

Entrepreneurial cognition and the decision making process.

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Preface

This thesis is written as the final part of my study, Business Administration. After a long study career I am very happy and proud to present this last piece of work.

Although I am not sure if I am ever going to be an entrepreneur myself, the topic of entrepreneurship had my attention since the beginning of my study career. '*Cognitive style*' and the '*decision making process*' were very interesting subjects to work with, because it is about people, and therefore also about myself. Studying these subjects made me more conscious about my own actions and behavior.

In the first place I would like to thank Martin Stienstra for his valuable guidance, feedback and patience. Also I would like to thank Michel Ehrenhard for reading the report and giving feedback.

Besides all family and friends who helped and supported me during my study career, there are a few people I specially would like to thank. First my parents and girlfriend, for their unconditional support and for their trust in me. Also would like to thank Krijn Lock and Marten Becker for their insights and valuable comments on the report.

Thijs IJdens

Management Summary

This research attempts to make a contribution to the theory of effectuation by establishing a new link between cognitive style and effectuation by answering the following research question: *To what extent are the preferences in decision making processes of effectuation and causation influenced by the cognitive characteristics of an individual?*

The cognitive style of an individual considers the preferred attitude towards encountered information encountered. When individuals encounter the possibility of becoming an entrepreneur, their cognitive style may influence the way they approach, frame and solve problems. Allinson and Hayes (1996) refer to two different and pervasive modes of cognitive style. Intuition, which is a non-conscious, automatic and non-selective thinking process, where information is processed by observing it at once at the whole. Secondly analytic, which in contrast, is a conscious, intentional and selective thinking process. Information is processed by observing it in sequenced steps.

There are two different approaches that entrepreneurs use when making decisions in the new venture development process; effectuation and causation. Effectuation is a means oriented process while causation is goal driven process. The distinguishing characteristic between causation and effectuation is in the set of choices; choosing between means to create a particular effect, versus choosing between many possible effects using a particular set of means. It is assumed that a more effectual approach works best in uncertain environments (Sarasvathy, 2001; 2008). Mitchell, et al. (2002) argue that ventures often occur in fast changing and uncertain environments. This created a tendency to present 'effectual decision making' as the best mode of decision making in new venture development process. This is strengthened by Dew (2009a) who argues that experienced entrepreneurs and senior managers apply more effectuation than novice entrepreneurs and junior managers. The combination of the pervasive nature of cognition and the 'success' of effectuation in the new venture development process leads to the relevance of this research. If a preference for 'effectuation' is pre-determined by hardly alterable factors such as the cognitive style of an individual; it would be possible to predict which individuals have better chances to become successful entrepreneurs in uncertain environments.

The literature study on entrepreneurial cognition and the decision making process revealed similar characteristics indicating that these concepts are related. In general, individuals with a more intuitive cognitive style are expected to have a preference for an effectual approach in the decision making process. For three of the underlying constructs of effectuation and causation, the: '*means based principle*', for the '*attitude towards contingencies principle*', and the '*view on the future principle*' intuitive individuals are expected to prefer the effectual component and more analytical individuals are expected to prefer the causal component.

To test the hypotheses and answer the research question, 759 students were tested for their cognitive style and their preferences in the decision making process. This is done by a questionnaire in which the cognitive style is measured by the Cognitive Style Index (CSI) from Allinson, Chell and Hayes (2010a) and the decision making process is tested by a customized questionnaire from (Brettel, Mauer, Engelen, & Küpper, 2012).

In line with the expectations all the hypotheses are rejected, indicating that cognitive style is significantly influencing individuals in the decision making process. In answer to the research question: individuals with a more analytical cognitive style prefer causation in the decision making process. But, individuals with an intuitive cognitive style do not have a clear preference for either causation or effectuation.

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1. Introduction

This first chapter will introduce the general area of this study: Entrepreneurship. This introduction will be followed by purpose and objectives of the study. In addition, the research question and research strategy are addressed.

1.1 Background of the study

Already in the beginning of the last century the importance of entrepreneurship is addressed by Schumpeter (1934) Nowadays, entrepreneurship still is an increasingly important field of research (Shane & Venkataraman, 2000). Entrepreneurship is important, because it is considered the engine behind innovation, job creation, productivity growth and economic growth. (Busenitz et al., 2003, p. 291).

Shane & Venkataraman (2000) conceptualized entrepreneurship into a framework in which they describe the field of entrepreneurship as the scholarly examination of how, by whom, and with what effects opportunities are discovered evaluated and exploited. The 'how' can be described as the creation, discovery and exploitation of opportunities, which refer to entrepreneurial processes. This definition is simplified by Morroz and Hindle (2011, p.4): *'what entrepreneurs actually do and how they do it'*. Sarasvathy (2001, 2008) describes this process as the sequence of activities and decisions an entrepreneur have to go through, leading from an idea or opportunity to a successful venture. In this decision making process entrepreneurs often encounter uncertain environments. Mitchell, et al (2007, p. 1052) state: *'It is widely recognized that entrepreneurship invariably occurs within the context of change and high uncertainty'*. Most of the entrepreneurial opportunities emerge in changing environments, in which former successful ways of doing are not as successful as before. These environments can be described as uncertain and unpredictable.

Earlier research focused on planned strategies to coop with uncertain environments by predicting the future, in order to avoid uncertainty. These planned strategies are consistent with causation. Sarasvathy (2001) distinct two alternative approaches that entrepreneurs use in the new venture development process; causation and effectuation. Effectuation is a means oriented process while causation is goal driven process. The distinguishing characteristic between causation and effectuation is in the set of choices; choosing between means to create a particular effect, versus choosing between many possible effects using a particular set of means.

Another important factor in the decision making process is *'the who'*, i.e. the individual making the decisions; the entrepreneur. The cognitive perspective considers the use of specific information that entrepreneurs use to make leaps in the development stage of new ventures (Busenitz et al., 2003). It also may influence the way entrepreneurs go through the different stages of starting a new venture. The link between the entrepreneur and the entrepreneurial decision making process is made by Sarasvathy, 2001) Effectuation begins with a set of unalterable characteristics of the decision-maker (i.e. the entrepreneur) (Sarasvathy, 2001)

Kickul et al.(2009) argues that individuals with a more intuitive cognitive style are more confident in indentifying and recognizing opportunities, but are less comfortable and

capable in planning and evaluating entrepreneurial activities such as gathering assets. In contrast, individuals with a more analytic cognitive style are less capable in searching and recognizing but more comfortable in their abilities to plan and evaluate when gathering assets.

'The evidence indicates that the content of an expert's knowledge base need not differ from that of a novice, but experts typically organize or structure the content differently.' (Krueger, 2007, p. 123) This might indicate that not the individual himself changes over time but they way he processes information does. Entrepreneurial attitudes are partly driven by deep cognitive structures, but as research suggests this attitude might change over time. Krueger (2007) distinguishes knowledge content from knowledge structure, and states that in the process of cognitive development. Does this mean that analytical thinkers have the ability to become 'effectuators' or at least are able to adopt a more effectual way of problem solving.

1.2 Research Gap

This research makes a contribution to the theory of effectuation by establishing a new link between cognitive style and effectuation. Earlier research focused on effectuation and entrepreneurship, the behavioral aspects of entrepreneurship and the link between cognition and opportunity recognition. However, no research directly linking the concept between the cognitive characteristics of the entrepreneur and the preference for either effectual or causal decisions making is found.

Furthermore; according to Perry (2011), studies in the field of effectuation are in a nascent state of research and more experimental en field study has to be done. Sarasvathy (2005) argues that effectuation is a logic of entrepreneurial expertise which can be used by all entrepreneurs operating in the highly unpredictable process of creating a new venture. In contrast, Perry et al. (2011) argue that the current concept of effectuation is based on studies among expert entrepreneurs and does not concern the whole population of entrepreneurs which also includes novice-entrepreneurs.

1.3 Research purpose and design

1.3.1 Research purpose

The purpose of this research is to unravel the concepts of first effectuation versus causation and second rational versus intuitive. The aim is to link the main attributes of effectuation to the cognitive characteristics and preferences of the entrepreneur.

This leads to the goal of the research: prove that the cognitive style of students, whom are potential entrepreneurs, is influencing their start-up decision. And more specific, in what way their cognitive preferences lead to higher proportions of effectual or casual decisions.

Another interesting feature in this research is to measure the level to which effectuation is a teachable concept. The combination of the pervasive nature of cognition and the 'success' of effectuation in the new venture development process leads to the relevance of this research. If a preference for '*effectuation*' is pre-determined by hardly alterable factors such as the, cognitive style of an individual, and it is possible to measure these factors; it

would be possible to predict which individuals have better chances to become successful entrepreneurs in uncertain environments. Further research on cognitive style could provide a basis for identifying potentials successful entrepreneurs (Allinson, Chell, & Hayes, 2010a).

1.3.2 Research Question

The following research question is presented:

'To what extent are the preferences in decision making processes of effectuation and causation influenced by the cognitive characteristics of an individual'.

Additional sub-research question:

'To what extent is a preference for effectuation in the decision making process, influenced by education'

The research model is visualized in the figure below.

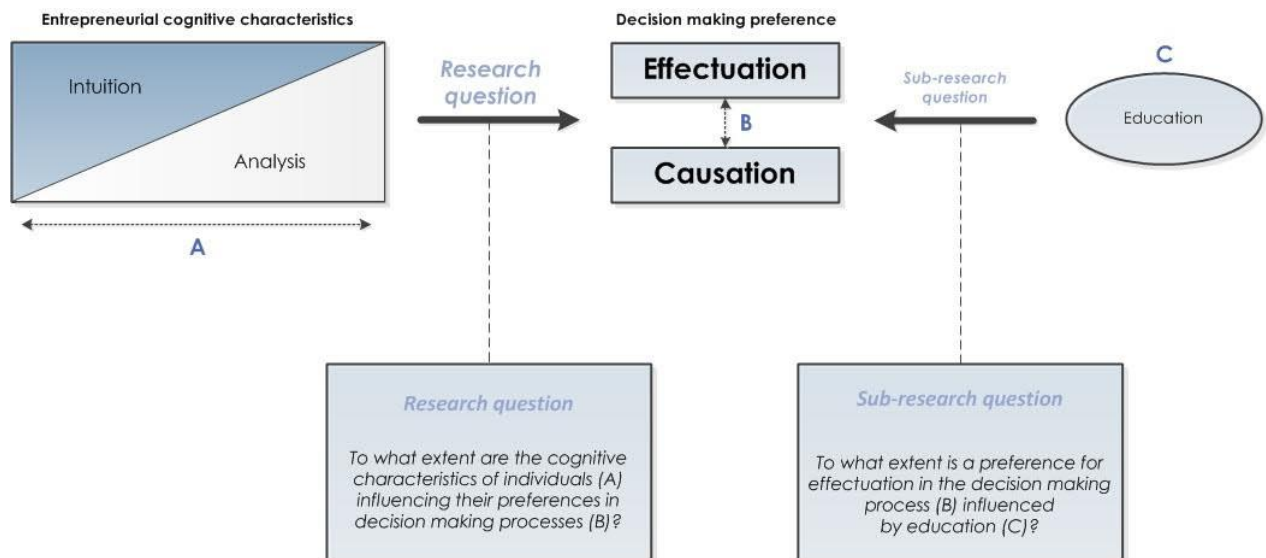


Figure 1: *Research model*

1.3.3 Research strategy

In order to explore the relationship between cognition and effectuation, exploratory and quantitative research will be performed. A self-administered questionnaire is distributed among bachelor and master students. The first part of this questionnaire concerns the 'independent variable'; cognition (Allinson, Chell, & Hayes, 2010a). The second part of the questionnaire concerns the dependent variable; effectuation. In this part a business case is presented. Respondents are asked to imagine themselves within the context and answer 25 multiple-choice questions, according to a 7-point Likert-scale items (Babbie, 2007). The third part contains bio-data questions and personal intentions towards entrepreneurship. The CSI (Allinson, Chell, & Hayes, 2010a; Chandler, DeTienne, McKelvie, & Mumford, 2011) and the effectuation questionnaire (Brettel, Mauer, Engelen, & Küpper, 2012) were both taken from existing empirically research and are tested for reliability and validity. They are further described in the methodology chapter.

1.3.4 Outline of the study

In order to further investigate the links between causation and effectuation, a solid background of literature has to be provided. This will be conducted in the second chapter. The concepts are explained and the available research on the topics is discussed. In the third chapter the review of the literature is combined and hypotheses are derived from the theory. The methodology is then more thoroughly explained in the third chapter, including the sample, the research methods which have been used and the statistical methods which have been applied. The fifth chapter presents the results. The descriptive statistics are represented followed by the acceptance or rejections of the hypotheses. In the final chapter the conclusion is presented followed by a discussion and interpretation of the results, including the limitations of the study and the suggestions for further research.

2. Literature Review

In this chapter the literature about the main subjects of the study is reviewed. First the cognitive style in the perspective of entrepreneurship. Secondly, the decision making process of entrepreneurs.

2.1 Cognitive Style

Allinson et al. (2010) state that entrepreneurs can be distinguished by non-entrepreneurs, based on their intentions. However, 'good' intentions are no guaranty for entrepreneurial success. An alternative for differentiation is the cognitive style of an individual, which considers the preferred attitude towards information encountered.

In the psychology literature, cognitive style is widely recognized as a determining factor of individual behavior. When individuals encounter the possibility of becoming an entrepreneur, their cognitive style may influence the way they approach, frame and solve problems (Kickul, Gundry, Barbosa, & Whitcanack, 2009). The information required to enable entrepreneurs to discover and explore new business opportunities is perceived through the individual perception and interpretation of information (Kickul, Gundry, Barbosa, & Whitcanack, 2009, p. 440). Entrepreneurial cognitions can be defined as *'the knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation and growth'* (Mitchel, et al., 2002, p. 97).

It is important to note some characteristics of cognitive style. According to Brigham et al. research has shown that; *'(1) cognitive style is a pervasive dimension that can be assessed using psychometric techniques; (2) it is stable over time; (3) it is bipolar; and (4) it may be value differentiated.'* i.e. it describes different rather than better thinking processes (Brigham, De Castro, & Shepherd, 2007, p. 31). The pervasive nature of cognitive style is widely accepted in the field of psychology research. According to Rider & Rayner (1998) cognitive style is an automatic way of responding to information and situations. This style might be present at birth or at least is developed and fixed in an early stage of live (Riding & Rayner, 1998). This strengthens the theory that a cognitive style is stable over time.

Several researchers attempted to establish a measurement tool for the analysis of individual differences in cognitive style (Hodgkinson, Sadler-Smith, Sinclair, & Ashkanasy, 2009). The first challenge is to determine the relevant categories in which to divide and define cognitive style. Ornstein (1977), argues that there are two different and pervasive modes of consciousness. Holistic, which is a non-conscious, automatic and non-selective thinking process, where information is processed by viewing at once at the whole. 2. Analytic, which in contrast, is a conscious, intentional and selective thinking process. Information is processed by viewing at it in sequenced steps. These two thinking processes reflect what are often is referred to as the rational and intuitive sides of a person. This dimension of cognitive style is often referred to as intuitive and analytic.

In order to measure an individual's preference for either intuitional thinking or analytical thinking, Allinson and Hayes (1996) developed the 'Cognitive style index'. *'The CSI evaluates cognitive style as a uni- dimensional construct, where analysis and intuition are viewed as bipolar opposites of a single continuum'* (Allinson & Hayes, 1996, p. 54) They

define analysis as a characteristic of left brain orientation (i.e. left brain thinking), analytical thinking refers to judgment and decisions making processes based on mental reasoning with a focus on details. Individuals with an analytical cognitive style prefer a structured and step by step analysis in the process of problem solving and are more comfortable with systematic methods of investigation. Intuition is defined as a characteristic of right brain orientation (i.e. right brain thinking). Individuals with an intuitive cognitive style prefer an open-ended approach in the process of problem solving, and perform better with ideas requiring overall assessment (Allinson & Hayes, 1996). Another important difference between the two, is that analytical thinkers are more compliant while intuitive thinkers are less conformist (Sadler-Smith, Spicer, & Tsang, 2000).

Allinson et al. (2010) compared cognitive styles of 156 founders of successful ventures with the cognitive style of 546 managers from various organizations. They came up with the following results: Managers who are successful in identifying and exploiting opportunities have a more intuitive cognitive style than the general population of managers. These successful managers had a similar level of cognitive style as senior managers and executives (Allinson, Chell, & Hayes, 2010a). This may contribute to the idea that individuals with an intuitive style have better chances to become successful (i.e. senior manager or executive). With these results they have shown that the cognitive perspective has potential to contribute to the research field of entrepreneurs.

The differences between intuition and analysis are described extensively described by Allinson and Hayes (1996), as displayed in table 1.

INTUITION	ANALYSIS
<p>Non-conscious. Learners are unaware that they are acquiring and using knowledge</p>	<p>Conscious Learners are aware that they are acquiring and using knowledge</p>
<p>Automatic Because learning and problem solving is a non-conscious process it happens automatically and without any deliberate effort or attention.</p>	<p>Intentional/deliberate Learning involves a deliberate and conscious effort to achieve understanding.</p>
<p>Non-selective Intuition is non-selective because it draws on all available data and does not involve any conscious attempt to filter out any elements that appear to be irrelevant.</p>	<p>Selective Analysis is selective because it involves attending to and thoroughly assessing only those elements of a situation that are perceived to be relevant</p>
<p>Unconstrained Intuition is unconstrained because it includes the processing of non-salient associations between elements. These associations are so weak that they are below the threshold for conscious awareness and therefore they are inaccessible to conscious control and logical manipulation.</p>	<p>Constrained Rule based/rational Analysis is constrained because it is restricted to the processing of salient associations between elements. Because learners are consciously aware of these associations, the processing of information tends to be much more rational and open to conscious manipulation.</p>
<p>Holistic (big picture), Intuition is holistic in the sense that it focuses on the big picture and considers all elements of a situation <i>simultaneously</i>.</p>	<p>Segmented (focus on parts) Analysis is a fragmented process in the sense that it involves considering all the separate parts of a situation in turn.</p>
<p>Synthesis and recognition of patterns Intuition involves synthesizing data and recognizing connections that build to provide a non-conscious understanding of the rules and principles that govern a situation.</p>	<p>Logical search for connections Analysis involves a search for connections that entails a conscious step-by-step application of rules or other systematic procedures and/or the formulation and testing of hypotheses.</p>

Table 1: The differences between analysis and intuition (Allinson & Hayes, 2010, p. 3).

Some individuals will have a clear preference for intuition or analysis, but most of the people will have a preference that lies somewhere in between. This means that their preference for processing information contains elements of both analysis and intuition. This effects is displayed in figure 2. Allinson and Hayes (1996) define five equal-sized subcategories. These subcategories; (1) intuitive, (2) quasi-intuitive, (3) adaptive, (4) quasi analyst and (5) analyst are each accounting for 20% of the population.

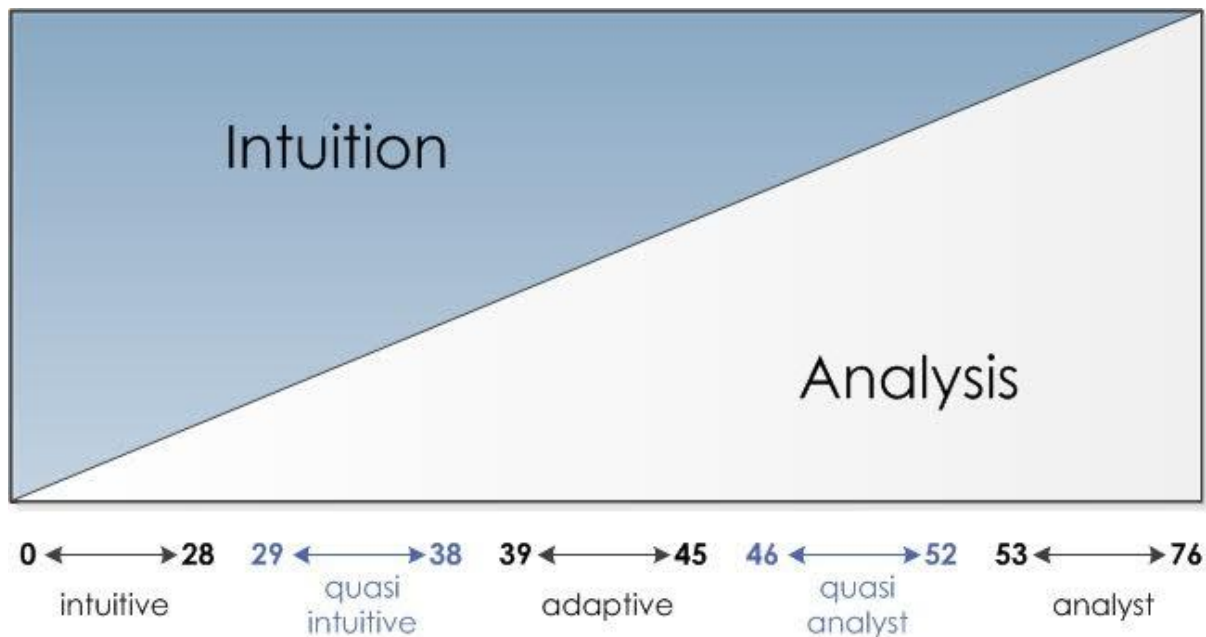


Figure 2: *The intuitive-analytical dimension of cognitive style (Allinson & Hayes, 2010)*

The characteristics for the different categories of cognitive style are extensively described by Allinson & Hayes. In order to get a better understanding of the categories the highlights are briefly described. ‘Intuitives’ often experience an immediate sense of knowing which they cannot explain. For example, they may suddenly, and without obvious reason, know the solution to a problem or suddenly see a link between apparently unrelated ideas or experiences without being aware of why they have made the connection. They feel comfortable acting on the basis of ‘gut feelings’ and do not feel a need to spend much analyzing every aspect a situation before making a judgment. ‘Quasi intuitives’ tend to have similarities with intuitive with the difference that they are more cautious when it comes to trust on their gut feeling as a basis for decision making. ‘Adopters’, do not have strong preference for one of the modes. ‘Quasi analysts’ apply rule based systemic procedures like analysts, with the difference that they also pay attention to other senses of knowing. Analyst like to collect as much information as possible in order to perceive understanding via logical step by step analysis.

Another characteristic of cognitive frameworks is described by Krueger *‘The evidence indicates that the content of an expert’s knowledge base need not differ from that of a novice, but experts typically organize or structure the content differently.’* (Krueger, 2007, p. 123). This might indicate that not the individual himself changes over time but they way he processes information does. Entrepreneurial attitudes are partly driven by deep cognitive structures, but as research suggests this attitude might change over time. Krueger (2007)

distinguishes knowledge content from knowledge structure, and states that in the process of cognitive development knowledge structures can be altered but knowledge content stays the same. This process is visualized in the figure below;

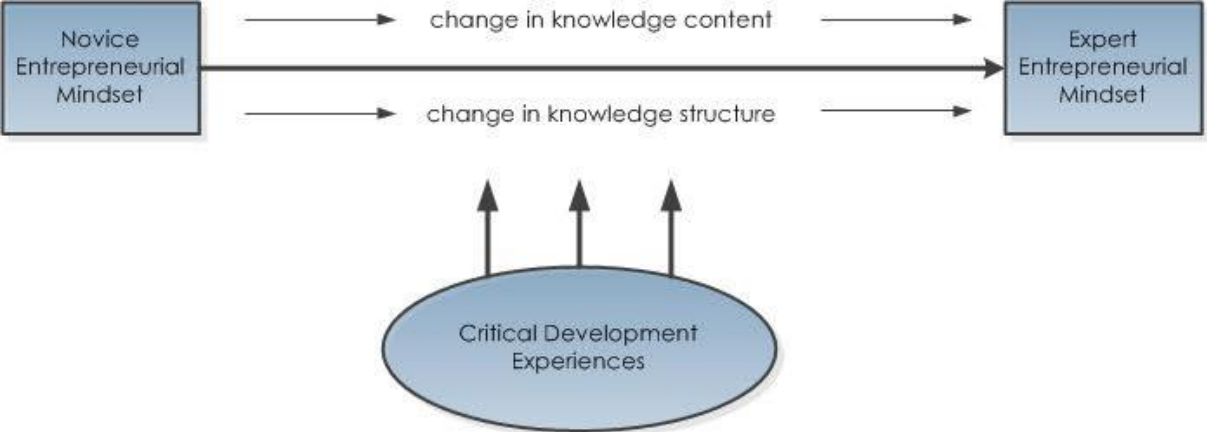


Figure 3: *Entrepreneurial cognitive development (Krueger, 2008, P 124)*

The knowledge content is the cognitive framework of an individual. The knowledge structure is influenced by experiences. Derived from the effectuation literature, we know that entrepreneurs learn along the way by making *affordable losses*, acquire new and improved means from *strategic alliances*, and getting experts in the recognition of the right contingencies.

2.2 Decision making processes

It is assumed that a more effectual approach works best in the uncertain environments (Sarasvathy, 2001; 2008). Mitchell, et al. (2002) argue that ventures often occur in fast changing and uncertain environments. This created a tendency to present 'effectual decision making' as the best mode of decision making in new venture development process. This is strengthened by Dew (2009a) who argues that experienced entrepreneurs and senior managers apply more effectuation than novice entrepreneurs and junior managers.

Uncertainty can be defined as the difference between information possessed and information that is required to perform a certain task. It's important not to confuse uncertainty with risk. In addition to Sarasvathy, Chandler (2011) argues that causation is negatively associated with uncertainty and that 'experimentation' which is a sub-dimension of effectuation is positively related to uncertainty (Chandler, DeTienne, McKelvie, & Mumford, 2011).

In order to achieve competitive advantage, the new venture development process might follow a well defined and planned path, which identifies opportunities and brings together resources efficiently. On the other hand, entrepreneurial success can also be achieved by following a path of experimentation and flexibility (Chandler, DeTienne, McKelvie, & Mumford, 2011).

Earlier research in the field of entrepreneurship and the new venture development process is based on rational decision-making models (Perry, Chandler, & Markova, 2011). These decision making models focus on the logic of causation. A causal approach is consistent with planned strategies. In contrast, Sarasvathy (2001) present the process of effectuation, which is consistent with emergent or non predictive strategies (Sarasvathy, 2001).

In addition to Sarasvathy, Chandler (2011) proposes that effectuation is formative and multi-dimensional, consisting of four different constructs. Three of these constructs (flexibility, experimentation and affordable loss) distinguish effectuation from causation. The fourth construct (pre-commitments) is shared with causation (Chandler, DeTienne, McKelvie, & Mumford, 2011). Sarasvathy defined the difference between causation and effectuation as follows: '*Causation processes take a particular effect as given and focus on selecting means to create that effect. Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means*' (Sarasvathy, 2001, p. 245).

A practical example of the difference between effectuation and causation is given by Sarasvathy. Causation can be seen as cooking, following a pre-defined recipe In which all ingredients and sequential steps are exactly described. In contrast, effectuation can be seen as cooking without a recipe, but with just one or more ingredients. The cook himself has to adopt to the ingredient. The result in this way of cooking is more uncertain and the way of working requires flexibility and some experimentation. Relying on this metaphor; it's quite obvious that a more experienced cook would obtain better results the 'effectual 'way

of cooking than a non-experienced cook. In addition, also it is likely that an experienced cook would prefer the 'effectual-way', since more flexibility could lead to more freedom in making choices.

Sarasvathy (2010) deduced the definition of an entrepreneurial opportunity, consisting of "a set of ideas, beliefs and actions that enable the creation of future goods and services in the absence of current markets for them". In effectuation the goals are the combined result of the imagination and aspirations of an individual. These are altered during the process by unexpected events, lessons from affordable mistakes and the people interacted with during the process (Read S. , Sarasvathy, Wiltbank, Dew, & Ohlsson, 2011).

Effectuation	Causation
Means based	Goal Driven
Affordable Loss	Expected returns
Strategic alliances/ Pre commitments	Competitive analysis
Exploiting contingencies	Exploiting pre-existing knowledge
Controlling an unpredictable future	Predict an uncertain future

Table 2: Differences between effectuation and causation (Sarasvathy, 2001)

When starting a new venture, following the process of effectuation, entrepreneurs are in an ongoing process. They constantly adjust their means and goals on developments during the different stages of setting up a new venture. 'Effectuation assumes that the future is unpredictable but that entrepreneurs can control a value-creating part of it through the use of a given set of means' (Mitchell, et al., 2007, p. 1047).

This process of 'creating value' is visualized by Sarasvathy and Dew (2005):

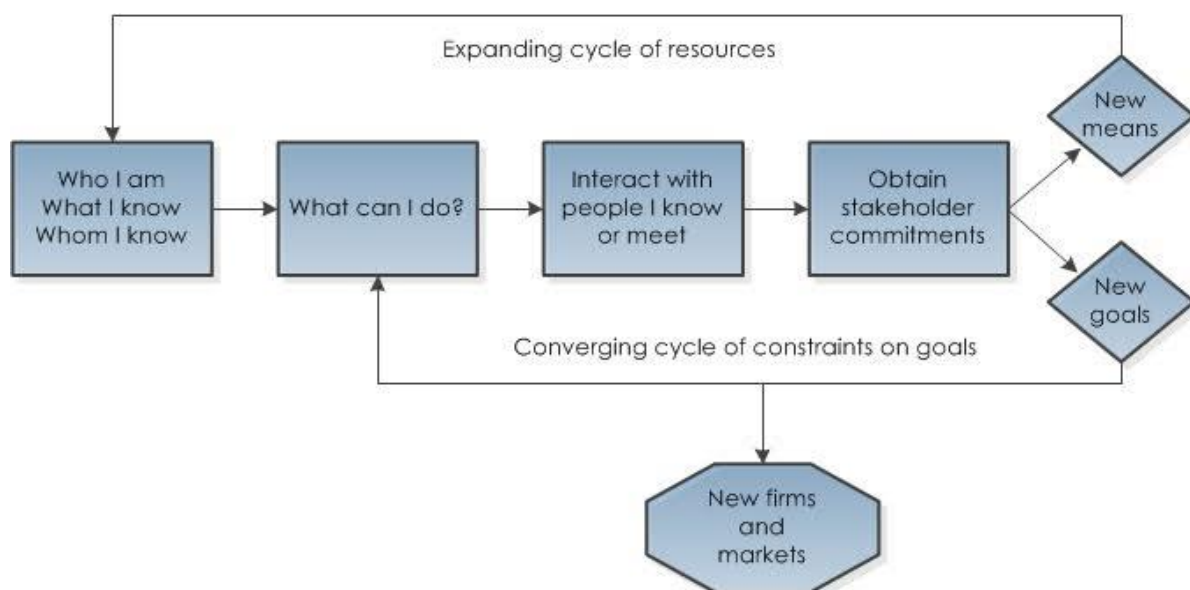


Figure 4: The process of effectuation (Read & Sarasvathy, 2005)

As explained, effectuation consist of five different sub-constructs. These are further elaborated in the following sections in this chapter.

2.2.1 Means based versus goal oriented

This principle is about the basis for taking action. In context of effectuation 'means based' emphasizes on utilizing existing means. These means are divided in three different categories: who they are, what they know and who they know (Sarasvathy & Dew, 2005). 'Who they are' emphasizes on personal characteristics, such as personality, personal background, and cognitive framework (Krueger, 2007) 'What they know' concerns their knowledge and expertise is influenced by education and experience. 'Who they know' concerns personal networks and partnerships. 'Effectuators' accept means as given and work with the available set (Sarasvathy, 2008) This does not mean that these means won't change over time. Controversy, 'learning by doing' alters and improves the means of an entrepreneur. In contrast to the means based approach, causation focuses on selecting a goal first. In popular terms the *means based* principle is also known as the *bird-in-hand* principle.

2.2.2 Affordable loss versus expected returns

This principle focuses on the attitude towards risk and resources. Causation focuses on maximizing returns by creating an optimal strategy. These strategies are based on forecasts of possible risks and future sales. Based on these measurements and expected returns, resources will be gathered (Sarasvathy, 2001). These resources could also be investors or loans. This causal way of reasoning relies on the upside potential, which in case of a worse scenario could lead to substantial losses (Dew, Read, Sarasvathy, & Wiltbank, 2009a). This makes strategies, relying on expected returns, more vulnerable in uncertain situations. In contrast, effectuation focuses on the resources that are already available. Effectual entrepreneurs only invest what they are able and willing to lose in a worst case scenario. This way of reasoning makes the effectual entrepreneur more flexible in responding to changes in the environment (Dew, Sarasvathy, Read, & Wiltbank, 2009b). Where the causal entrepreneurs need time to research possible markets, calculate the risks and gather resources, the effectual entrepreneur only needs information about the financial situation and the worst case scenario.

According to Sarasvathy (2008), an advantage of the affordable loss principle is that failures are not disastrous. This makes it possible to fail and do it over again, which gives entrepreneurs the chance to improve themselves by evaluating their investments. Enabling them to recognize failures in an earlier stage of investment and make less expensive mistakes. Another characteristic of the affordable loss principle is that the incentive of a project lies in the motivation of the entrepreneur, the incentive is the project itself, based on an individual's means and not the making of big profit. *'The effectuator prefers options that create more options in the future over those that maximize returns in the present.'* (Sarasvathy, 2001, p. 252).

It is important to note that the success of any of the approaches depends on our understanding of entrepreneurial wealth creation. If entrepreneurial success is only measured according to 'return on investments' or 'internal rate of return', crucial behaviour factors in the decision making process are ignored (Dew, Sarasvathy, Read, & Wiltbank, 2009b).

2.2.3 Strategic alliances and pre-commitments

The third principle is about the attitude towards outsiders. The effectual approach relies on pre-commitments and forming strategic alliances rather than focus on competitive analysis. The logic behind this approach is that entrepreneurs are in control with the alliances they form and the pre-commitments they make. Enabling them to control the future instead of having to predict the future (Chandler, DeTienne, McKelvie, & Mumford, 2011). Pre-commitments help to reduce uncertainty by spreading responsibility and risks with all stakeholders involved. Stakeholders could be customers, suppliers or other strategic partners. Furthermore, investments could be shared in order to make new ventures affordable or at least within the boundaries of affordable losses. Another advantage of strategic alliances is the share of knowledge and other resources, or in terms of effectuation; means (Sarasvathy, 2008).

Chandler (2011) argues that '*pre-commitments*' is a shared principle with causation. In contrast, Sarasvathy (2008) argues that there is a difference in the selection of partners. She believes that partners in an effectual partnership, select themselves and thereby shape the venture into what it is. In causal relationships partners are selected to fit a given goal. In popular terms the *Strategic alliances* principle is also known as the *patchwork-quilt* principle.

2.2.4 Exploiting contingencies

The fourth principle is about the attitude towards unexpected events. Causation models are preferable when pre-existing means, such as particular technological knowledge, form the source of competitive advantage (Sarasvathy, 2001). In uncertain and changing environments, where unexpected contingencies arose over time, effectual approaches might be preferable. According to Chandler (2011), the strength lies in the flexibility of the entrepreneur. By embracing unexpected events as opportunities instead of problems, effectual entrepreneurs create new and unexpected business opportunities. By looking at a problem as a building block it can be utilized as a resource for a new-venture. In every new venture the entrepreneur already has some building blocks (i.e. means), together with the building blocks acquired along the way the venture is build (Read S. , Sarasvathy, Wiltbank, Dew, & Ohlsson, 2011). This practical example also illustrates that not all the building blocks are known at the start of a new venture, which gives the outcome an open end. In popular terms the *exploiting contingencies* principle is also known as the *lemonade* principle.

2.2.5 Controlling an unpredictable future

The fifth principle is about the view of the future. Causation focuses on the predictable aspects of the uncertain future. This means that the future is controllable as far as it is predictable. In contrast, the logic behind effectuation is to control the future so prediction is not necessary. As Sarasvathy (2011, P. 252) states; 'To the extent that we can control the future we, we do not need to predict it'. In causal reasoning the market is seen as independent from the venture or entrepreneur, in which it is the goal of the entrepreneur to gather as much market share as possible. In effectual reasoning the entrepreneur is seen as the maker of the market. In popular terms the *controlling an unpredictable future* principle is also known as the *pilot-in-plane* principle.

2.3 Cognition and effectuation in perspective

From the perspective of marketing and strategy management (de Wit & Meyer, 2010) similar processes are described. However they focus more on strategic decision in more developed stages of ventures the underlying principles seem to be similar. The underlying assumptions are described in the table below. They have shown some similarities between the strategic planning perspective and causation, for example; intentionally designed and goals based. Whilst on the same time strategic planning shows similarities with an analytical cognitive style such as: first think, then act. These link are further described in the hypotheses.

	Strategic planning perspective	Strategic instrumentalism perspective
Emphasis on:	Deliberateness over emergence	Emergence over deliberateness
Nature of strategy:	Intentionally designed	Gradually shaped
Nature of formation:	Figuring out	Finding out
View of the future:	Forecast and participate	Partially unknown and unpredictable
Posture towards the future:	Make commitments, prepare	Postpone commitments, remain flexible
Formation process:	Formally structured and comprehensive	Unstructured and fragmented
Formation process steps:	First think, then act	Thinking and acting intertwined
Decision-making:	Hierarchical	Dispersed
Decision-making focus:	Optimal resource allocation and coordination	Experimentation and parallel initiatives
Implementation focused on:	Programming (organizational efficiency)	Learning (organizational)
Strategic change:	Implemented top-down	Requires broad cultural and cognitive shifts

Table 1: Strategic planning versus strategic instrumentalism perspective (de Wit & Meyer, 2010, p. 128)

3. Hypotheses

In order to answer the research question, hypotheses are formulated. The influence of entrepreneurial cognition, is linked to the dimensions of the entrepreneurial decision making process in order to define the expected directions of the influences. Hypotheses are formulated in case a relation is expected. These hypotheses are formulated as 'zero-hypotheses' indicating that no relation is expected. They will all be tested on both the effect with causation and effectuation.

3.1 H1 Cognitive style and the decision making process

Causation processes are effect dependent, effectuation processes are actor dependent. Therefore, causation processes are most suitable when exploiting knowledge, controversially effectuation is most suitable when exploiting contingencies (2001) Analysts tend to focus on knowledge in order to break problems. They like to collect as much knowledge as available in order to make a clear step-by-step analysis. Intuitives tend to learn by doing, in which it is possible to react on contingencies. Therefore it is expected that 'intuitive' thinking is related to effectuation and less to causation.

H1₀: The cognitive characteristic's of an individual does not significantly influence the preference in the decision making process.

The expectations of its hypotheses are partly separated by the different constructs of effectuation. They are further elaborated in the hypotheses connected to the underlying principles of effectuation and causation. The underlying principles of effectuation are expected to influence H1. This first hypothesis can be seen as the sum of hypotheses 2A, 2B, and 2C.

3.2 H2: Cognitive style and underlying constructs

The literature about cognition is compared with the five principles of effectuation. In some, but not all, similarities are found. For the *affordable loss* principle there seem to be no specific and distinct connections, other than the ones shared with the concept as a whole. This is in line with the Chandler (2011), who argues that the *strategic alliances and pre-commitments* principal is shared among causation and effectuation.

3.2.1 Means based versus goals oriented

Allinson and Hayes (1996) argue that individuals with an intuitive cognitive style often experience an immediate sense of knowing things which they cannot explain. This is an unconscious process in which they may suddenly know the solution to a problem or see links between apparently unrelated patterns. These ideas, solutions and links are embedded in the means or more specifically in the 'what I know' of the person. They are already present before goals are generated. Furthermore intuitive rarely feel a need to analyze all aspects a situation before making a judgment. Therefore it is expected that 'intuitive' thinking is related to the means based principle and less to the goals oriented approach. .

H2A: The cognitive characteristic's of an individual does not significantly influence the preference for a means- or goals based approach in the decision making process.

3.2.2 Exploiting contingencies

Individuals with an intuitive cognitive style prefer an open-ended approach in the process of problem solving (Allinson, Chell, & Hayes, 2010a). In terms of the *leveraging contingencies* construct, effectual entrepreneurs tend to incorporate and exploit unexpected events or environmental changes into their ventures (Read S. , Sarasvathy, Wiltbank, Dew, & Ohlsson, 2011). In this way new-ventures become an adventure with an open end. To be successful at exploiting contingencies this, flexibility towards occurring events is crucial (Chandler, DeTienne, McKelvie, & Mumford, 2011). Combining these theories, it is expected that students with a intuitive cognitive style prefer effectuation. Which brings up the following hypotheses:

H2B: The cognitive characteristic's of an individual does not significantly influence the attitude towards contingencies in the decision making process.

3.2.3 Control the unpredictable future versus prediction of the future

Analytical thinkers are more compliant while intuitive thinkers tend to be less conformist (Kickul, Gundry, Barbosa, & Whitcanack, 2009). Sarasvathy (2008) states that effectual entrepreneurs try to control the environment and therefore do not need to predict it. This means they are not compliant with the existing situation and try to alter it. In contrast to causal entrepreneurs who try to predict the environment they already confirmed themselves with, because they are not trying to control it. Entrepreneurs with an intuitive cognitive style are more comfortable towards unexpected. In contrast with causal entrepreneurs, who respond to the unusual by searching for more information in order to make sense of the situation (Krueger, 2007).

H2C: The cognitive characteristic's of an individual does not significantly influence the view on the future in the decision making process.

3.3 H3 The influence of education

In the questionnaire students will be asked if they are familiar with the concept of effectuation and to what degree. It would be quite interesting to see if these students have a preference for effectuation in the decision making process. As Krueger (2007) argues; knowledge structures can be altered by critical development experiences. Becoming familiar with the concept of effectuation through education can be seen as a development experience. Whether this is a critical development will be tested by the following hypotheses.

H3₀: Familiarity with the concept of effectuation does not significantly influence the preference for effectuation in the decision making process.

4. Methodology

Because the research question emerged from a research gap in literature, the research method is theory oriented. *'In theory oriented research the starting point is literature'* (Van Aken, Berends, & Van der Bij, 2009, p. 33). The second choice is whether to use quantitative or qualitative research methods. Because the research focuses on a clear cause-and-effect relationship (Babbie, 2007), generalizable results from a large sample are desired. Quantitative research is especially useful for studying large samples (Babbie, 2007). Quantitative research is relatively quick because it can be acquired digitally and analysis is less time consuming using statistical software.

4.1 Sample and Setting

Because it is not possible to study the whole population a sample is made (Babbi, 2007). In this study the sample will be bachelor and masters student from applied sciences school (HBO) and the universities of Twente en Münster. A total of 759 filled in the questionnaire. In the first place students are selected because they are close to our personal network and therefore easy to reach. Furthermore, the use of students in order to measure the *'entrepreneurial decisions-making'* process is justified in earlier research. Dew et al (2009a) found similar results between students and entrepreneurs, while measuring the decision making process of novice entrepreneurs. And more general, Bateman and Zeithaml (1989) state that students and managers respond similarly when interviewed about strategic decisions. In addition; Perry (2011, p. 13) states: *'entrepreneurs look similar to the population from which they arise'*. Also students who graduated in the past year were asked to fill in the questionnaire. Initially, there are no additional requirements for respondents. Respondents who did not meet the required educational level were deleted, also some double cases were found and deleted.

4.2 Variables and measurement tools

In this research the cognitive style of the individual is the independent variable. The preference for effectuation in the decision making process and the preference for causation in the decision making process are the main dependent variables. The third dependent variable is measured by the extent to which individuals are familiar with the concept of effectuation. The four variables are measured separately by three different parts of the questionnaire. These are further elaborated in the following paragraphs.

The cognitive style of an individual is measured by the cognitive style index from Allinson and Hayes (1996). There are several alternatives measuring different scales of cognitive style, such as The Rational Experiential Inventory (Epstein, Amherst, Pacini, Denes-Raj, & Heirer, 1996). However, none of them is as highly cited and supported as the CSI (Kickul et al., 2009). Allinson & Hayes (1996) claim that the CSI has excellent reliability in terms of internal reliability temporal stability. This is confirmed by Sadler-Smith et al. (2000) whom investigated outcomes on a sample of 1050 individuals, and extensively reported the factor analysis, the construct validity and the concurrent validity. Furthermore, the CSI is easy to use and gives clear directions for the interpretation of results.

The CSI is a 38-item self support inventory. Respondents are asked to answer the questions on a trichotomous scale (true, uncertain, false). In order to improve reliability, reverse coding

is applied. Depending on the question, a score of 0, 1 or 2 is given. Of the 38 questions, 17 items are negatively scored (true = zero), the remaining 21 items are positively scored (true = two). In theory a total score can range from 0 to 76, in which a higher score indicates a very strong preference for an analytical way of thinking.

There are different ways to deal with the outcomes of the CSI. Allinson and Hayes (2010) provided a model with different categories of cognition, namely; (1) intuitive, (2) quasi-intuitive, (3) adaptive, (4) quasi analyst and (5) analyst. These are each accounting for 20% of the population. Next to these categories an alternative interpretation will be used. A dichotomous scale is created, in which the distribution is split up by the median, resulting in two groups; '*analysts*' and '*intuists*'. The questionnaire can be found in *Appendix I: The C*.

4.2.2 Decision making process questionnaire

The second part of the questionnaire focuses on the dependent variable; effectuation. The main body of research concerning effectuation is based on qualitative research in which think aloud protocols are used (Chandler et al., 2011). These think aloud protocols are used as a basis to create the questionnaires. Brettel et al. (2012) conducted empirical research on the effects of the decision making process, in the context of R&D. In this research a scale is developed to measure four of the five constructs of the decision making process. This scale is reviewed by Wiltbank et al. (2009) who also added a scale for the fifth construct. In this part, a business case is presented. Respondents are asked to imagine themselves within the context and answer 25 multiple-choice questions, according 7-point Likert-scale items (Babbie, 2007).

The business case and questions are altered to fit in a context, suitable and imaginable for students. Also is discussed whether to use a six or seven point Likert-scale. The advantage of a six-point Likert scale is, that respondents are forced to choose a side. Which in turn forces respondents to think a bit longer about the question. Although this might lead to greater deviations from the mean, answers might not always be in line with reality. Because of this and since the questions are already validated, the 7-point scale is maintained. There are twelve questions measuring the degree of effectuation used and thirteen questions measuring the degree of causation. It is important to note that effectuation and causation are different concepts and that they do not measure the same. The actual questionnaire can be found in appendix II.

4.2.3 Additional Questions and bio data

Together with the five parts of the questionnaire, extended bio-data and control variables were gathered. In this part students is also asked whether students they are familiar with the concept of effectuation. The influence of these control variables will be investigated during the analysis of the data and could be used as control variables in case an influence in the effects of the expected.

4.3 Operationalization

The data was collected by a group of four students as part of their master thesis. All students worked on their thesis individually, but since all subjects are related to the decision making process, acquiring the data could be a joined task. The questionnaire consisted of five parts, of which only the three earlier mentioned are further described. The upside of working together was the bundling of power in gathering as much responses as possible, resulting in more than 750 useable responses. The downside was the length of the questionnaire and the time needed to fill in all the questions, which resulted in a high number of uncompleted questionnaires.

4.3.1 Data collection

Most of the data is gathered through a survey website. To find the most suitable option several sites are compared and tested. Survey-monkey turned out to be the most reliable, user-friendly and affordable option. Also it had the best options to extract data and transform it into appropriate formats. The link to the survey is distributed by e-mail and through social networks. Survey monkey offered an option to send reminders to the persons who did not respond yet. In order to reach more respondents hardcopies were distributed among college-students in the library, and in class. Survey-monkey offered the possibility to manually enter these cases.

4.3.2 Pilot

Before the final questionnaire was distributed a pilot was conducted. Relatives and fellow students were asked to fill in the pilot, read the questions carefully and extensively comment on it. Most of the relatives were selected because they have experience in research, are PhD-students or native English speakers. The most occurring and important suggestions are listed below.

- Suggestions on the understandability of the questions and the case
- Improvements in spelling and grammar
- Comments on the length of the survey
- Technical improvements for the digital environment
- Uncertainty about the interpretation of some questions

After improving this, some tests with the pilot data were executed. Giving us some suggestions to improve the questionnaire in order to improve the analysis for the final version. Next to that, running this pilot improved our own capabilities in acquiring and analyzing the data, which eased the later processes.

4.4 Data analysis

Before we could commence with the analysis, some cases had to be deleted. Through the site of Survey monkey it was already possible to extract these cases. Some had to be excluded because of couple respondents did not meet the required level of education. Other cases were extracted because respondents filled in the questionnaire too fast, indicating that they did not thoroughly read the cases and questions.

After extraction, the data was transferred into an SPSS Database. In order to prevent chaos and make the dataset more clear, the set was trimmed and non-relevant variables are excluded. Also the labels are improved. Some variables had to be recoded because of the reverse coding. New variables are computed for the mean scores of causation, effectuation and their underlying principles. The new variables are controlled by a principal component analyses in order to see whether they are measuring the same.

The cognitive style index is tested for the normality of distribution. However the distribution of the independent variable does not influence the choice of tests, it is useful to find influential outliers or concentrated values (Field, 2009). In order to validate the scale, the inter-reliability is tested by Cronbach alpha. Because the CSI consists of a relative high number of questions with a low variance, a high inter-reliability is expected.

The questionnaire on the decision making process is tested for the normality of the data. This is important to determine which tests can be used for the analysis of the data. In case the test is normally distributed parametric tests (T-tests and Anova's) and correlation (Pearson) can be used. In case the data is significantly different from a normal distribution alternative tests will be used. In order to control the reliability of the scales the questions and different underlying principles of effectuation and causation are separately tested on Cronbach's alpha's. A Cronbach's alpha higher than 0.7 is desirable in order to have a reliable scale. (Field, 2009)

The research questions will be answered by the rejection or acceptance of the zero-hypotheses. Therefore, the data of the questionnaires will be compared. First the means among the categories of Allinson and Hayes will be compared. Further performed test will rely on the outcomes of earlier test. The mean scores on effectuation will be tested on the degree to which students are familiar with the concept of effectuation.

4.4.1 Constructs of effectuation and causation

For a better understanding of the data analysis and result section, it is important to know that effectuation and causation are not measuring the same and are no contradictions. Chandler et al. (2011) argue that effectuation is a multidimensional formative construct and causation is a uni-dimensional construct. This means the underlying principles of causation are influenced by the total construct of causation. In effectuation, the underlying principles have effect on the total construct. The constructs are displayed in table 3 and visualize the relations between the constructs.

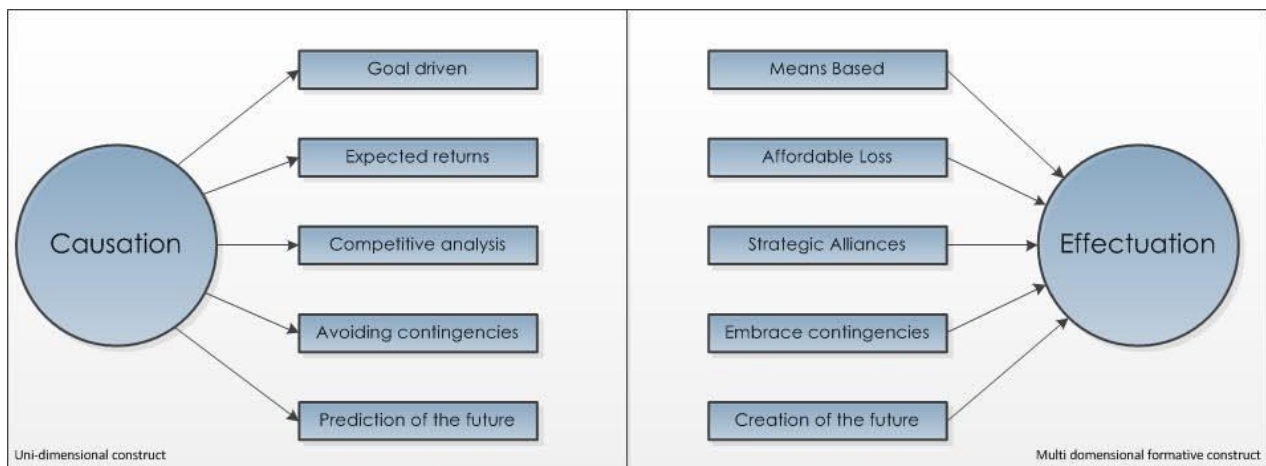


Table 2: Construct of effectuation and causation

5. Results

In this chapter the results of the data from the questionnaires are given. First the general descriptions of the sample are given. Then the data of the CSI and effectuation causation questionnaire are separately tested for the quality of the data. Finally the data is analyzed and compared among the constructs. In the last paragraph the hypotheses are tested.

5.1 Descriptive statistics

The questionnaire is filled in by a total of 759 students, from which 534 are complete and usable questionnaires. From the sample 320 (60%) respondents are male. 136 respondent (25%) are master students and 294 (55%) are bachelor students (applied sciences and university). The other 20% are PhD-students who recently graduated or pre-master students. From the sample, 14% of the students turned out to be familiar with the concept of effectuation.

5.1.1 Missing data

There are several options to deal with missing values. Missing points can be replaced or excluded (Field, 2009). Replacement includes replacing missing values by the average value of other cases. For exclusion there are two options given by SPSS. List-wise deletion; in which all data from a case with missing values is removed. Next to that, pair-wise deletion: in which loss of data is decreased by using each pair of variables available. Replacing would standardize the data which is not favorable. In order to maximize statistical power of the analyses, as many cases as possible will be measured. Therefore missing cases will be deleted pair-wise.

5.2 Distribution of the Cognitive Style Index

The dataset concerning the cognitive style index represents the results from 692 valid cases. The mean score of the respondents on the CSI is 39,77 which is relatively close to the theoretical mean of 38.5. Also the results are quite similar to the results of earlier test with students (Allinson & Hayes, 1996; Chaston & Sadler-Smith, 2012). The descriptive data is displayed in appendix IV-A.

5.2.1 Test of normality

The data of the CSI is tested on the normality of distribution in order to search for influential outliers or concentrated values. According to Field (2009) Z-scores between -1,96 and 1,96 indicate a normal distribution. Z-scores are the results of the skewness divided by the standard error (SE). As shown in appendix IV-A, cognitive style is negatively skewed with a value of -.287 (SE = .093) Resulting in a z-score of -3.09. The kurtosis shows a value of -.366 (SE= .186), which gives a z-score of -1,967. Both z-scores just fall out of the preferred scores (Field, 2009). Indicating that the distribution is not normal. Also the Kolmogorov-Smirnov test and the Shapiro-Wilk test are used to test the data. Both turned out to be significant ($P < .05$), which tells us that the results are significantly different from a normal distribution. In contrast with the test on normality, the histogram (Appendix IV-B) shows an image of a distribution close to a normal one. Furthermore, in the Q-Q plot the results are very close to the line of a normal distribution. The box-plot displays an symmetric image, which indicates that the data is distributed quite normally. Also no influential outliers or highly (unexpected) concentration is found.

5.2.2 Scale validation

Because the scale of the CSI has a relatively high number (38) of items, a score of at least 0.8 is desired to indicate internal consistency (Cortina, 1993). As presented in the table in appendix IV-C, the evidence of internal consistency is given by a Cronbach's alpha score of 0.82, which is excellent.

5.2.3 Subcategories of the CSI

The next scheme shows the scores of the students according to the intuitive-analytical dimensions of Allinson and Hayes (2010). The range of the sub-categories originally is constructed by a 20% distribution of the scores, based on earlier research. (see chapter 4). In the current sample we see a different distribution of the scores. Most notable is the small number analysts, with 14.3%, just 99. Significantly more students turned out to be 'quasi intuitive' or 'adoptive'. (Appendix IV-D)

	Intuitive	Quasi intuitive	Adoptive	Quasi analyst	Analyst
N=	143	155	155	140	99
% of total =	20,7%	22,4%	22,4%	20,4%	14,3%

Table 3: Scores on the intuitive analytical dimensions

5.3 Distribution of the effectuation questionnaire

The dataset concerning the effectuation questions represents the results from 568 valid cases. The means score for effectuation is 4.94, which is quite high compared to the theoretical mean of 4.5. Also the mean score for causation is quite high with 4.9. The mean scores for the underlying principles are displayed in table below. More in depth statistics are described in appendix V-A.

Effectuation		Causation	
Means Based	5.32	Goal driven	5.16
Affordable Loss	4.82	Expected returns	5.38
Strategic Alliances	4.93	Competitive analysis	5.05
Embrace contingencies	5.12	Avoiding contingencies	4.29
Creation of the future	5.36	Prediction of the future	5.08

Table 4: Mean scores for effectuation/causation

5.3.1 Test of normality

Because parametric statistical methods require that dependent variables are normally distributed, the data from the causation and effectuation questions is tested on the normality of distribution. (Field, 2009) The data on effectuation is negatively skewed with a value of -.700 (SE = .103) Resulting Z-score for skewness of -6,79 The kurtosis shows a value of 4,38 (SE= .205) resulting in a z-score of 21,37. Both are not within a desired range for z-scores between -1,96 and 1,96 for normal distribution (Field, 2009). Also the distribution of the items on causation do not meet the requirements for a normal distribution, with a negative skewness (-,598. SE = 103) and a positive Kurtosis (2,186. SE = ,205). This is in line with significant results on the Shapiro Wilk test for both effectuation and causation. For more in depth descriptive statistics see Appendix VI-a. However, Field (2009) argues that tests for normality have their limitations when dealing with a large sample size. In large samples it is very easy to get significant deviations from normality with small deviations in

the dataset. When screening the plots Appendix VI, distributions close to a normal distribution are displayed. However, a closer look to the box plots shows a relative large amount of outliers with low scores. The underlying principles are also tested for the normality of distribution, both show similar deviations. A solution could be the extraction of extreme observations. No specific cause for these outliers can be proved and therefore it is not an option to delete cases, since this would unnaturally change the (Schmider, Ziegler, Danay, Beyer, & Bühner, 2010).

5.3.2 Scale validation

The validation of the scale is tested by measuring the Cronbach's alpha scores.(appendix V-D) This is tested for the relevant underlying principles of both causation and effectuation. The Cronbach's alpha for effectuation is .612, which is below the required 0.7. However, Kline (1999) reasons that when dealing with tests concern psychological or sociology values, even scores below .7 can be expected . This is because of the diversity of constructs. Nevertheless, a higher score is desirable. This score can be improved by deleting Q 18 (Appendix III), resulting in a score of 0.652. The score for causation is .781, which is assumed to sufficient. By deleting Q19 the score could be improved to .784 and deleting Q22, could lead to a score of .789. These improvements would be negligible and therefore all questions will be taken in account when measuring causation. The Cronbach alpha scores of the underlying principles are displayed in the following schedule. Low Cronbach's alpha are expected because the principles consist of just two to four questions.

	Effectuation		Causation
Means Based	.017	Goal driven	.492
Affordable Loss	.334	Expected returns	.458
Strategic Alliances	.351	Competitive analysis	.664
Embrace contingencies	.551	Avoiding contingencies	.498
Creation of the future	.436	Prediction of the future	.324

Table 5: Cronbach's alpha effectuation/causation

The means bases principle shows a Cronbach's alpha of .01, this is caused by Q18 (I start my new venture without defining a clear target). Deleting this question, results in a Cronbach's alpha of .240. Because Q18 negatively correlates (-.064) on with the other two questions (Q9 and Q21), it is obviously not measuring the same effect. For further tests q18 will be dropped. Cronbach's alpha is useful to detect errors in the scale but only gives estimates of internal consistency. The Cronbach's alpha's for the causal questions are significantly higher than the ones for the effectuation questions. This indicates that these are more reliable, which could be taken in account when interpreting the results from the analysis.

5.4 Analysis

In order to test the hypotheses several tests are executed. As a result of earlier tests we know that the dependent variable, the outcome of the effectuation/causation test, is not normally distributed. Therefore parametric tests are not preferable. However, Schmider et al. (2010) conducted extended research on the robustness of t-tests and anova's. They argue that deviations from test with non-normal distributed data compared test with normally distributed data are small. Especially in larger samples. For this reason, the data is analyzed by comparing means (parametric) but outcomes are interpret with caution and results are verified by correlation tests for non-normally distributed data.

In line with Perry (2011) and Chandler (2011), the data shows that effectuation and causation are no opposites and therefore not measuring the same. Therefore, the effects of cognition on effectuation and causation are measured separately.

5.4.1 Comparing means

In order to visualize and create some understanding on the data, mean scores on the principles of effectuation and causation are compared among the categories of Allinson and Hayes. (appendix VI-A)

	Intuitive	Quasi intuitive	Adoptive	Quasi analyst	Analyst
Means based	5.18	5.34	5.23	5.40	5.42
Affordable Loss	4.32	4.55	4.86	5.14	5.14
Alliances	4.70	4.91	4.96	5.01	5.03
Embrace contin.	5.40	5.27	4.96	5.12	4.93
Creation of the	5.65	5.44	5.33	5.25	5.23
Total	5.11	5.14	5.05	5.18	5.11

Table 6: Categorized mean score of effectuation

Because this is only a test of comparing means. These results have to be interpret with caution. Some interesting deviations become visible. According to these results, the mean of effectuation in total is not influenced by the category of cognition. Clear differences are visible for 'affordable loss' and 'strategic alliances' in which higher scores are represented on the right side of the table (i.e. the more analyst the higher the mean score). The constructs of 'Embracing contingencies' and 'Creation of the future' show an opposite direction, in which higher level of intuition results in higher mean scores. The 'means based principle' shows higher means on the analyst, but differences are small.

	Intuitive	Quasi intuitive	Adoptive	Quasi analyst	Analyst
Goal Driven	4.69	5.06	5.33	5.21	5.16
Expected return	5.18	5.23	5.47	5.48	5.38
Analysis	4.79	4.90	5.14	5.02	5.39
Avoid conting.	3.85	4,13	4.51	4.38	4.41
Prediction	4.89	5.01	5.09	5.10	5.29
Total	4.68	4.86	5.11	5.04	5.19

Table 7: Categorized mean score of causation

5.4.2 Spearman Rho Correlations

Because the distribution of the dependent variable is not normally distributed, correlations are measured by Spearman's Rho test (Field, 2009). In line with the literature, negative correlations are expected between cognition and the overall score on effectuation. A low score on cognition means a preference for an intuitive approach. In contrast, causation is expected to positively be correlated with the score on cognition. Absolute values between .00 and 0.19 indicate a very weak correlation, scores between .20-.39 indicate a weak correlation (Field, 2009). More in depth statistics about the correlations are described in Appendix VI-B.

The correlation between effectuation and cognition is .075 with a (sig. 074), which is non-significant and very weak. The correlation between the underlying principles of effectuation are described in the table below. Significant positive correlations are found in the '*affordable loss principle*' and in the '*strategic alliances principle*'. Significant negative correlations are found in the '*embracing contingencies*' and '*creation of the future principle*'. The '*means based principle*' shows no significant correlations. The directions of the correlations is in line with the results of the compared means.

	Effectuation		Causation
Means Based	0.73 (.082)	Goal driven	.172 (.000)
Affordable Loss	.266 (.000)	Expected returns	.113 (.007)
Strategic Alliances	.113 (.007)	Competitive analysis	.191 (.000)
Embrace contingencies	-.179 (.000)	Avoiding contingencies	.172 (.005)
Creation of the future	-.158 (.000)	Prediction of the future	.121 (.000)

Table 8: Correlations between cognition and causation/effectuation

The correlation between causation and cognition is .231 ($p < .01$) which is in line with the expectation that causation is positively related to an analytical cognitive style. As displayed in table 8, all underlying principles show a weak but significant correlation with analytical style.

5.4.3 Mann-Whitney U tests

In order to further explain the relations, a Mann-Whitney U test is performed. (Appendix VI-C) Because the non-normal distribution of the data this test is used as an alternative for the eventually preferred independent sample t-test (Field, 2009). In order to measure the difference between an intuitive style cognitive style and an analytical cognitive style a new variable is computed. Individuals who score higher than the median score (41) are considered to be 'analysts', the other 50% of the sample, scoring lower are considered to be 'intuists'. The scores of both groups are then compared by their score on effectuation and causation. The test gives clear suggestions for the acceptance or rejection from the 0 hypotheses (Appendix V-II) The assumptions based on the Mann Whitney U-test are displayed in the table 8. As with other tests, clear distinction has to be made between Effectuation and causation.

Hypotheses	Based on effectuation	Based on Causation
H1: Decision making process:	Retain	Reject
H2A:Means- vs goals based:	Retain	Reject
H2BContingencies	Reject	Reject
H2cView on the future	Reject	Reject

Table 9: Results on the Mann Whitney U. test

5.4.4 Familiarity with effectuation

Students are asked whether they are familiar with the concept of effectuation. There are three options for answering this question: 'Yes', 'No' and 'Can't remember'. The results can be found in appendix VII

The mean scores on effectuation between the groups are displayed in table 9. The underlying principles are separately tested but since effectuation is a formative construct the reasons for the deviations might be declared by the underlying principles. Significant results are found in the 'contingencies' principle.

	Yes	No
Effectuation total	5.30	5.08
Means Based	5.60	5.44
Affordable loss	4.89	4.74
Alliances	5.13	4.98
Contingencies	5.43	4.98
Creation of the F.	5.34	5.37

Table 10: Familiarity with effectuation

5.5 Testing the hypotheses

The results from earlier paragraphs in this chapter will be described in the context of the hypotheses. The outcomes of the different analyses is combined for each hypotheses

5.5.1 Effects of cognition in the decision making process

As described in chapter three, it is expected that cognition influences decision making. By means, that individuals with a more analytical cognitive style are expected to have a preference for causation and less for effectuation. The following hypotheses is tested:

H1₀: The cognitive characteristic's of an individual does not significantly influence the preference in the decision making process.

Comparing the mean scores on effectuation among the groups of cognitive style does not result in significant deviations. A very low correlation score of ,075 (sig. 074), turned out not to be significant. Based on the relation with effectuation solely the zero hypothesis cannot be rejected. Comparing the means based on the preference for causation shows significant results, in which analytical thinkers have a strong preference for effectuation. A positive correlation of ,231 ($p < .01$) is weak, but significant. The Man Whitney U test shows no significant deviations based on the effectuation component but claims that the hypotheses should be rejected based on the causation component. Therefore the H1 is rejected. The interpretation of the rejection by only the 'causation-component' will be further explained in the discussion in the chapter 6.

5.5.2 Cognition and the underlying principles in the decision making process

H2A: The cognitive characteristic's of an individual does not significantly influence the preference for a means- or goals based approach in the decision making process.

There are some, but no linear deviations in the mean score of the 'means based' principle. This is in line with the non-significant correlation of 0.73 (sig. 082). Some small deviations are visible in the preference for causation by analysts. A correlation score of .172 ($p < .01$) shows that a goals based approach is preferred by analysts. The Man Whitney U test shows no significant deviations based on the 'means based' component but claims that the hypotheses should be rejected based on the component of 'goal driven'. As a result from all tests mentioned hypothesis H2A is rejected.

H2B: The cognitive characteristic's of an individual does not significantly influence the attitude towards contingencies in the decision making process.

The mean scores on the 'embracing contingencies principle' show clear deviations, in which intuitive individuals have a strong preference for the effectual approach. This is confirmed by relative weak but significant negative correlation score of $-.179$ ($p < .01$). The mean scores on the 'avoiding contingencies principle' show similar deviations but in the opposite direction. This is confirmed by relative weak but significant positive correlation score of $.178$ ($p < .01$). The Man Whitney U test shows significant deviations for both components. As a result from all tests mentioned hypothesis H2B is rejected.

H2C: The cognitive characteristic's of an individual does not significantly influence the view on the future in the decision making process.

Also the mean scores on the 'creation of the future' shows some deviations, in which intuitive individuals have a preference for the effectual approach. This is confirmed by relative weak but significant negative correlation score of $-.158$ ($p < .01$). The mean scores on the 'prediction of the future' show similar deviations but in the opposite direction. This is confirmed by relative weak but significant positive correlation score of $.121$ ($p < .01$). The Man Whitney U test shows significant deviations for both components. As a result from all tests mentioned hypothesis H2C is rejected.

5.5.3 Familiarity and effectuation

H3₀: Education on the concept of effectuation does not influence the preference for effectuation in the decision making process.

Students familiar with the concept of effectuation, have a mean score on effectuation of 5.30, students not familiar with the concept have a mean score of 5.08. Because of the small size of the sample no other tests than the comparing the means showed significant results. Based on the difference in the means the hypotheses is rejected.

6. Conclusion, discussion and limitations

In the conclusion the final results and answers to the research question are presented. First the outcomes from the literature review are briefly described, followed by the results of the quantitative research and the rejection or acceptance of the hypotheses. These results will then be discussed in the discussion. Finally, several suggestions for further research are given.

6.1 Conclusion

This research attempts to make a contribution to the theory of effectuation by establishing a new link between cognitive style and effectuation. The research question addresses the effects of the cognitive preference of individuals on the decision making process. It is stated as follows: *'To what extent are the preferences in decision making processes of effectuation and causation influenced by the cognitive characteristics of an individual'?*

Brigham et al (2007) argue that cognitive style is considered to be a pervasive characteristic that is stable over time. Therefore it is assumed that, in case cognition influences the decision making process, these influenced preferences are stable over time. In the decision making process two different approach are presented, namely; effectuation and causation. As mentioned before: *Causation processes take a particular effect as given and focus on selecting means to create that effect. Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means'* (Sarasvathy, 2001, p. 245). As concepts, effectuation and causation show contradictions, but it is important to mention that both can be applied at the same time. It is assumed that a mo

.re effectual approach works best in the uncertain environments (Sarasvathy, 2001; 2008). Mitchell, et al. (2002) argue that ventures often occur in fast changing and uncertain environments. This created a tendency to present 'effectual decision making' as the best mode of decision making in new venture development process. This is strengthened by Dew (2009a) who argues that experienced entrepreneurs and senior managers apply more effectuation than novice entrepreneurs and junior managers. The combination of the pervasive nature of cognition and the 'success' of effectuation in the new venture development process in leads to the relevance of this research. If a preference for 'effectuation' is pre-determined by hardly alterable factors such as the cognitive style of an individual ; it would be possible to predict which individuals have better changes to become successful entrepreneurs in uncertain environments. This also raises another question; can the level effectuation applied, be influenced by factors other than experience?

Some expectations are revealed on the relationship between the decision making-process and entrepreneurial cognition. Some characteristics determining the cognitive style of an individual seem to be suited for effectual or causal reasoning. In general, individuals with a more intuitive cognitive style are expected to have a preference for an effectual approach in the decision making process. Also in the underlying subjects, links are found between effectuation and causation. These expectations were translated into 'zero-hypotheses' H1₀, H2A₀, H2B₀ H2C₀.

Hypotheses 1 considers the overall effect between cognition and the decision making process, and states that there is no effect between the two. Because significant results are found between the preference for causation by individuals with a more analytical style this H_0 -hypotheses is rejected. Again it is important to mention that effectuation is a formative construct, in the light of answering *H1* this means that the effects of the underlying principles together form the sum of effectuation. One principal turned out not to be influenced, two loaded negatively and two others positively, eventually together ending up with a non-significant effect close to zero. From this it is concluded that there actually is an effect in the construct of effectuation.

The second hypotheses consists of three parts considering the underlying concepts in the decision making process. *Hypotheses 2A*, concerns the 'means based' and 'goal oriented' approach. It is rejected because a relation was found between, again, the causal approach and analytical characteristics. *Hypotheses 2B* concerns the 'attitude towards contingencies principle'. The hypotheses is rejected because relations were found on both sides. More intuitive individuals tend to have a preference for embracing contingencies (the effectual component), while more analytical individuals seemed to have a preference for avoiding contingencies (causal component). *Hypotheses 2C* concerns the 'vision on the future principle'. Also this hypotheses is rejected because relations were found on both sides. More intuitive individuals tend to have a preference for 'creation of the future' (the effectual component), while more analytical individuals seemed to have a preference for 'prediction of the future' (causal component). For this second part of the hypotheses it is important to mention that causation is a uni-dimensional construct. Therefore the construct of causation in total influences its underlying principles. So the effects of the underlying principle are partly already measured by *H1*.

This brings us to the answer for the research question: Yes, there is a clear evidence that the cognitive style of an individual influences the preferences in the decision making process. However influences are considered low and the direction of the influences is dispersed.

The additional sub-research question can also be answered with a yes. Students who were familiar with the concept of effectuation showed a higher preference for applying effectuation than students who did not. This higher preference was most significant for the construct of contingencies. This could indicate that students who are aware of the positive effects of 'embracing contingencies' are actually more open to contingencies.

6.2 Discussion

Most important in this discussion is the interpretation of the answers on the hypotheses and research questions. H_{10} , H_{2A0} , are rejected based on the effect in the causal construct only. Which means that the cognitive style of individuals only influences a preference for causation but does not influence the preference to apply effectuation. H_{2B0} and H_{2C0} are rejected based on both the causal and effectual construct.

This means no or too little effects were found in the constructs of effectuation. However the general outcome of the research is partly in line with the expectations, the lack of a clear directions of the effects of cognition on the effectuation components in the decision making process is a little disappointing.

Because effectuation is a multidimensional formative construct (Chandler et al, 2011), effectuation is the sum of its underlying constructs. As shown in the results, some constructs have positive correlations with cognition whilst other have negative correlations. This makes it hard to make interpretations about effectuation as a whole. Do all the underlying principles have the same value? And can we even make assumptions about effectuation as a whole? Maybe the total concept is too big to capture or measure.

When analyzing the data some problems emerged. First, the data for the dependent variable was not normally distributed. Some outliers are found in the data of effectuation and causation. A cause might be that no reverse coding is used in the effectuation and causation questions. However reverse coding was preferred, it turned out not to be possible because it would change the interpretation of the questions to much.

In order to create a reliable scale for effectuation, Q18, had to be removed. Which measured effectuation through the 'means based principle'. According to the factor analysis and Cronbach alpha the question does not measure the same as the other constructs and therefore was removed. The most obvious declaration is misinterpretation of the question.

The questions and case are formulated carefully but interpretations might lack in some cases. When reading the case belonging to the questionnaire another question comes up: to what extent is the preference for an effectual approach the same as actually being able to use effectuation? It is easy to imagine that respondents read between the lines and recognize the 'better' or 'most suitable answer'. Which might not always be in line with their real capabilities. Other questions tend to have some kind of underlying negative image. Such as for example: Q22 (My planning will be set before I start the implementation and cannot be altered afterwards.). This last part might have a bit of a negative layer, resulting in more students disagreeing with this question.

However, students were offered the possibility to comment on the questionnaire and not many comments or questions came up. Also when acquiring hard copies, hardly no questions concerning interpretation were asked. Indicating the questionnaire had no difficulties.

6.3 Limitations and suggestions for further research

The sample, consisting of students only could be a limitation of this research. A suggestion for further research is a comparative study among novice entrepreneurs, expert entrepreneurs or other relevant groups. This could be potential to answer several interesting questions; such as; Does the experience of entrepreneurs alter their preference for either effectuation or causation over time? and is the distribution of their cognitive preferences really not changing over time?

It turned out to be hard to define the relation between causation and effectuation. There are some contradictions but the concepts are no opposites and can be applied at the same time. Also the results on the underlying principles are pointing in different directions. Therefore I would suggest to focus on the effects of the underlying principles of effectuation. In what way do they connect or influence on each other?

The results on H3 showed significant results for effectuation. But, the results on the underlying construct are dispersed and the results seemed to be driven by the underlying principle of 'embracing contingencies'. These results are solely based on one question, namely; whether students are familiar with the concept of effectuation. In order to gain better insights I would suggest a more in depth study after the effects of education and effectuation. This could be done by making a sample of students who actually followed classes in which effectuation was an important subject.

The underlying principles are mostly measured by just two questions. This is a clear limitation of the research. In order to gain better insights in these principles, further research could focus on a single principles to more precisely find effects of cognition.

6.4 Additional remarks

This additional paragraph is written on request of the supervisors of this research. The aim is to answer the question; what I would do differently when I had a second change to investigate the link between effectuation and cognition? In the last few years a lot of students within the university of Twente wrote their bachelor or master-thesis regarding the theory of effectuation. Different topics came along, connecting the decision making process to related subjects, different business-cases and often to other cultures. This research, together with three other recently written reports, stands out because of the large quantity of respondents used.

If I would write another report about effectuation I would just choose one of the underlying constructs to have a better focus on that particular construct and the effects of cognition on this construct. In that case I could have taken more time to investigate that particular subject. If I would have the same research question, I would definitely search for new opportunities to measure effectuation and add qualitative component. Also to get a better feeling with the subject.

Personally I would prefer a research with more practical relevance. I think it would be quite interesting to find out what degree effectuation suits best for a particular situation or business case. This should be investigated for the underlying subjects in which I would ignore effectuation in total, because I think this is less relevant.

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Appendix I: The Cognitive style index

COGNITIVE STYLE INDEX

NAME.....	AGE.....
OCCUPATION.....	SEX.....

People differ in the way they think about problems. Below are 38 statements designed to identify your own approach. If you believe that a statement is *true* about you, answer **T**. If you believe that it is *false* about you, answer **F**. If you are *uncertain* whether it is true or false, answer **?**. This is not a test of your ability, and there are no right or wrong answers. Simply choose the one response which comes closest to your own opinion. Work quickly, giving your first reaction in each case, and make sure that you respond to every statement. Indicate your answer by completely filling in the appropriate oval opposite the statement:

T True	? Uncertain	F False
---------------	--------------------	----------------

1. In my experience, rational thought is the only realistic basis for making decisions.
2. To solve a problem, I have to study each part of it in detail.
3. I am most effective when my work involves a clear sequence of tasks to be performed.
4. I have difficulty working with people who 'dive in at the deep end' without considering the finer aspects of the problem.
5. I am careful to follow rules and regulations at work
6. I avoid taking a course of action if the odds are against its success.
7. I am inclined to scan through reports rather than read them in detail.
8. My understanding of a problem tends to come more from thorough analysis than flashes of insight.
9. I try to keep to a regular routine in my work.
10. The kind of work I like best is that which requires a logical, step-by-step approach.
11. I rarely make 'off the top of the head' decisions.
12. I prefer chaotic action to orderly inaction.
13. Given enough time, I would consider every situation from all angles.
14. To be successful in my
15. The best way for me to understand a problem is to break it down into its constituent parts.
16. I find that to adopt a careful, analytical approach to making decisions takes too long.
17. I make most progress when I take calculated risks.
18. I find that it is possible to be too organised when performing certain kinds of task.
19. I always pay attention to detail before I reach a conclusion.
20. I make many of my decisions on the basis of intuition.
21. My philosophy is that it is better to be safe than risk being sorry.

22. When making a decision, I take my time and thoroughly consider all relevant factors.
23. I get on best with quiet, thoughtful people.
24. I would rather that my life was unpredictable than that it followed a regular pattern.
25. Most people regard me as a logical thinker.
26. To fully understand the facts I need a good theory.
27. I work best with people who are spontaneous.
28. I find detailed, methodical work satisfying.
29. My approach to solving a problem is to focus on one part at a time.
30. I am constantly on the lookout for new experiences.
31. In meetings, I have more to say than most.
32. My 'gut feeling' is just as good a basis for decision making as careful analysis.
33. I am the kind of person who casts caution to the wind.
34. I make decisions and get on with things rather than analyse every last detail.
35. I am always prepared to take a gamble.
36. Formal plans are more of a hindrance than a help in my work.
37. I am more at home with ideas rather than facts and figures.
38. I find that 'too much analysis results in paralysis'.

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Appendix II: The Effectuation Case and Questionnaire

After reading the following scenario, please use your imagination, put yourself in the context of the scenario, and answer each question following the scenario as if you were creating a new venture yourself.

Scenario

For a while, I have been thinking of starting my own coffee-corner. When I looked at what existing franchising coffee-corners offered, I felt the price-quality ratio was unbalanced. I think, it should be possible to start my own successful coffee-corner with a better price-quality ratio. In several reports in newspapers and magazines I read that there is an increasing demand for drinking coffee in my home country.

The few resources or means that I have at my disposal are: limited financial capital, a few close business relations, and knowledge of the coffee industry, since I have been working at a coffee corner for five years.

Below you can find statements designed to identify your own approach in starting a coffee-corner. Please indicate to what extend you agree or disagree with each statement.

	Statements	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
1	Decisions will be primarily based on analysis of potential future returns.							
2	I will always pay attention that my initially defined target will be met.							
3	I will try to identify markets by a thorough market analysis.							
4	I allow changes in my planning if needed, even during the implementation process of my new venture.							
5	Before starting my new venture, I will first acquire all resources needed to achieve my target.							
6	Beforehand, I will calculate how many resources I need to achieve the expected returns.							
7	I expect to change my original target when confronted with new findings.							
8	The uncertainty of a market will not block me since I rely on my own experience to imagine opportunities.							
9	The decisions I make when starting my new venture will be based on the resources I have available.							

10	I allow delays during the development of my new venture when new opportunities emerge.								
11	Decisions will be made together with stakeholders based on our competences.								
12	I take a clearly pre-defined target as a starting point of the new venture.								
13	I will try to control the future by creating it.								
14	Decisions will be primarily based on minimization of risks and costs.								
15	I will talk to people I know to enlist their support in making opportunities a reality.								
16	I only spend resources I have available and I am willing to lose.								
17	I will study expert predictions on the direction the market is "heading", to determine what course of action my new venture will follow.								
18	I start my new venture without defining a clear target.								
19	My first priority is reaching my pre-set target without any delay.								
20	I will focus on early identification of risks through market analysis.								
21	I will ask my private network to help me out with starting my new venture.								
22	My planning will be set before I start the implementation process and cannot be altered afterwards.								
23	I will try to identify risks by a thorough competitors analysis.								
24	I will ask customers and suppliers to pre-commit to my new venture in order to reduce risks.								
25	I will try to control the future based on predictions of my previously obtained knowledge.								

Appendix III: Overview of effectuation/causation items.

Effectuation		Causation	
Means Based	9. The decisions I make when starting my new venture will be based on the resources I have available.	5. Before starting my new venture, I will first acquire all resources needed to achieve my target .	Goal driven
	18. I start my new venture without defining a clear target.	12. I take a clearly pre-defined target as a starting point of the new venture.	
	21. I will ask my private network to help me out with starting my new venture.		
Affordable Loss	14. Decisions will be primarily based on minimization of risks and costs.	1. Decisions will be primarily based on analysis of potential future returns.	Expected returns
	16. I only spend resources I have available and I am willing to lose.	6. Beforehand, I will calculate how many resources I need to achieve the expected returns.	
Alliances	11. Decisions will be made together with stakeholders based on our competences.	3. I will try to identify markets by a thorough market analysis.	Competative Analysis
	24. I will ask customers and suppliers to pre-commit to my new venture in order to reduce risks.	20. I will focus on early identification of risks through market analysis.	
		23. I will try to identify risks by a thorough competitors analysis.	
Embrace contingencies	4. I allow changes in my planning if needed, even during the implementation process of my new venture.	2. I will always pay attention that my initially defined target will be met.	Avoid contingencies
	7. I expect to change my original target when confronted with new findings.	19. My first priority is reaching my pre-set target without any delay.	
	8. The uncertainty of a market will not block me since I rely on my own experience to imagine opportunities.	22. My planning will be set before I start the implementation process and cannot be altered afterwards.	
	10. I allow delays during the development of my new venture when new opportunities emerge.		
Creation of the future	13. I will try to control the future by creating it.	17. I will study expert predictions on the direction the market is "heading", to determine what course of action my new venture will follow.	Prediction of the future
	15. I will talk to people I know to enlist their support in making opportunities a reality.	25. I will try to control the future based on predictions of my previously obtained knowledge.	
Shortlist with numbers			
Effectuation		Causation	
4, 7, 8, 9, 10, 11, 13, 14, 15, 16, 18, 21, 24		1, 2, 3, 5, 6, 12, 17, 19, 20, 22, 23,25	

Table 11: Overview of questions causation and effectuation

Appendix IV: Distribution of the Cognitive Style Index

Appendix IV-A: Descriptive statistics of the Cognitive Style index

Descriptives		Statistic	Std. Error	
Cognition Sum	Mean	39,7659	,45360	
	95% Confidence Interval for Mean	Lower Bound	38,8753	
		Upper Bound	40,6565	
	5% Trimmed Mean	39,9605		
	Median	41,0000		
	Variance	142,382		
	Std. Deviation	11,93240		
	Minimum	3,00		
	Maximum	71,00		
	Range	68,00		
	Interquartile Range	16,00		
	Skewness	-,287	,093	
	Kurtosis	-,366	,186	

Table 12: SPSS output: Descriptive statistics CSI

	Tests of Normality					
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Cognition Sum	,059	692	,000	,989	692	,000

a. Lilliefors Significance Correction

Table 13: SPSS output: Test of normality CSI

Appendix IV-B: Distribution statistics of the Cognitive style index

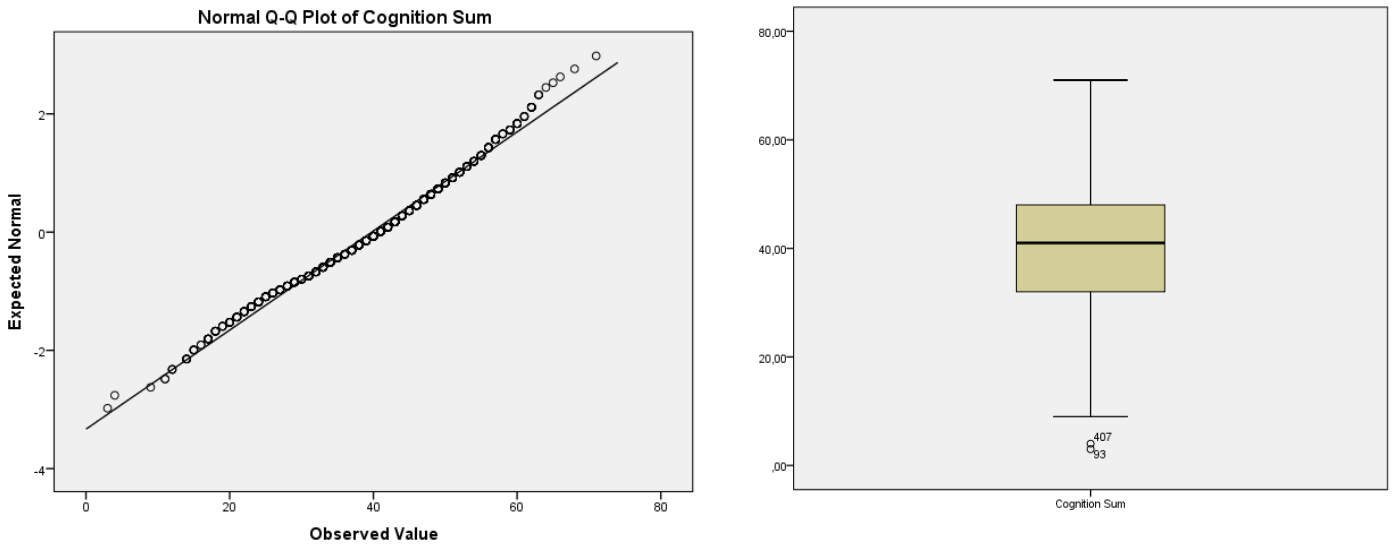


Figure 5: *Visualization of the distribution of the CSI*

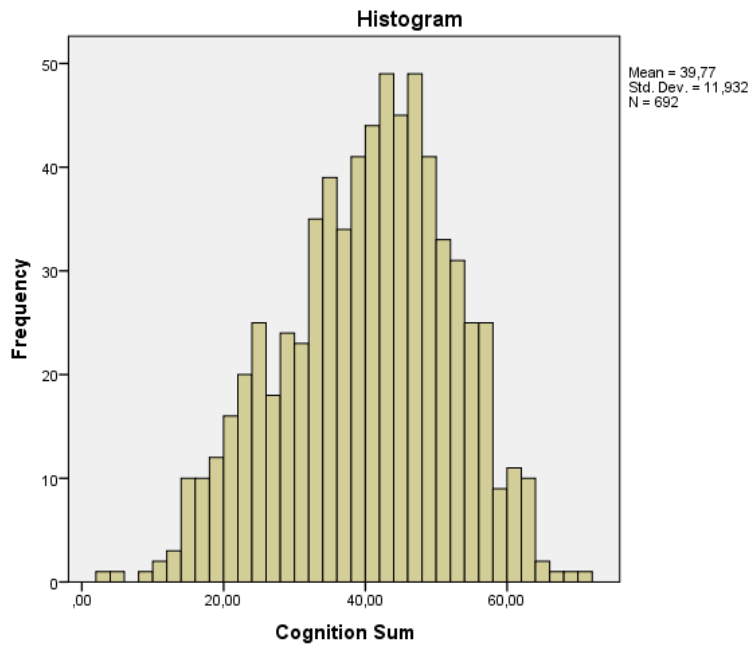


Figure 6: *Histogram of the distribution of the CSI*

Appendix IV-C: Distribution statistics of the Cognitive style index

Reliability Statistics		
	Cronbach's Alpha	
	Based on	
Cronbach's Alpha	Standardized Items	N of Items
,828	,825	38

Table 14: SPSS output: Reliability statistics - CSI

Appendix IV-D: Allinson and Hayes scores on the CSI

		Cognition sub categories			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Intuitive	143	18,8	20,7	20,7
	Qasi Intuitive	155	20,4	22,4	43,1
	Adoptive	155	20,4	22,4	65,5
	Quisi analyst	140	18,4	20,2	85,7
	Analyst	99	13,0	14,3	100,0
	Total	692	91,2	100,0	
Missing	System	67	8,8		
Total		759	100,0		

Table 15: SPSS output: Scores on the CSI

Appendix V: Distribution of Effectuation and Causation

Appendix V-A: Descriptive statistics Effectuation and Causation

Descriptives				
		Statistic	Std. Error	
Effectuation_Total	Mean	4,9363	,02370	
	95% Confidence Interval for Mean	Lower Bound	4,8898	
		Upper Bound	4,9829	
	5% Trimmed Mean	4,9449		
	Median	4,9500		
	Variance	,319		
	Std. Deviation	,56484		
	Minimum	1,00		
	Maximum	7,00		
	Range	6,00		
	Interquartile Range	,68		
	Skewness	-,700	,103	
	Kurtosis	4,382	,205	
	Causation_Total	Mean	4,9922	,02923
95% Confidence Interval for Mean		Lower Bound	4,9348	
		Upper Bound	5,0497	
5% Trimmed Mean		5,0076		
Median		5,0167		
Variance		,485		
Std. Deviation		,69671		
Minimum		1,00		
Maximum		7,00		
Range		6,00		
Interquartile Range		,89		
Skewness		-,598	,103	
Kurtosis		2,186	,205	

Table 16: SPSS output: Descriptive statistics Effectuation and Causation

Appendix V-B: Distributions effectuation and causation

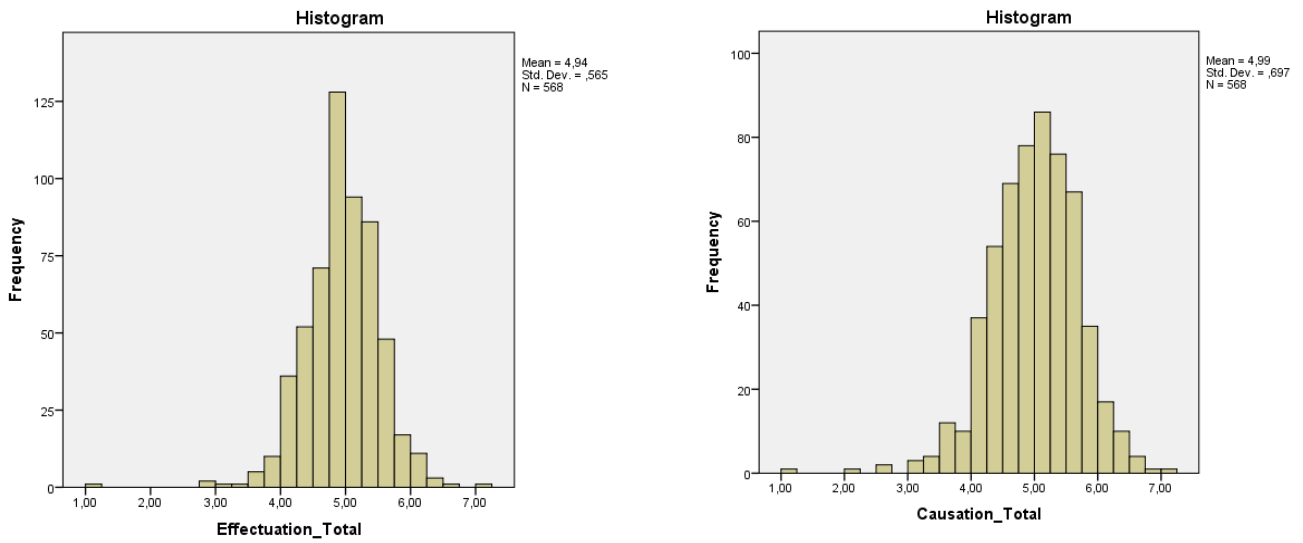


Figure 7: *Histograms on distribution effectuation/causation*

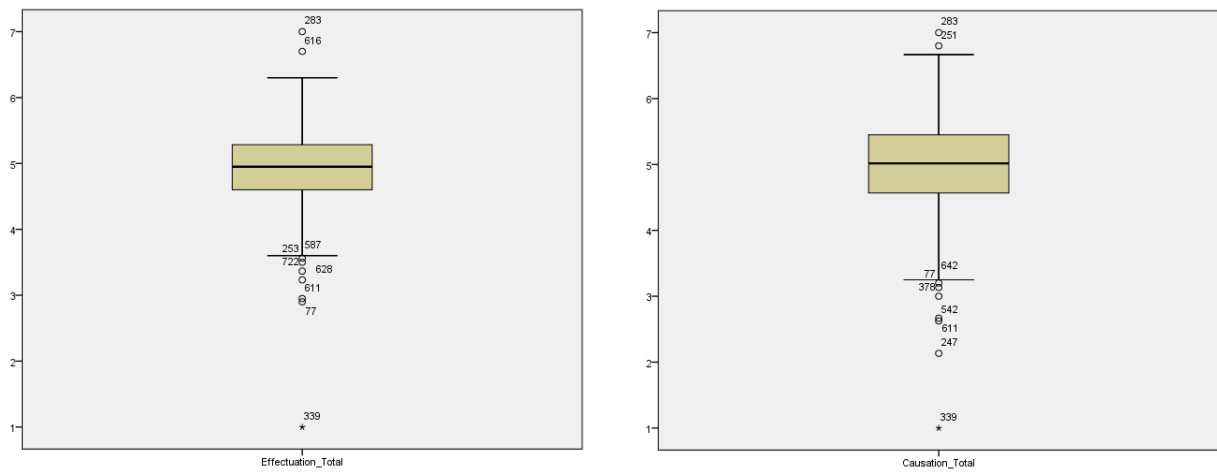


Figure 8: *Boxplot – distribution effectuation/causation*

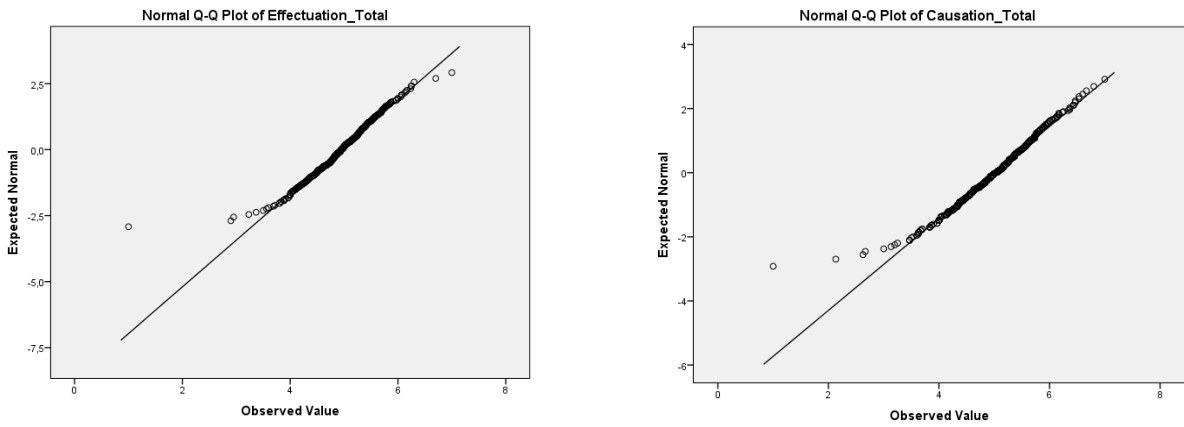


Figure 9: Q-Q plots effectuation/causation

Appendix V-C: Reliability effectuation and Causation

Cronbach's Alpha Effectuation

Cronbach's Alpha Causation

Reliability Statistics			Reliability statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,652	,670	12	,781	,792	12

Table 17: SPSS output: Cronbach Alpha's Effectuation / Causation

Appendix V-D: Reliability underlying principles Effectuation and Causation

Means based		Goals Driven	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
,240	2	,492	2

Affordable Loss		Expected returns	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
,334	2	,458	2

Alliances		Comp. analysis	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
,351	2	,664	3

Embrace contingencies		Avoid contingen.	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
,551	4	,498	3

Creation of the Future		Prediction of the F.	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
,436	2	,324	2

Table 18: SPSS output: Cronbach alpha's underlying principles

Appendix VI: Analysis

Appendix VI-A: Comparing means

		Effectuation mean				
Cognition sub categories		Effectuation_Mean s	Effectuation_Affor dable_Loss	Effectuation_Allian ces	Effectuation_Conti ngencies	Effectuation_Creat ionOfFuture
Intuitive	Mean	5,1842	4,3286	4,7039	5,4013	5,6513
	Std. Deviation	,95164	1,10953	,95978	,79065	,68809
Qasi Intuiitive	Mean	5,3419	4,5543	4,9118	5,2794	5,4412
	Std. Deviation	,86646	1,12020	,94258	,75710	,92107
Adoptive	Mean	5,2316	4,8680	4,9669	4,9669	5,3309
	Std. Deviation	1,00905	1,09461	1,00407	,91379	1,06148
Quisi analyst	Mean	5,4087	5,1405	5,0159	5,1270	5,2540
	Std. Deviation	,89084	,98154	,92073	,69552	,95445
Analyst	Mean	5,4247	5,1477	5,0376	4,9328	5,2312
	Std. Deviation	,83713	1,02036	1,01413	,77244	,84235
Total	Mean	5,3228	4,8293	4,9409	5,1301	5,3668
	Std. Deviation	,91603	1,10405	,96929	,80658	,93205

Table 19: SPSS output: Comparing effectuation means

		Causation means				
Cognition sub categories		Causation_GoalDr iven	Causation_Expect edreturns	Causation_Compe titive	Causation_Avoidc ontingencies	Causation_Predicti onofthefuture
Intuitive	Mean	4,6908	5,1842	4,7939	3,8509	4,8929
	Std. Deviation	1,08924	1,02581	1,02699	1,12005	,90045
Qasi Intuiitive	Mean	5,0662	5,2353	4,9032	4,1373	5,0116
	Std. Deviation	,94440	1,09026	,94184	,99585	,87381
Adoptive	Mean	5,3346	5,4743	5,1446	4,5196	5,0960
	Std. Deviation	1,07850	1,07207	,97263	,97606	,97694
Quisi analyst	Mean	5,2103	5,4802	5,0238	4,3836	5,1033
	Std. Deviation	,89522	,88634	1,00060	1,00228	,84142
Analyst	Mean	5,3763	5,4892	5,3907	4,4158	5,2898
	Std. Deviation	,95740	,90583	,80551	,93206	,73782
Total	Mean	5,1631	5,3818	5,0532	4,2910	5,0826
	Std. Deviation	1,01025	1,01018	,96897	1,02068	,87934

Table 20: SPSS output: Comparing causation means

Appendix VI-B Spearman rho's correlations

Nonparametric correlations			Cogntion_Sum
Spearman's rho	Effectuation_means	Correlation Coefficient Sig. (2-tailed)	,073 ,082
	Effectuation_Affordable_Loss	Correlation Coefficient Sig. (2-tailed)	,266** ,000
	Effectuation_Alliances	Correlation Coefficient Sig. (2-tailed) N	,113** ,007 567
	Effectuation_Contingencies	Correlation Coefficient Sig. (2-tailed) N	-,179** ,000 567
	Effectuation_CreationOfFuture	Correlation Coefficient Sig. (2-tailed) N	-,158** ,000 567
	Effectuation_Total	Correlation Coefficient Sig. (2-tailed)	,012 ,779

** . Correlation is significant at the 0.01 level (2-tailed).

Table 21: SPSS output: Non parametric Corralations Effectuation

Nonparametric correlations			Cogntion_Sum
Spearman's rho	Causation_GoalDriven	Correlation Coefficient Sig. (2-tailed) N	,172** ,000 567
	Causation_Expectedreturns	Correlation Coefficient Sig. (2-tailed) N	,113** ,007 567
	Causation_Competitive	Correlation Coefficient Sig. (2-tailed) N	,191** ,000 567
	Causation_Avoidcontingencies	Correlation Coefficient Sig. (2-tailed) N	,172** ,000 567
	Causation_Predictionofthefuture	Correlation Coefficient Sig. (2-tailed) N	,121** ,005 533
	Causation_Total	Correlation Coefficient Sig. (2-tailed) N	,231** ,000 567

** . Correlation is significant at the 0.01 level (2-tailed).

Table 22: SPSS output: Non parametric Correlations causation

Appendix VI-C: Man Whitney U Test

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Effectuation_Total is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,747	Retain the null hypothesis.
2	The distribution of Effectuation_means is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,567	Retain the null hypothesis.
3	The distribution of Effectuation_Affordable_Loss is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,000	Reject the null hypothesis.
4	The distribution of Effectuation_Alliances is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,025	Reject the null hypothesis.
5	The distribution of Effectuation_Contingencies is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,000	Reject the null hypothesis.
6	The distribution of Effectuation_CreationOfFuture is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,001	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is ,05.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Causation_Total is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,000	Reject the null hypothesis.
2	The distribution of Causation_GoalDriven is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,002	Reject the null hypothesis.
3	The distribution of Causation_Expectedreturns is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,084	Retain the null hypothesis.
4	The distribution of Causation_Competitive is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,000	Reject the null hypothesis.
5	The distribution of Causation_Avoidcontingencies is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,000	Reject the null hypothesis.
6	The distribution of Causation_Predictionofthefuture is the same across categories of Cognition_Median (binned).	Independent-Samples Mann-Whitney U Test	,032	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is ,05.

Table 23: SPSS: Output: Man-Whitney U test.

Appendix VII Education and Effectuation

Report

		Effectuation_Total	Effectuation_means	Effectuation_Affordable_Loss	Effectuation_Alliances	Effectuation_Contingencies	Effectuation_CreationOfFuture
Mean		5,1168	5,2746	4,8462	4,9119	5,1470	5,3650
N		437	437	403	437	437	437
Std. Deviation		,58334	,93302	1,10174	,98772	,80990	,91438
Can't remember	Mean	5,1917	5,5000	4,8000	5,2500	5,1500	5,3000
	N	10	10	10	10	10	10
	Std. Deviation	,42682	,52705	,88819	,42492	,67905	,94868
No	Mean	5,0869	5,4461	4,7451	4,9853	4,9853	5,3725
	N	102	102	102	102	102	102
	Std. Deviation	,53370	,86719	1,16624	,93728	,75027	,97921
Yes	Mean	5,3070	5,6053	4,8947	5,1316	5,4342	5,3421
	N	19	19	19	19	19	19
	Std. Deviation	,72225	,89099	,93659	,94048	1,03024	1,15533
Total	Mean	5,1191	5,3204	4,8277	4,9384	5,1276	5,3644
	N	568	568	534	568	568	568
	Std. Deviation	,57734	,91690	1,10359	,97032	,80794	,93299

Table 24: SPSS output: Means Education and effectuation

Report

Cognition_Sum

Education on Effectuation	Mean	N	Std. Deviation
	39,4018	560	12,36813
Can't remember	39,5000	10	8,24958
No	41,8835	103	10,21370
Yes	39,1579	19	7,74068
Total	39,7659	692	11,93240

Table 25: SPSS output: Education and cognition