension, Dean (1993) shows a high correlation of competitive aggressiveness with entrepreneurship on all levels of risk in a study that compares companies in low- and high risk environments. Furthermore competitive aggressiveness explained more variance (37 percent) in corporate entrepreneurship than did any other strategy or structural variable analyzed.

2.1.5 Autonomy

Autonomy refers to an independent spirit which is important for new-entry activity. In an organizational context it refers to action taken free from any organizational constraints. In an individual or team context it can be described as taking independent action or the ability and will to be self-directed in the pursuit of opportunities (Lumpkin and Dess, 1996). Autonomy can be defined as independent action by an individual or team aimed at bringing forth a business concept or vision and carrying it through completion (Lumpkin and Dess, 2001). There are different levels of autonomy, depending on the types of actions or decisions a group can control (Gulowsen, 1972). There are two levels of autonomy, structural and strategic. Structural autonomy enables a team to solve a problem with self-determined means. Strategic autonomy refers to the extent to which a team has control over ends, i.e. its goals. Strategic autonomy enables a team to operate outside normal organizational constraints in addressing what it will accomplish and how it will achieve its objectives. Autonomy from an EO perspective refers to strategic autonomy (Lumpkin et al., 2009). This level of autonomy enables teams not only to solve problems, but actually to define the problem and goals that will be met in order to solve the problem.

2.1.6 Dimensionality of the EO construct and the contingency framework

According to Miller (1983) an organization has an EO when it is concurrently risk taking, innovative and proactive. In this respect, entrepreneurship is a unidimensional construct. After adding the dimensions competitive aggressiveness and autonomy Lumpkin and Dess (1996) have proposed that EO is a multidimensional construct. This means that the EO dimensions may vary independently, depending on the environmental and organizational context. Therefore an organization has an EO when it scores high on some of the EO dimensions, not on a particular dimension or combination of dimensions. Furthermore, the influence of EO on performance is also context specific. Although only focusing on the dimensions by Miller (1983), Stetz et al (2002) and Kreiser et al. (2002) have shown that the EO dimensions show high correlations and each having their own influence on performance. They have therefore shown that the EO construct is in fact multidimensional.

Lumpkin and Dess (1996) have, based on the independence of the EO-dimensions and the dependence of the context, introduced a contingency model on the EO-performance relationship. Contingency theory holds that the relationship between two variables depends on the level of a third variable. Introducing moderators in two variable relationships helps to reduce the potential for misleading inferences and permits a more precise understanding of contingency relationships (Rosenberg, 1968, p. 100). Lumpkin and Dess (1996) have introduced internal and external environmental factors of the organization as contingency variables to describe the context in which the organization operates which will help to get a better understanding the influence of the organizational context on the EO –performance relationship. For this research the research context is manufacturing SMEs. Furthermore we will take the effect organizational age, size and industry type into account.

2.2 Innovation process

Innovation is the process of growing good ideas in practical use. Therefore the basic idea underlying each definition of innovation is the need to complete the development of and exploitation aspects of new knowledge, not just its invention (Tidd and Bessant, 2009). Innovation refers therefore to a process. There are many conceptualizations of the innovation process (e.g. Van de Ven et al., 1999; Tidd and Bessant, 2009; Cormican and O'Sullivan, 2004). Each of these authors distinguishes the innovation process in different steps. Van de Ven et al. (1990) distinguish the steps in an initiation period, a development period and an implementation and termination period. Tidd and Bessant (2009) distinguish the steps search, select, implement and capture. Cormican and O'Sullivan (2004) describe the same steps, except for capture. Although the scholars focus more or less on the same steps, the context of their process is different. This research focuses on manufacturing SMEs. All scholars focus on both product and process innovation. However, Van de Ven et al (1990) and Cormican and O'Sullivan focus mainly on large organizations, while Tidd and Bessant (2009) focus on both small and large organizations. The innovation process described by Tidd and Bessant (2009) seems therefore most appropriate to use in this research.

Another perspective on innovation is that of entrepreneurship, because it involves the identification of market opportunity and the combinations of resources to pursue it (Guth and Ginsburg, 1990). Shane and Venkataraman (2000, p. 218) argue that the field of entrepreneurship is defined by the study of "how, by whom and with what consequences opportunities to produce future goods and services are discovered, evaluated and exploited". According to Lumpkin and Dess (1996) entrepreneurship describes new entry by introduction of new products or services on new or existing markets. However, new entry can also be described by new ventures that enter the market with existing goods. Entrepreneurship is therefore not necessarily associated with innovation. Furthermore, entrepreneurship describes more roles than just that of innovation (Wennekers and Thurik, 1999). Therefore, entrepreneurship will not be used to describe innovation in this research.

According to Tidd and Bessant (2009) innovation is the core renewal process within an organization, refreshing what it offers the world and how it creates and delivers that option. Innovation is therefore more than simply coming up with good ideas; it is the process of growing them into practical use. To describe this process Tidd and Bessant (2009) have developed a framework that involves searching, selecting, implementing and capturing. This process is represented by the following model:

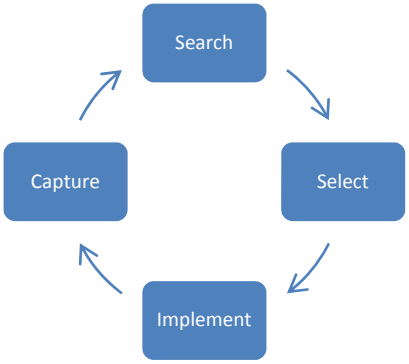

Figure 1: The innovation process

In short, the process consists of searching and selecting relevant and achievable signals. Thereafter these signals are transformed in some kind of innovation. The final stage is to capture benefits from the innovation, such as market share or learning. For each step follows a description, based on Tidd and Bessant (2009), on how it can be managed successfully.

2.2.1 Search

The first phase of the innovation process involves the detection of signals in the environment that have potential for change. There are many sources of which these signals can be obtained, it is therefore necessary for an organization to have well developed mechanisms for identifying, processing and selecting information from their environment.

2.2.2 Select

The purpose of this stage is to resolve the inputs from the organization into an innovation concept which can be progressed into further development. However, innovation is inherently risky. It is therefore necessary to make a selection of markets and technological opportunities. Furthermore there must be a fit with the overall business strategy of the organization and an organization must build on existing technical and marketing competencies. A selection based on these requirements increases the probability that the inputs of the organizations will result in a successful innovation.

2.2.3 Implement

When relevant signals are found and strategically selected, the next phase is to transform them in an actual innovation. The implementation phase can be seen as one that gradually pulls together different pieces of knowledge and weaves them into an innovation. At the early stages there is high uncertainty, such as technological feasibility, but over the implementation phase this uncertainty is replaced by knowledge acquired through various routes. The implementation phase can be described more thoroughly by considering three core elements: acquiring knowledge, executing the project and launching and sustaining the innovation. Acquiring knowledge involves combining new and existing knowledge. It results in a first draft of the solution and is likely to change considerably in its development. Executing the project forms the heart of the innovation process. Its inputs are a clear strategic concept and some initial ideas for realizing the concept. Its outputs are both a developed innovation and a prepared market, ready for final launch. The final stage involves the preparation of the market. Buyers must adopt the new product and therefore peoples must be made aware of the market through marketing. Further knowledge about the adoption of the innovation can help to refine it. For all the stages cooperation among the divisions that are responsible for the development of the innovation is important. For example there must be demand for the innovation and the innovation must technically feasible. If marketing and R&D don’t cooperate the innovation will not succeed.

2.2.4 Capture

The purpose of innovating is not only to create innovation for their own sake but rather to capture some kind of value from them, such as commercial success or market share. Another outcome of the launch of an innovation is the creation of stimuli for restarting the cycle. Based on experiences with failed or successful innovations, organizations can improve their next generation innovation. A main requirement in this stage is the willingness to learn from completed projects. This can be achieved by capturing all learned lessons, from both success and failure, and feed these through the next generation. Therefore organizations need to set up routines to evaluate their current innovation process, capture lessons, and distribute these lessons learned through the organization. The capture stage can therefore be distinguished in an evaluation and learning stage.

2.3 The relationship between EO and the innovation process

Organizations with an EO are able to continuously identify and exploit opportunities that arise from asymmetries of market and technological knowledge (Hayton, 2005). EO can also help to explain which managerial processes lead to the early recognition of these signals which will likely lead to better performance than that of competitors. Furthermore, EO reflects the priority that firms place on the process of identifying and exploiting market opportunities (Baker, 2009). Underlying an EO is a tendency to pursue the creation and acquisition of new knowledge and the integration of new knowledge and capabilities with existing resources in the form of new combinations (Hayton, 2005). Therefore, EO stimulates the innovative potential of an organization.

Although the EO dimension innovativeness seems to have potential to describe whether an organization is innovative, it actually describes the willingness to support creativity and experimentation in new product development, technology adaption and internal processes and procedures (Baker, 2009). However, EO stimulates an organizations' creativity, creates a proactive stance towards innovation, has an aggressive attitude towards competitors, encourages autonomy and stimulates innovation. We therefore expect that EO has influence on the innovation process and all its steps. Therefore, we suggest:

H1a: EO influences the innovation process.

H1b: EO influences all the innovation process steps.

The relationship between each EO dimension with each of the innovation process steps is described in the following paragraphs.

2.3.1 Innovativeness

Innovativeness stimulates creativity and experimentation in an organization. Such attitude is necessary for organizations that want to explore opportunities that may result in organizational development (Dess and Lumpkin, 2005b)**.** Furthermore innovativeness contributes in renewing the presence of the organization in existing markets and businesses (Kollmann and Stöckmann, 2010). According to Baker (2009) innovativeness describes creativity and experimentation in new product development, technology adaption and internal processes and procedures. Innovativeness implies a willingness to depart from existing practices in an organization (Özsomer et al., 1997). We expect that the willingness to be innovative has influence on the innovation process steps searching, selecting and implementing to come up with new products and/or services but also in the steps evaluating and learning because an organization must learn from its practices to provide an input for future innovation. Therefore, we suggest:

H2: Innovativeness influences all the innovation process steps.

2.3.2 Risk taking

Organizations engaging in radical innovations must be willing to take financial and business risks to be successful (Kollmann and Stöckmann, 2010). When organizations face uncertainty, risk taking may give the organization bias to take action (Dess and Lumpkin, 2005b). However, when considering exploitative innovation, the fast decision making that is associated with risk taking contradicts the in-depth analysis and negotiations that are needed to identify weaknesses and potentials of existing technologies and products (Kollmann and Stöckmann, 2010). The amount of risk that an organization takes is therefore, depending on the organizational context, important when it comes to innovation success.

During the innovation process steps searching and selecting an organization faces uncertainty. This uncertainty reduces while the innovation is implemented (Tidd and Bessant, 2009). According to Hitt et al. (2001) organizations with a strong EO have the ability to make environmental uncertainty work to their benefit. Although the amount of risk may differ, risk is inevitable during the innovation process because the exact outcome of the process cannot be known beforehand. We expect that risk taking is involved until the innovation is completed and is therefore related to the innovation process steps searching, selecting and risk taking. Therefore, we suggest:

> *H3: Risk taking influences the innovation process steps searching, selecting and implementing in an organization.*

2.3.3 Proactiveness

Proactiveness is an opportunity seeking, forward-looking perspective (Lumpkin and Dess, 2001). A proactive attitude facilitates an organization with the introduction of new products or services ahead of competition, because it is more receptive for trends in customer demands (Kollmann and Stöckmann, 2010 and it enhances processes and operations that make operations stay ahead of competitors (Dess and Lumpkin, 2005a). To stay ahead of competitors, a proactive attitude is necessary during all innovation process steps. An organization must not only be the first to come up with a new innovation to the market, but must also be proactive in evaluating and learning to keep advantage over competitors. Therefore, we suggest:

> *H4: Proactiveness influences all the innovation process steps in an organization.*

2.3.4 Competitive aggressiveness

Competitive aggressiveness requires intense action that is aimed at outperforming industry rivals. This can either be done by improving current products as well as doing things differently. Organizations can therefore find a new niche for themselves or target at the competitors' weaknesses by developing superior products or services (Kollmann and Stöckmann, 2010). Furthermore organizations can respond aggressively and quickly with innovation when it faces creative and disruptive actions of rivals (Smith et al., 2001). Competitive aggressiveness mobilizes continuous competitor assessment and thus the deconstruction of the value packages of the rivals to generate superior offerings (Hughes and Morgan, 2007). The input about the strength and weaknesses of the competitors serve for both the adjustments of existing offerings and for radical new products and services (Kollmann and Stöckmann, 2010). Therefore competitive aggressiveness is involved in searching the environment for competitor's characteristics, select where to aim and implement a new product offering. Competitive aggressiveness is more focussed on the external environment of the organization because it aims at competitors. It does therefore not affect the innovation process steps evaluating and selecting. Therefore, we suggest:

H5: Competitive aggressiveness influences the innovation process steps searching, selecting and implementing.

2.3.5 Autonomy

Autonomy encourages innovation as it is a source for creativity and initiative. Entrepreneurial initiatives are transformed in entrepreneurial outcomes by autonomous efforts of key individuals acting outside the chain of command (Lumpkin and Dess, 2001; Lumpkin et al., 2009). Such individuals are often referred to as champions (Green et al, 1999). Organizations that wish to explore venture opportunities often must create environments where innovation team members are free to explore possibilities without the influence of strategic norms or organizational traditions that may impede the discovery process (Burgelman, 1983). We therefore expect that autonomy influences the innovation process steps searching and implementing because these stages involve looking for opportunities and creative combination of resources. The selecting stage should be conducted in line with the strategy of the organization and is therefore not associated with autonomy. The evaluating and learning stages must both be conducted in an organized manner to be successful. Therefore, we suggest:

H6: Autonomy influences the innovation process steps searching and implementing.

3 Methodology

This chapter describes the methodology for this study. It focuses on the used sample and data collection in paragraph 3.1, the measurement of the research variables in paragraph 3.2 and the used analytical techniques in paragraph 3.3.

3.1 The Sample

The Verenigde Maakindustrie Oost (VMO) has asked the University of Twente to conduct a research on the innovativeness of this industry. Therefore a survey "Innovatiescan" was send to all the 170 members of the VMO. The survey is addressed to the owner or general manager of each organization. Scholars have argued that an organizations owner or general manager is the key decision maker and thus sets the strategic orientation of the organization (Lumpkin and Dess, 1996; Miller, 1983). The survey measures managerial perceptions of the firm-level variables and has the advantage that it poses questions that address directly the underlying nature of a construct which enhances the validity (Lyon, 2000). This has advantages for small organizations, because the view of the respondent may reflect that of the organization and the respondent is most likely the most knowledgeable person of the organization (Glick et al., 1990). To ensure a response as high as possible, first a reminder by e-mail was send and secondly the firms that had not responded yet - where asked by phone to send their response. This resulted in a response of 63 organizations, approximately forty percent of all members. Of the 63 organizations, 41 organizations provided data which could be used to measure EO. The organizations have an average age of 42.8 (SD = 33.45) years and average size of 115.47 (SD = 255.58) full time employees.

3.2 The Measures

This paragraph describes the operationalization and measurement of the research variables, namely: (1) EO and its dimensions; (2) the innovation process; and (3) the control variables.

3.2.1 Entrepreneurial Orientation

To measure the EO dimensions, questions from Lumpkin and Dess (2001) were adopted in the Innovatiescan. The used scales are developed and tested by Khandwalla (1977), Miller (1983), Covin and Slevin (1986, 1989), and Covin and Covin (1990). Lumpkin and Dess (2001) have extended the scale by adding two items to capture aspects of the subconstructs that were not included in the previous used scales. According to Covin and Wales (2011) the Miller (1983) scale measures entrepreneurial orientation as an underlying construct, instead of the individual influence of the EO dimensions. The addition of the two items by Lumpkin and Dess (2001) enhances the measurement of the independent dimensions which is in line with the proposed multidimensional construct by Lumpkin and Dess (1996). Autonomy is not included in the Innovatiescan because the scales that were available for strategic autonomy during the development of the Innovatiescan showed a number of shortcomings. The scales lack generalizability across contexts, are sometimes indistinct from measures of (de)centralization, and are often limited to measurement of structural autonomy without regard to strategic autonomy (Lumpkin et al., 2009).

Appendix A shows that the measurement of each dimension is conducted with multiple questions. Question P2 and P3 have been recoded as both questions ask the opposite of question P1, i.e. answering ‘agree’ to P1 means something different then answering ‘agree’ to P2, recoding solves this problem. These reverse-phrased questions are important to reduce response bias (Field, 2009).

All the EO items are measured on a five-point Likert scale, ranging from ‘totally agree’ to ‘totally disagree’. Technically speaking, a Likert scale has an ordinal distribution. However in academic research it is common practice to treat a Likert scale as if its data is distributed on an interval scale. It is therefore a continuous variable. This implies that most statistical techniques can be used (Jamieson, 2004).

Each EO dimension is measured with multiple items. Combining these items improves the reliability of measurement. However, if one wants to obtain meaningful scores the items must all be indicators of some common underlying construct, i.e. all items should share common variance. This phenomenon is also described as unidimensionality. A common misunderstanding exists between unidimensionality and internal consistency. The former assumes that *all* items share common variance whilst the latter assumes that an item shares common variance with *some* other items. Factor analysis provides the strongest line of evidence to support a claim that a scale is unidimensional (Gardner, 1995). Therefore a factor analysis, with varimax rotation, is conducted. Varimax rotation attempts to maximize the dispersion of loadings within factors. Therefore, it tries to load a smaller number of variables highly onto each factor resulting in more interpretable clusters of factors (Field, 2009). A factor analysis with all EO items (Table 6, appendix B) identifies four underlying components. It is troublesome to typify the components as individual EO dimensions. However, the analysis shows that EO is a multidimensional construct.

Since the factor analysis is inconclusive, a Cronbach alpha analysis is conducted on all the EO dimensions to identify their reliability. The dimensions innovativeness and proactiveness have a low reliability, as shown in Table one. Further analysis shows that the innovativeness item I2 has low or negative correlation with the other two innovativeness items. For proactiveness, item P3 has a negative correlation with item P1 and a significant correlation with item P2. Because the improvement of alpha is high after deleting these items, we will not bring them in further analysis. The improvement of alpha of both dimensions is shown in Table one. All the other dimensions could not be further improved. The Cronbach alphas are reported in Table four and indicate that the EO items have a high to average reliability. The average of each EO dimension items is taken for further analysis.

Table 1: Improvement item reliability

Item	Old alpha	New alpha	Item deleted
Innovativeness	.49	.88	I2
Proactiveness	.53	.65	P3

After removing item I2 and P3 another factor analysis is conducted (Table 7, appendix B). This analysis results in two remaining factors and shows that one factor consists mostly of the items of the innovativeness and proactiveness dimensions and that the other factor consists of the items of the risk taking and competitive aggressiveness dimensions. Although we were not able to identify four separate EO dimensions, the factor analysis supports Lumpkin and Dess's (1996) claim that EO is a multidimensional construct.

3.2.2 Innovation process

The innovation process is measured on its five steps: searching, planning, implementing, evaluating and learning. These steps are based on the innovation process described by Tidd and Bessant (2009). As mentioned before the capture step can be distinguished in an evaluating and learning step. Tidd and Bessant (2009) have developed a self-assessment tool that focuses on the important areas of innovation management. This tool consists of multiple statements which are included in the "Innovatiescan". Each statement is measured on a five point Likert scale, ranging from 'totally agree' to 'totally disagree'. A Cronbach alpha analysis is conducted on the items to identify and improve their reliability. The results shown in Table six indicate that the innovation process steps have a high reliability ($\alpha > .79$). The item IP implementation has a low reliability. It is improved from $\alpha = .25$ to $\alpha = .52$ by deleting one question.

3.2.3 Control variables

Businesses of different size and age may exhibit different organizational and environmental characteristics. The same is true for organizations in different industries (Wiklund and Shepherd, 2005). With respect to innovation, large organizations may devote more resources to innovative processes, but may lack the flexibility needed to pursue innovation (Kollmann and Stöckmann, 2010). Second, the firms' age may have a positive effect due to increased experience and produces more innovations or have a negative effect due to the fact that an organization may lose sight of external developments and produces fewer innovations (Sørensen and Stuart, 2000). Therefore, firm age, size and industry type are included as control variables for possible confounding effects. The participants of the survey are all manufacturing organizations. To determine the industry type, the organizations were asked after their position in the value chain of the product. Therefore the following supplier types could be selected: original equipment manufacturer, generic system supplier, application system supplier / system developer, process supplier, and part supplier. Respondents were also asked in which year their firms were founded, which was used to calculate firm age. Finally, the respondents were asked how many full time employees work in the organization at the present time. The number of employees was used to control for firm size.

3.3 Analysis

The purpose of this study is to investigate the influence of EO on the innovation process and its steps. A correlation analysis is conducted to determine whether there exists a relationship between EO and the innovation process. Subsequently the influence of EO on the innovation process and its steps is investigated.

Before we describe the analytical technique, we first have to consider the dimensionality of both constructs. EO is a multidimensional construct (Lumpkin and Dess, 1996). Furthermore the innovation process consists of several different steps and is therefore also multidimensional. Therefore, the measurement of the effect EO on the innovation process includes more than one independent variable and more than one dependent variable. A standard ANOVA model is therefore inadequate. Instead an extension of this technique, known as the multivariate analysis of variance (MANOVA), is used. This technique measures the interaction effect of several dependent and independent variables, but is also measures the main effect between two variables. However, in addition to the continuous variables that are measured the relationship we also control for the industry type in which an organization operates. This is a variable with categorical data, therefore the Multivariate analysis of covariance (MANCOVA) suits best (Field, 2009). When relationships with one dependent variable are tested, ANCOVA analysis is used. (M)ANCOVA analysis takes into account the differences of variance of the independent variables. By doing so, adding an additional variable to the analysis will affect the investigated relationships to some extent (Field, 2009). We can therefore control for age, size and industry by adding them to the initial analysis.

4 Results

This chapter describes the results that are obtained from the analysis on the relationship between EO and the innovation process. Both constructs are first examined in a unidimensional level in order to determine whether there exists a relationship. Then the influence of EO on the innovation process steps is investigated. These analyses will test hypothesis 1a and 1b and are presented in paragraph 4.1. Subsequently the influence of EO, as a multidimensional construct, on the innovation process steps is investigated to test hypothesis two, three, four and five. The results of this analysis are presented in paragraph 4.2. Hypothesis six is not tested, because autonomy is not included in the Innovatiescan.

4.1 Relationship EO – Innovation Process

Hypothesis 1a suggests that EO influences the innovation process in an organization. A correlation analysis between EO and the innovation process shows that there exists a strong and significant relationship between both constructs, namely $r = .65$, $p < .01$. Although the test-statistic is significant, it doesn't give insight in the strength of the relationship or if the measured effect is important or meaningful. Therefore a standardized way to measure the size of the effect that we are testing is developed, known as the effect size. An effect size is an objective and standardized measure of the magnitude of observed effect (Field, 2009). Cohen (1992) has made some widely used suggestions about what constitutes a large or small effect for correlation coefficients: $r = .1$ is a small effect; $r = .3$ is a medium effect and $r = .5$ is a large effect. Therefore EO has a large effect on the innovation process ($r > .5$).

Although the previous analysis has shown that the effect of EO on the innovation process is large, it does not give insight on the influence of EO on the innovation process. Therefore an ANCOVA analysis is conducted with the innovation process steps as dependent variables and EO as independent variable. Table two reports the ANCOVA analysis on the influence of EO on the innovation process. Using Wilks's statistic, the analysis indicates that EO does have a significant influence on the innovation process: $\Lambda = .610$, $F(5, 29) = 3.704$, $p < .01$.

Table 2: ANCOVA analysis on the effect of EO on the innovation process

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	.595	3.946	5.000	29.000	.008
EO	.610	3.704	5.000	29.000	.010

When we control for age, size and industry the effect of EO on the innovation process remains significant. The results are shown in appendix C, Table eight, nine and ten. For age it is $p < .1$, for size $p < .01$ and for industry $p < .1$. Furthermore the control variables do not have a significant effect on the innovation process. This analysis has shown that EO does have an influence on the innovation process. Therefore we accept hypothesis 1a.

Hypothesis 1b suggests that EO also influences all the individual innovation process steps. Table three reports the results of the correlation analysis on the relationship of the EO construct with each of the innovation process steps. It is worthwhile to mention that EO has a significant relationship, $p < .01$, with all the innovation process steps. According to Cohen (1992), EO has a medium effect on IP searching ($r > .3$) and has a large effect ($r > .5$) on the other innovation process steps. Furthermore the innovation process steps do all have a large effect on each other. Based on the results shown in Table three, we conclude that EO has a strong and significant relationship with the innovation process steps.

Table 3: Correlation analysis EO and innovation process steps

Variable	1	2	3	4	5
1. EO					
2. IP Searching	.454**				
3. IP Selecting	.631**	.545**			
4. IP Implementing	.548**	.533**	.696**		
5. IP Evaluating	.531**	.678**	.730**	.586**	
6. IP Learning	.581**	.693**	.713**	.643**	.784**

Notes: * $p < 0.05$; ** $p < 0.01$.

The correlation analysis has shown that there exists a strong relationship between EO and the innovation process steps. However this test does not explain whether changes of EO have an effect on the innovation process steps. Therefore an MANCOVA analysis is conducted. This analysis indicates that EO does have significant effect on all the individual innovation process steps. The following results are obtained:

- IP Searching: $F (1, 33) = 3.561$, $p < .01$;
- IP Selecting: $F (1, 33) = 9.397$, $p < .01$;
- IP Implementing: $F (1, 33) = 4.234$, $p < .01$;
- IP Evaluating: $F (1, 33) = 5.925$, $p < .01$;
- IP Learning: $F (1, 33) = 10.918$, $p < .01$.

When we control for age and size the influence of EO on the innovation process steps remains significant and is respectively $p < .05$ and $p < .01$, see Table 11 Appendix D. For industry the influence of EO on searching is significant on $p < .1$, for implementing $p < .05$ and for selecting, evaluating and learning it is $p < .01$. Table 12 (Appendix D) shows that the control variables do not have a significant effect on the innovation process steps.

Hypothesis 1a tested the influence of EO on the innovation process as a whole. A correlation analysis has shown that EO has a strong positive relationship with the innovation process. Furthermore an ANCOVA analysis has shown that EO influences the innovation process. Hypothesis 1b suggests that EO has influence on all the innovation process steps. A correlations analysis has shown that EO has a medium to strong positive relationship with all the innovation process steps. A MANCOVA analysis has shown that EO has a significant effect on all the innovation process steps. Because EO does have influence on the innovation process and its steps and this relationship is not influenced by the control variables, we accept hypotheses 1a and 1b. We can therefore conclude that EO influences both the innovation process as a whole and all its individual steps.

4.2 The EO dimensions and the Innovation Process steps

The preceding analyses have indicated that EO as a unidimensional construct influences both the innovation process and its steps in an organization. Hypothesis two, three, four and five suggest that each EO dimension, in varying extent, influences the innovation process steps in an organization. To investigate the relationship and the influence of each dimension a correlation analysis is conducted in paragraph 4.2.1. Paragraph 4.2.2 reports the results of a MANCOVA analysis which measures the influence of each EO dimension on the innovation process steps.

4.2.1 The relationship between the EO dimensions and the innovation process steps

To investigate the existence of a relationship between EO and the innovation process steps, a correlation analysis is conducted. Table four reports the correlation, the descriptive statistics and the Cronbach alpha's for the multi-item scales. On average the organizations show a low to neutral EO. This is in line with Kemelgor (2002) who showed that organizations in the Netherlands demonstrated a significantly lower EO than did organizations from the United States. The Cronbach alpha is high for most items, except for risk taking, competitive aggressiveness and the innovation process implementing. The Cronbach alpha analysis has shown that these items could not further be improved.

It is worthwhile to note that all the EO dimensions show moderate ($r > .3$) to high ($r > .5$) correlations. The innovation process steps also show high ($r > .5$) correlations. The Pearson's correlation coefficients indicate that proactiveness has a consistently strong ($r > .48$) relationship with all the innovation process steps (all $p < .01$). By contrast, risk taking has only a moderately strong significant relationship with IP learning ($r = .35$; $p < .05$). Innovativeness shows high to moderately strong relationships with IP planning ($r = .50$; $p < .01$), IP implementing ($r = .45$; $p < .01$) and IP evaluating ($r = .40$; $p < .05$). Competitive aggressiveness shows moderately strong relationships with IP searching ($r = .42$; $p < .05$), IP planning ($r = .40$; $p < .05$) and IP learning ($r = .39$; $p < .05$).

Table 4: Descriptive statistics, correlations and reliabilities

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9
1. Innovativeness	2.31	1.19	(0.88)								
2. Risk Taking	1.96	.78	.33*	(0.48)							
3. Proactiveness	2.15	1.07	.69**	.51**	(0.65)						
4. Competitive Aggressiveness	1.52	.82	.59**	.57**	.61**	(0.56)					
5. IP Searching	2.16	.68	.25	.24	.48**	.42*	(0.79)				
6. IP Selecting	2.22	.94	.50**	.31	.62**	.40*	.55**	(0.79)			
7. IP Implementing	2.83	.79	.45**	.22	.63**	.21	.53**	.70**	(0.52)		
8. IP Evaluating	2.02	.80	.40*	.15	.66**	.31	.68**	.73**	.59**	(0.89)	
9. IP Learning	2.15	.97	.32	.35*	.65**	.39*	.69**	.71**	.64**	.78**	(0.90)

Notes: * $p < 0.05$; ** $p < 0.01$. Reliabilities (Cronbach alphas) are in parentheses.

4.2.2 The influence of the EO dimensions on the innovation process steps

This paragraph forms a description of the results of the MANCOVA analysis that is conducted to investigate the influence of the EO dimensions on the innovation process steps.

Table five shows the results of the MANCOVA analysis on the effect of the EO dimensions on the innovation process. Using Wilks's statistic, there is a significant effect of proactiveness on the innovation process, $\Lambda = .583$, $F(5, 24) = 3.433$, $p < .05$. The other EO dimensions do not have a significant effect on the innovation process (Table five). When the relationship between proactiveness and the innovation process is controlled for age, size and industry, the effect remains significant (Appendix E, Table 13). The control variables do not have a significant effect on the innovation process. Although they slightly affect on the influence of the other EO dimensions on the innovation process, these influences do not become significant.

Table 5: Effect of EO on the innovation process - MANCOVA analysis

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	.525	4.337	5.000	24.000	.006
Innovativeness	.922	.407	5.000	24.000	.839
Risk taking	.850	.850	5.000	24.000	.528
Proactiveness	.583	3.433	5.000	24.000	.018
Competitive Aggressiveness	.858	.792	5.000	24.000	.566

The analysis on the individual effect of the EO dimensions on the innovation process steps shows that proactiveness is the only EO dimension that has an effect on the innovation process. It has a significant effect on all the innovation process steps. The following results are obtained:

- Searching: $F(1, 28) = 2.026$, $p < .05$;
- Selecting: $F(1, 28) = 2.809$, $p < .05$;
- Implementing: $F(1, 28) = 3.947$, $p < .01$;
- Evaluating: $F(1, 28) = 5.598$, $p < .01$;
- Learning: $F(1, 28) = 7.205$, $p < .01$.

The influence of the other EO dimensions is shown in Appendix E, Table 14. When we control for age, size and industry, proactiveness shows only a significant effect on the innovation process steps implementing, evaluating and learning. The control variables themselves do not have a significant effect on the innovation process steps (Appendix E, Table 14).

The EO construct consists of five dimensions of which four are examined in this research, innovativeness, risk taking, proactiveness and competitive aggressiveness. Hypothesis two, three, four and five suggest that each dimension predicts the presence of the innovation process to some extent. We will discuss the results of this study with respect to these hypotheses.

Hypothesis two suggests that the EO dimensions innovativeness influences all the innovation process steps. A correlation analysis has shown that innovativeness has a positive relationship with the innovation process steps selecting, implementing and evaluating. Surprisingly we did not find evidence that innovativeness has an effect on the innovation process steps. We therefore do not accept hypothesis two.

Hypothesis three suggests that risk taking influences the innovation process steps selecting and implementing. The correlation analysis has shown that risk taking has, in contrast what we expected, a significant positive relationship with the innovation process step learning. However, the MANCOVA analysis has shown that risk taking does not influence any of the innovation process steps. We therefore do not accept hypothesis three.

Hypothesis four suggests that proactiveness influences all the innovation process steps. The correlation analysis has shown that proactiveness has a strong, significant and positive relationship with all the innovation process steps. Furthermore the MANCOVA analysis has shown that proactiveness both influences the innovation process as a whole, but also all its individual steps. We therefore accept hypothesis four.

Hypothesis five suggests that competitive aggressiveness influences the innovation process steps searching, selecting and implementing. The correlation analysis has shown that competitive aggressiveness has a significant and positive relationship with the innovation process steps searching, selecting and learning. For learning we did not expect an effect. However, the MANCOVA analysis has shown that competitive aggressiveness does not influence any of the innovation process steps. Therefore we do not accept hypothesis five.

5 Conclusion and discussion

This chapter describes the conclusion of this research by giving an answer to the research question in paragraph 5.1. Subsequently the limitations of this research are discussed, with some suggestions for further research in paragraph 5.2.

5.1 Conclusion

Some scholars (e.g. Alegre and Chiva, 2009; Baker, 2009) suggest that EO does not have a direct effect on organizational performance. They have therefore introduced a mediating variable, innovation performance. Although Baker (2009) has shown that EO indirectly influences organizational performance via innovation performance, there is little known on the internal organizational processes that link EO to innovation (Harms et al., 2010). We have therefore focused on the influence of EO on the innovation process of an organization. In so doing we have put a special focus on manufacturing SMEs. To accomplish this goal the following research question is formulated:

To what degree does entrepreneurial orientation influence the innovation process and its steps in manufacturing SMEs?

The theoretical framework described that EO stimulates an organizations' creativity, creates a proactive stance towards innovation, has an aggressive attitude towards competitors, encourages autonomy and stimulates innovation. Therefore each EO dimension stimulates the innovation process of an organization and it is expected that EO as a construct influences the innovation process (H1a) and all its individual steps (H1b) in an organization. A correlation and MANCOVA analysis has shown that EO influences both the innovation process and all its individual steps. With respect to research question one and two, we can conclude that EO and the innovation process have a strong, positive and significant relationship and that all innovation process steps are influenced by EO.

Hypotheses two, three, four and five all suggested that each EO dimension influences the innovation process and its steps to varying extent. We have accepted hypothesis four (proactiveness) and did not accept hypotheses two, three and five (respectively innovativeness, risk taking and competitive aggressiveness. Although the EO dimensions innovativeness, risk taking and competitive aggressiveness do not have an effect on the innovation process and its steps there were some unexpected relationships which we will discuss here.

Hypothesis two suggested that innovativeness influences all the innovation process steps. The analysis showed that innovativeness does not influence the innovation process steps. This is remarkable because it seems logical that an innovative attitude influences the innovation process in an organization positively. However, there exists a positive relationship with the innovation process steps selecting, implementing and evaluating. There is however no relationship with the innovation process steps searching and learning. For searching we expected that an organization with an innovative attitude would be more receptive for signals from its environment. However, the possibility exists that organizations have standard mechanisms for this and start to be innovative in the remaining steps. The lack of a relationship between innovativeness and learning could be caused by an inability to from the evaluation. Furthermore, if an organization is not sensitive for signals from the external environment, it is probably also not sensitive for signals from the internal environment. It does therefore not see the need to produce these signals by learning from their own process.

Hypothesis three suggested that risk taking influences the innovation process steps searching, selecting and implementing. Although risk taking has no influence on all the innovation process steps, it has a positive relationship with the innovation process step learning. This is unexpected because learning involves routines within an organization whilst risk taking involves breaking away from routines. This relationship could be explained because the risk taking attitude for the organizations is quite low, namely a mean of 1.92. Naldi et al. (2007) suggested that the amount of risk that an organization takes is dependent on the environment in which it operates. Low risk taking implies that an organization follows routines instead of breaking away of it. It is therefore possible that the members of the VMO operate in a stable environment in which risk taking is not necessary to gain advantage. Another explanation could be that organizations try to do things differently during the learning process to gain advantage over competitors.

Hypothesis five suggested that competitive aggressiveness influences the innovation process steps searching, selecting and implementing. As mentioned before we did not find evidence to support this hypothesis. However, competitive aggressiveness does have a positive relationship with the innovation process steps searching, selecting and learning. We did not expect a relationship with the innovation process step learning. There are two possible explanations for the existence of this relationship. First, the same as risk taking, the organizations have a low competitive aggressiveness attitude. This implies that the focus of the organizations lies more on internal processes such as learning than for instance beating the competitor to the punch. However, if the competitive aggressive attitude is low one would expect that there would be a relationship with searching and selecting. We have no explanation for this contradiction. Second, it could be possible that organizations might want to use the input from the learning step to take competitive advantage over competitors.

With respect to research question three and four we can conclude that the only EO dimension that influences the innovation process and all its steps is proactiveness. The other dimensions show to some extent significant relationships with the innovation process and its steps, but do not influence them.

Based on the answers of the research questions, we can give an answer on the central question. When EO is considered as a unidimensional construct, it influences the innovation process and its individual steps. However, when EO is considered as a multidimensional construct the only dimension that has influence on the innovation process and its steps is proactiveness.

This research has some theoretical and practical implications which we will discuss here. Current EO research focuses mainly on the influence of EO on organizational performance. However, the presence of this relationship or the influence of EO on performance is not always self-evident. Therefore, some scholars have introduced innovation performance as a mediating variable and have shown that EO affects performance via this variable. However, little is known on the underlying processes of this relationship. This research has therefore focused on a part of this mediating relationship, namely EO and the innovation process. We have shown that EO as a unidimensional construct influences the innovation process and its individual steps. Furthermore, as a multidimensional construct the only EO dimension that influences the innovation process is proactiveness. We have thereby contributed to a better understanding of how EO influences innovation within an organization. It surprised us that the other EO dimensions do not influence the innovation process and its steps. According to Lumpkin and Dess (1996) EO is a multidimensional construct and suggested that when an organization scores high on some EO dimensions, it will lead to high organizational performance. We could extent this suggestion by stating that organizations should score high on some EO dimensions to influence other constructs positively as well. The organizations of the VMO showed a low EO attitude. It is likely that because the EO of the organizations is low, they do only slightly influence the innovation process in the organizations. However, future research must confirm this statement.

Furthermore this research has contributed to the discussion on the dimensionality of the EO construct, by showing that EO is multidimensional in this context. This was not only apparent by the factor analyses, but also because the EO dimensions all showed their own influence on the innovation process and its steps. Further, this research has contributed by answering Lumpkin and Dess' (1996) call to investigate the EO construct in different contexts. We have investigated EO for manufacturing SMEs in the Netherlands and have shown that organizations in this context show a low EO attitude.

With respect to the discussion on the interdependence of the dimensions, we argue that the EO dimensions are independent. Although the correlation analysis has shown that the EO dimensions all show high and significant correlations, further analysis on the influence of EO on the innovation process and its steps has shown that each EO dimension has its own influence on the innovation process steps. In this respect the dimensions are not dependent of each other. Therefore the EO dimensions show interdependence in this context.

For the innovation process we have shown that the members of the VMO put a moderate focus on their innovation process. Their main focus is on the implementing step, where they transform their concepts in an actual new product or service offering. With respect to other literature on innovation management we expect the same results, because the innovation process as described by other scholars consists mainly of the same steps. These models are mostly developed for large organizations and it would be interesting to know to what degree EO would have influence in such a context. Large organizations may devote more resources to innovative processes, but may lack the flexibility needed to pursue innovation (Kollmann and Stöckmann, 2010).

With respect to practical implications, organizations should take into account that the adoption of an EO has a positive influence on the innovation process in their organization. They should enhance the proactive attitude of their organization to influence the innovation process positively.

5.2 Limitations and future research

Several limitations that provide meaningful directions for future directions merit discussion. First the group of respondents is small. This may lead to sampling error because the group of respondents is only a small part of the whole population and might therefore not present the whole population (Shadish, Cook and Campbell, 2002, p. 34).

Second, this research has focused on a specific industry, manufacturing SMEs, in the Netherlands. External validity describes to what extent a causal relationship observed during the experiment holds over variation in persons, settings, treatment and measurement variables (Shadish, Cook and Campbell, 2002, p. 20). It is therefore arguable to what extent the results of this analysis remain valid in other situations. Therefore we recommend testing the influence of EO on the innovation process in other industries and countries.

Third, Lumpkin and Dess (1996) have proposed that EO is multidimensional construct that consists of five dimensions. This research has only taken four EO dimensions into account, because during the development of the survey there was no scale available that measures autonomy in a strategic manner. Lumpkin and Dess (2009) have developed such a scale and we therefore recommend including this scale in further EO research. This will result in a better understanding of the individual effect of each EO dimension on other constructs, such as the innovation process. Furthermore, Lumpkin and Dess (1996) suggested that the impact of the EO dimensions varies based on the internal and external environmental context in which the organization operates. Future research should incorporate these contingency variables to obtain a better understanding of the dimensionality of the EO construct and the influence of different contexts on the relationship with other constructs.

Fourth, the survey measured managerial perceptions of business owners and entrepreneurial executives. Although measuring with multi-item scales has a high level of construct validity, a disadvantage is that a managerial perception is self-reporting which results in an analysis with subjective data (Lyon, 2000). In this study each organization had only one respondent, this can increase the possibility of common method variance problems, which can artificially amplify relationships (Campbell and Fiske, 1959). However, there is high like hood that the most knowledgeable person in the organization may fill in the report which leads to valuable data (Lyon, 2000). These characteristics should be taken into account for future research. One method to overcome this limitation is the use of triangulation (Covin and Wales, 2011) which we suggest to use for further research.

Fifth, the relationship between EO and performance is not always immediately apparent (Dess et al, 2003) and is directly influenced by internal and external organizational contingencies and variables (Thoumrungroje and Tansuhaj, 2005). There are other variables that are more sensitive to the influence of EO and may therefore mediate the EO-performance relationship. Alegre and Chiva (2009) and Baker (2009) have suggested that innovation performance is such a variable. This research has investigated how EO affects the innovation process. Future research should investigate how the innovation process functions as a mediating variable. This will result in a better understanding of the proposed model by Alegre and Chiva (2009) and Baker (2009).

Sixth, were suprised that item I2 from the questionaire showed a negative correlation with the other two items from the questionaire. The original question, adopted from Lumpkin and Dess (2001), is formulated as follows: “Changes in product or service lines have usually been quite dramatic”. When we translate the Dutch question into English, the question is formulated as follows: “In our company, changes in product lines or services are asually very radical”. Both questions ask about the same, so the explanation cannot be found in translation problems. Futhermore this question has not led to any problem in other studies (e.g. Lumpkin and Dess, 2001; Kreiser, 2002). However, translation should be taken into account. We therefore suggest a “double back-translation" procudure as employed by Kreiser (2002) to ensure that the questions mean the same in both languages.

Seventh, we have adopted the EO construct as defined by Lumpkin and Dess (1996) because it is not context specific and focuses on new entry. However, many scholars have used the EO construct as defined by Covin and Slevin (1989) had Miller (1983). Next to these scholars, there are many other definitions and configuration of the EO construct (George and Marino, 2011; Rauch, 2009). Because the focal construct of EO is not clearly defined it is hard to enhance the knowledge base (George and Marino, 2011). Before the current knowledge base of the EO construct and its influence on the innovation process could be further enhanced, it is necessary to come up with a uniform EO definition. This implies that future research should focus on the dimensionality of the construct, the interdependence of its dimensions, the nature of its dimensions and the relationship between the construct and its antecedent and consequent construct.

6 References

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Appendix A – Relevant items questionnaire

Entrepreneurial Orienation

For each EO dimensions the relevant items of the questionnaire are given.

Risk taking items

R1. Vanwege de omgeving waarin wij opereren zijn er ingrijpende en risicovolle acties nodig om de doelstellingen van ons bedrijf te halen.

R2. In onzekere situaties zetten wij alles op alles om er zeker van te zijn dat we kansen benutten.

R3. Ons bedrijf heeft de voorkeur voor risicovolle projecten.

Innovativeness items

I1. Over het algemeen legt de directie een sterke nadruk op innovatie.

I2. In ons bedrijf zijn veranderingen in productlijnen of dienstensoorten meestal erg ingrijpend.

I3. Ons bedrijf heeft de afgelopen 5 jaar heel veel innovaties op de markt gezet.

Proactiveness items

P1. Typerend voor ons bedrijf is dat wij acties initiëren waarop de concurrentie reageert.

P2. Ons bedrijf is zelden de eerste die innovaties introduceert.

P3. Wat betreft de introductie van nieuwe producten of ideeën heeft onze directie de neiging om de marktleider te volgen.

Competitive aggressiveness items

C1. In vergelijking met onze concurrenten is ons bedrijf uiterst agressief en intens competitief.

C2. Ons bedrijf heeft als doelstelling (impliciet of expliciet) om de concurrentie hard aan te pakken.

Appendix B – Factor analysis EO

Table 6: Rotated factor loading on all EO items

	Component			
	1	2	3	4
Innovativeness (3)	.894			
Innovativeness (1)	.889			
Risk taking (2)	.787			
Proactiveness (1)	.646		.511	
Competitive aggressiveness (1)	.637	.431		
Proactiveness (2)	.589			.428
Risk taking (1)		.852		
Competitive aggressiveness (2)		.793		
Risk taking (3)		.630		
Innovativeness (2)			-.924	
Proactiveness (3)				.949

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Table 7: Rotated factor loadings on a selection of EO items

	Component	
	1	2
Innovativeness (3)	.880	
Innovativeness (1)	.852	
Risk taking (2)	.778	
Proactiveness (1)	.761	
Competitive aggressiveness (1)	.621	.414
Proactiveness_2	.619	
Risk taking (1)		.851
Competitive aggressiveness (2)		.812
Risk taking (3)		.642

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Appendix C – EO and the innovation process – control variables

Table 8: Influence EO on the innovation process - controlled for organizational age

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	.550	3.771	5.000	23.000	.012
EO	.659	2.378	5.000	23.000	.071
Organizational age	.836	.904	5.000	23.000	.496

Table 9: Influence EO on the innovation process - controlled for organizational size

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	.783	1.548	5.000	28.000	.207
EO	.578	4.089	5.000	28.000	.007
Organizational Size	.881	.756	5.000	28.000	.589

Table 10: Influence EO on the innovation process - controlled for industry type

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	.636	2.403	5.000	21.000	.071
EO	.620	2.578	5.000	21.000	.057
Industry type	.498	.827	20.000	70.599	.674

Appendix D – EO and the innovation process steps – control variables

Table 11: Influence EO on the innovation process steps - controlled for age, size and industry

		Organizational age		Organizational size		Industry type	
Source	Dependent variable	F (1, 27)	Sig.	F (1, 32)	Sig.	F (1, 25)	Sig.
EO	IP Searching	4.564	.042	9.925	.004	3.504	.073
	IP Selecting	10.138	.004	15.923	.000	9.418	.005
	IP Implementing	5.901	.022	10.567	.003	7.552	.011
	IP Evaluating	7.850	.009	15.335	.000	11.353	.002
	IP Learning	11.337	.002	19.180	.000	9.852	.004

Table 12: Influence of the control variables on the innovation process steps

Source	Organizational age		Organizational size		Industry type	
Dependent variable	F (1, 27)	Sig.	F (1, 32)	Sig.	F (4, 25)	Sig.
IP Searching	.275	.604	1.508	.228	.047	.996
IP Selecting	.124	.727	.337	.565	.140	.966
IP Implementing	1.794	.192	2.185	.149	.830	.519
IP Evaluating	.171	.682	2.387	.132	1.077	.389
IP Learning	.572	.456	2.062	.161	.905	.476

Appendix E – The EO dimensions and the innovation process steps – control variables

Table 13: Influence of the EO dimensions on the innovation process, controlled for age, size and industry

Control Variable	Organizational age			Organizational size			Industry type		
Effect	Value	F (5, 18)	Sig.	Value	F (5, 23)	Sig	Value	F (5, 16)	Sig.
Intercept	.380	5.875	.002	.698	1.991	.118	.539	2.733	.057
Innovativeness	.966	.128	.984	.932	.336	.886	.854	.549	.737
Risk taking	.713	1.447	.256	.851	.802	.559	.698	1.387	.281
Proactiveness	.466	4.121	.011	.630	2.705	.046	.473	3.564	.023
Competitive Aggressiveness	.759	1.143	.374	.858	.763	.585	.771	.951	.475
Organizational age	.784	.989	.452	-	-	-	-	-	-
Organizational size	-	-	-	.960	.191	.963	-	-	-
Industry type	-	-	-	-	-	-	.369	.947	.535

Table 14: Influence of the EO dimensions on the innovation process steps, controlled for age, size and industry

Control variables					Org. age			Org. size			Industry type		
Source	Dependent variable	Mean square	F (1, 28)	Sig.	Mean square	F (1, 22)	Sig.	Mean square	F (1, 27)	Sig.	Mean square	F (1, 20)	Sig.
Intercept	IP Searching	2.384	5.630	.025	2.253	4.258	.051	.632	1.464	.237	1.647	2.933	.102
	IP Selecting	.705	1.102	.303	.638	.843	.369	.285	.431	.517	.411	.496	.490
	IP Implementing	7.111	15.046	.001	8.283	22.750	.000	2.730	5.636	.025	4.005	10.328	.004
	IP Evaluating	.597	1.665	.207	1.094	3.056	.094	.136	.367	.550	.003	.007	.936
	IP Learning	.011	.018	.893	.205	.311	.583	.144	.240	.628	.023	.033	.858
Innovativeness	IP Searching	.039	.092	.764	.007	.013	.909	.010	.023	.880	.199	.355	.558
	IP Selecting	.262	.410	.527	9.988E-5	.000	.991	.272	.411	.527	.088	.106	.748
	IP Implementing	.000	.001	.978	.057	.155	.697	.010	.020	.889	.107	.275	.606
	IP Evaluating	.290	.809	.376	.051	.141	.710	.339	.920	.346	.193	.489	.492
	IP Learning	.017	.029	.865	.096	.145	.707	1.686E-5	.000	.996	.195	.286	.599
Risk taking	IP Searching	.100	.236	.631	.081	.152	.700	.031	.072	.790	.180	.320	.578
	IP Selecting	.044	.069	.795	.110	.145	.707	.030	.045	.833	.005	.006	.938
	IP Implementing	.053	.113	.739	.256	.702	.411	.013	.027	.871	.583	1.503	.234
	IP Evaluating	.466	1.299	.264	.424	1.185	.288	.337	.913	.348	.344	.870	.362
	IP Learning	.190	.320	.576	.231	.350	.560	.361	.601	.445	.590	.864	.364

Control variables					Org. age			Org. size			Industry type		
Source	Dependent variable	Mean square	F (1, 28)	Sig.	Mean square	F (1, 22)	Sig.	Mean square	F (1, 27)	Sig.	Mean square	F (1, 20)	Sig.
Proactiveness	IP Searching	2.026	4.784	.037	1.819	3.438	.077	1.458	3.380	.077	2.183	3.886	.063
	IP Selecting	2.809	4.395	.045	2.207	2.916	.102	2.432	3.671	.066	2.038	2.456	.133
	IP Implementing	3.947	8.352	.007	2.884	7.921	.010	3.113	6.425	.017	2.235	5.763	.026
	IP Evaluating	5.598	15.609	.000	5.704	15.932	.001	4.671	12.653	.001	6.004	15.181	.001
	IP Learning	7.205	12.109	.002	5.198	7.886	.010	5.489	9.133	.005	5.359	7.846	.011
Competitive aggressiveness	IP Searching	1.134	2.679	.113	.538	1.018	.324	1.234	2.862	.102	1.101	1.960	.177
	IP Selecting	.957	1.497	.231	.382	.505	.485	.967	1.460	.237	.530	.639	.434
	IP Implementing	.004	.009	.927	.419	1.152	.295	.012	.024	.878	.070	.180	.676
	IP Evaluating	.196	.546	.466	.086	.240	.629	.222	.601	.445	.660	1.669	.211
	IP Learning	.235	.395	.535	.020	.030	.864	.311	.517	.478	.039	.057	.814
Control variables Age / Size / Industry	IP Searching	-	-	-	.190	.359	.555	.211	.490	.490	.058	.103	.980
	IP Selecting	-	-	-	.004	.005	.943	.011	.016	.901	.045	.054	.994
	IP Implementing	-	-	-	1.037	2.848	.106	.152	.314	.580	.538	1.388	.274
	IP Evaluating	-	-	-	.187	.523	.477	.074	.202	.657	.380	.960	.451
	IP Learning	-	-	-	.890	1.350	.258	.432	.719	.404	.319	.466	.760