The joint influence of personality traits and individual absorptive capacity on innovation activities in SME's

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Summary

This thesis addresses the influence of combinations of the big-five personality traits of a CEO combined with the individual absorptive capacity of a CEO on the innovation activities adopted by an SME. The key concepts in this thesis are the big-five personality traits and individual absorptive capacity. The big-five personality traits consist of five dimensions. The big-five personality traits are five broad dimensions that are used to describe a person's personality. These dimensions are emotional stability, openness to experience, extraversion, conscientiousness and agreeableness. Individual absorptive capacity consists of four dimensions. Individual absorptive capacity is defined as the activity of an individual to recognize the importance and value of external sources of knowledge, assimilate it and apply it for commercial use. The dimensions of individual absorptive capacity are recognition, assimilation, transformation and exploitation. In this thesis innovation activity was split up into two categories. These categories are exploitation and exploration. Exploration innovation activity can be defined as an SME's search for new knowledge, the use of technology that is not known by the SME and to produce products or services for which the demand is unknown to the SME. An exploitation innovation activity can be defined as, an SME will improve his existing knowledge, technologies, products or services for which the demands to a certain extend are known by the SME.

Earlier research already indicated that the personality of a CEO and the individual absorptive capacity of a CEO have an influence innovation within an SME. No research has been conducted that looks at combinations of the big-five personality traits of a CEO combined with individual absorptive capacity of a CEO and how they together influence the innovation activities of an SME. The primary objective of this thesis was to find combinations of the big-five personality traits combined with individual absorptive capacity that will influence the adopted innovation activity of an SME.

The data for this thesis was obtained with the use of a questionnaire. The sample consists of 35 CEO of SME's operation in the region of Twente in the Netherlands. The data obtained was analyzed with the use of fuzzy set qualitative comparative analysis (fs/QCA 2.0).

The results obtained in this thesis show that certain combinations of the big-five personality traits of a CEO combined with individual absorptive capacity of a CEO lead to exploration or exploitation as innovation activities of an SME. The results show that a low score on openness to experience, a high score on conscientiousness and a low score on individual absorptive capacity or a high score on emotional stability, a high score on openness to experience and a high score on individual absorptive capacity will lead to a high score on exploration as an SME's innovation activity. The results also show that a low score on emotional stability and a low score on openness to experience will lead to a high score on exploitation as an SME's innovation activity.

The obtained results of this thesis show that the five personality traits of the five factor model and individual absorptive capacity should be seen as complements instead of substitutes. A CEO's personality traits and individual absorptive capacity have a combined influence on the innovation outcome of an SME.

Samenvatting

Deze thesis richt zich op de invloed van combinaties van de vijf persoonlijkheidsdimensies van een CEO gecombineerd met individuele absorptie capaciteit van een CEO op de innovatie activiteit van een midden- en klein bedrijf (MKB). De belangrijkste concepten van deze thesis zijn de vijf persoonlijkheidsdimensies en individuele absorptie capaciteit. De vijf persoonlijkheidsdimensies zijn vijf brede dimensies die gebruikt worden om een individu zijn of haar persoonlijkheid te bepalen. Deze dimensies zijn emotionele stabiliteit, openheid voor ervaringen, extraversie, zorgvuldigheid en goedaardig. Individuele absorptie capaciteit bestaat uit vier dimensies. Individuele absorptie capaciteit is gedefinieerd als de activiteit van een individu om het belang en waarde van externe kennis te herkennen, te assimileren en te gebruiken voor commerciële doeleinden. Deze vier dimensies zijn herkenning, assimilatie, transformatie en exploitatie. In deze thesis is innovaties activiteit onderverdeeld in twee categorieën. Deze categorieën zijn exploitatie en exploratie. Een exploratie innovatie activiteit kan gedefinieerd worden als de zoektocht van een MKB naar nieuwe kennis, het gebruik van technologie dat niet bekend is bij de MKB and het produceren van producten, services of processen waarvan de vraag onbekend is. Een exploitatie innovatie activiteit kan gedefinieerd worden als het verbeteren van de bestaande kennis, technologieën, producten of services van een MKB waarvan de vraag tot op zekere hoogte bekend is.

Eerder onderzoek heeft al aangetoond dat de persoonlijkheid van een CEO en the individuele absorptie capaciteit van een CEO invloed hebben op innovatie binnen een MKB. Er is geen eerder onderzoek gedaan dat kijkt naar combinaties van de vijf persoonlijkheidsdimensies van een CEO gecombineerd met de individuele absorptie capaciteit van een CEO en hoe deze gezamenlijk invloed hebben op de aangenomen innovatie activiteit van een MKB. De primaire doelstelling van deze thesis was om combinaties van de vijf persoonlijkheidsdimensies gecombineerd met individuele absorptie capaciteit te vinden die invloed hebben op de aangenomen innovatie activiteit van een MKB.

De data voor deze thesis is verzameld aan de hand van een vragenlijst. De steekproef voor deze thesis bestaat uit 35 CEO's van MKB's die werkzaam zijn in de regio Twente in Nederland. De verkregen data is geanalyseerd met behulp van fuzzy set qualitative comparative analysis (fs/QCA 2.0).

The resultaten verkregen in deze thesis laten zien dat bepaalde combinaties van de vijf persoonlijkheidsdimensies van een CEO gecombineerd met individuele absorptie capaciteit leiden tot exploratie of exploitatie als de innovatie activiteit van een MKB. The resultaten laten zien dat een lage score op openheid voor ervaringen, een hoge score op zorgvuldigheid en een lage score op individuele absorptie capaciteit of een hoge score op emotionele stabiliteit, een hoge score op openheid voor ervaringen en een hoge score op individuele absorptie capaciteit leiden tot exploratie als de innovatie activiteit van een MKB. De resultaten laten ook zien dat een lage score op emotionele stabiliteit en een lage score op openheid voor ervaringen leiden tot exploitatie als de innovatie activiteit van een MKB.

De verkregen resultaten van deze thesis laten zien dat de vijf persoonlijkheidsdimensies en individuele absorptie capaciteit elkaar aanvullen in plaats van vervangen. Een CEO zijn of haar persoonlijkheidstrekken en individuele absorptie capaciteit hebben een gezamenlijke invloed op de innovatie uitkomst van een MKB.

Preface

In front of you lies my bachelor thesis from the discipline Business Administration at the University of Twente.

The aim of this thesis was to find out which combinations of a chief executive officers big-five personality traits combined with his or hers individual absorptive capacity will influence the innovation activities of a small-and-medium sized enterprise. This thesis I think generated some interesting findings which could stimulate further research in this field.

I worked on this thesis with great pleasure and I hope this is recognizable in the end result.

I would like to thank Dr. Ir. Sandor Löwik and Dr. Jeroen Meijerink for all their help, because without them the final product could not have been achieved.

I would also like to thank my family for all their support and interest they showed in my thesis.

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1. Introduction

Over the last years research has been done about the influence of big-five personality traits on innovation and about the influence of individual absorptive capacity on innovation in organizations. This has shown that personality traits as well as individual absorptive capacity have an influence on innovation within organizations. To my knowledge no research has been conducted to see if certain combinations of personality traits combined with individual absorptive capacity have an influence on innovation activities within organizations. This thesis is aimed at finding combinations of big-five personality traits together with individual absorptive capacity that lead to innovation activities in small-and-medium sized enterprises (SME's).

The big-five personality traits and individual absorptive capacity are the key concepts of this thesis. Research has shown that the personality of a chief executive officer (CEO) has an influence on innovation in organizations (Hambrick & Mason, 2008). The individual absorptive capacity of an individual is also been researched and has proven to have an influence on innovation in organization (Löwik, 2013). It would be very interesting to see if and what combinations of the big-five personality traits combined with individual absorptive capacity will lead to an SME's innovation activity. Because this could add new insight into relevant literature because no research has been conducted that looks at combinations of personality traits with individual absorptive capacity and how they lead to an SME's innovation activity. It also shows how a CEO has an influence on the innovation activities of an SME.

This thesis is aimed at answering the following research questions:

What combinations of a CEO's big-five personality traits together with individual absorptive capacity will influence an SME's innovation activities?

The big-five personality traits are five broad dimensions that are used to describe a person's personality. The big-five personality traits are emotional stability, extraversion, conscientiousness, agreeableness and openness to experience (Giberson, Resick, Dickson, Mitcheslson, Randall & Clark, 2009).

Individual absorptive capacity shows the ability of an individual to recognize the importance and value of external sources of knowledge, assimilate it and apply it for commercial use (Ko, Kirsch & king, 2005). Individual absorptive capacity consists of four dimensions which are recognition, assimilation, transformation and exploitation (Löwik, 2013).

The big-five personality traits and individual absorptive capacity should be considered as complements rather than substitutes. This comes from the fact that this thesis is aimed at looking at the joint combination of the big-five personality traits and individual absorptive capacity. If the big-five personality traits and individual absorptive capacity where seen as substitutes they would not have a joint influence on the innovation outcome of an SME.

Innovation activity in this thesis is conceptualized in two dimensions because of all of the difficulties an organizations will face when trying to adopt the two dimensions at the same time (He & Wong, 2004). These dimensions are exploration and exploitation. Exploration innovation activity can be defined as an SME's search for new knowledge, the use of technology that is not known by the SME and to produce products or services for which the demand is unknown to the SME (Greve, 2013). An

exploitation innovation activity can be defined as, an SME will improve his existing knowledge, technologies, products or services for which the demands to a certain extend are known by the SME (Greve, 2013).

This thesis is relevant for theory because it looks at a topic that has not been research before in combination with each other. This research could add new insights in the debate about the influence of personality traits and individual absorptive capacity on innovation. Earlier research already showed that a CEO's personality and a CEO's individual absorptive capacity separate of each other have an influence on the adopted innovation activity of an organization. No research has been conducted about the combined influence of the big-five personality traits of a CEO together with individual absorptive capacity of a CEO on the innovation activities in an organization. The main theoretical relevance relies in the novelty of the topic of this thesis. The new knowledge gained in this thesis is which combinations of big-five personality traits together with individual absorptive capacity leads to exploration or exploitation as innovation activities within SME's. This thesis will give an insight in which combinations of personality traits together with individual absorptive capacity will lead certain innovation outcomes.

The practical relevance of this thesis is that it will give CEO's of SME's an insight into how they influence innovation activities within SME's. It shows that CEO's have an influence on innovation activities in SME's but also more importantly what combinations of personality traits and individual absorptive capacity leads to exploration or exploitation as an SME's innovation activity. This thesis also gives an insight in if an organization is looking for a CEO and they have exploitation or exploration as innovation activity the organization can see what kind of personality of a CEO will fit with exploitation or exploration as an organizations innovation activity.

This thesis will start with giving a deeper insight into the relevant literature and the development of the hypotheses in chapter 2. This is followed by an explanation of the methodology in chapter 3. In chapter 4 the data analysis will be explained. The obtained results will be shown and explained in chapter 5. And finally, chapter 6 includes a discussion where the contribution, future research and limitations will be discussed.

2. Literature review

In this chapter the three main concepts used in this thesis will be explained. First the personality traits of an individual will be explained on the basis of the big-five personality traits and the influence of personality on innovation will be explained. Second individual absorptive capacity will be explained also the influence of individual absorptive capacity on innovation will be explained. Third exploration and exploitation as innovation activities will be explained.

Research has already proven that the personality of a CEO has an influence on innovation in organizations (Hambrick & Mason, 1984). Also a CEO's individual absorptive capacity influences the innovation activity within an SME (Löwik, 2013).

The final aim of this thesis is to find out which combinations of a CEO's big-five personality traits combined with individual absorptive capacity will influence an small-and-medium-sized enterprises (SME's) innovation activity (see figure 1, theoretical framework).

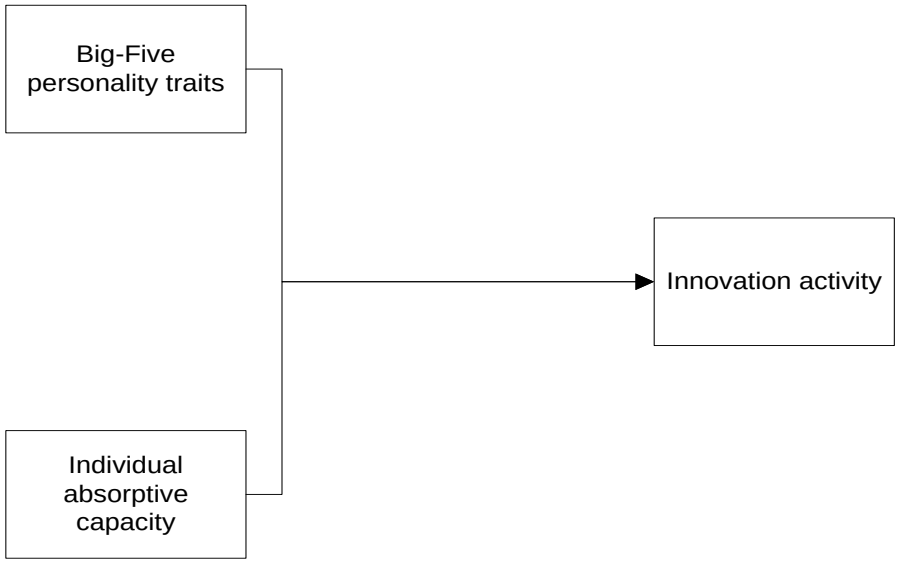

Figure 1, Theoretical framework

2.1 The CEO's influence on innovation in SME's

Numerous studies have been done about the role of a CEO in SME's. The CEO of a small firm plays a big role in the adoption of innovation. Studies have suggested that CEO's in SME's are a major factor in the adoption of innovations (Lefebvre & Lefebvre, 1992; Thong & Yap, 1995; Hambrick & Mason, 1984). One of the reasons is that CEO's in SME's are seen as the first person to think of introducing new innovations and is also the ones who makes the decision about whether or not to adopt a new innovation (Lefebvre & Lefebvre, 1992). The upper echelon theory states that a firm's organizational outcome is partially predicted by a manager's background. This means that innovation and other strategic choices of a CEO are influenced by among other variables a CEO's personality, experience, age and education (Hambrick & Mason, 1984). Thong and Yap (1995) state that the CEO of an SME is the crucial person that determines innovation within an SME. This comes from the fact that the qualities of the CEO make up the overall management style of the SME (Thong and Yap, 1995). Finally the CEO of an SME plays a big role in the adoption of innovation because he is involved in all the different stages of innovation and can therefore be considered as an important player in the adaption of innovation (Lefebvre & Lefebvre, 1992).

2.2 The CEO's personality traits

The innovativeness and personality of a CEO are of great importance to the adoption of innovation within SME's (Marcati, Guido & Peluso, 2008). Over the last years researchers have paid a growing attention to the factors of individuals that lead to their innovative behavior (Marcati et al, 2008). This is shown by the growing literature available about the relation between personality and innovation. Especially for SME's it is important to focus on the CEO and his role in the innovation process because research has shown that within SMEs the CEO is the main driver for innovation (Marcati et al., 2008). Innovation and other strategic decisions are influenced by a CEO in an SME because an organizations outcome is partially predicted by a CEO's background as stated in the upper echelon theory (Hambrick & Mason, 1984). This means that a CEO's personality among other variables (age, education and career experience) has an influence on organizational outcome thus on the innovation activity of an SME.

A widely accepted model to describe the personality of an individual is the Five-Factor model (Digman, 1990; McCrae & John, 1992). Following the upper echelon theory (Hambrick & Mason, 1984) this thesis will focus on the big five personality trait theory to look at the effect of a CEO's personality on a SME's innovation activities. Because the upper echelon theory states that the personality of a CEO has an influence on the organizational outcomes of an organization thus on innovation activities. The big five personality traits theory allows you to investigate a person's personality in five broad dimensions.

2.2.1 The Five-Factor model

The Five-Factor model has become a generally accepted model for looking at personality traits of individuals (Giberson, Resick, Dickson, Mitchelson, Randall & Clark, 2009). Almost all personality characteristics of an individual can be categorized into one of the five broad dimensions (Goldberg, 1990). The big five traits include emotional stability, openness to experience, extraversion, conscientiousness and agreeableness (Giberson et al, 2009; Saucier, 1994). The Five-Factor model has proven to be an accurate model in two ways. First the Five-Factor model has proven to be an accurate model for different situations and cultures (Barrick & Mount, 1991). Second the Five-Factor model has proven to be stable over time (Judge, Higgins, Thoresen & Barrick, 1999).

2.2.2 Emotional stability

The first construct in the five-factor model is emotional stability. Emotional stability is present in almost every measure of personality (Judge, Higgins, Thoresen & Barrick, 1999). Emotional stability indicates how an individual deals with anxiety, personal insecurity and depression (Judge et al., 1999). A high score on the construct emotional stability means a individual is secure, deals well with problems and difficulties and is not depressed or hostile (Barrick, Mount & Judge, 2001). On the other hand a low score on the construct emotional stability represents that an individual is more likely to experience problems such as anxiety, fear, stress and depression. A low score on emotional stability is also associated with a low self-confidence and self-esteem (Judge et all., 1999; McCrae & Costa, 1991; Judge & Bono, 2000; Barrick, Mount & Gupta, 2003).

2.3.3 Openness to experience

The second construct of the five-factor model is openness to experience. Openness to experience is associated with individuals who are open to new experiences, creative and adventurous. Openness to experience also refers to individuals who have a high degree of acceptance towards others and

have trust in the ideas of other individuals (Judge et al., 1999; Marcati et al., 2008). Individuals who score high on openness to experience are imaginative, unconventional and creative (Barrick et al., 2003). Individuals who are more conservative and are more comfortable with ideas that are familiar and conventional instead of novel and unique will score low on openness to experience (Costa & McCrae, 1992).

2.2.4 Extraversion

The third construct in the five-factor model is extraversion. Extraversion is associated with the ability to be outgoing and social (Judge et al., 1999). The experience of strong positive emotions as well as being socially, socially dominant, ambitious and adventurous are associated with a high score on extraversion (Judge et al., 1999). A low score on extraversion means an individual is detached, withdrawn, searches for calmness and is unassertive (Gray, 2007).

2.3.5 Conscientiousness

The fourth construct in the five-factor model is conscientiousness. Conscientiousness is associated with individuals who are achievement orientated, responsible, careful and organized (Judge et al., 1999). An individual with a need for self-control, an individual that is persistent, thorough and hardworking will score high on conscientiousness (Costa, McCrae & Dye, 1991; Barrick at al., 2001). A low score on the construct conscientiousness means an individual is lazy, irresponsible and careless (Barrick et al., 2001).

2.3.6 Agreeableness

The fifth and last construct in the five-factor model is agreeableness. Agreeableness means that individuals are cooperative in nature and likable (Judge et al., 1999). An individual who score high on agreeableness is friendly, flexible, selfless and eager to help others and sympathetic towards others (Barrick, et al., 2003). A low score on the construct agreeableness means an individual shows antisocial or dysfunctional behavior (Witt, Barrick, Burke & Mount, 2002).

2.3 Absorptive capacity

The first people to introduce the term “absorptive capacity” in business literature where Cohen and Levinthal (1989). Their definition of absorptive capacity is still the most widely used. Cohen and Levinthal (1989) define absorptive capacity as ‘*the firm’s ability to identify, assimilate and exploit knowledge from the environment*’ (Chen & Belcher, 2010, p. 292). In their following paper Cohen and Levinthal (1990) suggest that absorptive capacity is ‘*a firm ability to recognize the value of new information, assimilate it and apply it for commercial ends*’ (Chen & Belcher, 2010, p. 293).

When an SME has a high absorptive capacity this enables the organization to identify new and promising knowledge in a fast way. It also means that the entire organization can quickly assimilate the newly gained external knowledge among its employees and apply this newly gained knowledge to create new products, processes and services (Löwik, 2013).

There are four different but associated capabilities that together define a firm’s absorptive capacity (Zahra & George, 2002). These capabilities are acquisition, assimilation, transformation and exploitation (Zahra & George, 2012). Acquisition is the step that defines an organizations ability to identify and acquire external knowledge that is useful to the organization (Zahra & George, 2002). Assimilation means that an organization has routines and processes that allow the organization to analyze, process, interpret and understand externally gathered knowledge (Kim, 1997).

Transformation concerns an organizations capability to develop and enhance the routines that make it possible to combine existing knowledge and new knowledge (Zahra & George, 2002). Exploitation concerns organizations routines that allow it to enhance, extend and use new information to their advantage for existing or new competencies by using acquired and transformed knowledge in their operations (Zahra & George, 2002). Cohen & Levinthal (1990) argued in their paper that it is critical for a company when it wants to be innovative to be able to exploit outside sources of knowledge (Da Silva & Davis, 2011).

2.4 Individual absorptive capacity

Da Silva and Davis (2011) argue that most of the research about absorptive capacity has been done on a country, interorganization and organizational level. Da Silva and Davis (2011) state that it also applies to the individual level.

Absorptive capacity has been used to explain how organizations assimilate knowledge. However, an organizations absorptive capacity will depend on the absorptive capacity of its individual members (Liu, Feng, Hu & Huang, 2011). The higher the level of an individual's absorptive capacity the easier it is for an individual to acquire and retain new knowledge (Fishman & Kemerer, 1997). Individual absorptive capacity shows the ability of an individual to recognize the importance and value of external sources of knowledge, assimilate it and apply it (Ko, Kirsch & king, 2005).

Cohen and Levinthal (1990) stated in their paper that the absorptive capacity of an organization will depend on the absorptive capacity of the individual members of that organization. The ability of an individual toward problem solving and learning determines how creative new knowledge is created (Cohen & Levinthal, 1990). This means the individuals of an organization are the people that store and create knowledge (Löwik, 2013). Lefebvre and Lefebvre (1992) stated that a CEO is seen as a major factor in the adoption of innovation in SME's. This comes from the fact that the CEO is seen as the first person to think of introducing a new innovation and is also the person to make the decision whether or not to adopt a new innovation (Lefebvre & Lefebvre, 1992). Innovation is seen as the development of new products, services and processes (Zahra & George, 2002). Lane et al. (2006) see new products, services and processes as the commercial outcomes of absorptive capacity. Innovation on the individual level is the result of the implementation of ideas of individuals (Löwik, 2013). This means that the individual absorptive capacity of a CEO has an influence on innovation within an SME because the CEO's implementation of ideas and the fact that the CEO is the major driver for innovation in SME's will result in the innovation activities of an SME's. Cohen and Levinthal (1990) also stated that the absorptive capacity of an organization depends on the transfer of knowledge between employees. The individuals of an organization are the people that interact with each other to exchange their knowledge and to integrate their knowledge (Löwik, 2013).

As stated before organizational absorptive capacity consists of four dimensions (acquisition, assimilation, transformation, exploitation) (Zahra & George, 2002). In this thesis individual absorptive capacity is defined as the activities to recognize, assimilate, transform and exploit new external knowledge (Löwik, 2013). Following Löwik (2013) from now on individual absorptive capacity will be seen as activities an individual undertakes. The following example will explain this. When a CEO has the ability to recognize, assimilate, transform and exploit new external knowledge but is not able to take action towards this ability because he does not have the proper tools or is not at the right place. He will still have that ability but will not have a high individual absorptive capacity. A CEO will only

have a high individual absorptive capacity when he has the ability to recognize, assimilate, transform and exploit new external knowledge and also undertakes the activities associated with individual absorptive capacity because the CEO is at the right place with the proper tools. This means the CEO will be able to undertake the activities needed to recognize, assimilate, transform and exploit new external knowledge. Zahra & George (2002) name the first dimensions acquisition which is the firms' ability to acquire and identify external knowledge. For this thesis the dimension acquisition is redefined as recognition (Todorova & Durisin, 2007). Following Todorova and Durisin (2007) who include in recognition the technical processes of knowledge acquisition, but also the entrepreneurial ability to see opportunities for the organization in all the external knowledge available (Löwik, 2013). For this a CEO needs entrepreneurial alertness, which consists of scanning and searching for new external knowledge, making connections with people outside the organization and evaluating and judging the externally generated new knowledge (Tang, Kacmar & Busenitz, 2012). Therefore from now on the first dimension of individual absorptive capacity will be named recognition because a CEO besides acquiring and identifying new knowledge also needs to know if external information is relevant for the organization and gives the organization an opportunity for new products, processes or services (Löwik, 2013). Individuals' **recognition** refers to activities such as searching for new knowledge, identifying new knowledge and seeing whether or not it has a potential for beneficial use (Löwik, 2013). Associated with recognition are activities such as scanning and searching for new knowledge. The obtained new knowledge needs to be connected to the already existing knowledge. At this point new ideas and insights are created. The recognition step ends when the new ideas generated are seen as potentially valuable and are further developed to be useful to the organization (Löwik, 2013). **Assimilation** is an individual's activity to transform newly acquired knowledge in such a way that is understandable by and transferable to other members of the organization (Löwik, 2013). The assimilation step is associated with interpretation, where the new knowledge is given meaning and translated so others in the organization are able to understand it. To make sure the new knowledge can be communicated between individuals the knowledge needs to be articulated. The last step in assimilation is the codification of the new knowledge. This means that the knowledge is stored within the organization for future use and to improve the understanding of the new knowledge of other individuals (Löwik, 2013). **Transformation** in individual absorptive capacity concerns the creation of new ideas of an individual in collaboration with others of the organization (Löwik, 2013). The transformation step includes activities to change organizations procedures, manuals and databases. Also the knowledge of multiple individuals needs to be combined and integrated within the organization (Löwik, 2013). Members of the organization need to engage in frame braking activities. The knowledge of the individual members needs to be combined and integrated with each other to create new organizational capabilities (Löwik, 2013). To achieve this, individual members of the organization need to be creative in groups. For this individuals members need to be socially skilled. The social skills of the individual members are critical to transform ideas into solutions (Löwik, 2013). And last **exploitation** refers to the activity of an individual to apply new knowledge in work routines (Löwik, 2013). This step consists of the integration of new knowledge in the work routines of the organization. This step is mostly done by teamwork but can be done by an individual (Löwik, 2013). Cohen and Levinthal (1990) stated in their paper that outside sources of knowledge are very important and often critical for organizations innovation processes. This means that the ability to exploit externally generated knowledge is a crucial part of the innovation process (Cohen & Levinthal, 1990).

2.5 Innovation activity

To measure the innovation activity of an SME this thesis will look at whether an SME has an exploration innovation activity or an exploitation innovation activity. Exploration innovation activity can be defined as an SME's search for new knowledge, the use of technology that is unknown by the SME and to produce products or services for which the demand is unknown to the SME (Greve, 2013). An exploitation innovation activity can be defined as, an SME will improve his existing knowledge, technologies, products or services for which the demands to certain extend are known by the SME (Greve, 2013).

He and Wong (2004) conceptualized exploration and exploitation as two different dimensions because of all of the difficulties an organizations will face when trying to adopt the two dimensions at the same time.

Exploration is an activity that is associated with terms as searching, variation, risk taking, experimentation, flexibility and discovery (March, 1991). Exploration is also associated with the activity of reorganizations to enable a organization to produce or provide new products, services or processes and to acquire new knowledge outside of the domain where the organization is already operating in also called 'long jumps' (Tidd & Bessant, 2009). On the other hand exploitation is associated with refinement, choice, efficiency, implementation and execution (March, 1991). Exploitation also involves activities such as the use and improvement of products, services or processes already known to the organization, knowledge improvement activities and a high degree of path dependency (Tidd & Bessant, 2009).

2.6 Hypotheses

In this section the hypotheses will be derived. The hypotheses will be used to answer the main research question: *What combinations of a CEO's big-five personality traits together with individual absorptive capacity will influence an SME's innovation activities?* This section will first include a short summary of why the big 5 personality traits and individual absorptive capacity have an influence on the innovation activity of an SME. Then an explanation of how the five traits of the big 5 personality traits and the four dimensions of individual absorptive capacity have an influence on exploration as an SME's innovation activity will be given. This will finally result in the first hypothesis. Finally an explanation will be given of how the five traits of the big 5 personality traits and the four dimensions of individual absorptive capacity have an influence on exploitation as an SME's innovation activity will be given. This will result in the second hypothesis.

The upper echelon theory states that the innovative outcome of an organization is partially predicted by a CEO's background (Hambrink & Mason, 1984). This means a CEO's personality (amongst other variables) has an influence on the innovation outcome of an organization. Thus a CEO's personality traits have an influence on the innovation activity adopted by an SME. Löwik (2013) stated that innovation on the individual level is the result of the implementation of ideas of individuals. Lefebvre and Lefebvre (1992) stated that a CEO is seen as the major factor in the adoption of innovation within SME's. Following Löwik (2013) and Lefebvre and Lefebvre (1992) this means that the individual absorptive capacity of a CEO has an influence on the innovation activity of an SME because the CEO's implementation of ideas and the fact that the CEO is the major driver for innovation in SME's will result in the innovation activities of an SME's.

2.6.1 Formulation of hypothesis one

Exploration is the activity of searching for new knowledge, the use of technology that is not known by the SME and producing products and services for which the demand is unknown (Greve, 2013). Exploration is associated with activities such as searching, risk taking, experimentation, flexibility and discovery (March, 1991). Exploration involves risk because the demand is unknown (Greve, 2013). This means that the innovation can become a success and earn good money for the SME or that the innovation fails and will cost the SME a lot of money. A high score on **emotional stability** indicates that a CEO has the ability to stay calm under these circumstances and when faced with problems (Barrick, Mount & Judge, 2001). Exploration is also associated with searching for new ideas, experimentation and discovery. A CEO with a high score on **extraversion** is ambitious and adventurous (Judge et al., 1999). A CEO will need these qualities for exploration because when a CEO is adventurous and ambitious he or she will search for new activities unknown to the SME in which the SME can operate in (long jumps (Tidd & Bessant, 2009)). Exploration is also associated with being flexible (Barrick et al., 2003). A high score on **agreeableness** is associated with the ability flexibility (among other abilities) (Barrick, et al., 2003). This indicates that a CEO with a high score on **agreeableness** has the ability to be flexible. Innovation is never the effort of a single person but of a team. Knowledge needs to be shared among individuals (Tidd & Bessant, 2009). For this a CEO also needs a high score on **extraversion** and **agreeableness**, because that means a CEO is social, good with other individuals and friendly (Judge et al., 1999; Barrick et al., 2003). Exploration indicated doing things that has not been done before, there for a CEO needs to be creative, imaginative and unconventional. Thus a high score on **openness to experience** is needed because this includes being creative, imaginative and unconventional (Barrick, et al., 2003). Ideas for activity an SME is not currently operating in can come from external sources. A high level of **individual absorptive capacity** of the CEO indicates that it is easier for a CEO to acquire and retain new knowledge (Fishman & Kemerer, 1997). For exploration a high level of **individual absorptive capacity** is needed because this means the CEO undertakes the activities to acquire new knowledge that can be beneficial to the SME and that the CEO will undertake the activities to use this knowledge to create new product, services or processes (Löwik, 2013). A high on **conscientiousness** will not lead to exploration because of all the uncertainty that comes with exploration its hard keep self-control. A CEO with a high score on **conscientiousness** will need self-control (Costa et al., 1991). A low score **on conscientiousness** will not lead to exploration because a CEO that scores low on conscientiousness is lazy and irresponsible (Barrick et al., 2001). Because this thesis is aimed at looking at which combinations of personality traits together with individual absorptive capacity have an influence on an SME's innovation activity the independent variables (the five personality traits and individual absorptive capacity) should be considered as complements.

Following these statements the following hypotheses is formulated.

H1: The combination of a high score on emotional stability, extraversion, agreeableness and openness to experience and a high level of individual absorptive capacity will lead to exploration.

2.6.2 Formulation of hypothesis two

Exploitation is the activity of improving existing knowledge, technologies, products or services of the SME for which the demand to certain extend is known (Greve, 2013). Exploitation is associated with activities such as refinement, choice, efficiency, implementation and execution (March, 1991). During innovation activities there will always be problems thus also with exploitation. There are a lot of things that can go wrong during the improvement of an SME's products, services or processes. A high score on **emotional stability** indicates that a CEO has the ability to handle these problems and stays calm (Barrick et al., 2001). Although a CEO is the main driver for innovation (Lefebvre & Lefebvre, 1992) the entire innovation process is always a team effort because knowledge needs to be shared amongst individuals (Tidd & Bessant, 2009). This means a CEO needs a high score on **extraversion** and **agreeableness** which means the CEO is good with other people because he is social, friendly and likes to help others (Judge et al., 1999; Barrick et al., 2003). Because exploitation involves the improvement of products, services and process of an SME for which demand is known to certain extend (Greve, 2013) a CEO will need a low level of **openness to experience**. A low level of **openness to experience** indicates a CEO is more comfortable with ideas that are familiar thus a CEO is more comfortable with the refinement of processes, products or services know to the SME (Costa & McCrae, 1992). Because exploitation indicates the refinement of familiar product, service or processes a low level of **individual absorptive capacity** will be needed. The CEO is familiar with the operations of the SME. Which means the CEO will know what needs to be refined in the SME. It can also be explained by the fact that the ideas for innovation mostly come from the CEO as he or she is the main driver for innovation in SME's (Marcati et al., 2008). It is also possible that ideas come from outside the organization and when they do the CEO needs to be able to acquire and use this information. A high score on **conscientiousness** will not lead to exploitation because with exploitation there are also things unknown to the CEO which means it is hard to keep control and order (Costa et al., 2001). A low score on **conscientiousness** will not lead to exploration because a CEO that scores low on **conscientiousness** is lazy and irresponsible (Barrick et al., 2001). Because this thesis is aimed at looking at which combinations of personality traits together with individual absorptive capacity have an influence on an SME's innovation activity the independent variables (the five personality traits and individual absorptive capacity) should be considered as complements.

Following these statements the following hypotheses is formulated.

H2: The combinations of a high score on emotional stability, extraversion, agreeableness, a low score on openness to experience and a low level of individual absorptive capacity will lead to exploitation.

3. Methodology

This chapter will discuss the questionnaire and its sample size and the biases of the sample. The variables and operationalization of the questions and their reliability will be given in this chapter. Finally an explanation to why the analysis software fuzzy set Qualitative Comparative Analysis (fs/QCA) is the appropriate analysis software will be given.

3.1 Questionnaire and respondents

The data to test the hypothesis of this thesis where obtained with a questionnaire. The questionnaire was send to 196 CEO's of SME's in the Netherlands region Twente. All the questions in the questionnaire where aimed at the CEO's. The questions used in this thesis from the questionnaire contained questions about the SME's innovation activities (He and Wong, 2005), individual absorptive capacity (Löwik, 2013) and a CEO's personality traits (Saucier, 1994). These questions from the questionnaire are shown in appendix A. The questionnaire also contained other questions for example about education, work experience and turnover.

The following tables 1, 2 and 3 will give a short oversight about some characteristics of the sample. These tables contain information about the CEO's highest level of education, the age class of the CEO's, and the industry the CEO's operate in.

Highest level of education	**Percentage**
Primary School	0%
Lower secondary professional education	0%
Lower vocational education	0%
Intermediate vocational Education	25.7%
Pre-university education / Pre-higher professional education	2.9%
Higher professional education	51.4%
Higher education	20%
Total:	**100%**

Table 1, Highest level of education of sample

Age	Percentage
Up to 20 years	0%
From 21 till 30 years	2.9%
From 31 till 40 years	2.9%
From 41 till 50 years	37.1%
From 51 till 60 years	48.6%
From 61 years and more	8.6%
Total:	**100%**

Table 2, Age of sample

Industry	Percentage
Industry – plastic and rubber products	2.9%
Industry – metal products (no machines)	37.1%
Industry – electronics, electronic components and wire	2.9%
Industry – machines and appliances	25.7%
Consultancy/ business services (architects, business consultants, engineering, market research)	2.9%
Other	28.6%
Total:	**100%**

Table 3, Operating industry of SME

The questionnaire was send to 196 CEO's of SME's in the region Twente. A total number of 35 CEO's completed the questionnaire this gives a response rate of 17.9%.This is a high response rate and therefore acceptable. The fact that the CEO of the SME answered all the question of the questionnaire also gives drawbacks. This may cause the CEO to give such answers that it puts him or her or the SME in a positive daylight. The CEO can also answer the questions in such a way that he or she thinks the questions are supposed to be answered or are socially desirable. Al of the CEO's operate in the region of Twente. This is a convenience sample and was chosen because this population was close to hand. This causes the drawback that the results of this thesis cannot be generalized to the total population but only account for the region Twente because it is not

representative enough. This is not representative enough because there can be differences between the regions in for example culture and ethics which can have an influence on how the questions are answered. The great majority of the CEO's where between 41 and 60 years of age (85.7%). This means the results obtained in this thesis can only be generalized to CEO's who also are between 41 and 60 years old. Finally the majority of the CEO's are working in the industry sector (68.6%). This means the results obtained in this thesis mostly account for CEO's working in the industry sector.

3.2 Variables and operationalization

The independent variables in this thesis are the big five personality traits. These traits are emotional stability, conscientiousness, extraversion, agreeableness and openness to experience (Saucier, 1994). Also individual absorptive capacity is the independent variables in this thesis. The dependant variables are the two dimensions of innovations activity. These two dimensions are exploitation and exploration (Greve, 2013).

3.2.1 Innovation activity

The questions about innovation activity were categorized in four different types of innovation. The first type is product innovation, the second type is market innovation, the third type is product-market combined-innovation and the fourth type is process innovation. Following He and Wong (2004) the questions about product innovation, market innovation and product-market combined-innovation measure exploration as innovation activity. The questions about process innovation measure exploitation as innovation activity. The questions give an indication about an SME's innovation activity. There are a total of 8 questions asked. The questions asked were answered on a Likert scale from 1 to 5. Where 1 means very unimportant and five means very important. The questions about exploration had a cronbach's alpha of 0.76 (Table 4). The questions about exploitation had a cronbach's alpha of 0.85 (Table 5). The questions about exploration and exploitation are both reliable because they have a cronbach's alpha above 0.7 (Peterson, 1994). For all the questions that measure innovation activity see appendix A, innovation activity.

Reliability exploration	
Cronbach's Alpha:	0.76
N:	4

Table 4, Reliability exploration

Reliability exploitation	
Cronbach's Alpha:	0.85
N:	4

Table 5, Reliability exploitation

3.2.2 Individual absorptive capacity

The questions about individual absorptive capacity give an insight in a CEO's individual absorptive capacity. The questions asked relate to the different dimensions of individual absorptive capacity. These dimensions are recognition, assimilation, transformation and exploitation (Löwik, 2013). If a question related to the dimension recognition aspects of recognition are included in the question for example looking for new knowledge. There are a total of 14 questions asked. The questions asked were answered on a 1 to 7 Likert scale. Where 1 means strongly disagree and 7 means strongly agree. The cronbach's alpha for recognition is 0.85, for assimilation is 0.94, for transformation is 0.89 and for exploitation is 0.89 which means they are reliable (see tables 6, 7, 8 and 9) (Peterson, 1994). The question about distinguishing between profitable or not so profitable information is not used to

generate the results from the datasheet because this question does not measure the construct recognition and therefore caused a cronbach's alpha below 0.7. For all the questions that measure individual absorptive capacity see appendix A, individual absorptive capacity.

Reliability recognition	
Cronbach's Alpha:	0.85
N:	3

Table 6, Reliability recognition

Reliability assimilation	
Cronbach's Alpha:	0.94
N:	3

Table 7, Reliability assimilation

Reliability transformation	
Cronbach's Alpha:	0.89
N:	4

Table 8, Reliability transformation

Reliability exploitation	
Cronbach's Alpha:	0.89
N:	3

Table 9, Reliability exploitation

3.2.3 Personality traits

The questions about the personality of a CEO give an insight in the personality traits of a CEO. The questions asked relate to the five traits of the big 5 personality traits. These big 5 personality traits are emotional stability, conscientiousness, extraversion, agreeableness and openness to experience (Saucier, 1994). Saucier (1994) used in his paper 40 items to measure the 5 dimensions of personality traits. In this thesis 42 items were used to measure the 5 dimensions of personality traits. This was done because some of the items Saucier (1994) used are a bit vague. That's why in this thesis some items where changed or split up into more items to keep the items clear and understandable for the respondent. The questions asked were answered on a 1 to 5 Likert scale. Where 1 indicates extremely inaccurate and 5 indicates extremely accurate. The cronbach's alpha for emotional stability is 0.71, for conscientiousness is 0.78 and for agreeableness is 0.77 which means they are reliable because the cronbach's alpha is higher than 0.7 (Peterson, 1994) (see tables 10, 13 and 14). The cronbach's alpha for openness to experience is 0.69 and the cronbach's alpha for extraversion is 0.65 (see tables 11 and 12). These cronbach's alphas are below 0.7 but are seen as sufficient for this thesis. Too many questions needed to be taken out of the questionnaire in order to get a higher cronbach's alpha. If this was done it would mean that the construct openness to experience or extraversion would not be measured correctly. For extraversion the questions bashful and extroverted where not used to create the datasheet. For openness to experience the questions complex and uncreative where not used to create the datasheet. These questions were not used because they did not measure what they were intended to measure. For all the questions that measure the personality traits see appendix A, personality traits.

Reliability emotional stability	
Cronbach's Alpha:	0.71
N:	9

Table 10, Reliability emotional stability

Reliability openness to experience	
Cronbach's alpha:	0.93
N:	7

Table 11, Reliability openness to experience

Reliability extraversion	
Cronbach's Alpha:	0.65
N:	6

Table 12, Reliability extraversion

Reliability conscientiousness	
Cronbach's alpha	0.78
N:	8

Table 13, Reliability conscientiousness

Reliability agreeableness	
Cronbach's Alpha:	0.77
N:	8

Table 14, Reliability agreeableness

3.3 Fuzzy set Qualitative Comparative Analysis

To analyze the obtained data from the survey the software fuzzy set Qualitative Comparative Analysis 2.0 (fs/QCA 2.0) was used. Fs/QCA is an analysis software tool that is especially suitable for answering research questions about combinations (Fiss, 2011). In comparison with classical linear regression analysis fs/QCA is able to define different paths that will lead to the same outcome (Fiss, 2007). Classical linear regression analysis looks at how one independent variable has an influence on an outcome. Fs/QCA looks at how combinations of independent variables explain the dependent variable. For this thesis this means that fs/QCA is suitable because it gives the researcher the opportunity to look at the combination of the big five personality traits combined with individual absorptive capacity and how these together have an influence on an SME's innovation activity. This is the aim of this thesis. Fs/QCA gives specific combinations that lead to the desired outcome. The final reason why fs/QCA is the appropriate analysis tool for this thesis is that fs/QCA software can deal with small sample sizes (10 to 50) (Löwik, 2013). This is suitable for this thesis because this thesis has a sample size of 35.

4. Data analysis

To analyze the data obtained in this thesis the analysis software fs/QCA 2.0 and SPSS 20 where used. All the data obtained from the survey (N=35) was put into a SPSS 20 datasheet.

The first thing done was to make a new datasheet in SPSS 20 with only the answers to the questions used in this thesis. Because not all of the respondents had filled in the entire survey the missing answers needed to be filled in. For this SPSS 20 software was used. The tool for this used in SPSS 20 software was analyze – missing value analysis. This tool answered the unanswered question in the datasheet by making use of the means of the answers given. When all the unanswered questions got a score subscribed to them the reversed questions needed to be altered. For this SPSS 20 software was also used. The tool for this used in SPSS 20 was transform – recode into different variables. Reversed questions are questions that are asked in a reversed way opposed to other questions. This means that when you can answer questions on a 1 to 5 scale and the respondent filled in 5 for the not reversed questions the reversed questions needs to have the answer 1. This was done so it was seen when a respondent answered questions at random or very quickly without ready the question. After this the average scores of the answers where calculated for each trait of the big-five personality traits, for individual absorptive capacity and for the answers to exploitation and exploration. For this SPSS 20 was used with the tool transform – compute variables.

The dimensions of individual absorptive capacity where summed up to get one score for each respondent on individual absorptive capacity to minimize the number of outcomes. Fs/QCA 2.0 gives 2^k outcomes where k is the number of causal conditions (Ragin, 2008). This means number of outcomes was reduced from 512 (2^9) to 64 (2^6).

The reliability of the used questions where tested with the use of the SPSS 20 tool analyze – scale – reliability analysis to see whether or not the used questions are reliable. The final thing in SPSS 20 was to calculate the lower 25 percentiles, 50 percentiles and the upper 25 percentiles. This was done with the SPSS 20 tool analyze – descriptive statistics – frequencies. This was done because threshold values needed to be chosen by the researcher to calibrate fuzzy scores. Threshold values needed to be chosen for full membership corresponding with fuzzy set score 1, non membership corresponding with fuzzy set score 0 and for the crossover point corresponding with fuzzy set score 0.5 (Raging et al., 2008). For this purpose percentiles where chosen where the 75^{th} percentiles corresponds with full membership, the 25^{th} percentile corresponds with non membership and the 50^{th} percentile corresponds with the crossover point.

The next thing done was to copy all the average scores in a Microsoft Excel file. This file was saved as a .csv file so the fs/QCA 2.0 software could open the datasheet.

Once the datasheet was opened in fs/QCA 2.0 fuzzy set membership scores needed to be generated. For this the percentiles generated with SPSS 20 where used. To generate fuzzy sets the fs/QCA 2.0 tool variables – compute – calibrate(x,n1,n2,n3) was used (x = name variable you want to calibrate, n1 = score 75^{th} percentile of variable, n2 = score 50^{th} percentile of variable and n3 = score 25^{th} percentile of variable) (Ragin et al., 2008). These percentiles where chosen because this means that the average scores of the variables (conditions) where divided into four groups of the same size (Huizingh, 2008). This means that the scores are arranged in such a way that for example the 25 percentile will be the average score of the lowest 25 percentage of the answers given. For the calibrated dataset see appendix B, Table 23, Calibrated fuzzy scores.

Next the necessary conditions table was generated. This was done with fs/QCA 2.0. The tool used in fs/QCA 2.0 was analyze – necessary conditions. Exploration and exploitation (high and low) were chosen as outcome, individual absorptive capacity (high and low) and the big 5 personality traits

(high and low) were chosen as causal condition. A condition is seen as necessary when for the outcome Y to occur the causal condition X is almost always present (Ragin, 2008).
Once the necessary condition where generated 4 truth tables where compiled using the fuzzy set scores. This was done with fs/QCA 2.0 software tool analyze – fuzzy truth table algorithm. Exploration and exploitation where chosen as outcome, for both the scores high and low were chosen which gave four different fuzzy set truth tables. The conditions chosen where the big 5 personality traits and individual absorptive capacity. Truth tables represent all combination of causal conditions that will lead to the desired outcome (Ragin, 2008).These truth tables where used to derive the parsimonious solution.). The parsimonious solution is chosen for this thesis because it makes use of all possible simplifying assumptions, the use of easy and difficult counterfactual cases, to generate a simpler solution (Ragin, 2008).

5. Results

This chapter will mention and explain the results obtained from the data analysis and compare them to the hypotheses.

5.1 Fuzzy sets

The first step done in this thesis to generate results is creating fuzzy set scores in fs/QCA. Fuzzy set scores range from 0 to 1. The value 0 means 'full non-membership' and the value 1 means 'full membership' (Ragin, 2008). The values between 0 and 1 for example 0.8 could mean 'mostly but not fully membership' and the value 0.4 could mean 'more or less out of full-membership' (Ragin, 2008). To change the interval scores of the survey into fuzzy sets fs/QCA 2.0 software is used. This was done by using the calibration tool in fs/QCA 2.0. To end up with fuzzy set scores first three threshold values need to be chosen. A threshold value needs to be chosen for full-membership (1), for full non-membership (0) and for the crossover point (0.5) (Ragin et al., 2008). In this thesis percentiles where chosen by the researcher to generate fuzzy set scores. The upper 25 percentiles is the threshold value for full-membership (fuzzy score 1), the lower 25 percentiles the threshold value for full non-membership (fuzzy score 0) and the 50 percentiles was chosen as the crossover point (fuzzy score 0.5). These percentiles where chosen because this means that the average scores of the variables (conditions) where divided into four groups of the same size (Huizingh, 2008). This means that the scores an arranged in such a way that for example the 25 percentile will consist of the average score of the lowest 25 percentage of the answers given. Using percentiles as threshold values is used in multiple studies (Ragin, 2008; Fiss, 2011).

The percentiles are shown in table 15, Percentiles of conditions.

Variable (Condition)	**Percentiles** 25%	50%	75%
iACAP (IACAP)	4.58	5.29	5.69
Emotional Stability (EMOT)	3.44	3.78	4.11
Extraversion (EXTR)	3.33	3.67	4.00
Conscientiousness (CONS)	3.25	3.61	4.25
Agreeableness (AGRE)	3.75	4.00	4.50
Openness to experience (OPEN)	2.86	3.29	3.86
Exploration (EXPLOR)	3.00	3.75	4.25
Exploitation (EXPLOIT)	3.25	3.75	4.25

Table 15, Percentiles of conditions

5.2 Necessary conditions

This section will show the necessary conditions. A condition is seen as a necessary condition when the condition is present when the outcome is present and when the outcome is not present

(Schneider & Wagemann, 2010). This means that the outcome is a subset of the cause. The following example will explain this. When the outcome Y occurs the causal condition X will (almost) always be present in the combinations that lead to the outcome Y (Ragin, 2008). To see whether or not a conditions is seen as necessary is determined by the following formula, Consistency ($Y_i \leq X_i$) = $\sum[\min(X_I, Y_I) / \sum(Y_I)]$. In this formula X_i is the value of the i-th condition X and Y_i is the value of the i-th condition Y (Ragin, 2008). The consistency value shows whether the membership in the outcome is consistently less than or equal to the membership in the condition (Ragin, 2008).

In this thesis the Boolean algebra is followed to point out the conditions as suggested by Schneider and Wagemann (2006). The conditions written in uppercase letters mean conditions with a fuzzy set score near 1. The conditions written in lowercase letters mean conditions with a fuzzy set score near 0.

The analysis is done with the use of fs/QCA 2.0 software for the outcome of high and low exploration (EXPLOR / explor) and high and low exploitation (EXPLOIT / exploit). This analysis was also done for the big 5 personality traits with conditions high and low emotional stability(EMOT / emot), high and low extraversion (EXTR / extr), high and low agreeableness (AGRE / agre) high and low openness to experience (OPEN / open) and high and low conscientiousness (CONS / cons) and for high and low individual absorptive capacity (IACAP / iacap). The consistency value shows whether or not a conditions needs to be present to achieve the desired outcome. To generate the consistency value a threshold value needed to be determined. For this thesis a threshold value of 0.8 is chosen as recommended by Fiss (2011). When a necessary conditions scores a consistency value of 0.8 or higher this means that this conditions needs to be present if the desired outcome is to be achieved.

The analysis of the necessary conditions is shown in table 16, Necessary conditions. Table 16 shows that none of the causal conditions are necessary conditions for one of the four desired outcomes. This means that none of the causal conditions need to be present in a certain combination to achieve the desired outcome.

Causal condition	**Consistency value for necessity**			
	EXPLOIT	exploit	EXPLOR	explor
IACAP	0.56	0.59	0.61	0.61
iacap	0.55	0.51	0.49	0.49
EMOT	0.55	0.56	0.66	0.66
emot	0.56	0.54	0.45	0.45
EXTR	0.53	0.55	0.67	0.67
extr	0.56	0.52	0.45	0.45
CONS	0.62	0.44	0.62	0.62
cons	0.46	0.64	0.52	0.52
AGRE	0.56	0.52	0.70	0.70
agre	0.54	0.57	0.42	0.42
OPEN	0.42	0.64	0.50	0.50
open	0.70	0.47	0.60	0.59

Table 16, Necessary conditions

5.3 Sufficient conditions

This section will contain the sufficient conditions. When an outcome is present together with a causal condition but this outcome can also be present without the causal condition this causal conditions is a sufficient conditions (Schneider & Wagemann, 2006). In other words the cause is a subset of the outcome. The following example will explain this. The outcome Y occurs when the causal condition X is present in a combination but the outcome Y can also occur when the causal condition is not present in a combination (Ragin, 2008).

To see whether a condition is sufficient the following formula is used, Consistency $(X_i \leq Y_i) = \sum[\min(X_I, Y_I) / \sum(X_I)]$. In this formula X_I is the value of the i-th condition of X and Y_I is the value of the i-th condition of Y (Ragin, 2008). The consistency value shows whether the membership in the condition is consistently less than or equal to the membership in the outcome (Ragin, 2008). The coverage value shows that the higher the coverage the higher the number of cases is that are covered by the combination.

The analysis of sufficient conditions start with the construction of truth tables. A truth table shows all the possible combination of causal conditions that lead to the desired outcome. The number of combinations increases with 2^k combination. K indicates the number of conditions (Ragin, 2008). There are a total of 6 conditions in this thesis which will lead to 64 (2^6) combinations. Not all of the combinations will have cases. The combinations without cases are called logical remainders. In this thesis the fs/QCA software will determine what the best outcome value will be for the logical remainders . When logical remainders are treated like this it could lead to oversimplifying solutions (Ragin, 2008).

A threshold value of 0.7 is used because of the size of the sample size (N=35). Ragin (2008) stated that 0.7 is the minimum consistency value that should be used. The cut-off value used is 1 as recommended by Ragin (2008). A cut-off value of 1 is recommended by Ragin (2008) for smaller sample sizes.

Finally the truth tables where used to derive the parsimonious solution. The parsimonious solution incorporates the rows of the truth table that lead to the desired outcome. Additionally the parsimonious solution also incorporates some of the remainder rows as counterfactual cases. This means the parsimonious solution embraces some additional rows (Ragin, 2008). These counterfactual cases include the remainders. For these remainders it is assumed that they will lead to the desired outcome and are then matched with the real cases. This produces greater parsimony (Ragin, 2008). The parsimonious solution is chosen for this thesis because it makes use of all possible simplifying assumptions , the use of easy and difficult counterfactual cases, to generate a simpler solution (Ragin, 2008). The easy counterfactual cases fit with the existing knowledge and theories. The difficult counterfactual cases do not fit with existing knowledge and theories (Ragin et al., 2008).

The following tables (tables 17, 18, 19 and 20) show the parsimonious solution. This shows the combinations that lead to de desired outcome. The parsimonious solution is derived for high and low exploration and high and low exploitation. The parsimonious solution for low exploration and low exploitation where generated to see for example whether or not a low score on exploitation will mean a high score on exploration (see section 5.4.2). The * represents the logical AND-function. The raw coverage is shown. The raw coverage indicates how much the membership of the outcome is

explained by each causal condition of the solution. This means the raw coverage shows the share of the outcome explained by each condition. The unique coverage is the share of the outcome that is covered by the solution and is not covered by another solution. The consistency is shown. The consistency shows what the degree is which the causal condition in the solution is a subset of the outcome. This means the consistency value shows the extent to which a combination leads to an outcome. When the consistency is below 0.7 it is likely that another causal condition is at work that has not been considered in the analysis (Ragin, 2008). Number of cases shows the number of cases that had a fuzzy set score at least 0.5 on the causal conditions of the solutions, which indicates that the case has a membership-set of more in then out or a maximum fuzzy set score of 0.5 on the negated causal conditions of the solution which indicates more out then in. Through use of the calibrated data set (appendix B) the number of cases was generated. This was done by looking whether or not a causal condition had a membership score of at least 0.5 for the desired outcome or a maximum membership score of 0.5 for the desired outcome.

Parsimonious solution EXPLOR	Raw coverage	Unique coverage	Consistency	Number of cases
AGRE*iacap	0.279439	0.090909	0.686657	5
open*CONS*iacap	0.232459	0.067724	0.721591	4
EXTR*agre*IACAP	0.179378	0.046370	0.690141	2
EMOT*OPEN*IACAP	0.341062	0.204393	0.714834	5
Solution coverage: 0.662599				
Solution consistency: 0.693044				

Note: The model used is: EXPLOR: f(EMOT, EXTR, CONS, OPEN, EXTR, ICAP).
Table 17, Parsimonious solution high exploration

Parsimonious solution explor	Raw coverage	Unique coverage	Consistency	Number of cases
extr	0.643203	0.176787	0.686353	12
agre*iacap	0.477163	0.088662	0.739384	9
emot*AGRE	0.211177	0.068243	0.773622	4
Solution coverage: 0.803332				
Solution consistency: 0.688940				

Note: The model used is: explor: f(EMOT, EXTR, CONS, OPEN, EXTR, ICAP).
Table 18, Parsimonious solution low exploration

Parsimonious solution EXPLOIT	Raw coverage	Unique coverage	Consistency	Number of cases
emot*open	0.494539	0.305825	0.779904	8
open*CONS	0.382888	0.194175	0.735431	6
Solution coverage: 0.688714				
Solution consistency: 0.774216				

Note: The model used is: EXPLOIT: f(EMOT, EXTR, CONS, OPEN, EXTR, ICAP).
Table 19, Parsimonious solution high exploitation

Parsimonious solution exploit	Raw coverage	Unique coverage	Consistency	Number of cases
EMOT*cons	0.319654	0.231641	0.883582	6
extr*OPEN	0.341793	0.049136	0.874309	7
emot*OPEN	0.409287	0.147948	0.854566	9
Solution coverage: 0.722462				
Solution consistency: 0.868831				

Note: The model used is: exploit: f(EMOT, EXTR, CONS, OPEN, EXTR, ICAP).
Table 20, Parsimonious solution low exploitation

5.4 Final solutions

This section will show the final obtained solution. First the combinations that will lead to a high score on exploration or a high score on exploitation will be discussed and compared to the formulated hypotheses. After that the combinations that will lead to a low score on exploitation and a low score on exploration will be discussed. The final solutions chosen where the solution with a minimal consistency of 0.7. Following Ragin (2008) 0.7 is the minimal consistency that should be used. Also the cases with the combinations that leads to the desired outcome where compared to each other. This was done because there cannot be an overlap in the same cases that contain different combinations but lead to the same desired outcome.

5.4.1 Comparison of the hypothesis and results

This section will contain the comparison of the proposed hypothesis and the results obtain through analysis with fs/QCA 2.0 software. The symbol + indicates the Boolean function or (Ragin et al., 2008). When the Boolean or function occurs this means that there are two paths that will lead to the desired outcome.

The first hypothesis (H1) stated that a high score on emotional stability, extraversion, agreeableness and openness to experience and a high level of individual absorptive capacity will lead to exploration. The result obtained with fs/QCA 2.0 software shows that a low score on openness to experience, a high score on conscientiousness and a low score on individual absorptive capacity or a high score on emotional stability, a high score on openness to experience and a high score on individual absorptive

capacity needs to be present in a CEO's personality and will result in a high score on exploration as innovation activity, as shown in the obtained result:

*open*CONS*iacap + EMOT*OPEN*IACAP ≤ EXPLOR (coverage = 0.341062, consistency = 0.721591)*

The following table consists of a comparison between the hypothesis and the obtained result.

Hypothesis:	EMOT*EXTR*AGRE*OPEN*IACAP ≤ EXPLOR
Result:	open*CONS*iacap + EMOT*OPEN*IACAP ≤ EXPLOR

Table 21, Comparison between hypothesis and result exploration

The obtain result from the analysis with fs/QCA 2.0 software state that agreeableness is not present in either combination that leads to exploration as innovation activity. The absence of agreeableness can be explained by the negative effect of agreeableness on innovation (Cooper & Robertson, 2002). The obtained results do state a low score on openness to experience which is an unexpected outcome. A low score on openness to experience can be explained by the fact that a CEO of an SME will try to avoid risk as much as possible in order to keep the business operating for the long-term. The presence of a high score on conscientiousness was also unexpected as the hypothesis states that conscientiousness is absent in the combination. Most literature showed that the absence of conscientiousness is associated with innovation (Cooper & Robertson, 2002). The presence of conscientiousness might be explained by the fact that innovation activities come with a lot of setbacks. Therefore an individual needs to be persistent and hardworking to deal with these setbacks. The last unexpected outcome of the analysis was a low score on individual absorptive capacity. A low score on individual absorptive capacity indicates that a CEO does not actively undertake the activities associated with individual absorptive capacity. This is unexpected because exploration is associated with doing things that are unknown to the organization. External sources of knowledge are a great source that can give CEO's an idea about what kind of new activity they can operate in. In order to acquire and assimilate external knowledge a high score on individual absorptive capacity is needed. No literature was found to explain the presence of low individual absorptive capacity which means more research needs to be conducted to look at this relation. A high score on emotional stability, openness to experience and individual where expected as the hypothesis (H1) shows. A high score on emotional stability was expected because exploration as innovation activity always involves risk and problems. A high score on emotional stability indicates that a CEO has the ability to stay calm under these circumstances and when faced with problems (Barrick, Mount & Judge, 2001). A high score on openness to experience was expected because exploration indicates doing something new and unknown wherefore creativity and doing unconventional things is needed. Thus a high score on openness to experience is needed because this includes being creative, imaginative and unconventional (Barrick, et al., 2003). The results also show that the independent variables of the big five personality traits and the independent variable individual absorptive capacity are complementary variables because they together have a joint effect on the innovation activity of an SME. The results in this thesis show that a low score on openness to experience, a high score on conscientiousness and a low score on individual absorptive capacity complement each other and have a joint influence that leads to exploration as an SME's innovation activity. The results also show a second path that leads the exploration as an SME's innovation activity. This second path is a high score on emotional stability, a high score on openness to

experience and a high score on individual absorptive capacity. Again these independent variables complement each other and have a joint influence that leads to exploration as an SME's innovation activity.

The second hypothesis (H2) stated that a high score on emotional stability, extraversion, agreeableness, a low score on openness to experience and a low level of individual absorptive capacity will lead to exploitation. The result of the analysis with fs/QCA 2.0 software shows that a low score on emotional stability and a low score on openness to experience needs to be present in a CEO's personality and will result in a high score on exploitation as innovation activity, as shown in the obtained result:

*emot*open ≤ EXPLOIT (coverage = 0.494539, consistency = 0.779904)*

The following table consists of a comparison between the hypothesis and the obtained result.

Hypothesis:	EMOT*EXTR*AGRE*open*iacap ≤ EXPLOIT
Result:	emot*open ≤ EXPLOIT

Table 22, Comparison between hypothesis and result exploitation

The obtained result state that the scores on conscientiousness, extraversion, agreeableness and individual absorptive capacity are not important to lead to a high score on exploitation as innovation activity. The absence of conscientiousness was expected as stated in the hypothesis. The absence of extraversion is in line with the research of Cooper and Robertson (2002) who state that extraversion is a less important personality trait that influences innovation. The absence of agreeableness can be explained by the negative effect of agreeableness on innovation (Cooper & Robertson, 2002). The absence of individual absorptive capacity is unexpected but can be explained by the fact that exploitation is associated with the refinement of existing product, services or processes. A CEO will already know a lot about the existing product, services or processes which gives it a greater change that the CEO knows what needs to be refined instead of hearing it from an external source. This can also be explained by the fact that the CEO is seen as the first person to think of introducing a new innovation (Lefebvre & Lefebvre, 1992). The result do show that a low score on emotional stability and openness to experience is needed. Little research has been done to see how emotional stability influences innovation. The literature available about the relation between emotional stability and innovation appears to be inconsistent (Cooper & Robertson, 2002). More research on how emotional stability influences innovation is necessary. A low score on openness to experience was expected and indicates that an individual tends to be more conservative and are more comfortable with ideas that are familiar and conventional instead of novel and unique (Costa & McCrae, 1992). This is associated with exploitation as innovation activity because exploitation indicates the refinement of familiar products, processes or services. Finally a high score on individual absorptive capacity is needed because this means the CEO undertakes the activities to acquire new knowledge that can be beneficial to the SME and that the CEO will undertake the activities to use this knowledge to create new product, services or processes (Löwik, 2013). The obtained result here shows that a low score on emotional stability and a low score on openness leads to exploitation as an SME's innovation activity. This indicates that these independent variables are complementary variables because they have a joint influence that will lead to exploitation as an SME's innovation activity.

5.4.2 The low scores on exploitation and exploration

This section will explain why there was also an analysis conducted that results in a low score on exploitation and exploration. The symbol + indicates the Boolean function or (Ragin et al., 2008). When the Boolean or function occurs this means that there are two paths that will lead to the desired outcome.

To see whether a high score on exploitation indicates an SME has a low score on exploration an analysis with fs/QCA 2.0 software was conducted with the negated scores of exploitation and exploration. The results indicate that if an SME has a high score on exploitation this does not mean that that SME has a low score on exploration. The same goes for when an SME has a low score on exploitation this does not indicate that the SME has a high score on exploration. When this would have been the case the combination that leads to a high score on exploitation would be the combinations that leads to a low score on exploration. The results do not show this. The obtained results from this analysis are as followed:

*EMOT*cons + extr*OPEN ≤ exploit (coverage = 0.341793, consistency = 0.883582)*

*agre*iacap + emot*AGRE≤ explor (coverage = 0.477163, consistency = 0.739384)*

The results indicate that it is possible for an SME to have exploration as an innovation activity as well as exploitation as innovation activity. This is in line with the research of Greve (2013) who states that it is difficult to adopt both exploration and exploitation but it is possible to find a balance between exploration and exploitation.

5.4.3 Individual absorptive capacity and exploitation and exploration

In this section an analysis with fs/QCA 2.0 software is conducted to see which combinations of the dimensions of individual absorptive capacity have an influence on an SME's innovation outcome. This is done because to generate the final solutions (see section 5.4.1) the four dimensions of individual absorptive capacity (recognition, assimilation, transformation and exploitation) where taken together as one to limit the number of variables in the analysis. It is interesting to see which combinations of the four dimensions of individual absorptive capacity have an influence on the innovation activity of an SME. For this a new dataset needed to be generated. This was done with fs/QCA software in the same fashion as earlier on is this chapter (see section 5.2, 5.3 and 5.4). First the 25^{th}, 50^{th} and 75^{th} percentiles were generated of the four dimensions of individual absorptive capacity. After that the necessary conditions table was generated. Finally the sufficient conditions were generated to acquire the parsimonious solutions. For the percentiles, the calibrated dataset, the necessary conditions and parsimonious solutions see appendix C, tables 24, 25, 26, 27, 28, 29 and 30.

The following results were obtained from the analysis:

*ASS*exp ≤ EXPLOIT (coverage = 0.230582, consistency = 0.737864)*

*REC*ass ≤ exploit (coverage = 0.273758, consistency = 0.697387)*

*rec*ASS ≤ EXPLOR (coverage = 0.302013, consistency = 0.736607)*

*REC*tra ≤ explor (coverage = 0.318109, consistency = 0.821082*

The results show that a high score on assimilation and a low score en exploitation will lead to high score on exploitation as innovation activity. The results also show that a high score on recognition and a low score on assimilation will lead to a low score on exploitation as innovation activity. Although for this result the consistency is below the threshold value (0.7). Which means it is likely that another causal conditions is at work that is not being considered in the analysis (Ragin, 2008).

The results also show that a low score on recognition and a high score on assimilation will lead to a high score on exploration as an SME's innovation activity. Furthermore the results show that a high score on recognition and a low score on transformation will lead to a low score on exploration.

It can be concluded from the obtained results that the certain dimensions of individual absorptive capacity joint together have an influence on the innovation activity of an SME. The results also show that the dimensions of individual absorptive capacity as independent variables are complementary variables because they have a joint effect on the desired outcome. If they would have been substitute variables no combination would have been found that would lead to the desired outcome.

6. Discussion

This chapter contains an explanation about the contribution this thesis makes and the limitations of this study. This chapter will also contain recommendations for future research and finally a conclusion will be discussed.

6.1 Contribution

The aim of this thesis was to find out which combinations of personality traits together with individual absorptive capacity will lead to an SME's innovation activity. Research already indicated that the big-five personality and individual absorptive capacity have an influence on innovation in organization (Hambrick & Mason, 1984, Löwik, 2013).

The hypothesis formulated in this thesis assumed that most of the big-five personality traits in combination with individual absorptive capacity of a CEO will have an influence on the kind of innovation activity of an SME. The results of the analysis in this thesis showed that there are specific combination of the big-five personality traits together with individual absorptive capacity will lead to exploration as the innovation activity of an SME. The results obtained in this thesis also showed that only a specific combination of personality traits without individual absorptive capacity will lead to exploitation as an SME's innovation activity. The results of this thesis indicate that how a CEO scores on certain traits of the big-five personality traits is more important than how the CEO's scores on other traits of the big-five personality traits to achieve exploration or exploitation as the innovation activity of an SME. The combination of a low score on emotional stability and a low score on openness to experience where sufficient to lead to a high score on exploitation as the innovation activity of an SME. For a high score on exploration as innovation activity of an SME the result showed that it was sufficient to possess the combination of a low score on openness to experience, a high score on conscientiousness and a low score on individual absorptive capacity or to possess the combination of a high score on emotional stability, a high score on openness to experience and a high score on individual absorptive capacity.

The theoretical relevance of this thesis is that this research adds new insights in the debate about the big-five personality traits and individual absorptive capacity and how they influence the innovation activities of an organization. No earlier research has been conducted that looks at combinations of personality traits together with individual absorptive capacity and how they influence the innovation activities of SME's. The novelty of this research adds to the theoretical relevance of this thesis. This thesis gave results of combinations instead of the dimensions separate of personality traits with individual absorptive capacity that will lead to the innovation activities of an SME. This has not been examined before. The results obtained in this thesis have shown that there are specific combinations of personality traits with individual absorptive capacity that will lead to exploration as an SME's innovation activity. This thesis also showed that there is a specific combinations of personality traits without individual absorptive capacity that will lead to exploitation as an SME's innovation activity. The results also show that the big five personality traits of a CEO and individual absorptive capacity of a CEO should been seen as complement instead of substitutes. Certain personality traits of a CEO and a CEO's individual absorptive capacity have a joint influence on the innovation activity adopted by an SME.

The practical relevance of this thesis is that it gives CEO's of SME's an insight in how they influence innovation activities within SME's. First it shows CEO's of SME's that they influence the innovation

activity of SME's with their personality and their individual absorptive capacity. Second it shows how the personality and the individual absorptive capacity of an CEO influences the innovation activities of SME's. This thesis also gives an insight in if an organization is looking for a CEO and they have exploitation or exploration as innovation activity the organization can see what kind of personality of a CEO will fit with exploitation or exploration as an organizations innovation activity.

6.2 Limitations

The first limitation of this research is about generalizations. All of the respondents operate in the region of Twente in the Netherlands. This combined with the low sample size (N=35) means that you cannot generalize this thesis to a larger population then the region of Twente.

A second limitation of this research is that the CEO's filled the questionnaire in themselves. This could lead to answers given by the CEO that will put him or her or the SME in a positive daylight. It could also lead to the fact that the CEO fills in the answers in such a way that he or she things the questions need to be answered or a socially desirable.

The third and last limitation of this research is that the dimensions of individual absorptive capacity are taken together to generate the results. This was done to keep the number of outcomes manageable. The drawback that comes with this is that now you don't know how each dimension individually contributes to the innovation activities in an SME.

6.3 Future research directions

The sample for this thesis was restricted to CEO's of SME's in the region Twente in the Netherlands. It would be interesting to see what the results of the same study would be when you integrate CEO's of SME's outside the region of Twente or from other countries. Because of the small sample size (N=35) of this thesis it would be interesting to see what the results will be when there is a bigger sample size. Because of the small sample size there could be a lot of variance in the answers which can influence the final solutions obtained for this thesis.

This thesis gives combinations of the big-five personality traits together with individual absorptive capacity of a CEO that need to be present to get to the outcome exploitation or exploration. What you do not know are the weights of each construct within the combination. It would be interesting to see which of the combinations has the highest weight on the outcome and which the lowest. Then you can see the relevance of the constructs and their contribution to the solution.

For future research is would also be interesting to see how the dimensions of individual absorptive capacity are individually involved in the desired outcome. Instead of taking the sum of all the four dimensions combined you could take all the dimensions individually. This means that it would become feasible which dimensions has an influence on the desired outcome.

Finally little research has been conducted to see how emotional stability influences innovation activities. The results of this thesis show that emotional stability has an influence on the innovation activity of an SME. For future research it would be interesting to see what the influence of emotional stability on innovation is.

6.4 Conclusion

This thesis shows that a CEO's personality traits combined with a CEO's individual absorptive capacity has an influence on the kind of innovation activity of an SME executes. The results of this thesis suggest that there are certain combinations of personality traits combined with individual absorptive capacity that will lead to exploration or exploitation for an SME's innovation activities. The obtained results also show that the big five personality traits and individual absorptive capacity should be seen as complements. This thesis offers a new insight into how combinations of personality traits and individual absorptive capacity lead to an SME's innovation activities.

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8. Appendix A

Questionnaire

Innovation activity

There are four types of innovation
1. **Product innovation**: this is the creation of completely new products or services for existing customers and markets

2. **Market innovation**: this is the offering of existing products or services to new customers and markets.

3. **product-market combination-innovation**: this is the creation of completely new products or services for new customers and markets, which often requires the development of new competences or processes.

4. **Process innovation**: this is changing existing competences and processes to better serve existing customers and markets (e.g. through lower costs, shorter delivery times and better service)

1. Please indicate how important the following goals were for your company during the last three years (2010 - 2012). INNPRES (He and Wong, 2004 – EXPL = exploration, EXPLOI = exploitation)

		very **unimportant**				very **important**
	Product innovation					
1	Introduce new generation of products for existing customers/markets <EXPL1>	O	O	O	O	O
2	Extend product range <EXPL2> *	O	O	O	O	O
	Market innovation					
3	Open up new markets <EXPL3>	O	O	O	O	O
	Product-market combined innovation					
4	Enter new technology fields <EXPL4>	O	O	O	O	O
	Process innovation					
5	Reduce production cost <EXPLOI1>	O	O	O	O	O
6	Improve yield or reduce material consumption <EXPLOI2>	O	O	O	O	O
7	Improve production flexibility <EXPLOI3>	O	O	O	O	O
8	Improve existing product quality <EXPLOI4>	O	O	O	O	O

Individual absorptive capacity (Löwik 2013)

2. The following propositions concern your use of information and knowledge for your work. Please indicate the extent of your agreement for each proposition.

		strongly **disagree**						strongly **agree**
1	I often apply newly acquired knowledge to my work <IAEXP1>	1	O	O	O	O	O	7
2	I am always actively looking for new knowledge for my job <IAREC2>	O	O	O	O	O	O	O
3	I frequently share my new knowledge with colleagues to establish a common understanding <IAASS2>	O	O	O	O	O	O	O
4	I intentionally search for knowledge in many different areas to look 'outside the box' <IAREC3>	O	O	O	O	O	O	O
5	I translate new knowledge in such a way that my colleagues understand what I mean <IAASS3>	O	O	O	O	O	O	O
6	I communicate newly acquired knowledge that might be of interest for our company <IAASS4>	O	O	O	O	O	O	O
7	I am good at distinguishing between profitable opportunities and not-so-profitable information or business opportunities <IAREC4>	O	O	O	O	O	O	O
8	I often sit together with colleagues to come up with good ideas <IATRA2>	O	O	O	O	O	O	O
9	I exploit new knowledge to create new products, services, or work methods <IAEXP4>	O	O	O	O	O	O	O
10	I attend meetings with people from different departments to come up with new ideas <IATRA4>	O	O	O	O	O	O	O

11	I develop new insights from knowledge that is available within our firm <IATRA5>	O	O	O	O	O	O	O
12	I easily identify what new knowledge is most valuable to us <IAREC6>	O	O	O	O	O	O	O
13	I constantly consider how I can apply new knowledge to improve my work <IAEXP6>	O	O	O	O	O	O	O
14	I can turn existing knowledge into new ideas <IATRA6>	O	O	O	O	O	O	O

Personality Traits (Big 5 – Saucier, 1994)

3. The following aspects are about your personality. Use the following list with general personality traits to describe yourself as accurate as possible. See yourself as you really are and not as you want to be. Compare yourself with other people you know from the same gender and about the same age. Indicate per trait to what extend each personality traits is an accurate description about yourself. <PERS>

	Extremely inaccurate				**Extremely accurate**
	1	**2**	**3**	**4**	**5**
01. Bashful <1>	0	0	0	0	0
02. Bold <2>	0	0	0	0	0
03. Careless <3>	0	0	0	0	0
04. Cold <4>	0	0	0	0	0
05. Complex <5>	0	0	0	0	0
06. Cooperative <6>	0	0	0	0	0
07. Creative <7>	0	0	0	0	0
08. Deep <8>	0	0	0	0	0
09. Disorganized <9>	0	0	0	0	0
10. Efficient <10>	0	0	0	0	0
11. Energetic <11>	0	0	0	0	0
12. Envious <12>	0	0	0	0	0
13. Extroverted <13>	0	0	0	0	0

	Extremely inaccurate				**Extremely accurate**
	1	**2**	**3**	**4**	**5**
22. Organized <22>	0	0	0	0	0
23. Philosophical <23>	0	0	0	0	0
24. Practical <24>	0	0	0	0	0
25. Quiet <25>	0	0	0	0	0
26. Relaxed <26>	0	0	0	0	0
27. Rude <27>	0	0	0	0	0
28. Shy <28>	0	0	0	0	0
29. Sloppy <29>	0	0	0	0	0
30. Sympathetic <30>	0	0	0	0	0
31. Systematic <31>	0	0	0	0	0
32. Talkative <32>	0	0	0	0	0
33. Temperamental <33>	0	0	0	0	0
34. Touchy <34>	0	0	0	0	0

14. Fretful <14>	0	0	0	0	0
15. Harsh <15>	0	0	0	0	0
16. Imaginative <16>	0	0	0	0	0
17. Unsympathetic <17>	0	0	0	0	0
18. Intellectual <18>	0	0	0	0	0
19. Jealous <19>	0	0	0	0	0
20. Kind <20>	0	0	0	0	0
21. Moody <21>	0	0	0	0	0
35. Uncreative <35>	0	0	0	0	0
36. Unenvious <36>	0	0	0	0	0
37. Unintellectual <37>	0	0	0	0	0
38. Inefficient <38>	0	0	0	0	0
39. Warm <39>	0	0	0	0	0
40. Withdrawn <40>	0	0	0	0	0
41. Artistic <41>	0	0	0	0	0
42. Unanxious <42>	0	0	0	0	0

9. Appendix B

Case	Exploit	Explor	Emot	Extr	Agre	Open	Cons	iACAP
1	0.05	0.02	0.05	0	0.19	0.05	0.29	0.44
2	1	1	1	1	0.99	0	1	0.48
3	0	0.1	0.88	0.23	0.05	0.68	0.66	0.17
4	0.18	0.95	0.99	1	0.95	0.95	0.98	1
5	0.05	0.95	1	0.5	0.91	0.26	0.05	0.95
6	0	0.05	0.99	0.95	0.5	0.99	0.86	0.5
7	0.95	0.82	0.05	0.5	0.05	0.12	0.29	0.05
8	0	0	0.5	0.81	0.95	0.68	0.95	0.88
9	0.99	0.5	0.73	0.18	0.91	0.12	0.66	0.04
10	1	0.5	0.5	1	0.5	0.95	0.86	0.99
11	0.82	0	0	0	0	0.26	0.02	0
12	0.99	1	0.05	0.05	0	0.12	0.05	0.5
13	0	0.82	1	0.81	0.69	0.05	0.29	0.13
14	0.82	0.05	0	0.01	0	0.16	0	0
15	0	0	0.13	0.05	0.05	0.95	0.02	1
16	0	0.01	0	0.95	0.01	0.91	0	0
17	0.18	0.05	0.73	0.01	0	0.26	0.29	0.02
18	0.5	0.99	1	0.5	0.82	0.95	0.98	0.46
19	0.05	0.29	0.95	0.81	0.95	0	0.05	0.01
20	0.5	0.27	0.05	0.18	0.19	0.68	0.05	0.2
21	0.5	0.05	0.5	0.05	0.05	0.68	0.97	0.83
22	0.82	0.95	0.13	0.05	0.19	0	0.5	0
23	0.82	0.75	0.02	0.08	0	0.05	0.52	0.15
24	0.99	0.97	0.88	1	1	0.68	0.86	0.81
25	0.05	0.01	0.05	0.18	0.82	0.81	0.78	0.99
26	0.5	0.01	0.95	1	0.69	0	1	0.91
27	1	0.5	0.88	1	1	0.01	0.99	1
28	0.18	0.27	0.13	0.18	0.01	0.5	0.52	0.23
29	0.18	0.27	1	0.99	0.5	0.95	0.05	0.83
30	1	1	0.88	1	0.99	0.95	1	1
31	0.5	0.82	0.5	0.01	0.95	0	0.05	0.01
32	0.05	0.5	0.02	0.81	0.99	0.95	0	0.99
33	0.99	1	1	0.81	1	0.9	1	1
34	0	0.82	0	0.81	0.05	1	0.29	0.95
35	0.82	0.12	0.02	0.05	0.19	0.12	0.13	0.83

Table 23, Calibrated fuzzy scores

10. Appendix C

This table (table 24) shows the percentiles of exploitation, exploration and the dimensions of individual absorptive capacity.

Variable (Condition)	Percentiles 25%	50%	75%
Exploitation (EXPLOIT)	3.25	3.75	4.25
Exploration (EXPLOR)	3.00	3.75	4.25
Recognition (REC)	4.67	5.33	5.67
Assimilation (ASS)	4.99	5.67	6.00
Transformation (TRA)	4.50	5.00	5.75
Exploitation (EXP)	4.33	5.00	6.00

Table 24, Percentiles of conditions of the dimensions of individual absorptive capacity and exploitation, exploration

This table (table 25) shows the calibrated dataset of exploitation, exploration and the dimensions of individual absorptive capacity.

Case	Exploit	Explor	Rec	Ass	Tra	Exp
1	0.05	0.02	1	0.01	0.01	0.95
2	1	1	0.05	0.95	0.95	0.19
3	0	0.1	0.59	0.05	0.05	0.3
4	0.18	0.95	1	0.95	0.98	0.98
5	0.05	0.95	0.95	0.95	0.95	0.73
6	0	0.05	0.95	0.95	0.05	0.5
7	0.95	0.82	0.05	0.05	0.	0.19
8	0	0	0.95	0.5	0.73	0.88
9	0.99	0.5	0.18	0	0.05	0.05
10	1	0.5	0.95	1	0.88	0.95
11	0.82	0	0	0	0	0
12	0.99	1	0.5	0.05	0.05	0.88
13	0	0.82	0.18	0	0.5	0.5
14	0.82	0.05	0	0	0.01	0
15	0	0	1	1	0.98	0.98
16	0	0.01	0	0	0	0.01
17	0.18	0.05	0.05	0	0.18	0.01
18	0.5	0.99	0.5	0	0.5	0.5

19	0.05	0.27	0.01	0.05	0.05	0
20	0.5	0.27	0.05	0.5	0.05	0.5
21	0.5	0.05	0.95	0.18	0.5	0.95
22	0.82	0.95	0	0	0	0
23	0.82	0.75	0.18	0.5	0.05	0.05
24	0.99	0.97	0.5	0.5	0.73	0.88
25	0.05	0.01	0.95	0.95	0.95	0.95
26	0.5	0.01	1	1	0.18	0.5
27	1	0.5	0.05	1	1	0.99
28	0.18	0.27	0.18	0.05	0.5	0.5
29	0.18	0.27	0.18	0.95	0.98	0.5
30	1	1	1	1	1	1
31	0.5	0.82	0.05	0.05	0	0
32	0.05	0.5	0.05	1	0.99	0.99
33	0.99	1	1	1	1	1
34	0	0.82	1	0.18	0.95	0.88
35	0.82	0.12	1	0.18	0.5	0.88

Table 25, Calibrated fuzzy scores of the dimensions of individual absorptive capacity and exploitation, exploration

This table (table 26) show the necessary conditions for high and low exploitation and exploration.

Causal condition	Consistency value for necessity			
	EXPLOIT	exploit	EXPLOR	explor
REC	0.47	0.59	0.51	0.55
rec	0.62	0.49	0.59	0.53
ASS	0.55	0.51	0.58	0.45
ass	0.57	0.60	0.50	0.63
TRA	0.51	0.54	0.61	0.41
tra	0.62	0.57	0.47	0.66
EXP	0.59	0.64	0.64	0.57
exp	0.55	0.49	0.48	0.53

Note: no necessary conditions were found for this analysis.

Table 26, Necessary conditions of the dimensions of individual absorptive capacity for exploitation and exploration

These tables (tables 27, 28, 29 and 30) show the parsimonious solutions of exploitation (high and low) and exploration (high and low) as outcome and the four dimensions of individual absorptive capacity as conditions.

Parsimonious solution EXPLOIT	Raw coverage	Unique coverage	Consistency	Number of cases
ASS*exp	0.230582	0.230582	0.737864	4

Solution coverage: 0.230582
Solution consistency: 0.737864

Note: The model used is: EXPLOIT: f(REC, ASS, TRA,EXP).
Table 27, Parsimonious solution high exploitation and the dimensions of individual absorptive capacity

Parsimonious solution exploit	Raw coverage	Unique coverage	Consistency	Number of cases
REC*ass	0.273758	0.273758	0.697387	7

Solution coverage: 0.273758
Solution consistency: 0.697387

Note: The model used is: exploit: f(REC, ASS, TRA,EXP).
Table 28, Parsimonious solution low exploitation and the dimensions of individual absorptive capacity

Parsimonious solution EXPLOR	Raw coverage	Unique coverage	Consistency	Number of cases
exp*REC	0.167175	0.067114	0.625571	1
rec*ASS	0.302013	0.201952	0.736607	3

Solution coverage: 0.369127
Solution consistency: 0.645678

Note: The model used is: EXPLOR: f(REC, ASS, TRA,EXP).
Table 29, Parsimonious solution high exploration and the dimensions of individual absorptive capacity

Parsimonious solution explor	Raw coverage	Unique coverage	Consistency	Number of cases
REC*tra	0.318109	0.318109	0.821082	2
Solution coverage:	**0.318109**			
Solution consistency:	**0.821082**			

Note: The model used is: explor: f(REC, ASS, TRA,EXP).

Table 30, Parsimonious solution low exploration and the dimensions of individual absorptive capacity