Master thesis Business Administration

The effect of an entrepreneur's level of extroversion and educational background on effectuation.

Gerben Noortman, 2727706

Program: MSc Business Administration (Entrepreneurship, Innovation & Strategy)

Faculty of Behavioral, Management and Social Sciences

University of Twente

First supervisor: Dr. M.R. Stienstra

Second supervisor: Drs. P. Bliek

Date: 14 February 2023

Abstract

The Dutch have never founded more companies than in the last ten years. In order to keep a company on track, an appropriate strategy might be useful. Current literature on strategies suggests two ways in which an entrepreneur can build a strategy; the planned and the emergent approach. Effectuation logic is one of the emergent approaches. It contrasts with the planned approach known as causation logic. In current literature, it is shown that the choice for one of these can be predicted by the personality of the entrepreneur. However, the personality scale that is used in the existing literature might be outdated. The role of business education in relationship with effectuation was already examined, but the relationship between different educational backgrounds and effectuation was not investigated until now. The goal of this study is to investigate the influence of extroversion on effectuation and causation and the possible mediating role of educational background will be taken into account. Therefore, the following research question has been formulated:

To what extent does the entrepreneur's level of extroversion have an effect on effectuation/causation and what is the role of educational background?

To answer this research question, data were collected from 98 Dutch entrepreneurs who participated in a survey. The study reveals that extroversion does not influence effectuation or causation. However, I found that women are less inclined to utilize pre-commitments and causation logic than men. Furthermore, entrepreneurs aged 30 to 39 and 40 to 49 are, on average, more flexible than people aged 60 to 69. In line with the work of Humburg (2017) and Vedel et al. (2015), I found that extroverted entrepreneurs are more likely to choose a humanities or social science study. However, I did not find evidence that introverted entrepreneurs are more likely to choose a natural/formal science study. Lastly, no mediating effects of educational background were found.

Keywords: extroversion; introversion; effectuation; causation; experimentation; affordable loss; flexibility; pre-commitments; educational background

Table of contents

1. Introduction

1.1 Background

In the last ten years, the number of companies in the Netherlands increased with 700.000 to more than two million ventures in 2022 (Central Bureau of Statistics [CBS], 2022). Running a company is amongst others about designing and executing plans (Olson, 2017). In order to design and execute plans, an appropriate strategy is needed. In strategy research, two main perspectives exist for the formation of a strategy. There are schools that suggest that making a strategy is a planning task. These strategies are also called deliberate strategies (Mintzberg & Waters, 1985) and they become deliberate when the intended strategy gets realized. In their study they argue that to have a flawless deliberate strategy, three requirements must be met: clear and specific intentions must be established within the organization, leaders must endorse these intentions, and the external environment must be either predictable, harmless or fully controlled by the organization. These conditions are stringent, making it unlikely to find a strategy that fully satisfies them (Mintzberg & Waters, 1985). Deliberate strategies are especially useful in dynamic and unstable environments because planning reduces uncertainty, makes faster decision-making possible and introduces controls subjectivity (Brinckmann et al., 2010).

The planning school suggests that more frequent analyses, looking for trends, and evaluation of more alternatives guide the firm to its best possible strategy going forward (Schendel & Hofer, 1979). According to the rational planning perspective, organizations that put in extra effort to diligently study and anticipate shifts in their operating environment amid heightened uncertainty will outperform those that do not (Wiltbank et al., 2006). This notion was supported by several empirical studies. Goll & Rasheed (1997) found that rational decision-making is most closely linked with performance in high-discretion environments. Similarly, Brews & Hunt (1999) found that a more detailed and specific planning process was related to improved financial market outcomes. Additionally, Priem et al. (1995) found that a more rational approach to strategy development- including thorough examination, analysis, and completeness- was linked to superior performance across multiple metrics when compared to similar firms. Hough & White (2003) argue that the predictive approach may not be perfect as prediction is difficult, but it is the best method of remaining effectively aligned with one's environment. The competitive analysis of Porter (1997) is a planned strategy that is used to predict the future competitive balance of the industry and the position of the company. Ansoff (1980) came up with the model of interdependence between threats, opportunities, strengths and weaknesses to plan strategies and learn in uncertain environments.

Others argue that strategies should not be planned but should emerge from practice. These are called emergent (Mintzberg & Waters, 1985) or non-predictive strategies (Wiltbank et al., 2006) and were

never intended. A perfectly emergent strategy, as Mintzberg & Waters (1985) describe, requires consistency in actions over time without conscious intention. However, it is hard to imagine actions taken without any intention, even if only at a local level (Mintzberg & Waters, 1985). In their research, they argue that purely emergent strategies are as rare as purely deliberate strategies. Nevertheless, some patterns of action can come close to being purely emergent when the environment imposes a pattern directly onto an organization (Mintzberg & Waters, 1985). Particularly in uncertain and unpredictable environments emergent strategies make it possible to initiate actions quickly and to capture arising opportunities (Brinckmann et al., 2010).

W. C. Kim & Mauborgne (1997) suggest that strategies become more effective when shift from simply responding to conventional markers of success in the market, to actively utilizing resources to exceed expectations on product characteristics co-created with customers while disregarding other anticipated success indicators entirely. According to Ogilvie (1998), when dealing with environments that are unstable and uncertain, managers can improve the quality of their decision-making by using decision-making processes that are dynamic, creative and based on action. The study found that those decision-makers who received instruction on both the importance and the method of incorporating imagination in their strategic decision-making produced significantly better solution sets than those who were trained to use a more traditional, rational approach.

Sarasvathy (2001) also suggests that there are two ways in which entrepreneurs can create a new venture: causation (planned approach) and effectuation (emergent approach). The causation process *"…takes a particular effect as given and focuses on selecting between means to create that effect"* (Sarasvathy, 2001, p. 245). An effectuation process *"…takes a set of means as given and focuses on selecting between possible effects that can be created with that set of means"* (Sarasvathy, 2001, p. 245). Hence, the main difference between causation and effectuation is in the options available. Causation involves selecting the best way to achieve a specific outcome, whereas effectuation involves choosing from multiple possible outcomes using a set of means (Sarasvathy, 2001). Causation and effectuation are both important aspects of human reasoning and often occur together in various decision-making and action contexts. However, Sarasvathy (2001) intentionally separated them as distinct concepts for the purpose of a more clear and detailed theoretical discussion. In accordance with the effectuation approach, entrepreneurs start with three types of "means": their own personal characteristics, skills, and connections; their knowledge and expertise in certain areas; and the networks they are a part of (Sarasvathy, 2001). According to the effectuation literature, environments can be made stable and predictable for limited periods (Sarasvathy et al., 2008).

In addition to the work of (Sarasvathy, 2001), many scholars have contributed to the effectuation literature (e.g., Alsos et al., 2014; Arend et al., 2015; Brettel et al., 2012; Chandler et al., 2011; Grégoire & Cherchem, 2020; McMullen & Shepherd, 2006; Perry et al., 2012; Werhahn et al., 2015). Chandler et al. (2011) suggest that effectuation is resting on the logic of control by making use of available resources, experimentation and flexibility. Effectuation is especially relevant for entrepreneurial efforts to introduce novel and innovative products, services and other ways of doing business (Grégoire & Cherchem, 2020; McMullen & Shepherd, 2006). Perry et al. (2012) point out that effectuation represents a paradigmatic shift in a way that we can understand entrepreneurship. Therefore, measuring effectuation seems useful in order to understand an entrepreneurs' choices during the venture creation. According to Brettel et al. (2012), causation approaches are beneficial in contexts with low levels of innovativeness, while effectuation is more useful in contexts with high level of innovation.

Grégoire & Cherchem (2020) found that many studies on causation and effectuation rely heavily on qualitative case analysis, lacking specifics on their coding methods, indicators and measures used to support their conclusions. Chandler et al. (2011) suggest that most of the research on causation and effectuation has been based on experimental studies that involve analyzing the verbal protocols of entrepreneurs as they make decisions or field studies that involve collecting and analyzing qualitative data. To further advance the area of effectuation and causation research into a more mature phase (Edmondson & Mcmanus, 2007), Chandler et al. (2011) developed and refined quantitative measures for the two approaches. The effectuation approach is measured by the subdimensions; experimentation, affordable loss, and flexibility. Causation has its own construct and pre-commitments is a shared subdimension that is both, an effectuation and a causation construct.

1.2 Context

Entrepreneurial identity influences whether an entrepreneur engages in effectual or causal behavior (Alsos et al., 2017). Coudounaris and Arvidsson (2021) investigated the relationships between the Big-5 personality traits on causation and effectuation decision-making logics under managers and entrepreneurs in the Estonian IT sector, using the scale from Chandler et al. (2011). Coudounaris and Arvidsson (2021) showed that personality traits could have an impact on whether one is using the effectuation or causation approach, but the scale they used is possibly outdated (Costa & McCrae, 1988). This was supported by McCrae himself who argues that classic personality theories are outdated as the modifying influences of social and cultural environment are not taken into account (McCrae, 2011). In their future research, Coudounaris & Arvidsson (2021) recommended future researchers to use a more recent scale such as the six factor model of personality traits (HEXACO) because innovation and the structure of society has changed over the years. I address this gap by using a more recent scale

(Ashton & Lee, 2009). However, addressing all traits would lead to a higher chance that entrepreneurs would not participate or quit before the end of the questionnaire (Galesic & Bosnjak, 2009). Galesic & Bosnjak (2009) also found that the further away from the beginning, the shorter time response and the lower the variability of the answers. Therefore, I focus on one trait to increase the participation frequency but also to improve the quality of the measurement.

Extroversion was found to be the most important trait to explain entrepreneurial effectiveness (Janowski & Szczepańska-Przekota, 2022). In addition, extroversion was found to be positively related to entrepreneurial intention and firm performance (Zhao et al., 2010). Furthermore, Costa et al. (1984) states that extroverts are attracted to enterprising occupations. Therefore, the entrepreneur's level of extroversion seems to play an important role in the venture creation process. In the literature, extraversion and extroversion are both used for the same subject (Carvalho et al., 2020). In order to ensure consistency, I used "extroversion" in this research.

Causation has been the predominant logic in MBA education (Sarasvathy, 2001). Dew et al. (2009) found that MBA students (novices) are less likely to use effectuation logic than expert entrepreneurs. Hence, an educational background in MBA studies might lead to more causation, but when the entrepreneur becomes an expert or attain more experience this might change. In their study, MBA students had to solve decision-making problems in venture creation. However, it might be more useful to investigate the role of education later on when alumni MBA students are entrepreneurs already. Furthermore, not all entrepreneurs followed an MBA study before they became an entrepreneur. Other study backgrounds might also have an effect on the entrepreneur's choice for effectuation or causation. Therefore, I will also investigate the role of educational background on effectuation or causation.

1.3 Research gap and question

Chandler et al. (2011) point out that future research is needed to explore the relationship between human capital (e.g. experience, expertise and education) and causation and effectuation processes. More research is thus needed on 'what I know' entrepreneur (Sarasvathy et al., 2008). Research has been done on the influence of expertise on effectuation and causation (Dew, Read, et al., 2009; Harms & Schiele, 2012; Read & Sarasvathy, 2005; Ruiz-Jiménez et al., 2021). Furthermore, the role of experience on effectuation and causation has been investigated by (Dew, Read, et al., 2009; Nelson, 2012). However, there is a limited amount of research done on educational background in relation with effectuation and causation. Especially, no literature was found about other disciplines than business studies (different academic disciplines) and the probability that someone will use causation,

effectuation or a mix of both in the creation of a new venture. This gap, mentioned by Chandler et al. (2011), was investigated. Hence, the following research question is stated:

To what extent does the entrepreneur's level of extroversion have an effect on effectuation/causation and what is the role of educational background?

By answering this research question, this study contributes to the existing literature on effectuation. Most important, it points out that there is no relationship found between extroversion and effectuation and causation. Besides, it shows that educational background is not a mediating variable in this relationship. The practical contribution of this paper is that causation logic is not used in the venture creation process under entrepreneurs with an educational background in business studies.

1.4 Research design

This thesis has seven chapters. After the introduction chapter, the next chapter includes a literature review with hypotheses. As the aim of this thesis is to investigate the effectual and causal effects on extroversion, it is crucial to operationalize these principles. In this thesis, the scales of (Chandler et al., 2011) were used to operationalize the constructs of effectuation and causation, while the HEXACO-PR-I 60 scale (hereafter mentioned as HEXACO-60) was used to measure the entrepreneur's level of extroversion (Ashton & Lee, 2009). In chapter three, the methodology, I discussed what the sample looks like, what method I used and how the analysis was done. Chapter four consists of the data collection and analysis. In chapter five I discussed the findings, described the theoretical and practical contributions, and I mentioned the limitations and recommendations for future research. In chapter, six the conclusions were made and in the last chapter acknowledgements were made.

2. Literature review and hypotheses:

2.1 Effectuation and causation

The study by Sarasvathy (2001) suggests that effectuation consists of four principles. Later on, Sarasvathy et al. (2008) came up with five principles that point to a logic of action called effectuation. These principles involve means-driven; affordable loss; strategic alliances; exploitation of contingencies; and control of an unpredictable future. On the contrary, the principles of causation involve; goal-driven; expected returns; competitive analyses; preexisting knowledge; and prediction of an uncertain future. Each of the five principles of effectuation personifies techniques of non-predictive control (Sarasvathy et al., 2008). Reymen et al. (2015) found that entrepreneurs typically employ hybrid decision-making logic in which they combine effectual and causal decision-making. This is supported by Agogué et al. (2015) who found that a combination of the two approaches is helpful to technology entrepreneurs to create a more holistic map with consequential paths. To further advance the area of effectuation and causation research into a more mature phase (Edmondson & Mcmanus, 2007), quantitative data was needed. The collection of quantitative data on effectuation and causation can be done on the firm level (Brettel et al., 2012; Werhahn et al., 2015) or on the individual level of the entrepreneur (Alsos et al., 2014; Chandler et al., 2011; Fisher, 2012). In this research, the individual level of the entrepreneur was investigated because effectuation and causation were measured in relationship with extroversion, a personality trait (Ashton & Lee, 2009; Costa & McCrae, 1988; Eysenck et al., 1985).

To measure the unfolding process of entrepreneurial action (effectuation) and the prediction-based approach (causation), the scale of Chandler et al. (2011) was used. Based on Sarasvathy (2001), Chandler et al. (2011) came up with four principles that differentiate effectuation and causation:

- Effectuation focuses on projects where the loss in a worst-case scenario is affordable, while causation focuses on maximizing expected returns;
- Effectuation focuses on short-term experiments to identify business opportunities, while causation focuses on predicting the future by defining a final objective upfront;
- Effectuation emphasized pre-commitments and strategic alliances to control the future, while causation focuses on business planning and competitive analyses;
- Effectuation involves exploiting environmental contingencies through flexibility, while causation involves exploiting pre-existing capabilities and resources.

Based on these outcomes, Chandler et al. (2011) build their scale to measure effectuation and causation. Chandler et al. (2011) suggest that effectuation has three associated sub-dimension; experimentation, affordable loss and flexibility. Furthermore, effectuation has a shared dimension

with the causation construct; pre-commitments. The causation construct consists only of pre-commitments and causation. These subdimensions consist of items that are validated by the first study of Chandler et al. (2011). Sarasvathy (2001) stated that the causation process is typified in the procedures of marketing management stated by (Kotler, 2000). A lot of similarities can be found between the procedures of Kotler (2000) and the seven items of Chandler et al. (2011) that measure causation. This supports the outcomes of the first study that showed that the items are valid and in accordance with Sarasvathy's definition (Chandler et al., 2011). The subconstructs are further explained in the next subparagraphs.

2.1.1 Causation

The causation subconstruct of Chandler et al. (2011) is based on Sarasvathy (2001) and is about envisioning goals, business planning, maximizing expected returns, competitive analyses to predict an uncertain future, and pre-existing knowledge. Causation-oriented entrepreneurs define the objectives they want to accomplish before the venture creation and systematically search to reach those objectives (Fiet, 2002; Herron & Sapienza, 2017). They evaluate and select opportunities that maximize the expected returns (Drucker, 1998). Lastly, they analyze and plan as they seek to exploit their pre-existing knowledge and resources. All efforts are directed to achieve the pre-envisioned state (Chandler et al., 2011).

2.1.2 Experimentation

Experimentation has been thoroughly researched. One definition is that of Nicholls-Nixon et al. (2000): *"…a series of trial and error changes pursued along various dimensions of strategy, over a relatively short period of time, in an effort to identify and establish a viable basis for competing"*. An effective manager has the ability to both proactively identify new opportunities and respond to competitors' actions by experimenting, which allows them to stay ahead of the game and stay ahead of the competition (Eisenhardt & Brown, 1998). Experimenting with new alternatives is a crucial aspect of exploration and should be balanced with exploiting existing competencies and technologies. Refining and expanding these assets helps in maximizing the potential of a business (March, 1991). Effectuation involves experimenting with various approaches in the market before finalizing a business idea. This process of testing and adjusting helps in refining the concept and ensures its success (Sarasvathy, 2001). The experimentation construct of (Chandler et al., 2011) is based on work of Sarasvathy (2001), Brown & Eisenhardt (1997) and Koberg et al. (2003). Effectuators try different approaches before settling a business concept (Sarasvathy, 2001). Experimentation can be used to test the different approaches (Chandler et al., 2011). When the experiments turn out poorly, investments can be shifted away from those experiments and new avenues can be explored (McGrath, 1999). Hence, experiments are used to identify and establish a viable basis for competing (Nicholls-Nixon et al., 2000). Chandler

et al. (2011) suggest that the effectuation process can be seen as series of experiments to identify which business model fits best.

2.1.3 Affordable loss

Causation models, as explained by Sarasvathy (2001), focus on maximizing returns by selecting the best strategies. On the other hand, effectuation starts by determining the acceptable level of loss and emphasizes experimentation with as many strategies as feasible within the available means. Sarasvathy (2001) suggest that the focus of effectuation is on creating more options for the future, rather than maximizing current returns. The approach of effectuation helps entrepreneurs take control by considering the potential downside of a venture rather than solely focusing on risk. This mindset can enable them to pursue new opportunities in uncertain situations (Sarasvathy, 2001). However, because the negative aspects of a venture tend to be more noticeable to decision-makers than the potential positive outcomes (Dew, Sarasathy, et al., 2009), the focus may be on opportunities where the loss is deemed acceptable (affordable) (Harms & Schiele, 2012). This focus on affordable loss may result in prioritizing opportunities that require fewer resources. Affordable loss is important in the start-up phase when financial decisions are taken. Effectuators are likely to try different strategies and experiment a lot (Sarasvathy, 2001). However, some experiments cost the entrepreneur more money than he can afford. Those experiments will be rejected in favor of affordable experiments (Chandler et al., 2011). Additionally, Sarasvathy (2001) suggests that the willingness to take risks should be essential to entrepreneurs. The affordable loss construct from (Chandler et al., 2011) is focused on predetermining the affordable loss instead of expected return (Sarasvathy, 2001).

2.1.4 Flexibility

The effectuation approach prioritizes capturing new opportunities and avoiding stagnation within the organization (Alsos & Clausen, 2014). Alsos & Clausen (2014) suggest tat effectuation supports quick decision making and shies away from investing significant resources into uncertain processes with a long-term outlook, as doing so would limit the organization's adaptability to future changes. Entrepreneurs that are effectuation oriented, tend to remain flexible because the emerging structure of the organization depends on contingent opportunities and investments made by the stakeholders (Chandler et al., 2011). Therefore, the need for prediction is reduced (Sarasvathy, 2001). As firms grow they must implement policies, procedures and routines (March & Simon, 1958). Hence, they become less flexible over time while it is important for entrepreneurs to maintain flexibility to get rid of unsuccessful experiments and move to other experiments (McGrath, 1999). This is in line with Kuckertz et al. (2020) who found that start-ups are better prepared and can better adapt their business models in a crisis because of their flexibility. While their business models are becoming less flexible, effectuators are more likely to maintain flexible than causation-oriented entrepreneurs (Chandler et

al., 2011). The flexibility construct reflects the flexibility of entrepreneurs over time (Chandler et al., 2011).

2.1.5 Pre-commitments

According to effectuation theory, entrepreneurs can aim to control the future rather than predict it through forming alliances and securing pre-commitments (Sarasvathy, 2001). In this approach, the entrepreneur may make agreements with customers, suppliers, and other key partners about access to resources or markets, thereby ensuring control of these assets for future use (Alsos & Clausen, 2014). Chandler et al. (2011) suggest that the pre-commitments construct is both effectuation and causation related. On the one hand, pre-commitments and strategic alliances are important for an effectuator to maintain flexibility, minimize costs and reduce uncertainty (Chandler et al., 2011). Moreover, diversifying risks among multiple stakeholders helps them to reduce uncertainty and allows them to constrain potential loss. On the other hand, causation-oriented entrepreneurs use pre-commitments as a way to acquire essential resources and implement plans (Chandler et al., 2011).

2.2 Extroversion and introversion

Extroversion is the most easily identifiable personality trait and can even be identified by strangers very accurately (Connelly & Ones, 2010). This research is not only about identifying extroversion but also about identifying introversion (low extroversion). Therefore, it is important to know what the difference is between introversion and extroversion.

Extroversion is a personality trait that consists of specific characteristics such as assertiveness, sociability, high activity level, positive emotions, and impulsivity (Lucas & Diener, 2001). An extrovert is more interested in what is happening around him than in his own thoughts and emotions while it is the opposite for an introvert (Zhang, 2008). Moreover, Zhang (2008) found that extroverts are more likely to find someone to help when he is having a problem than an introvert. Introversion is a personality trait that can be defined as the opposite of extroversion (Eysenck et al., 1985), but has also its own characteristics such as quietness, humbleness and being highly sensitive. Furthermore, introverts are cautious in processing information and persistent in solving problems by thinking about it by themselves before sharing it with others (S. Y. Lee et al., 2020). Extroverted people differentiate themselves from introverted people in stressful situations. They have a better resistance to stress in environments with time pressure and high information flows (Dewaele & Furnham, 1999).

To measure the extent of extroversion of the entrepreneur, the HEXACO-60 was used (Ashton & Lee, 2009). This scale is based on lexical studies in different languages. Based on twelve languages, a set of six factors emerged to measure the dimensions of personality rather than the five factors from early English-language lexical studies (Ashton & Lee, 2007). The two-dimensional space of agreeableness

and neuroticism of the big five can better be explained by the three constructs of HEXACO; honesty-humility, agreeableness and emotionality. Based on the twelve different languages, extroversion was found to be commonly connected with outgoing, lively, extroverted, sociable, talkative, cheerful, active versus shy, passive, withdrawn, introverted, quiet, and reserved (Ashton & Lee, 2007). Ashton & Lee (2007) translated these words into operationalized items about expressiveness, social boldness, sociability and liveliness.

2.3 Educational background

Effectuation is amongst others about selecting between possible effects that can be created with a set of means. There are three categories of means available to entrepreneurs. In the first place, 'who I am', consists of the stable traits, abilities and attributes of the entrepreneur. Second, 'what I know'. This category consists of the entrepreneur's education, experience and expertise. The last category, 'whom I know', has to do with the network of the entrepreneur (Sarasvathy et al., 2008). Chandler et al. (2011) point out that future research is needed to explore the relationship between human capital (e.g. experience, expertise and education) and causation and effectuation processes. More research is thus needed on 'what I know'. Research has been done on the influence of expertise on effectuation and causation (Dew, Read, et al., 2009; Harms & Schiele, 2012; Read & Sarasvathy, 2005; Ruiz-Jiménez et al., 2021). Furthermore, the role of experience on effectuation and causation has been investigated by (Dew, Read, et al., 2009; Harms & Schiele, 2012; Nelson, 2012). However, there is a limited amount of research done on educational background in relation to effectuation and causation.

Causation has been the predominant logic taught in MBA education (Sarasvathy, 2001). Dew et al. (2009) investigated decision-making differences between expert entrepreneurs and MBA students (novices) and found that MBA students are less likely to use effectuation logic. This is in line with Pot (2013) who shows that entrepreneurs who follow an MBA study are more likely to use causal decision-making processes than non-MBA students. Hence, an educational background in MBA studies might lead to a more causal approach, but when the entrepreneur becomes an expert or attain more experience this might change. Therefore, the educational background could have an impact on the decision-making approach of the entrepreneur. Mäkimurto-Koivumaa & Puhakka (2013) suggest that a mix of causation and effectuation is essential in management and economics education to respond to unexpected situations. Hence, an effectuation approach could also be taught to students. Barrick and Mount (1991) showed that extroversion traits such as sociable, talkative, assertive, active and gregarious would lead to effective performance in a management or sales function. These traits were less important in jobs such as assemblers, production workers, engineers and architects. Therefore, there seems to be a relationship between extroversion and someone's job. This implies that there is probably also a relationship between extroversion and academic discipline since the job requires

academic knowledge about management or sales to fulfil this function. Therefore, the educational background could be a (partial) explanator of the effectuation or causation logic the entrepreneur uses in the venture creation process.

However, not all entrepreneurs have followed a business study before they became an entrepreneur. As a result, it is harder to determine whether the educational background outside of business studies impacts the decision to adopt an effectuation or causation approach. The lack of education about causation logic for non-MBA students might lead to more effectuation in their venture creation because they are not familiar with causation logic. Furthermore, art students were found to have higher perceptual flexibility than non-art students (Chamberlain et al., 2018). Since flexibility is a construct of effectuation, this example shows another reason why educational background can have a mediating effect. Chandler et al. (2011) recommended future research to explore the relationship between education and causation and effectuation processes. Their call for future research was answered and the relationships between business education and effectuation and causation were investigated (Dew et al., 2009; Pot, 2013; Sarasvathy, 2001). However, I did not find literature on the relationship between educational background in different academic disciplines and effectuation and causation. Hence, I included educational background as a possible mediator.

2.4 Relationships and conceptual framework

Introversion as a dependent variable on the parameter: "readiness to act directly to a situation" has a low value which means a lot of thinking (exploring and planning activities) and less action (Dorner & Hille, 1995). In addition, they show that extroversion means a high readiness to react directly. Based on these findings, introversion has a link to causation and extroversion to effectuation. Furthermore, Jensen & Ditiberio (1984) found that introverts have difficulties with writing long and complex theses because they want every word out before putting anything on paper. Introverts are blocked by too much reflection, while extroverts start writing even without planning and discovering their meaning as they write. This supports the idea that introverts rely on planning while extroverts rely on a more emergent approach in which flexibility and experimentation are important. Additionally, Coudounaris and Arvidsson (2021) found that extroversion has a positive and significant effect on experimentation and flexibility. This is supported by Shalender & Yadav (2019) who show that extroversion relates positively to strategic flexibility. Also, Robertson et al. (1999) suggest that flexibility is a competence that is more likely to be displayed by extroverted people. Moreover, Gocłowska et al. (2018) show that novelty seeking is positively linked to extroversion. This implies that trying new things (experimentation) is closely linked to extroversion. Furthermore, Lucas & Diener (2001) suggest that extroversion is associated with more impulsivity which can be linked to experimentation or flexibility. Hence, it is expected that extroversion will have a positive effect on the effectuation subconstructs

flexibility and experimentation. The research conducted by Coudounaris and Arvidsson (2021) suggests that there is no significant relationship between extroversion and affordable loss. However, I expect to find a positive relationship as extroverts are inclined to take more risks than introverts (Nicholson et al., 2006). Moreover, a study by Benischke et al. (2019) found that CEOs with high levels of extroversion are less likely to decrease their firm's strategic risk-taking. Therefore, it is crucial for extroverted entrepreneurs to accurately assess the level of loss they can afford in their risk-taking practices more than for introverted entrepreneurs. Coudounaris and Arvidsson (2021) also did not find evidence for a positive relationship between extroversion and pre-commitments. However, I expect to find a positive relationship as Caliendo et al. (2009) suggest that to handle uncertainty it is important that an entrepreneur engages in network building. Extroverted people are characterized by their outgoing, sociable and talkative nature (Ashton & Lee, 2007). Given this, it is likely that a greater level of extroversion leads to more successful network building, which in turn results in the ability to make pre-commitments that reduce uncertainty. This is supported by Awwad & Al-Aseer (2021) who suggest that extroversion captures an individual's level of ease and comfort in establishing social networks.

Coudounaris and Arvidsson (2021) hypothesized that extroversion would have a positive effect on causation as well. However, they did not find evidence for this. As Dorner & Hille (1995) suggest that introverts are not likely to react directly to a situation and instead plan activities, it is expected that introverts are more causation oriented. Additionally, Eysenck (1962) suggests that extroverts act on the spur of the moment while introverts plan ahead. Hence, it is expected that a low level of extroversion will have a positive impact on causation, while a high level of extroversion will have a negative impact on causation.

Humburg (2017) shows that higher extroversion is associated with a higher probability of choosing Law and Business and Economics (humanities and social sciences). Furthermore, he found that an extrovert student is less likely to choose a STEM (Science, Technology, Engineering and Mathematics) study. Increasing the level of extroversion leads to a shift from STEM studies to Law and Business and Economics. This implies that introversion is associated with STEM studies (natural/formal sciences). In addition, Vedel et al. (2015), found that science students (natural/formal sciences) scored significantly lower on extroversion than humanities and social sciences. Educational background is in this research included as a possible mediating variable. Educational background seems to be partially explained by extroversion/introversion while it also might affect effectuation/causation (Chandler et al., 2011). The mediating role of education is widely investigated and found in broad contexts (Bellani & Bia, 2019; Karlson & Birkelund, 2019; Sheikh et al., 2014). Crant (1996) and Hamid et al. (2014) showed that education could also be a mediating variable in the business context. Crant (1996) showed that education is a mediator in the relationship between proactive personality and entrepreneurial

intentions. In addition, Hamid et al. (2014) showed that education plays a mediating role in the relationship between sustainability innovation and sustainable consumer behavior. This strengthens the reasoning of this research, that education might be a mediating variable in the relationship between extroversion and effectuation/causation. The reason that extroversion has an effect on educational background in this framework is that extroverts are more likely to make a choice for humanities or social sciences while more introverts choose more often to do a natural/formal study (Humburg, 2017; Vedel et al., 2015). As mentioned in section 2.3, causation has been the predominant logic taught in MBA education (Dew et al., 2009; Pot, 2013; Sarasvathy, 2001). Hence, the educational background of those students might have an effect on the choice of whether to use effectuation or causation in the venture creation process.

In a business study (social science) students train and improve their oral communication skills (Lamb et al., 2016), which could be linked to items of the HEXACO-60 that measure extroversion (Ashton & Lee, 2009). This means that students that choose a business study might become more extroverted during their studies. However, Humburg (2017) and Vedel et al. (2015) showed that introverted people are less likely to choose a social study while extroverted people are less likely to choose a STEM study. Therefore, it is more likely that the choice for a certain study is partly based on one's extroversion rather than that education creates the level of one's extroversion.

Combining the theoretical considerations by Sarasvathy (2001), Dorner & Hille (1995), Shalender & Yadav (2019), Jensen & Ditiberio (1984), Coudounaris & Arvidsson (2021), Humburg (2017), Vedel et al. (2015), Chandler et al. (2011), Dew et al. (2009) and Pot (2013), gives us insight into possible relationships between one's extroversion and effectuation/causation. Furthermore, it provides us with the possibility that educational background might be effected by extroversion, while it might influences effectuation/causation logic. Hence, the conceptual framework is presented as follows in figure 1.
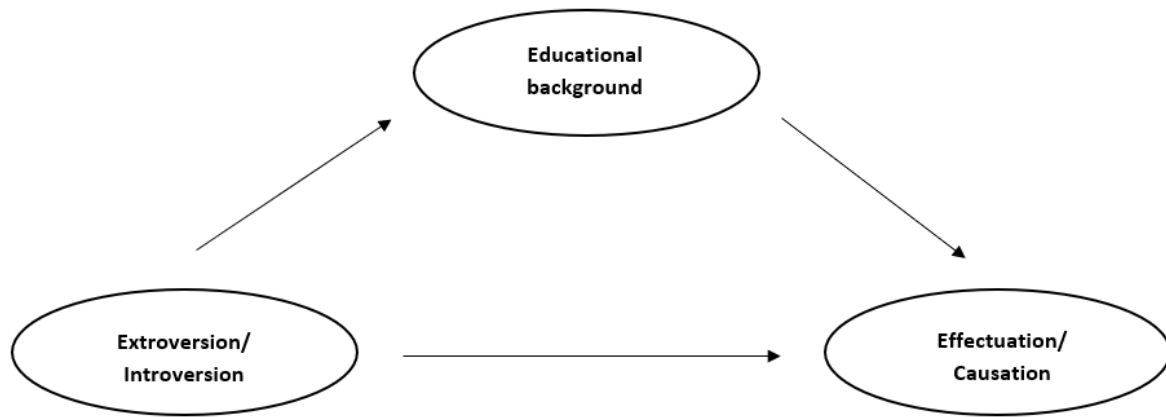
Figure 1: Conceptual framework: Extroversion/introversion, educational background & effectuation/causation

In the next paragraph, the relationships and the hypotheses are discussed.

2.5 Hypotheses

According to the research by Coudounaris and Arvidsson (2021), extroversion has a positive effect on experimentation and flexibility – subconstructs of effectuation. Therefore, I expect that this research will also show a positive relationship between extroversion and experimentation and flexibility. Extroverted people have a better resistance to stress in environments with time pressure and high information flows (Dewaele & Furnham, 1999). Entrepreneurs should remain flexible because the emerging structure of the company depends on contingent opportunities and investments (Chandler et al., 2011). Hence, we expect that extroverted entrepreneurs are more flexible than introverted entrepreneurs. As Lucas & Diener (2001) suggest that extroversion is associated with more impulsivity, we expect that extroversion is also positively related to experimentation.

While Coudounaris and Arvidsson (2021) did not find evidence for the other subconstructs of effectuation, I expect that this research will reveal a positive and significant relationship between extroversion and both affordable loss and pre-commitments. This is because these constructs, together with flexibility and experimentation measure the effectuation construct (Chandler et al., 2011). Furthermore, Nicholson et al. (2006) and Benischke et al. (2019) argue that extroverts are more likely to take (strategic) risks. Hence, it is crucial for extroverts to accurately determine the level of loss they can afford in their risk-taking practices more than for introverts. Additionally, due to their outgoing and sociable nature (Ashton & Lee, 2007), extroverts possess traits that are essential in network building. As a result, it is expected that a high level of extroversion is related to the ability to make pre-commitments. Hence, the hypothesis is stated as follows:

H1a: Extroversion has a positive effect on effectuation

Hypothesis H1a was measured based on effectuation as a whole but also per subconstruct. I did this because it gives me the opportunity to say something about the extent of the effect that extroversion has on effectuation.

Coudounaris and Arvidsson (2021) did not find significant evidence that extroversion has a negative effect on causation. However, Sarasvathy (2001) suggests that effectuation processes are the contrast of causation processes. Additionally, Eysenck (1962) suggests that extroverts tend to act impulsively, while introverts are more inclined to plan in advance. Hence, I expect that a high level of extroversion will have a negative effect on causation. Therefore, the following hypothesis has been created:

H1b: Extroversion has a negative effect on causation.

In H1a, I hypothesized that extroversion has a positive effect on effectuation. One of the subconstructs that measure effectuation is 'pre-commitments'. As pre-commitments is a shared construct between effectuation and causation, the opposite could be true as well; extroversion could have a negative effect on pre-commitments as it is a subconstruct of causation.

Humburg (2017) and Vedel et al. (2015) found evidence of a relationship between the level of extroversion and study choice. In order to investigate whether this relationship also exists in this research, the following hypotheses have been proposed:

H2a: Extroversion has a positive effect on the chance of choosing a humanities/social science study
H2b: Extroversion has a negative effect on the chance of choosing a natural/formal science study.

The educational background of an individual is influenced by their level of extroversion (Humburg, 2017; Vedel et al., 2015). However, education can also help to become more extroverted (or introverted) during his/her study (Lamb et al., 2016). Furthermore, scholars found that causation has been the predominant logic taught in MBA education (Dew et al., 2009; Pot, 2013; Sarasvathy, 2001). Therefore, an extrovert who chooses to study MBA (social science) may, as a result of the education received, become more causation-oriented than if he had chosen a different field of study. Hence, the following hypotheses have been created:

H3a: Educational background mediates the relationship between extroversion and effectuation.
H3b: Educational background mediates the relationship between extroversion and causation.

In these hypotheses, the mediating variable 'educational background' was investigated from six perspectives. Specifically, educational backgrounds in humanities, social sciences, natural/formal sciences, other, business studies, and non-business studies. The reason for investigating both business

and non-business studies alongside the three academic disciplines (and the category 'other') is that causation has traditionally been the predominant logic in business education (Dew et al., 2009; Pot, 2013; Sarasvathy, 2001). As a result, the mediating role of business studies is expected to play an even more significant role than non-business studies on the choice for an effectuation or causation approach. As Chandler et al. (2011) have noted that further research is needed on the relationship between education and causation and effectuation processes, I have included all three academic disciplines in my research. No literature was found that other studies than business studies teaching anything about effectuation or causation. However, Chamberlain et al. (2018) showed art students are more flexible than non-art students. A possible reason for this phenomenon might be that art students are taught to be flexible. The reason to teach students to be flexible might not have the purpose that one will use this flexibility in venture creation. However, when a certain student decides to start a venture one day, he might use his flexibility to get rid of unsuccessful experiments and move to other experiments (McGrath, 1999), or to be prepared for a crisis (Kuckertz et al., 2020).

3. Methodology

The purpose of this Master thesis is to find out whether the entrepreneur's extroversion and educational background have an effect on the effectuation or causation approach one is using in the creation of a venture. To further advance the area of effectuation and causation research into a more mature phase (Edmondson & Mcmanus, 2007), I decided to do research in a quantitative way. Qualtrics online survey tool of the University of Twente was used to send out a questionnaire to Dutch-speaking entrepreneurs in the Netherlands. To answer the research question it was necessary to gather quantifiable data. For the data collection, it did not matter what type of entrepreneur someone was, in which sector he/she was active or how many employees there were working in the firm. To say something about the role of educational background (part of human capital) and the relationship with causation and effectuation processes (Chandler et al., 2011), information about the entrepreneur's educational background was collected. By including entrepreneurs from different academic disciplines in the sample it was possible to discover new relationships.

3.1 Sample

An estimated number of 350 entrepreneurs were approached, 141 started the questionnaire, and 101 completed all questions, leading to a response rate of 28.9%. After checking for outliers, three cases were deleted and a dataset with 98 participants remained. The profile of the participants was as follows: 68 males and 30 females with an average age of 37.5. Most entrepreneurs completed an HBO or WO Bachelor's (57.1%) or a Master's (29.6%). MBO was done by 9.2% of the participants and secondary school by only 3.1%. There was one person in the dataset that did a PhD. 74.5% of the entrepreneurs had an educational background in social sciences, while 13.3% were in natural/formal sciences and 3.1% in humanities. The other 9.2% of the entrepreneurs had another educational background. Of all entrepreneurs, 42.9% had an educational background in business studies. Most entrepreneurs had less experience as an entrepreneur than 20 years (88.8%). 9.2% was an entrepreneur for 20-29 years, while there were 2 people (2%) with experience between 30 and 39 years. Most entrepreneurs started just one or two companies (87.8%). 10 entrepreneurs (10.2%) started three companies, one (1%) four and one (1%) five companies. The collection of the data happened between 25 October and 5 December 2022.

3.2 Method

To measure an entrepreneur's level of extroversion, standardized items were used. McCrae (2011) argues that classic personality theories are outdated as the modifying influences of the social and cultural environment are not taken into account. To ensure that extroversion is measured in a way that is compliant with today's society structures (Coudounaris & Arvidsson, 2021), the HEXACO-60

scale from (Ashton & Lee, 2009) was used. The HEXACO-60 consists of honesty-humility, emotionality, extroversion, agreeableness, consciousness and openness to experience. Each of them contains ten items, but for this research, only the items that measure extroversion were used. The choice for this scale was made based on the recommendations from Coudounaris & Arvidsson (2021) to use this scale. The HEXACO-60 has been widely used already, including in studies by Costantini et al. (2015), Aghababaei & Arji (2014) and Lee et al. (2013). Ashton & Lee (2009) argue that researchers who wish to use the Big Five or the Dark Triad could use the HEXACO-60 as an efficient way to capture the same personality variance. In addition, García et al. (2022) showed that the HEXACO-60 is a useful instrument to conduct personality trait research and practice around the world. Ashton & Lee (2009) and Ristic et al. (2021) suggest that the HEXACO-60 is more suitable for brief surveys than the HEXACO-100 or HEXACO-200. To increase participation, reduce early quitting, and improve the quality of the outcomes, the HEXACO-60 seems most suitable (Galesic & Bosnjak, 2009). The participants had to answer ten five-point Likert-scale items about expressiveness, social boldness, sociability and liveliness (Ashton & Lee, 2007), ranging from strongly disagree (1) to strongly agree (5) (Ashton & Lee, 2009).

In this research, the terms 'effectuation' and 'causation' are consistent with the constructs of Chandler et al. (2011) and hence might differ from the initial definition (Sarasvathy, 2001). The scales from Chandler et al. (2011) were used to measure effectuation and causation in a quantitative way. I considered using alternative quantitative scales from e.g. Fisher (2012) and Alsos & Clausen (2014), however, I am specifically studying the impact of an entrepreneur's extroversion on the approach they are using. As Coudounaris and Arvidsson (2021) were the only researchers to examine the relationship between personality traits and effectuation and causation logic, I chose to use the same scale for consistency. Chandler et al. (2011) operationalized effectuation by the subdimensions; experimentation, affordable loss, and flexibility, while causation has its own construct. Pre-commitments is a shared subdimension that is both, an effectuation and a causation construct (Chandler et al., 2011). The scale of Chandler et al. (2011) is widely used in effectuation literature (e.g. Fischer et al., 2021; Deligianni et al., 2016; Smolka et al., 2018; Palmié et al., 2019). Hence, the scale seems useful to determine one's preference for effectuation or causation. Effectuation consists of three sub-dimensions and has a shared dimension with causation (pre-commitments). Furthermore, causation has its own construct. The participants had to answer the items on a five-point Likert scale, from strongly disagree (1) to strongly agree (5) (Chandler et al., 2011).

Next to the primary variables (extroversion, effectuation and causation), a filter question, some control variables and possible mediating variables were measured. To filter non-entrepreneurs out of the survey, the first question was: 'are you an entrepreneur?'. Also, some control variables were measured e.g. gender, age, amount of years entrepreneur, and amount of ventures started by the entrepreneur.

In order to test the possible mediating effect of educational background, questions were asked about the entrepreneur's highest educational level and the study he/she has done/is doing. I made four clusters based on academic discipline: humanities, social sciences, natural/formal sciences and other. Moreover, the differences between business and non-business studies were investigated to find out whether the causation logic, that was taught in MBA education (Dew et al., 2009; Pot, 2013; Sarasvathy, 2001), was a possible mediator in the relationship between extroversion and effectuation/causation processes.

Before uploading the questionnaire, ethical approval from the ethics committee was needed. After the approval, I shared the questionnaire on Facebook, LinkedIn and Instagram. Furthermore, I sent all my entrepreneur connections a personalized message and asked people around me to send the questionnaire to entrepreneurs they know. I sent reminders to the entrepreneurs that did not answer the first time. Additionally, I approached some entrepreneurs in real life and asked them to fill in the questionnaire. Moreover, I hung up QR codes at Incubase and an employee from Incubase offered to share my questionnaire on their intranet. In addition, I attended a drink at Incubase where I talked to entrepreneurs and asked them to fill in the questionnaire. Lastly, I searched for e-mail addresses on the internet and sent 61 entrepreneurs a personalized e-mail. I did this because I thought that personalized emails would probably lead to a higher response ratio. All these activities were done to achieve as many respondents as possible.

3.3 Analysis

The analysis was done using SPSS version 27. In this program, the raw data was translated into useful tables and graphs. Based on these data, things could be said about the significance of the hypotheses and the relationships between the variables. Descriptive statistics provided a summary of the data from the sample. A confirmatory factor analysis was done in order to determine if the factors conform to what is expected based on Sarasvathy (2001). Furthermore, Chandler et al. (2011) suggest that the subconstructs are components of effectuation and help to define effectuation. Lastly, Coudounaris and Arvidsson (2021) also used a confirmatory factor analysis to test the hypotheses. Hence, a confirmatory factor analysis was done using Amos 26.

To conduct a linear regression, some assumptions have to be met (Hair, 2009). A linearity test was done by making use of a scatterplot. A normality test was done using PP-plots and a correlation test was done using Spearman's Rho. The dots in the PP-plots should be close to the line to meet the normality assumption (Stirling, 1982). The Spearman's Rho was used because the questionnaire consists of ordinal measurement scales for the independent and dependent variables (Kruskal, 1958). The equal variance was tested by Levene's test which should be non-significant. The independence of

the error term was determined by using the Durbin-Watson test and should be between 1.5 and 2.5 (Hair, 2009). As all assumptions were met, a linear regression analysis was conducted to analyze possible relationships between the independent variable (extroversion) and the dependent variables (effectuation and causation constructs) (Su et al., 2012). To find out whether educational background has an effect on study choice, I created dummy variables for the different educational backgrounds. To measure the mediating role of educational background, I used the software of PROCESS v4.2 from Hayes for SPSS. Furthermore, dummy variables were created to test the role of control variables in the regression model. An analysis of variance (ANOVA) was done in SPSS 27 to investigate how much of the variance in the dependent variable has been explained by the different control variables. I did this because only one hypothesis was supported.

To measure the reliability of the constructs, I used Cronbach's alpha and the construct reliability based on the Principal Component Analysis. To ensure that the constructs are reliable, Cronbach's alpha should be above 0.7 (Tavakol & Dennick, 2011). In addition, I checked for convergent validity by looking for similar patterns between related constructs. Convergent validities of $r > 0.7$ are recommended while $r < 0.5$ should be avoided (Carlson & Herdman, 2012). To check for discriminant validity, I used the average variance extracted (AVE). This value must be higher than 0.5 (Fornell & Larcker, 1981).

4. Results and data analysis

4.1 Confirmatory factor analysis

To test the fit of the model, a confirmatory factor analysis was done in Amos 26. The model showed that there is not a good fit as RMSEA was 0.068 and CFI was 0.681 (H. Kim et al., 2016). Chi-square is 567.7 with a degree of freedom of 391. As the initial model reached the iteration limit, I deleted e29 which had a value of -6.963 and a standard error of 38.153. This option was chosen as it resulted in the least alteration to the model. Otherwise, I had to delete the whole item (Precom1), which would have a big effect on Precom2 and on the items of the other subconstructs. After deleting e29 from Precom1, the minimum model fit was achieved. The RMSEA of 0.068 is between 0.05 and 0.08 which and therefore acceptable (Maltby et al., 2016; Marsh & Hocevar, 1985). Furthermore, the CMIN/DF is less than 2 which is good (Maltby et al., 2016; Marsh & Hocevar, 1985). However, the CFI is not even close to 0.9, which means that the fit is not good (H. Kim et al., 2016). Furthermore, 14 items have a factor loading below the cut-off point of 0.5 (Carlson & Herdman, 2012). I considered deleting several items to improve the model fit, but I decided not to do that as I used validated scales. Nevertheless, in the next paragraph, I continued with hypothesis testing based on the existing model in figure 2. I did so because I wanted to adhere to the future research recommendations of Coudounaris and Arvidsson (2021) and investigate whether a more up-to-date scale (HEXACO-60) would have different outcomes compared to the outdated scale that was used in their study. The corresponding correlations among the constructs are shown in table 1 and are below the threshold of 0.7. Therefore, there is no multicollinearity problem (Dormann et al., 2013; Prunier et al., 2015).
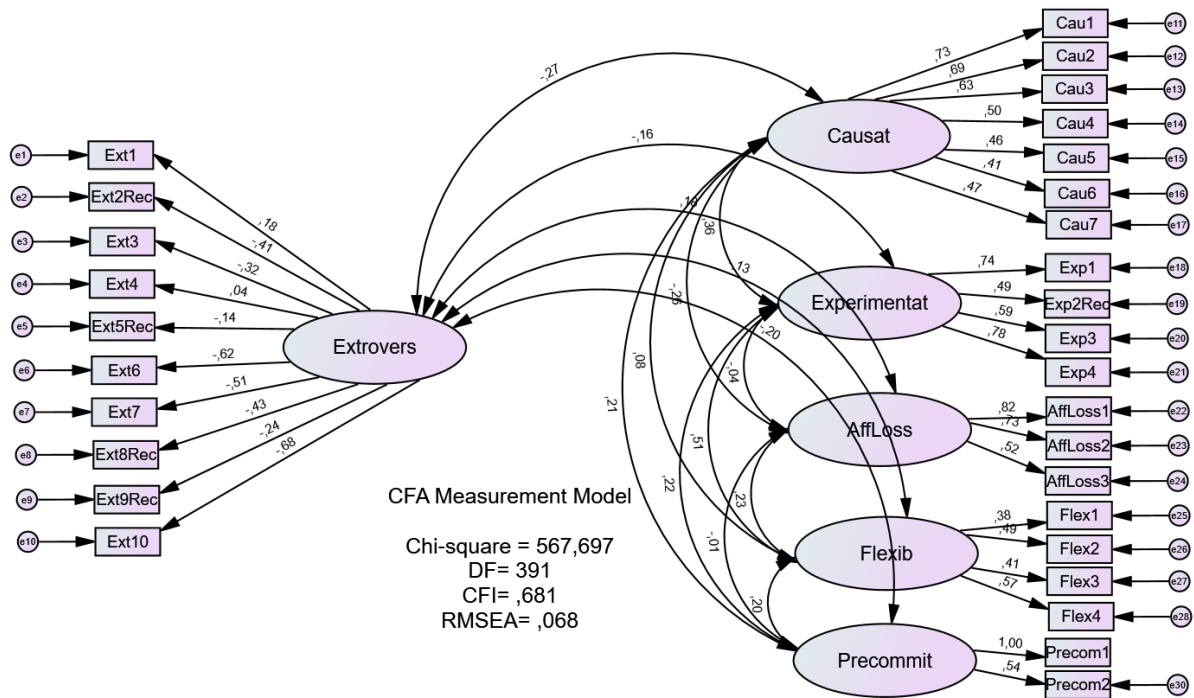
Figure 2: CFA Measurement Model

Table 1: Spearman's rho correlation matrix (N=98)

			Extroversion	Causation	Experimentation	Affordable Loss	Flexibility	Pre-commitments
					Correlations			
Spearman's rho	Extroversion	Correlation Coefficient	--					
		Sig. (2-tailed)						
	Causation	Correlation Coefficient	0,046	--				
		Sig. (2-tailed)	0,653					
	Experimentation	Correlation Coefficient	0,205*	0,279**	--			
		Sig. (2-tailed)	0,043	0,005				
	Affordable Loss	Correlation Coefficient	-0,123	-0,185	0,011	--		
		Sig. (2-tailed)	0,228	0,069	0,915			
	Flexibility	Correlation Coefficient	0,011	0,128	0,230*	0,081	--	
		Sig. (2-tailed)	0,912	0,209	0,023	0,429		
	Pre-commitments	Correlation Coefficient	0,037	0,268**	0,196	-0,023	0,104	--
		Sig. (2-tailed)	0,715	0,008	0,053	0,824	0,309	
* Correlation is significant at the 0.05 level (2-tailed)								
** Correlation is significant at the 0.01 level (2-tailed)								

4.2 Hypotheses testing

Linear regression was done in SPSS 27 to test whether the hypotheses should be accepted or rejected. To execute a linear regression, some assumptions must be met (Hair, 2009). In the first place, there should be a linear pattern between the dependent variable and the independent variables. The scatterplots show that there are linear relationships between the independent variables and the dependent variable, see Appendix D. Furthermore, the variables have to be normally distributed. As shown in Appendix D, the dots in the PP-plots are close to the line, meaning that the normality assumption is met. The homoscedasticity assumption is also met because equal variance was found in different groups, see Appendix F. The assumption for the independence of the error term was met as all constructs had values between 1.5 and 2.5 in the Durbin-Watson test, see Appendix D. This means that there is no auto-correlation between the residuals and the variables. As described in the previous

paragraph, there is no multicollinearity problem as the correlations among the constructs are below 0.7. As all assumptions are met, I can run the regression analysis.

Table 2: Hypotheses testing (N = 98)

Hypotheses	Relationship			Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
H1a	Extroversion	→	Effectuation	0,051	0,133	0,502	0,617	Non-supported
H1a (1)	Extroversion	→	Experimentat	0,197	0,199	1,968	0,052	Non-supported
H1a (2)	Extroversion	→	AffordLos	-0,107	0,248	-1,05	0,297	Non-supported
H1a (3)	Extroversion	→	Flexib	0,027	0,167	0,267	0,792	Non-supported
H1a (4)	Extroversion	→	Precommit	0,030	0,305	0,297	0,768	Non-supported
H1b	Extroversion	→	Causation	0,046	0,210	0,447	0,656	Non-supported
H1b (1)	Extroversion	→	Causat	0,046	0,217	0,447	0,656	Non-supported
H2a	**Extroversion**	**→**	**Human./Social**	**0,200**	**0,129**	**2,005**	**0,048**	**Supported**
H2b	Extroversion	→	Natural/formal	0,002	0,107	0,021	0,983	Non-supported
Indirect effects				LLCI	ULCI			
H3a	Extroversion → EduBack	→ Effectuation		-0,0371	0,1172			
H3b	Extroversion → EduBack	→ Causation		-0,0822	0,1874			

Abbreviations: Human, Humanities; LLCI, lower level confidence interval; ULCI, upper level confidence interval.

The relationship between extroversion and effectuation was insignificant (β = 0.051, *p* = 0.617). Moreover, no significance was found for extroversion on the separate constructs of effectuation. Only the relationship between extroversion and experimentation was close to significance (β = 0.197, *p* = 0.052). Hence, H1a was not supported. Extroversion was found insignificant on causation (β = 0.119, *p* = 0.236) and the constructs of causation were separately also insignificant. Therefore, I can state that H1b was not supported.

To test whether extroversion has a positive effect on choosing a humanities or social science study, a dummy variable was used. Natural/formal sciences and other got a 0 and humanities and social sciences 1. To test whether extroversion has a negative effect on choosing natural/formal sciences, natural/formal sciences got a 1 and Humanities and Social sciences got a 0. Extroversion was found to have a positive significant effect on choosing a humanities/social science study (β = 0.200, p = < .05). Hence, H2a was accepted. However, no evidence was found for the negative relationship between extroversion and natural/formal sciences (β = 0.002, *p* = 0.983). Hence, H2b was not supported.

To measure whether educational background has a mediating role in the relationship between extroversion and effectuation, PROCESS v4.2 from Hayes was used. It was found that educational background as a mediator between extroversion and effectuation has no significant effect (LLCI= -0.0371, UCLI= 0.1172) (i.e., H3a is not supported). Also, no evidence was found for the mediation of educational background on the relationship between extroversion and causation (LLCI = -0.0822, ULCI= 0.1874) (i.e., H3b is not supported). However, I found a tendency towards significance that entrepreneurs with an educational background in business studies are more likely to use the effectuation logic (β = 0.181, *p* = 0.074). This is surprising as scholars have argued that causation is the predominant logic taught in business education (Dew et al., 2009; Pot, 2013; Sarasvathy, 2001). The analysis of moderating effects may also be relevant. Existing literature shows that educational background could be a moderating variable (Ma et al., 2019; Staudt et al., 2022). However, I did not

find any evidence for the moderating role of educational background on the relationship between extroversion and effectuation/causation in our study.

4.3 Effects of control variables

As only one hypothesis was supported, I checked what the role of the control variables was in the regression model. Therefore, I created dummy variables for the different categories of the control variables. Afterwards, I added the dummy variables as independent variables next to extroversion in the regression model. This resulted in the outcomes that are shown in Appendix E. In table 3, an overview is given of the significant relationships.

Table 3: Regression model with control variables included

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,386	0,688	4,922	<0,001	
Extroversion	-0,019	0,207	-0,093	0,926	Non-significant
DummyGenderVrouw	**-0,39**	**0,145**	**-2,683**	**0,009**	**Significant**
a. Dependent variable: Causation*					
Model	**Beta**	**S.E.**	**C.R. (t)**	**p-value**	**Status of hypotheses**
(Constant)	3,477	1,011	3,438	0,001	
Extroversion	-0,055	0,305	-0,182	0,856	Non-significant
DummyGenderVrouw	**-0,502**	**0,213**	**-2,352**	**0,021**	**Significant**
a. Dependent variable: Pre-commitments					
Model	**Beta**	**S.E.**	**C.R. (t)**	**p-value**	**Status of hypotheses**
(Constant)	3,538	0,546	6,490	<0,001	
Extroversion	0,008	0,163	0,048	0,962	Non-significant
DummyAge2	0,339	0,198	1,710	0,091	Non-significant
DummyAge3	**0,562**	**0,258**	**2,174**	**0,032**	**Significant**
DummyAge4	**0,669**	**0,230**	**2,908**	**0,005**	**Significant**
DummyAge5	0,323	0,214	1,507	0,135	Non-significant
a. Dependent Variable: Flexibility					

* This is the causation construct. This construct consists of the subconstructs causation and pre-commitments

DummyAge1, 0-19 years old; DummyAge2, 20-29 years old; DummyAge3, 30-39 years old; DummyAge4, 40-49 years old; DummyAge5, 50-59 years old; and DummyAge6, 60-69 years old; DummyAge7, 70+ years old

Note: No entrepreneurs where found in the groups DummyAge1 and DummyAge7.

No significant differences were found between men and women on the predicted likelihood to use effectuation logic when taking extroversion into account. However, I found that, on average, being a woman has a negative effect on being causation-oriented. The difference between women and men is substantial and statistically significant after extroversion was taken into account (β = -0.390, $p < 0.05$). Furthermore, women have, on average, a negative effect on pre-commitments, after extroversion was taken into account (β = -0.502, $p < 0.05$). No significant differences were found between gender on the other (sub)constructs.

In addition, entrepreneurs aged 30 to 39 (β = 0.562, $p < 0.05$) and 40 to 49 (β = 0,669, $p < 0.05$) are on average more flexible than people aged 60 to 69 after extroversion was taken into account. No significant differences were found between age groups on the other (sub)constructs of effectuation and causation. Also, no significance was found for any of the levels of education on effectuation and

causation, when extroversion was taken into account. In addition, no significance was found for years of experience as a predictor of effectuation or causation, after extroversion was taken into account. Lastly, no significance was found for the amount of ventures an entrepreneur has started on any of the (sub)constructs of effectuation and causation.

4.4 Analysis of variance

I attempted to uncover the causes behind the lack of support for the hypotheses by examining differences in means and evaluating the impact of control variables on the dependent variables. I already tested the impact of the control variables on the regression model in the previous paragraph. To find differences in means between control variables and to say something about the variance that is explained by the control variables, I employed a One-way ANOVA in SPSS 27. As described in 4.2, the normality assumption was met. Furthermore, the independence assumption was met as the observations within each sample are independent. Levene's test showed homogeneity of variance across groups, see table 4. Also, the sample size assumption was met as the dataset existed of 98 entrepreneurs. The reasoning behind this One-way ANOVA was the possibility that the control variables may have played a significant role in the dependent variable's variance, resulting in the non-supported hypotheses. To do a One-way ANOVA, all independent variables had to be categorical. Therefore, I recoded the item 'age' into 'age groups'. All results of the One-way ANOVA and Levene's test, are shown in Appendix F, while the significant outcomes are presented in table 4. As the p-value of Levene's test is non-significant in all cases, the variance in each group is found to be equal.

Table 4: ANOVA table

Analysis of Variance							
					Homogeneity of variance (Levene's test)		
Independent variable	Dependent variable	F	p-value		Lev. Statistic	p-value	
Gender	Caus*	7,478	0,007	Significant	1,944	0,166	Non-significant
Gender	Pre-commitments	5,646	0,019	Significant	1,202	0,276	Non-significant
Age	Flexibility	2,591	0,042	Significant	0,389	0,816	Non-significant
YearsExperience	Pre-commitments	3,544	0,018	Significant	0,220	0,882	Non-significant
AmountCompanies	Flexibility	5,357	0,001	Significant	0,477	0,616	Non-significant

* This is the caustion construct, consisting of causation and pre-commitments

A significant difference in means was found between gender in relation to the causation construct (F= 7.478, *df*= 1, 96, *p*= 0.007) with an effect size of Eta^2 = 0.072, see Appendix G. This means that 7.2% of the variance in the causation construct is explained by gender. In addition, I found a significant difference in means for gender on the pre-commitments subconstruct (F= 5.646, *df*= 1, 96, *p*= 0.018). The strength of the effect, Eta^2 was 0.056, indicating that 5.6% of the variance in the pre-commitments subconstruct is accounted for by gender, see Appendix G.

Furthermore, a significant difference in means was found between age and the flexibility subconstruct (F= 2.591, *df*= 4, 93, *p*= 0.042). The strength of the effect, Eta^2 was 0.100, see Appendix G. This means that 10.0% of the variance in the flexibility subconstruct can be explained by age.

Also, a significant difference in means was found in the years of experience on pre-commitments (F= 3.544, *df*= 3, 94, *p*= 0.018), where 10.2% of the variance in pre-commitments is explained by years of experience (Eta^2 = 0.102), see Appendix G. Another significant difference was found for the number of companies started and flexibility (F= 5.357, *df*= 4, 93, *p*= 0.001), where 18.7% of the variance in flexibility is explained by the number of companies started by an entrepreneur (Eta^2 = 0.187), see Appendix G.

Control variables explain a significant amount of the variance in the causation construct and the subconstructs, pre-commitments and flexibility, making the regression analysis outcomes more understandable. Thus, the control variable 'gender' significantly contributes to the regression model for causation and pre-commitments; the control variable 'age' significantly contributes to the regression model for flexibility; 'years of experience' significantly contributes to the regression model for pre-commitments; and 'the number of companies found by the entrepreneur' significantly contributes to the regression model for flexibility. This means that the reliability of the outcomes of the regression model for the construct causation and the subconstructs pre-commitments and flexibility are questionable.

4.5 Reliability and validity

The reliability of the constructs is calculated in table 5 with the use of CFA and the estimation of Cronbach's alpha of the six constructs. Table 5 reveals that not all constructs have construct reliabilities above 0.7, but the average construct reliability is 0.734. The calculated constructs reliabilities via CFA are the following: 1: Causation = 0.862, 2: Experimentation = 0.864, 3: Extroversion = 0.768, 4: Affordable Loss = 0.878, 5: Pre-commitments = 0.516, and 6: Flexibility = 0.514.

Table 5: Standardized factor loadings, variance extracted, and construct reliability (N = 98)

Items	Rotated Component Matrix Component							Eigenvalues	δ = 1- item reliability	Σ of 1- item reliability
	1	2	3	4	5	6				
Cau1	0,727						0,727	4,192	0,273	2,808
Cau2	0,677						0,677		0,323	
Cau3	0,658						0,658		0,342	
Cau4	0,583						0,583		0,417	
Cau5	0,518						0,518		0,482	
Cau6	0,553						0,553		0,447	
Cau7	0,476						0,476		0,524	
Exp1		0,737					0,737	2,781	0,263	1,219
Exp2Rec		0,688					0,688		0,312	
Exp3		0,678					0,678		0,322	
Exp4		0,678					0,678		0,322	
AffLoss1				0,801			0,801	2,279	0,199	0,721
AffLoss2				0,808			0,808		0,192	
AffLoss3				0,670			0,670		0,330	
Flex1						0,548	0,548	1,594	0,452	2,406
Flex2						0,141	0,141		0,859	
Flex3						0,501	0,501		0,499	
Flex4						0,404	0,404		0,596	
Precom1					0,455		0,455	1,022	0,545	0,978
Precom2					0,567		0,567		0,433	
Ext1			-0,091				-0,091	3,693	-1,091	4,125
Ext2Rec			0,449				0,449		0,551	
Ext3			0,446				0,446		0,554	
Ext4			0,064				0,064		0,936	
Ext5Rec			0,131				0,131		0,869	
Ext6			0,708				0,708		0,292	
Ext7			0,621				0,621		0,379	
Ext8Rec			0,439				0,439		0,561	
Ext9Rec			0,166				0,166		0,834	
Ext10			0,760				0,760		0,240	
Variance extracted %	59,89	69,53	36,93	75,97	51,1	39,85	AVE= 55,545			
Construct Reliability	0,862	0,864	0,768	0,878	0,516	0,514	ACR= 0,734			

Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization
a. Rotation converged in 8 iterations
* Note: The following formulae are used for calculating VE and CR of constructs: VE = Σ of standardized regression weights/n,
CR = (Σ of standardized regression weights)^2/((Σ of standardized regression weights)^2 + (Σδ)), AVE = average variance extracted, ACR = average construct reliability.
Constructs: 1: Causation, 2: Experimentation, 3:Extroversion, 4: Affordable Loss, 5: Pre-commitments, 6: Flexibility

In addition, the Cronbach's alpha of the seven constructs was calculated in SPSS 27: Causation= 0.755, Experimentation= 0.759, Affordable loss= 0.728, Flexibility= 0.525, Pre-commitments= 0.699, Extroversion: 0.433. The average Cronbach's alpha is 0.645. The Cronbach's alpha for Flexibility, Pre-commitments and Extroversion is below the critical value of 0.7 (Tavakol & Dennick, 2011). However, scholars argue about the minimum of 0.7 and suggest that a Cronbach's alpha between 0.5 and 0.7 has moderate (acceptable) reliability (Ekolu, 2019; Hinton et al., 2004). In that sense, only the items from extroversion were not reliable. However, as the average Cronbach's alpha has moderately acceptable reliability, and because the constructs were validated, the confirmatory factor analysis was still executed.

To evaluate convergent validity, I looked for the factor loadings of the items in table 5. First, the factor loadings of eleven items were below 0.5. As only 6 out of the 30 values of factor loadings were above 0.7, this provides evidence that there is no convergent validity (Carlson & Herdman, 2012). Furthermore, the range of the factor loadings of related constructs is between 0.141 (Flex2) and 0.808 (AffLoss2), showing no convergent validity (Taherdoost, 2016). The average variance extracted (AVE) of the different constructs is 0.555. Since the AVE is greater than 0.5, and the square root of AVE is higher than the correlation among the constructs, see table 1, discriminant validity is satisfied (Fornell & Larcker, 1981). The constructs explain more information through their items than through inter-relationships with each other.

5. Discussion

5.1 Contributions to effectuation literature

Alsos et al. (2017) showed that the role of entrepreneurial identity plays an important role in the entrepreneurs' choice for an effectual or causal behavior. A recent study by Coudounaris and Arvidsson (2021) revealed that personality traits have a significant effect on effectuation and causation logic in the Estonian IT sector. Specifically, they found that extroversion is positively related to experimentation and flexibility. However, my findings reveal that effectuation and causation logic under Dutch-speaking entrepreneurs in the Netherlands cannot be predicted by extroversion (i.e., H1a and H1b are not supported).

That I did not find evidence for a significant relationship between extroversion and effectuation and causation could have different reasons. In the first place, the context in which I did my research differs from the study by Coudounaris and Arvidsson (2021). My research was done in the Netherlands while theirs was done in Estonia. Hence, cultural differences might affected the results (Stienstra et al., 2016). Second, in their study, they included managers and entrepreneurs, while I only included entrepreneurs. Lastly, Coudounaris and Arvidsson (2021) focused on the IT industry while I included entrepreneurs in all kinds of industries. I did this on purpose as I wanted to make my research applicable to entrepreneurs in general, and because it was more doable to gather enough entrepreneurs. However, this might have led to different outcomes than the study by Coudounaris and Arvidsson (2021). Therefore, I showed that their results are not generalizable in every context.

The mediating role of educational background was not significant (i.e., H3a and H3b are not supported). However, I found a positive and significant relationship between extroversion and humanities/social sciences, thus providing support for H2a. This is in line with Humburg (2017) and Vedel et al. (2015) who suggest that extroverted people are more likely to choose a humanities or social science study. However, I did not find evidence that introverted people are more likely to choose a natural/formal science study (i.e., H2b is not supported). Hence, I showed that outcomes of the studies by Humburg (2017) and Vedel et al. (2015) about extroverted people are generalizable in the Dutch context, but I showed that the results for introverts are not generalizable into the Dutch context.

Furthermore, I found a tendency to the significance that people who did a business study are more likely to use the effectuation logic. This is surprising as scholars have argued that causation is the predominant logic taught in business education (Dew et al., 2009; Pot, 2013; Sarasvathy, 2001). Hence, I contribute to the effectuation literature that some literature about extroversion in relation to effectuation needs to be revised as it might be not relevant anymore in certain contexts.

No significance was found for H1a and H1b, but significant differences were discovered between groups. The study shows that there is a significant difference between men and women in terms of their usage of causation logic (β = -0.390, p < 0.05), with women being less likely to employ the causation logic. This negative relationship is surprising, as Melo et al. (2019) found that women tend to exhibit the traits of a causal perspective, such as conducting more thorough research and taking more time in the planning and decision-making process. Hence, I showed that their results are not generalizable in every context. My research uncovered a notable disparity, with women being less inclined to utilize pre-commitments as compared to men (β = -0.502, p = 0.019). It is challenging to determine the reason behind this difference, as pre-commitments encompasses both causation and effectuation. It may be that women view acquiring necessary resources and implementing plans as less crucial or prioritize flexibility, cost-minimization, and uncertainty reduction to a lesser extent than men (Chandler et al., 2011).

Additionally, entrepreneurs aged 30 to 39 (β = 0.562, p < 0.05) and 40 to 49 (β = 0,669, p < 0.05) are on average more flexible than people aged 60 to 69 when taking extroversion into account. Bluedorn & Martin (2008) argue that the age of an entrepreneur is important in explaining one's flexibility. They found that the older the entrepreneur, the less stress was reported and the greater the perceived temporal flexibility of work. However, my research findings do not align with this theory, as there is no clear pattern linking age and flexibility in my data. Hence, I contribute to the literature that the study results by Bluedorn & Martin (2008) are not applicable in the Dutch context.

5.2 Practical implications

The findings of this research reveal that extroversion is not a predictor of one's effectuation or causal logic. Therefore, the entrepreneurs' level of extroversion will not provide the stakeholders with an explanation for certain actions or choices.

In addition, the findings show that causation, which is the predominant logic in MBA education, is not of big importance in one's venture creation process as effectuation logic has been used widely by business graduates. This implies that causation might be less important in the venture creation process than effectuation. Hence, MBA policymakers and lecturers should consider paying more attention to effectuation instead of causation logic. They can do so by exposing their students to an unusual situation in which the students are forced to be flexible and creative and to try different approaches in order to find the best solution to the problem.

Another practical contribution of this study is that stakeholders will better understand the decisions of the entrepreneur based on his/her gender. Stakeholders now know that women are less likely to

make pre-commitments and adopt a planning approach. Overall, these findings allow stakeholders to have a better grasp of the reasoning behind an entrepreneur's decisions.

5.3 Limitations and future research

Next to the useful contributions, this study has also some limitations. First of all, the low construct reliability/ Cronbach's alpha for flexibility, extroversion, and pre-commitments might threaten the reliability of the outcomes. A cutoff point that is regularly used for Cronbach's alpha or construct reliability is 0.7 (Tavakol & Dennick, 2011). However, some scholars argue that a Cronbach's alpha between 0.5 and 0.7 shows moderate (acceptable) reliability (Ekolu, 2019; Hinton et al., 2004). However, a lower Cronbach's alpha/ construct reliability leads to less reliable outcomes. I have considered deleting those items to increase Cronbach's alpha/ construct reliability, but as the constructs and items were validated in previous studies, I did not. Furthermore, the convergent validity was poor as the factor loadings of several items were below the cutoff point of 0.5 (Carlson & Herdman, 2012). I considered deleting those items to improve the model fit, but I decided not to do that as I used validated scales. To make sure that the reliability and validity will be better, future studies should come up with better items for the flexibility and pre-commitments constructs from Chandler et al. (2011).

In addition, the HEXACO-60 needs to be revised as the items have low factor loadings and poor Cronbach's alpha/ construct reliability. A possible cause for this might be the reverse-coded items as people might read them too fast and miss that the item is reverse-coded. Van Sonderen et al. (2013) found that reverse-worded items appear to increase the risk of inattention and confusion. In addition, the model fit was not good. As the scales were validated, I did not delete any items from the model. However, Weijters & Baumgartner (2012) suggest that factor models featuring reversed items tend to display weaker factor loadings. Therefore, a new scale must be created in which the extroversion construct will be measured without reverse-coded items.

Another limitation of my thesis is that the control variables had a significant contribution to the variance in causation and the subconstructs pre-commitments and flexibility. As 7.2% of the variance in causation was explained by gender, an explanation was found for the non-significance of H1b. This suggests that gender was an important factor in whether an entrepreneur would use the causation logic. Furthermore, 5.6% of the variance in pre-commitments was accounted for by gender, while 10.2% was explained by years of experience. As 15.8% of the variance in pre-commitments was explained by other variables than extroversion, it is not surprising that I did not find significance for the relationship between extroversion and effectuation/causation. As 18.7% of the flexibility subconstruct is explained by the number of companies started by the entrepreneur and 10.0% by the age of the entrepreneur, another reason for the non-significance of H1a was found.

I found a tendency towards significance that business graduates are more likely to use effectuation than causation logic in their venture creation process. To find out whether the literature about the relationship between business studies and effectuation/causation logic by Dew et al. (2009), Pot (2013) and Sarasvathy (2001) is not relevant anymore, a replication of this study with a larger sample is needed in different countries. Furthermore, researchers should consider other possible mediating variables, that might influence the relationship between extroversion and effectuation/causation logic. Finally, the study has the limitation that other personality traits than extroversion were not included. Future scholars should take these personality traits also into account, such as Coudounaris and Arvidsson (2021) did, but include educational background to check for possible mediating or moderating effects.

I found that women are less likely to use causation logic and pre-commitments to reduce uncertainty. More evidence is needed to find out whether these relationships are significant in different contexts. In order to do so, a larger sample is needed in which the amount of men and women that participate in the questionnaire is equal. Future researchers should investigate why women are less likely to make pre-commitments. They should examine whether this is because women view acquiring necessary resources and implementing plans as less crucial or prioritize flexibility, cost-minimization, and uncertainty reduction to a lesser extent than men (Chandler et al., 2011).

6. Conclusion

The aim of this study was to answer the research question '*To what extent does the entrepreneur's level of extroversion have an effect on effectuation/causation and what is the role of educational background?'.* I investigated whether extroversion can predict an entrepreneur's preference for a causal or effectuation approach. Furthermore, I assessed the potential mediating effects of educational background. In addition, I examined the possible relationships between extroversion and one's study preference (educational background) in order to test whether the existing theory is still relevant. This study did not find a relationship between extroversion and effectuation or causation. Moreover, no significant mediating effect of educational background was found. This research shows that extroverted people are more likely to choose a humanities/social science study. No evidence was found for a relationship between extroversion and choosing a natural/formal science study.

My research extended the existing literature on effectuation by showing that the findings of Coudounaris and Arvidsson (2021) are not applicable in the Dutch context. My research also revealed that women are less likely to use causation logic and make pre-commitments than men. Next to that, I found that entrepreneurs aged 30 to 39 and 40 to 49, on average, are more flexible than people aged 60 to 69. This is surprising as Bluedorn & Martin (2008) argue that older entrepreneurs are

more flexible. From a practical perspective, this research points out that study program developers and teachers should consider giving effectuation a more prominent role in business education.

7. Acknowledgements

References

Aghababaei, N., & Arji, A. (2014). Well-being and the HEXACO model of personality. *Personality and Individual Differences*, *56*(1), 139–142. https://doi.org/10.1016/J.PAID.2013.08.037

Agogué, M., Lundqvist, M., & Middleton, K. W. (2015). Mindful Deviation Through Combining Causation and Effectuation: A Design Theory-Based Study of Technology Entrepreneurship. *Creativity and Innovation Management*, *24*(4), 629–644. https://doi.org/10.1111/CAIM.12134

Ahsanullah, M., Kibria, B. M. G., & Shakil, M. (2014). *Normal and student's t distributions and their applications*.

Alsos, G. A., & Clausen, T. H. (2014). The start-up processes of tourism firms: The use of causation and effectuation strategies. *Handbook of Research on Innovation in Tourism Industries*, 181–202. https://doi.org/10.4337/9781782548416.00016

Alsos, G. A., Clausen, T. H., Hytti, U., & Solvoll, S. (2017). *Entrepreneurs' social identity and the preference of causal and effectual behaviours in start-Up processes*.

Alsos, G. A., Clausen, T. H., & Solvoll, S. (2014). Towards a Better Measurement Scale of Causation and Effectuation. *Https://Doi.Org/10.5465/Ambpp.2014.13785abstract*, *1*, 13785. https://doi.org/10.5465/AMBPP.2014.13785ABSTRACT

Ansoff, H. I. (1980). Strategic issue management. *Strategic Management Journal*, *1*(2), 131–148. https://doi.org/10.1002/SMJ.4250010204

Arend, R. J., Sarooghi, H., & Burkemper, A. (2015). Effectuation as ineffectual? Applying the 3E theory-assessment framework to a proposed new theory of entrepreneurship. *Academy of Management Review*, *40*(4), 630–651. https://doi.org/10.5465/AMR.2014.0455

Ashton, M. C., & Lee, K. (2007). Empirical, Theoretical, and Practical Advantages of the HEXACO Model of Personality Structure. *Http://Dx.Doi.Org/10.1177/1088868306294907*, *11*(2), 150–166. https://doi.org/10.1177/1088868306294907

Ashton, M. C., & Lee, K. (2009). The HEXACO-60: A short measure of the major dimensions of personality. *Journal of Personality Assessment*, *91*(4), 340–345. https://doi.org/10.1080/00223890902935878

Awwad, M. S., & Al-Aseer, R. M. N. (2021). Big Five personality traits impact on entrepreneurial intention: the mediating role of entrepreneurial alertness. *Asia Pacific Journal of Innovation and Entrepreneurship*, *15*(1), 87–100. https://doi.org/10.1108/APJIE-09-2020-0136

BARRICK, M. R., & MOUNT, M. K. (1991). THE BIG FIVE PERSONALITY DIMENSIONS AND JOB PERFORMANCE: A META-ANALYSIS. *Personnel Psychology*, *44*(1), 1–26. https://doi.org/10.1111/J.1744-6570.1991.TB00688.X

Bellani, L., & Bia, M. (2019). The long-run effect of childhood poverty and the mediating role of education. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *182*(1), 37–68. https://doi.org/10.1111/RSSA.12388

Benischke, M. H., Martin, G. P., & Glaser, L. (2019). CEO equity risk bearing and strategic risk taking: The moderating effect of CEO personality. *Strategic Management Journal*, *40*(1), 153–177. https://doi.org/10.1002/SMJ.2974

Bluedorn, A. C., & Martin, G. (2008). The time frames of entrepreneurs. *Journal of Business Venturing*, *23*(1), 1–20. https://doi.org/10.1016/j.jbusvent.2006.05.005

Brettel, M., Mauer, R., Engelen, A., & Küpper, D. (2012). Corporate effectuation: Entrepreneurial action and its impact on R&D project performance. *Journal of Business Venturing*, *27*(2), 167–184. https://doi.org/10.1016/J.JBUSVENT.2011.01.001

Brews, P. J., & Hunt, M. R. (1999). LEARNING TO PLAN AND PLANNING TO LEARN: RESOLVING THE PLANNING SCHOOL/LEARNING SCHOOL DEBATE. *Strategic Management Journal Strat. Mgmt. J*, *20*, 889–913. https://doi.org/10.1002/(SICI)1097-0266(199910)20:10<889::AID-SMJ60>3.0.CO;2-F

Brinckmann, J., Grichnik, D., & Kapsa, D. (2010). Should entrepreneurs plan or just storm the castle? A meta-analysis on contextual factors impacting the business planning–performance relationship in small firms. *Journal of Business Venturing*, *25*(1), 24–40. https://doi.org/10.1016/J.JBUSVENT.2008.10.007

Brown, S. L., & Eisenhardt, K. M. (1997). The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations. *Administrative Science Quarterly*, *42*(1), 1–34. https://doi.org/10.2307/2393807

Caliendo, M. ;, Fossen, F. M. ;, & Kritikos, A. S. (2009). A Service of zbw Leibniz-Informationszentrum Wirtschaft Leibniz Information Centre for Economics Standard-Nutzungsbedingungen. *Small Business Economics*. www.econstor.eu

Carlson, K. D., & Herdman, A. O. (2012). Understanding the impact of convergent validity on research results. *Organizational Research Methods*, *15*(1), 17–32. https://doi.org/10.1177/1094428110392383/ASSET/IMAGES/LARGE/10.1177_10944281103923 83-FIG2.JPEG

Carvalho, L. D. F., Pianowski, G., & Gonçalves, A. P. (2020). Personality differences and COVID-19: are extroversion and conscientiousness personality traits associated with engagement with containment measures? *APRS | CC-BY Trends Psychiatry Psychother*, *42*(2). https://doi.org/10.1590/2237-6089-2020

Central Bureau of Statistics [CBS]. (2022, April 15). *Bedrijven; bedrijfstak*. https://opendata-cbs-nl.ezproxy2.utwente.nl/statline/#/CBS/nl/dataset/81589NED/table?ts=1657006873652

Chamberlain, R., Swinnen, L., Heeren, S., & Wagemans, J. (2018). Perceptual flexibility is coupled with reduced executive inhibition in students of the visual arts. *British Journal of Psychology*, *109*, 244–258. https://doi.org/10.1111/bjop.12253

Chandler, G. N., DeTienne, D. R., McKelvie, A., & Mumford, T. v. (2011). Causation and effectuation processes: A validation study. *Journal of Business Venturing*, *26*(3), 375–390. https://doi.org/10.1016/J.JBUSVENT.2009.10.006

Connelly, B. S., & Ones, D. S. (2010). An other perspective on personality: meta-analytic integration of observers' accuracy and predictive validity. *Psychological Bulletin*, *136*(6), 1092–1122. https://doi.org/10.1037/A0021212

Costa, P. T., & McCrae, R. R. (1988). Personality in Adulthood: A Six-Year Longitudinal Study of Self-Reports and Spouse Ratings on the NEO Personality Inventory. *Journal of Personality and Social Psychology*, *54*(5), 853–863. https://doi.org/10.1037/0022-3514.54.5.853

Costa, P. T., McCrae, R. R., & Holland, J. L. (1984). Personality and vocational interests in an adult sample. *Journal of Applied Psychology*, *69*(3), 390–400. https://doi.org/10.1037/0021-9010.69.3.390

Costantini, G., Epskamp, S., Borsboom, D., Perugini, M., Mõttus, R., Waldorp, L. J., & Cramer, A. O. J. (2015). State of the aRt personality research: A tutorial on network analysis of personality data in R. *Journal of Research in Personality*, *54*, 13–29. https://doi.org/10.1016/J.JRP.2014.07.003

Coudounaris, D. N., & Arvidsson, H. G. S. (2021). Relationships between the Big-5 Model and Effectuation versus Causation Logics of Entrepreneurs in New Ventures: The Estonian IT Sector. *Administrative Sciences 2021, Vol. 11, Page 106*, *11*(4), 106. https://doi.org/10.3390/ADMSCI11040106

Crant, J. M. (1996). The Proactive Personality Scale as a Predictor of Entrepreneurial Intention. *Journal of Small Business Management*. https://www.researchgate.net/publication/247954830

Deligianni, I., Voudouris, I., & Lioukas, S. (2016). Do Effectuation Processes Shape the Relationship between Product Diversification and Performance in New Ventures?: *Https://Doi-Org.Ezproxy2.Utwente.Nl/10.1111/Etap.12210*, *41*(3), 349–377. https://doi.org/10.1111/ETAP.12210

Dew, N., Read, S., Sarasvathy, S. D., & Wiltbank, R. (2009). Effectual versus predictive logics in entrepreneurial decision-making: Differences between experts and novices. *Journal of Business Venturing*, *24*(4), 287–309. https://doi.org/10.1016/J.JBUSVENT.2008.02.002

Dew, N., Sarasathy, S., Read, S., & Wiltbank, R. (2009). Affordable loss: behavioral economic aspects of the plunge decision. *Strategic Entrepreneurship Journal*, *3*(2), 105–126. https://doi.org/10.1002/SEJ.66

Dewaele, J. M., & Furnham, A. (1999). Extraversion: The Unloved Variable in Applied Linguistic Research. *Language Learning*, *49*(3), 509–544. https://doi.org/10.1111/0023-8333.00098

Dormann, C. F., Elith, J., Bacher, S., Buchmann, C., Carl, G., Carré, G., Marquéz, J. R. G., Gruber, B., Lafourcade, B., Leitão, P. J., Münkemüller, T., Mcclean, C., Osborne, P. E., Reineking, B., Schröder, B., Skidmore, A. K., Zurell, D., & Lautenbach, S. (2013). Collinearity: a review of methods to deal with it and a simulation study evaluating their performance. *Ecography*, *36*(1), 27–46. https://doi.org/10.1111/J.1600-0587.2012.07348.X

Dorner, D., & Hille, K. (1995). Artificial souls: motivated emotional robots. *Proceedings of the IEEE International Conference on Systems, Man and Cybernetics*, *4*, 3828–3832. https://doi.org/10.1109/ICSMC.1995.538385

Drucker, P. F. (1998). The discipline of innovation. *Harvard Business Review*, *76*(6), 149–157. https://doi.org/10.1002/ltl.40619980906

Edmondson, A. C., & Mcmanus, S. E. (2007). Methodological fit in management field research. *Https://Doi.Org/10.5465/Amr.2007.26586086*, *32*(4), 1155–1179. https://doi.org/10.5465/AMR.2007.26586086

Eisenhardt, K. M., & Brown, S. L. (1998). Competing on the Edge: Strategy as Structured Chaos. *Long Range Planning*, *31*(5), 786–789. https://doi.org/10.1016/S0024-6301(98)00092-2

Ekolu, S. O. & Q. H. (2019). Reliability of assessments in engineering education using Cronbach's alpha, KR and split-half methods. *Global Journal of Engineering Education*.

Eysenck, S. B. G. (1962). The validity of a personality questionnaire as determined by the method of nominated groups. *Life Sciences*, *1*(1), 13–18. https://doi.org/10.1016/0024-3205(62)90026-7

Eysenck, S. B. G., Eysenck, H. J., & Barrett, P. (1985). A revised version of the psychoticism scale. *Personality and Individual Differences*, *6*(1), 21–29. https://doi.org/10.1016/0191-8869(85)90026-1

Fiet, J. O. (2002). *The Systematic Search for Entrepreneurial Discoveries - James O. Fiet - Google Books*. https://books.google.nl/books?hl=en&lr=&id=n1d3h03sy9gC&oi=fnd&pg=PR9&ots=vsrqff0Ekw&sig=7nPTUQzFm2Eco36427C2v-EIPO4&redir_esc=y#v=onepage&q&f=false

Fischer, D., Greven, A., Tornow, M., & Brettel, M. (2021). On the value of effectuation processes for R&D alliances and the moderating role of R&D alliance experience. *Journal of Business Research*, *135*, 606–619. https://doi.org/10.1016/J.JBUSRES.2021.07.007

Fisher, G. (2012). *Effectuation, Causation, and Bricolage: A Behavioral Comparison of Emerging Theories in Entrepreneurship Research*. https://doi.org/10.1111/j.1540-6520.2012.00537.x

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Galesic, M., & Bosnjak, M. (2009). EFFECTS OF QUESTIONNAIRE LENGTH ON PARTICIPATION AND INDICATORS OF RESPONSE QUALITY IN A WEB SURVEY. *Public Opinion Quarterly*, *73*(2), 349–360. https://doi.org/10.1093/poq/nfp031

García, L. F., Aluja, A., Rossier, J., Ostendorf, F., Glicksohn, J., Oumar, B., Bellaj, T., Ruch, W., Wang, W., Kövi, Z., Ścigała, D., Čekrlija, Đ., Stivers, A. W., di Blas, L., Valdivia, M., ben Jemaa, S., Atitsogbe, K. A., & Hansenne, M. (2022). Exploring the stability of HEXACO-60 structure and the association of gender, age, and social position with personality traits across 18 countries. *Journal of Personality*, *90*(2), 256–276. https://doi.org/10.1111/JOPY.12664

Gocłowska, M. A., Ritter, S. M., Elliot, A. J., & Baas, M. (2018). Novelty seeking is linked to openness and extraversion, and can lead to greater creative performance. *Journal of Personality*, *87*(2), 252–266. https://doi.org/10.1111/jopy.12387

Goll, I., & Rasheed, A. M. A. (1997). RESEARCH NOTES AND COMMUNICATIONS RATIONAL DECISION-MAKING AND FIRM PERFORMANCE: THE MODERATING ROLE OF ENVIRONMENT. *Strategic Management Journal*, *18*, 583–591. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7

Grégoire, D. A., & Cherchem, N. (2020). A structured literature review and suggestions for future effectuation research. *Small Business Economics*, *54*(3), 621–639. https://doi.org/10.1007/S11187-019-00158-5/TABLES/2

Hair, J. (2009). Multivariate Data Analysis. *Faculty Publications*. https://digitalcommons.kennesaw.edu/facpubs/2925

Hamid, S. A. R., Khan, M. K. N., Kiani, S. T. M., Shah, T. Z., & Kiani, S. (2014). The Impact of Education as Mediator on Sustainable Consumer Behavior. *International Review of Management and Business Research*, *3*, 4. www.irmbrjournal.com

Harms, R., & Schiele, H. (2012). Antecedents and consequences of effectuation and causation in the international new venture creation process. *Journal of International Entrepreneurship*, *10*(2), 95–116. https://doi.org/10.1007/S10843-012-0089-2/TABLES/6

Herron, L., & Sapienza, H. J. (2017). The Entrepreneur and the Initiation of New Venture Launch Activities. *Https://Doi.Org/10.1177/104225879201700106*, *17*(1), 49–55. https://doi.org/10.1177/104225879201700106

Hinton, P., McMurray, I., & Brownlow, C. (2004). *SPSS Explained*. Routledge. https://doi.org/10.4324/9780203642597

Hough, J. R., & White, M. A. (2003). Environmental dynamism and strategic decision-making rationality: an examination at the decision level. *Strategic Management Journal*, *24*(5), 481–489. https://doi.org/10.1002/SMJ.303

Humburg, M. (2017). Personality and field of study choice in university. *Education Economics*, *25*(4), 366–378. https://doi.org/10.1080/09645292.2017.1282426/SUPPL_FILE/CEDE_A_1282426_SM3467.PDF

Janowski, A., & Szczepańska-Przekota, A. (2022). The Trait of Extraversion as an Energy-Based Determinant of Entrepreneur’s Success—The Case of Poland. *Energies 2022, Vol. 15, Page 4533*, *15*(13), 4533. https://doi.org/10.3390/EN15134533

Jensen, G. H., & Ditiberio, J. K. (1984). *Personality and Individual Writing Processes*. *35*(3), 285–300.

Karlson, K. B., & Birkelund, J. F. (2019). Education as a mediator of the association between origins and destinations: The role of early skills. *Research in Social Stratification and Mobility*, *64*, 100436. https://doi.org/10.1016/J.RSSM.2019.100436

Kim, H., Ku, B., Kim, J. Y., Park, Y. J., & Park, Y. B. (2016). Confirmatory and Exploratory Factor Analysis for Validating the Phlegm Pattern Questionnaire for Healthy Subjects. *Evidence-Based Complementary and Alternative Medicine : ECAM*, *2016*. https://doi.org/10.1155/2016/2696019

Kim, W. C., & Mauborgne, R. (1997). Value Innovation: The Strategic Logic of High Growth. *Harvard Business Review*.

Koberg, C. S., Detienne, D. R., & Heppard, K. A. (2003). An empirical test of environmental, organizational, and process factors affecting incremental and radical innovation. *Journal of High Technology Management Research*, *14*, 21–45. https://doi.org/10.1016/S1047-8310(03)00003-8

Kotler, P. (2000). *Marketing Management, Millenium Edition*. www.pearsoncustom.com

Kruskal, W. H. (1958). Ordinal Measures of Association. *Journal of the American Statistical Association*, *53*(284), 814–861. https://doi.org/10.1080/01621459.1958.10501481

Kuckertz, A., Brändle, L., Gaudig, A., Hinderer, S., Morales Reyes, C. A., Prochotta, A., Steinbrink, K. M., & Berger, E. S. C. (2020). Startups in times of crisis – A rapid response to the COVID-19 pandemic. *Journal of Business Venturing Insights*, *13*, e00169. https://doi.org/10.1016/J.JBVI.2020.E00169

Lamb, C. W., Shipp, S. H., & Moncrief, W. C. (2016). Integrating Skills and Content Knowledge in the Marketing Curriculum. *Http://Dx.Doi.Org/10.1177/027347539501700203*, *17*(2), 10–19. https://doi.org/10.1177/027347539501700203

Lee, K., Ashton, M. C., Wiltshire, J., Bourdage, J. S., Visser, B. A., & Gallucci, A. (2013). Sex, Power, and Money: Prediction from the Dark Triad and Honesty–Humility. *European Journal of Personality*, *27*(2), 169–184. https://doi.org/10.1002/PER.1860

Lee, S. Y., Min, J., & Kim, J. (2020). Personality: Introversion. *Encyclopedia of Creativity*, 332–337. https://doi.org/10.1016/B978-0-12-809324-5.23727-9

Lucas, R. E., & Diener, E. (2001). Extraversion. *International Encyclopedia of the Social & Behavioral Sciences*, 5202–5205. https://doi.org/10.1016/B0-08-043076-7/01770-8

Ma, Y., Zhang, Q., Yin, Q., & Wang, B. (2019). The Influence of Top Managers on Environmental Information Disclosure: The Moderating Effect of Company's Environmental Performance. *International Journal of Environmental Research and Public Health 2019, Vol. 16, Page 1167*, *16*(7), 1167. https://doi.org/10.3390/IJERPH16071167

Mäkimurto-Koivumaa, S., & Puhakka, V. (2013). Effectuation and causation in entrepreneurship education. *International Journal of Entrepreneurial Venturing*, *Y*, 0–000.

Maltby, J., Day, L., Zemojtel-Piotrowska, M., Piotrowski, J., Hitokoto, H., Baran, T., Jones, C., Chakravarty-Agbo, A., & Flowe, H. D. (2016). An ecological systems model of trait resilience: Cross-cultural and clinical relevance. *Personality and Individual Differences*, *98*, 96–101. https://doi.org/10.1016/J.PAID.2016.03.100

March, J. G. (1991). Exploration and Exploitation in Organizational Learning. *Organization Science*, *2*(1), 71–87. https://doi.org/10.1287/orsc.2.1.71

March, J. G., & Simon, H. A. (1958). *Organizations*. https://books.google.com/books?hl=en&lr=&id=FbBJEAAAQBAJ&oi=fnd&pg=PR7&ots=I0Mtmf URDc&sig=ag-1y7eEy6w2DMYq_P54H2hodUU

Marsh, H. W., & Hocevar, D. (1985). Application of Confirmatory Factor Analysis to the Study of Self-Concept. First- and Higher Order Factor Models and Their Invariance Across Groups. *Psychological Bulletin*, *97*(3), 562–582. https://doi.org/10.1037/0033-2909.97.3.562

McCrae, R. R. (2011). Personality Theories for the 21st Century. *Teaching of Psychology*, *38*(3), 209–214. https://doi.org/10.1177/0098628311411785/ASSET/IMAGES/LARGE/10.1177_00986283114117 85-FIG1.JPEG

McGrath, R. G. (1999). Falling Forward: Real Options Reasoning and Entrepreneurial Failure. *Https://Doi.Org/10.5465/Amr.1999.1580438*, *24*(1), 13–30. https://doi.org/10.5465/AMR.1999.1580438

McMullen, J. S., & Shepherd, D. A. (2006). Entrepreneurial Action And The Role Of Uncertainty In The Theory Of The Entrepreneur. *Https://Doi.Org/10.5465/Amr.2006.19379628*, *31*(1), 132–152. https://doi.org/10.5465/AMR.2006.19379628

Melo, F., Silva, R., & Almeida, T. (2019). Gender and Entrepreneurship: a comparative study between the Causation and Effectuation approaches. *Brazilian Business Review*, *16*(3), 273–296. https://doi.org/10.15728/bbr.2019.16.3.5

Mintzberg, H., & Waters, J. A. (1985). Of strategies, deliberate and emergent. *Strategic Management Journal*, *6*(3), 257–272. https://doi.org/10.1002/SMJ.4250060306

Nelson, T. E. (2012). *EXPERIENCE, EFFECTUATION, AND SOMETHING GOOD DOES THE USE OF EFFECTUATION LEAD TO POSITIVE OUTCOMES?*

Nicholls-Nixon, C. L., Cooper, A. C., & Woo, C. Y. (2000). STRATEGIC EXPERIMENTATION: UNDERSTANDING CHANGE AND PERFORMANCE IN NEW VENTURES. *Journal of Business Venturing*, *15*, 493–521.

Nicholson, N., Soane, E., Fenton-O'Creevy, M., & Willman, P. (2006). Personality and domain-specific risk taking. *Https://Doi-Org.Ezproxy2.Utwente.Nl/10.1080/1366987032000123856*, *8*(2), 157–176. https://doi.org/10.1080/1366987032000123856

Ogilvie, dt. (1998). Creative action as a dynamic strategy: Using imagination to improve strategic solutions in unstable environments. *Journal of Business Research*, *41*(1), 49–56. https://doi.org/10.1016/S0148-2963(97)00011-8

Olson, P. D. (2017). Entrepreneurship: Process and Abilities: *Https://Doi-Org.Ezproxy2.Utwente.Nl/10.1177/104225878501000103*, *10*(1), 25–31. https://doi.org/10.1177/104225878501000103

Palmié, M., Huerzeler, P., Grichnik, D., Keupp, M. M., & Gassmann, O. (2019). Some principles are more equal than others: Promotion- versus prevention-focused effectuation principles and their disparate relationships with entrepreneurial orientation. *Strategic Entrepreneurship Journal*, *13*(1), 93–117. https://doi.org/10.1002/SEJ.1305

Perry, J. T., Chandler, G. N., & Markova, G. (2012). Entrepreneurial Effectuation: A Review and Suggestions for Future Research. *Entrepreneurship: Theory and Practice*, *36*(4), 837–861. https://doi.org/10.1111/J.1540-6520.2010.00435.X/ASSET/IMAGES/LARGE/10.1111_J.1540-6520.2010.00435.X-FIG2.JPEG

Porter, M. E. (1997). Competitive strategy. *Measuring Business Excellence*, *1*(2), 12–17. https://doi.org/10.1108/EB025476/FULL/XML

Pot, J. (2013, December 17). *Causation versus effectuation in entrepreneurial decision-making: the impact of family resources, family business background and education.* https://essay.utwente.nl/64645/

Priem, R. L., Rasheed, A. M. A., & Kotulic, A. G. (1995). Rationality in strategic decision processes, environmental dynamism and firm performance. *Journal of Management*, *21*(5), 913–929. https://doi.org/10.1016/0149-2063(95)90047-0

Prunier, J. G., Colyn, M., Legendre, X., Nimon, K. F., & Flamand, M. C. (2015). Multicollinearity in spatial genetics: separating the wheat from the chaff using commonality analyses. *Molecular Ecology*, *24*(2), 263–283. https://doi.org/10.1111/MEC.13029

Read, S., Dew, N., Sarasvathy, S. D., Song, M., & Wiltbank, R. (2009). Marketing under Uncertainty: The Logic of an Effectual Approach: *Https://Doi.Org/10.1509/Jmkg.73.3.001*, *73*(3), 1–18. https://doi.org/10.1509/JMKG.73.3.001

Read, S., & Sarasvathy, S. D. (2005). Knowing What to Do and Doing What You Know. *The Journal of Private Equity*, *9*(1), 45–62. https://doi.org/10.3905/JPE.2005.605370

Reymen, I. M. M. J., Andries, P., Berends, H., Mauer, R., Stephan, U., & van Burg, E. (2015). Understanding Dynamics of Strategic Decision Making in Venture Creation: A Process Study of Effectuation and Causation. *Strategic Entrepreneurship Journal*, *9*(4), 351–379. https://doi.org/10.1002/SEJ.1201

Ristic, I., Dotlic, J., Ignjatovic-Ristic, D., & Gazibara, T. (2021). HEXACO-60 Personality Trait Inventory: Psychometric characteristics in a sample of medical students from Serbia. *PsyCh Journal*, *10*(6), 934–941. https://doi.org/10.1002/PCHJ.484

Robertson, I., Gibbons, P., Baron, H., MacIver, R., & Nyfield, G. (1999). Understanding Management Performance. *British Journal of Management*, *10*(1), 5–12. https://doi.org/10.1111/1467-8551.00107

Ruiz-Jiménez, J. M., Ruiz-Arroyo, M., & del Mar Fuentes-Fuentes, M. (2021). The impact of effectuation, causation, and resources on new venture performance: novice versus expert entrepreneurs. *Small Business Economics*, *57*(4), 1761–1781. https://doi.org/10.1007/S11187-020-00371-7/FIGURES/2

Sarasvathy, S. D. (2001a). Causation and Effectuation: Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency. *Https://Doi.Org/10.5465/Amr.2001.4378020*, *26*(2), 243–263. https://doi.org/10.5465/AMR.2001.4378020

Sarasvathy, S. D. (2001b). Causation and Effectuation: Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency. *Https://Doi.Org/10.5465/Amr.2001.4378020*, 245. https://doi.org/10.5465/AMR.2001.4378020

Sarasvathy, S. D. (2001c). Causation and Effectuation: Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency. *Https://Doi.Org/10.5465/Amr.2001.4378020*, *26*(2), 243–263. https://doi.org/10.5465/AMR.2001.4378020

Sarasvathy, S. D., Dew, N., Read, S., & Wiltbank, R. (2008). *Designing Organizations that Design Environments: Lessons from Entrepreneurial Expertise*. https://doi.org/10.1177/0170840607088017

Schendel, D. E., & Hofer, C. W. (1979). STRATEGIC MANAGEMENT A New View of Business Policy and Planning EDITED BY. *Academy of Management*.

Shalender, K., & Yadav, R. K. (2019). Strategic Flexibility, Manager Personality, and Firm Performance: The Case of Indian Automobile Industry. *Global Journal of Flexible Systems Management*, *20*(1), 77–90. https://doi.org/10.1007/S40171-018-0204-X

Sheikh, M. A., Abelsen, B., & Olsen, J. A. (2014). Role of respondents' education as a mediator and moderator in the association between childhood socio-economic status and later health and wellbeing. *BMC Public Health*, *14*(1). https://doi.org/10.1186/1471-2458-14-1172

Smolka, K. M., Verheul, I., Burmeister-Lamp, K., & Heugens, P. P. M. A. R. (2018). WITHDRAWN–Administrative Duplicate Publication—Get it Together! Synergistic Effects of Causal and Effectual Decision–Making Logics on Venture Performance: *Https://Doi-Org.Ezproxy2.Utwente.Nl/10.1111/Etap.12266*, *42*(4), 571–604. https://doi.org/10.1111/ETAP.12266

Staudt, A., Freyer-Adam, J., Meyer, C., Bischof, G., John, U., & Baumann, S. (2022). The Moderating Effect of Educational Background on the Efficacy of a Computer-Based Brief Intervention

Addressing the Full Spectrum of Alcohol Use: Randomized Controlled Trial. *JMIR Public Health and Surveillance*, *8*(6). https://doi.org/10.2196/33345

Stienstra, M., Harms, R., van der Ham, R. A., & Groen, A. (2016). Culture & entrepreneurial processes: evidence of influence. *ICSB International Council for Small Business* .

Stirling, W. D. (1982). Enhancements to Aid Interpretation of Probability Plots. *The Statistician*, *31*(3), 211. https://doi.org/10.2307/2987987

Su, X., Yan, X., & Tsai, C. L. (2012). Linear regression. *Wiley Interdisciplinary Reviews: Computational Statistics*, *4*(3), 275–294. https://doi.org/10.1002/WICS.1198

Taherdoost, H. (2016). Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/Survey in a Research. *SSRN Electronic Journal*. https://doi.org/10.2139/SSRN.3205040

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53. https://doi.org/10.5116/IJME.4DFB.8DFD

van Sonderen, E., Sanderman, R., & Coyne, J. C. (2013). Ineffectiveness of Reverse Wording of Questionnaire Items: Let's Learn from Cows in the Rain. *PLOS ONE*, *8*(7), e68967. https://doi.org/10.1371/JOURNAL.PONE.0068967

Vedel, A., Thomsen, D. K., & Larsen, L. (2015). Personality, academic majors and performance: Revealing complex patterns. *Personality and Individual Differences*, *85*, 69–76. https://doi.org/10.1016/J.PAID.2015.04.030

Weijters, B., & Baumgartner, H. (2012). Misresponse to Reversed and Negated Items in Surveys: A Review. *Journal of Marketing Research and Journal of Consumer Research*, *XLIX*, 737–747. www.marketingpower.com

Werhahn, D., Mauer, R., Flatten, T. C., & Brettel, M. (2015). Validating effectual orientation as strategic direction in the corporate context. *European Management Journal*, *33*(5), 305–313. https://doi.org/10.1016/J.EMJ.2015.03.002

Wiltbank, R., Dew, N., Read, S., & Sarasvathy, S. D. (2006). WHAT TO DO NEXT? THE CASE FOR NON-PREDICTIVE STRATEGY. *Strategic Management Journal Strat. Mgmt. J*, *27*, 981–998. https://doi.org/10.1002/smj.555

Zhang, Y. (2008). *Asian Social Science The Role of Personality in Second Language Acquisition*. *4*(5). http://g6a55.mail.163.com/a/f/js3/0801290924/htmltool_js3_v1.htm

Zhao, H., Seibert, S. E., & Lumpkin, G. T. (2010). The relationship of personality to entrepreneurial intentions and performance: A meta-analytic review. *Journal of Management*, *36*(2), 381–404. https://doi.org/10.1177/0149206309335187

Appendices

Appendix A: Items Chandler for measuring effectuation/causation

Causation

- We analysed long run opportunities and selected what we thought would provide the best returns.
- We developed a strategy to best take advantage of resources and capabilities.
- We designed and planned business strategies.
- We organized and implemented control processes to make sure we met objectives.
- We researched and selected target markets and did meaningful competitive analysis.
- We had a clear and consistent vision for where we wanted to end up.
- We designed and planned production and marketing efforts.

Experimentation (effectuation)

- We experimented with different products and/or business models.
- The product/service that we now provide is essentially the same as originally conceptualized (reverse coded).
- The product/service that we now provide is substantially different than we first imagined.
- We tried a number of different approaches until we found a business model that worked.

Affordable loss (effectuation)

- We were careful not to commit more resources than we could afford to lose.
- We were careful not to risk more money than we were willing to lose with our initial idea.
- We were careful not to risk so much money that the company would be in real trouble financially if things didn't work out.

Flexibility (effectuation)

- We allowed the business to evolve as opportunities emerged.
- We adapted what we were doing to the resources we had.
- We were flexible and took advantage of opportunities as they arose.
- We avoided courses of action that restricted our flexibility and adaptability.

Pre-commitments

- We used a substantial number of agreements with customers, suppliers and other organizations and people to reduce the amount of uncertainty.
- We used pre-commitments from customers and suppliers as often as possible

Appendix B: The 10 items from the HEXACO-60 scale

1. I feel reasonably satisfied with myself overall.
2. I rarely express my opinions in group meetings. (R)
3. I prefer jobs that involve active social interaction to those that involve working alone.
4. On most days, I feel cheerful and optimistic.
5. I feel that I am an unpopular person. (R)
6. In social situations, I'm usually the one who makes the first move.
7. The first thing that I always do in a new place is to make friends.
8. Most people are more upbeat and dynamic than I generally am. (R)
9. I sometimes feel that I am a worthless person. (R)

10. When I'm in a group of people, I'm often the one who speaks on behalf of the group.

Appendix C: Questionnaire in Dutch

Controle vragen:

1. Ik ben ondernemer (nee/ja)
2. Wat is uw geslacht? (man/vrouw/anders)
3. Wat is uw leeftijd? (categorieën)
4. Wat is uw hoogst genoten/huidige opleiding? (categorieën)
5. Welke studierichting heeft u gedaan? (alfa wetenschappen, gamma wetenschappen, bèta wetenschappen)
6. Hoe lang bent u al ondernemer? (categorieën)
7. Hoeveel bedrijven heeft u? (1,2-5,6-10, meer dan 10 bedrijven)

Causation:

Geef aan in hoeverre u het eens bent met de volgende stellingen:

8. We hebben lange termijn kansen geanalyseerd en de kansen waarvan we dachten dat deze het beste rendement zouden opleveren geselecteerd.
9. We hebben een strategie ontwikkeld om de middelen en capaciteiten optimaal te benutten.
10. We hebben bedrijfsstrategieën ontworpen en gepland.
11. We hebben controleprocessen georganiseerd en geïmplementeerd om ervoor te zorgen dat we de doelstellingen halen.
12. We onderzochten en selecteerden doelmarkten en deden een concurrentieanalyse.
13. We hadden een duidelijke en consistente visie op waar we wilden eindigen.
14. We hebben productie- en marketinginspanningen ontworpen en gepland.

Experimenteren

Geef aan in hoeverre u het eens bent met de volgende stellingen:

15. We hebben geëxperimenteerd met verschillende producten en/of business modellen.
16. Het product/de dienst die we nu leveren is in wezen hetzelfde als oorspronkelijk geconceptualiseerd (omgekeerd gecodeerd).
17. Het product/de dienst die we nu leveren is wezenlijk anders dan we ons eerst hadden voorgesteld.
18. We probeerden een aantal verschillende benaderingen totdat we een business model vonden dat werkte.

Veroorloofbare verliezen

Geef aan in hoeverre u het eens bent met de volgende stellingen:

19. We zorgden ervoor dat we niet meer middelen inzetten dan we ons konden veroorloven te verliezen.
20. We waren voorzichtig om niet meer geld te riskeren dan we bereid waren te verliezen met ons oorspronkelijke idee.
21. We zorgden ervoor dat we niet zoveel geld riskeerden dat het bedrijf in financiële problemen zou komen als het niet goed zou gaan.

Flexibiliteit

Geef aan in hoeverre u het eens bent met de volgende stellingen:

22. We lieten het bedrijf evolueren naarmate de kansen zich voordeden.
23. We hebben wat we deden aangepast aan de middelen die we hadden.
24. We waren flexibel en benutten kansen zodra ze zich voordeden.
25. We vermeden acties die onze flexibiliteit en ons aanpassingsvermogen beperkten.

Vooraf gemaakte afspraken

Geef aan in hoeverre u het eens bent met de volgende stellingen:

26. We hebben een flink aantal overeenkomsten aangegaan met klanten, leveranciers en andere organisaties en mensen om de hoeveelheid onzekerheid te verminderen.
27. We hebben zo vaak mogelijk gebruik gemaakt van vooraf gemaakte afspraken met klanten en leveranciers.

Vragen over extraversie/introversie:

28. Alles bij elkaar heb ik wel een tevreden gevoel over mijzelf.
29. Ik geef zelden mijn mening in groepsbijeenkomsten. (R)
30. Ik heb liever een baan waarin men veel met andere mensen omgaat dan één waarin men alleen dient te werken.
31. De meeste dagen voel ik me blij en optimistisch.
32. Ik heb het gevoel dat ik een impopulair persoon ben (R)
33. Als ik anderen ontmoet, ben ik meestal diegene die het contact op gang brengt.
34. Het eerste dat ik altijd doe als ik ergens nieuw ben, is vrienden maken.
35. De meeste mensen zijn levenslustiger en dynamischer dan ik over het algemeen ben. (R)
36. Soms heb ik het gevoel dat ik een waardeloos persoon ben. (R)
37. Als ik met andere mensen samen ben, ben ik vaak de woordvoerder van de groep.

Appendix D: Linear regression assumptions
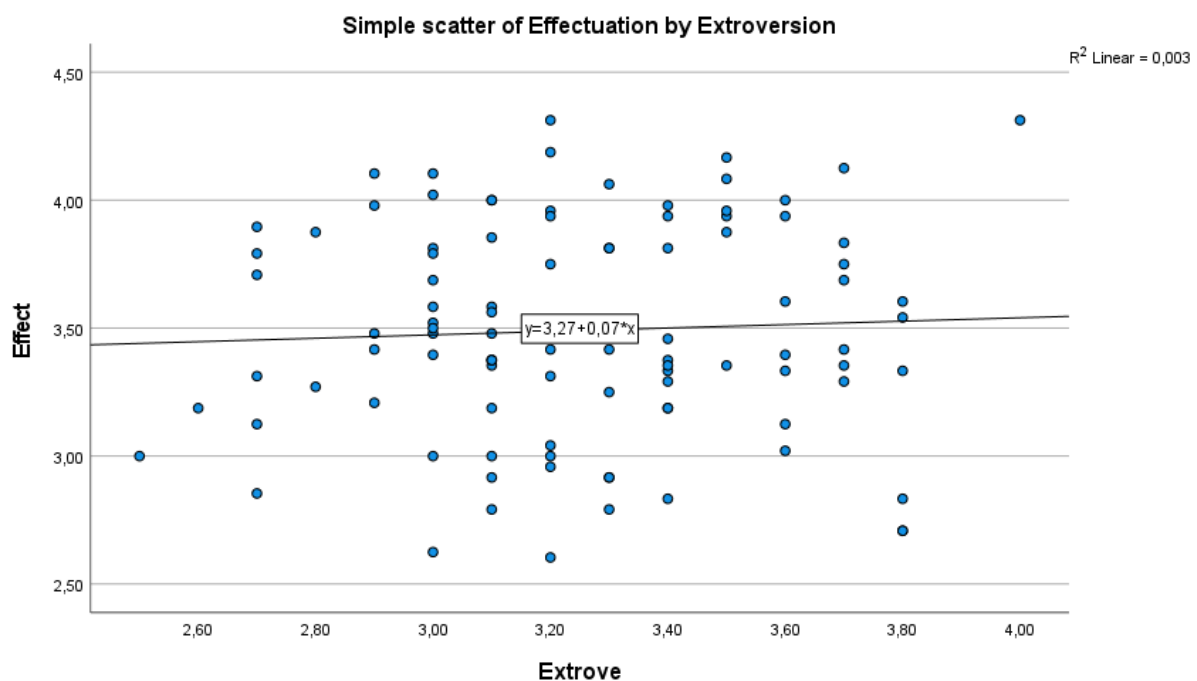
Figure 3: Linearity of the phenomenon, DV: Effectuation
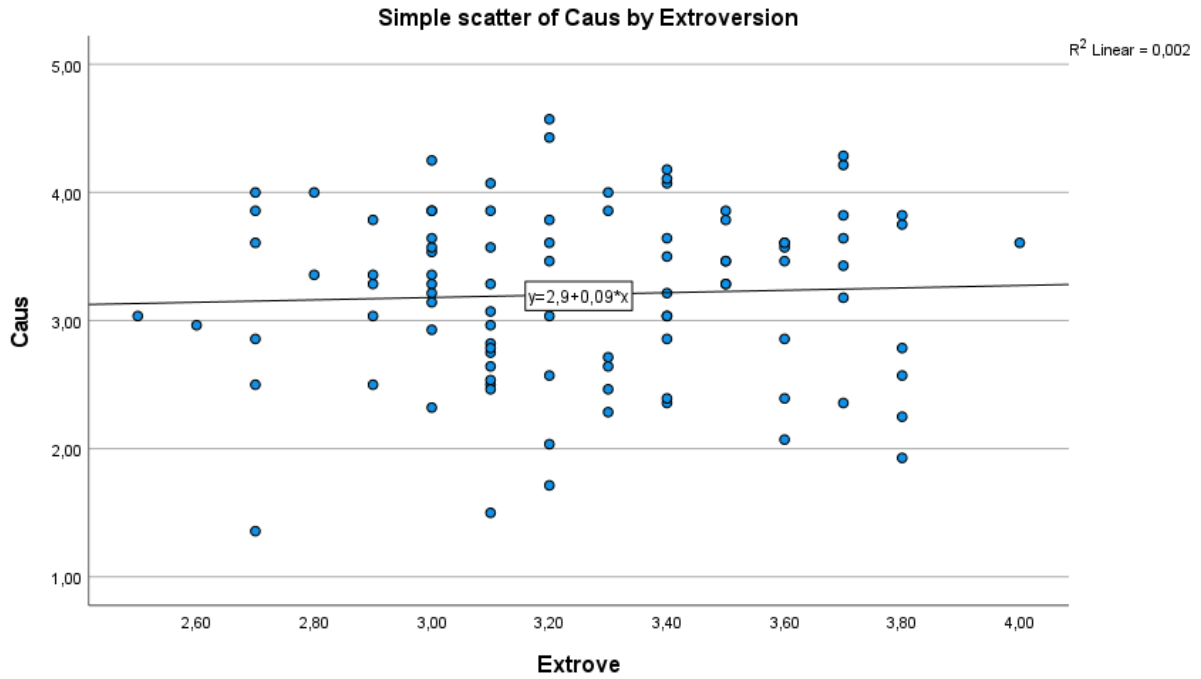
Figure 4: Linearity of the phenomenon, DV: Caus (the construct)
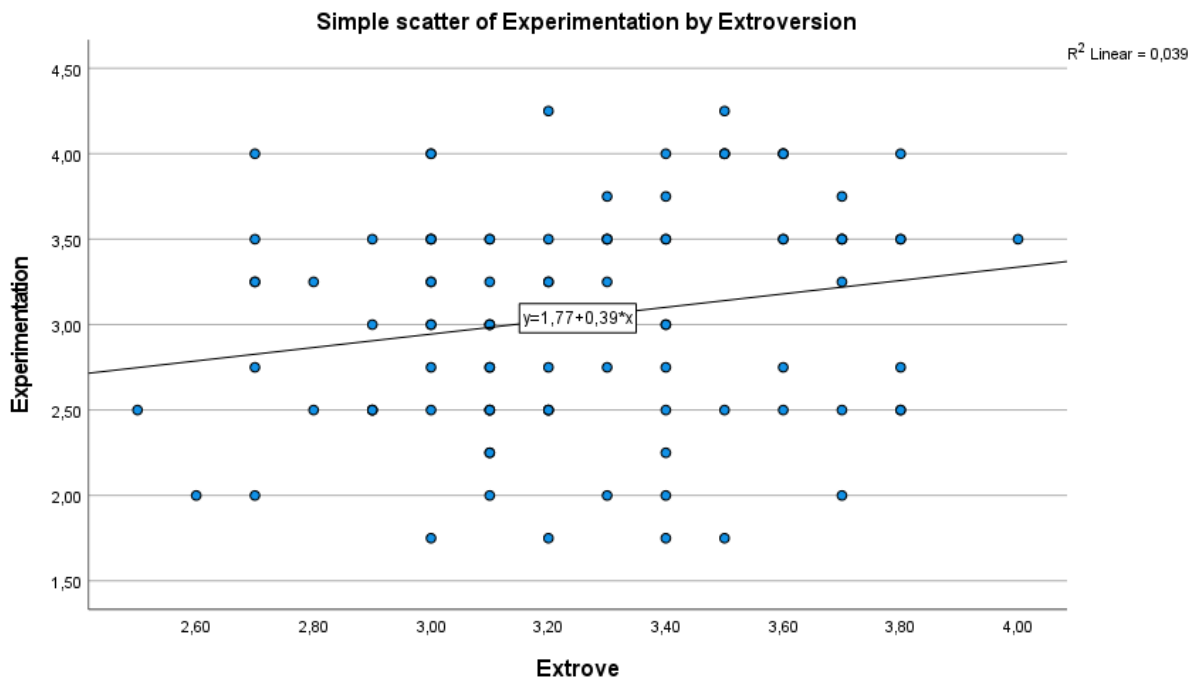
Figure 5: Linearity of the phenomenon, DV: Experimentation
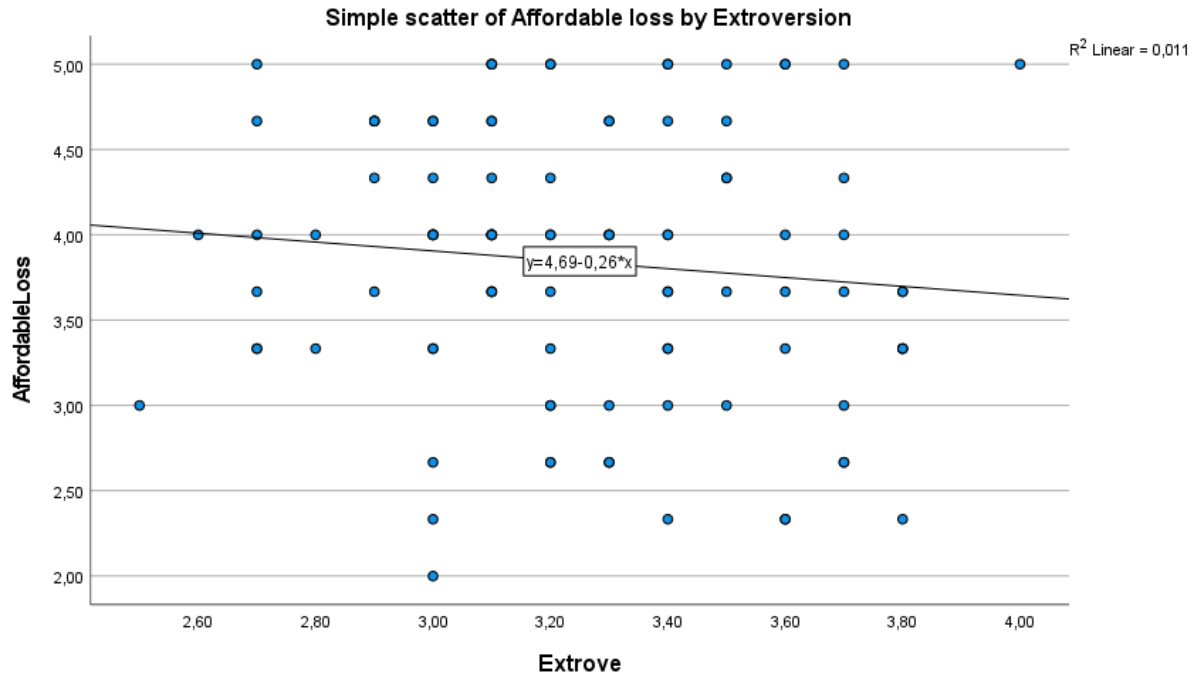
Figure 6: Linearity of the phenomenon, DV: Affordable loss
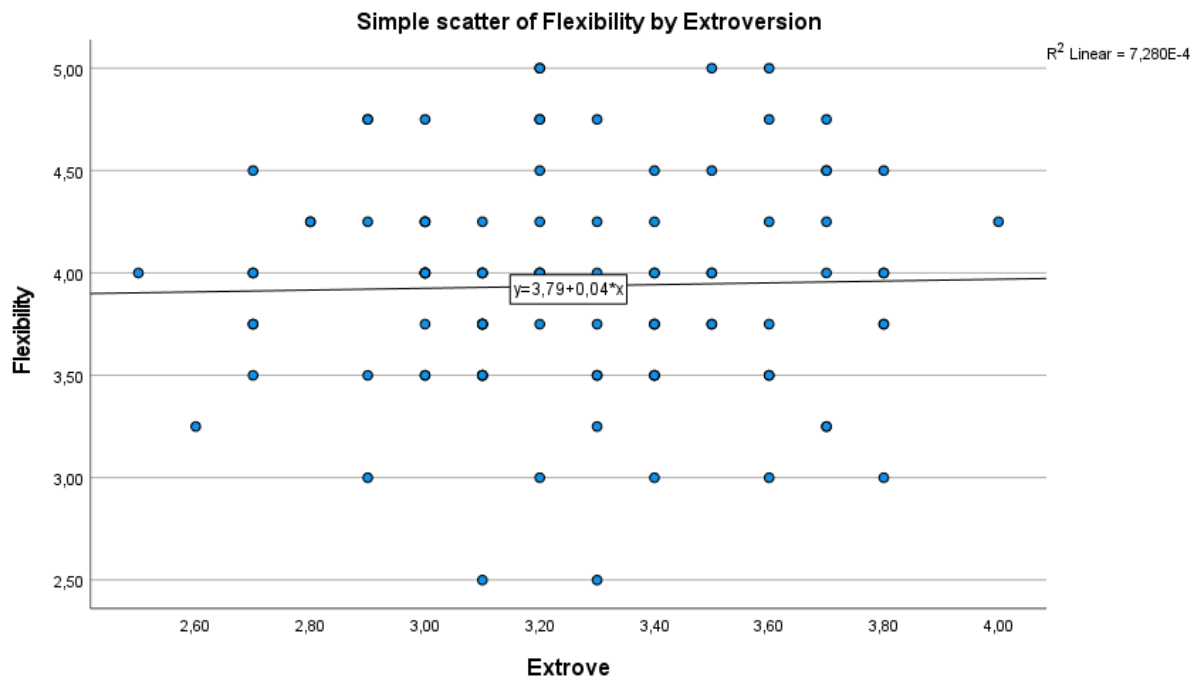
Figure 7: Linearity of the phenomenon, DV: Flexibility
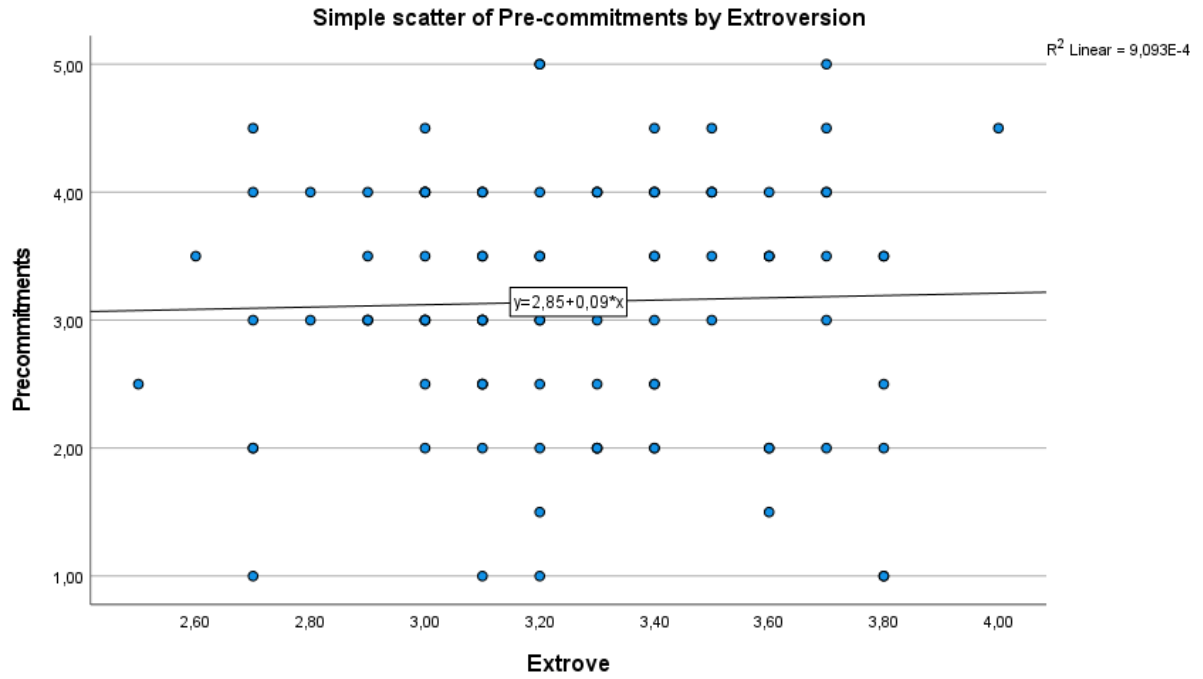
Figure 8: Linearity of the phenomenon, DV: Pre-commitments
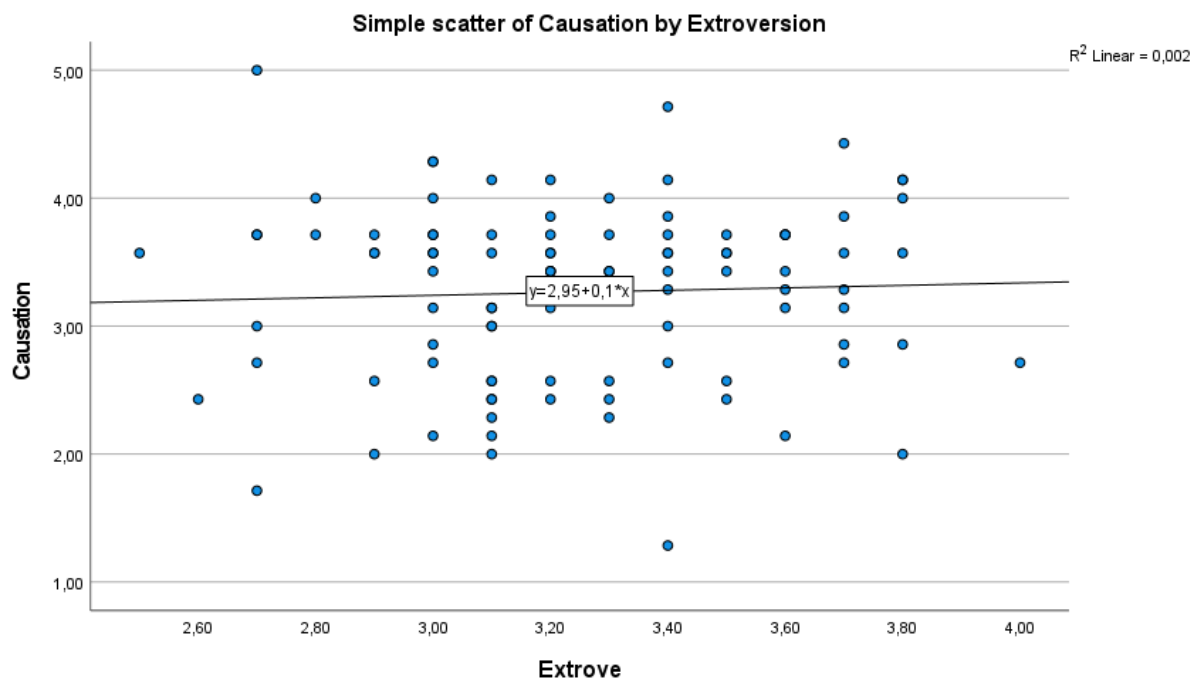
Figure 9: Linearity of the phenomenon, DV: Causation (subconstruct)
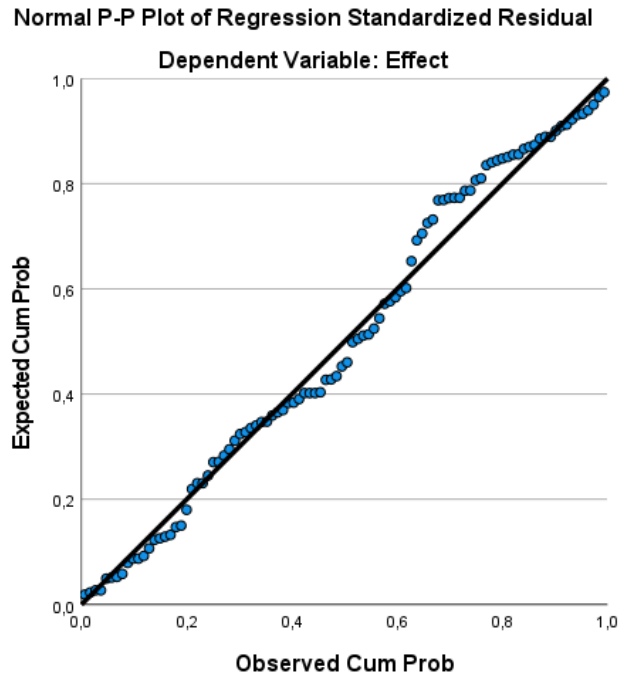
Figure 10: Normality of the phenomenon, DV: Effectuation
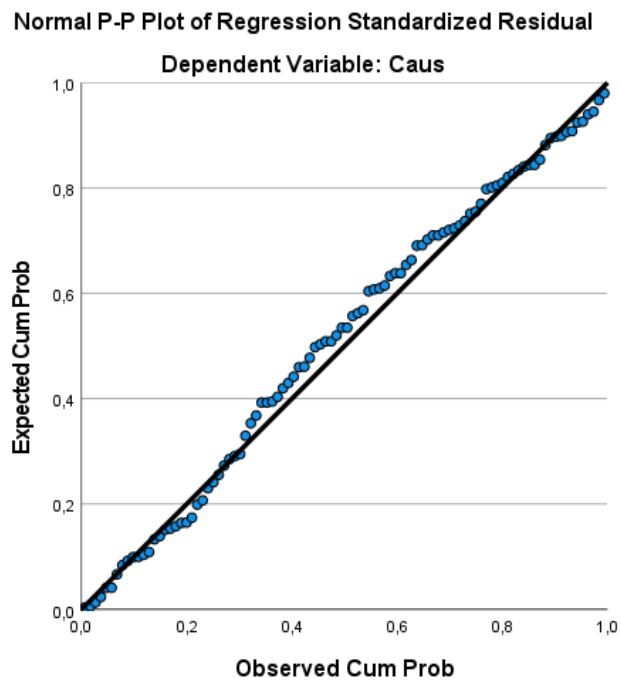
Figure 11: Normality of the phenomenon, DV: Caus (the construct)
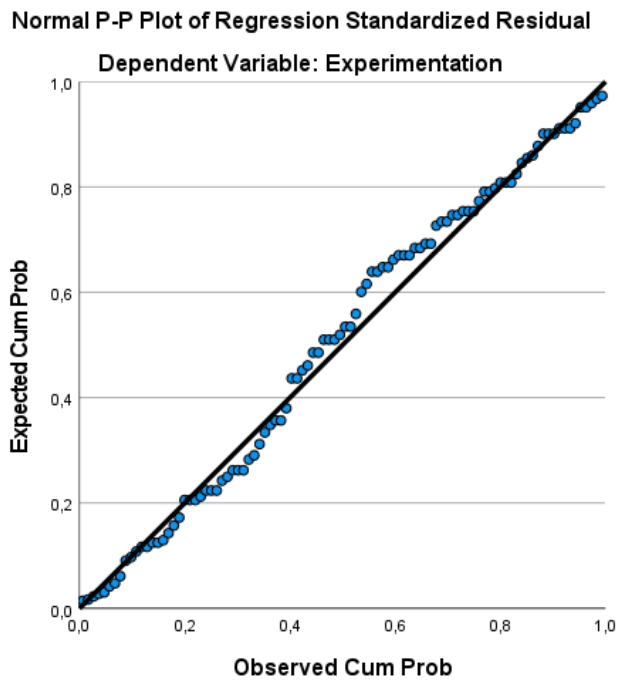
Figure 12: Normality of the phenomenon, DV: Experimentation
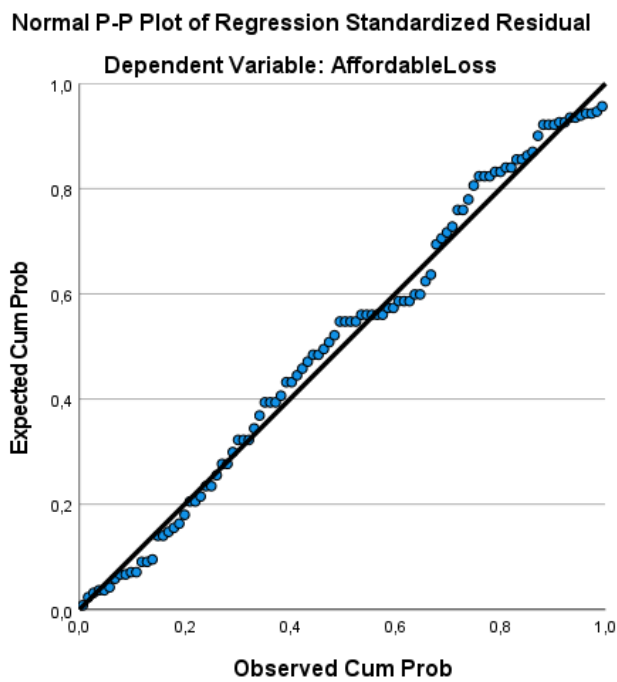
Figure 13: Normality of the phenomenon, DV: Affordable loss
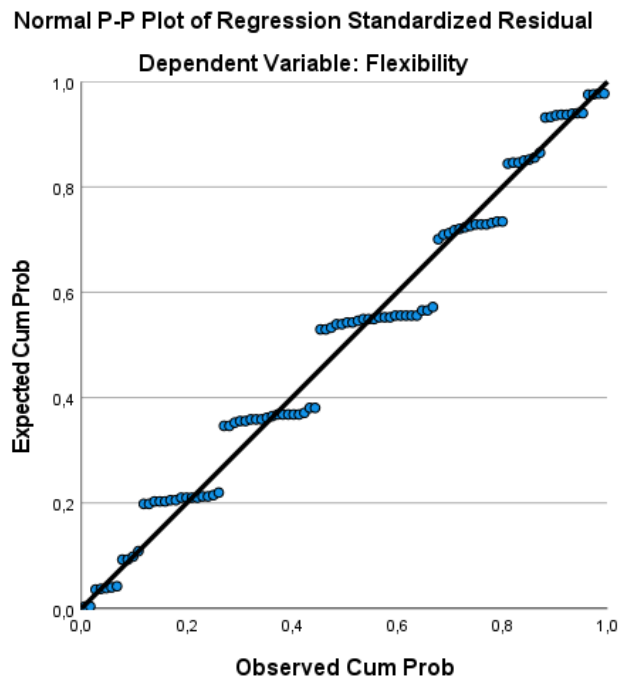
Figure 14: Normality of the phenomenon, DV: Flexibility
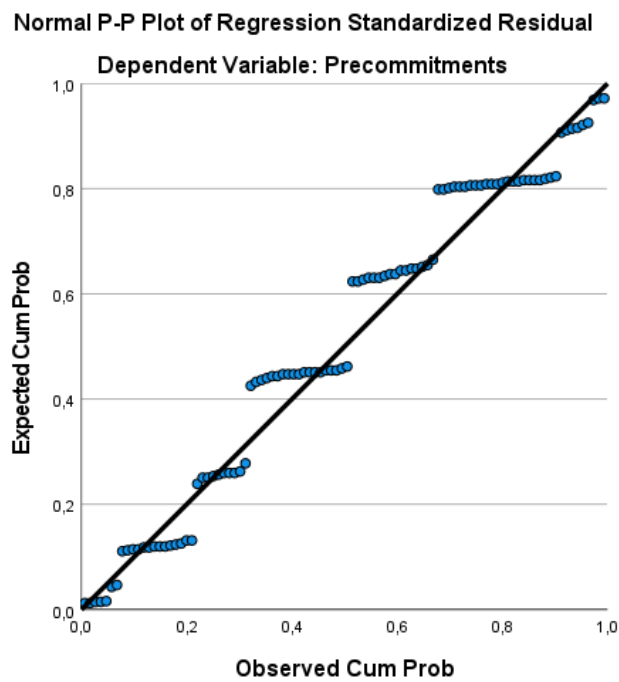
Figure 15: Normality of the phenomenon, DV: Pre-commitments
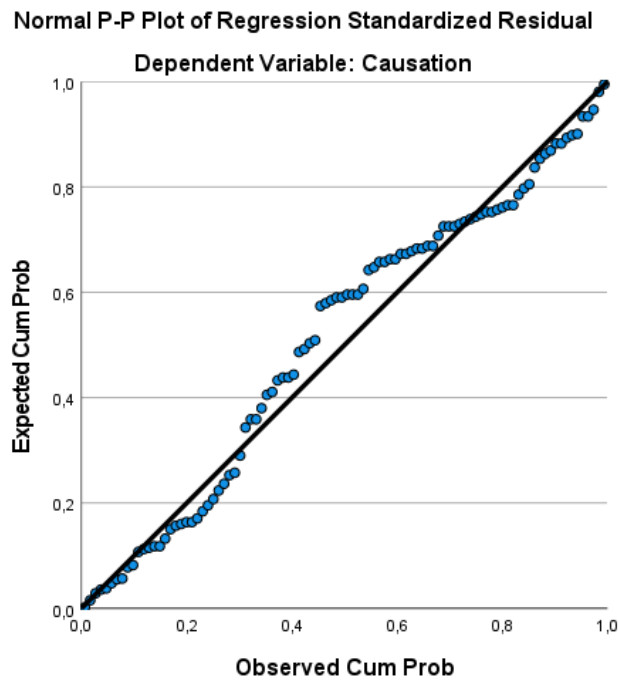
Figure 16: Normality of the phenomenon, DV: Causation (the subconstruct)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,051[a]	,003	-,008	,42500	1,972

a. Predictors: (Constant), Extrove

b. Dependent Variable: Effect

Figure 17: Independence of the error term, DV: Effectuation

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,046[a]	,002	-,008	,66926	1,752

a. Predictors: (Constant), Extrove

b. Dependent Variable: Caus

Figure 18: Independence of the error term, DV: Caus (the construct)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,197[a]	,039	,029	,63682	1,968

a. Predictors: (Constant), Extrove

b. Dependent Variable: Experimentation

Figure 19: Independence of the error term, DV: Experimentation

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,107[a]	,011	,001	,79076	1,923

a. Predictors: (Constant), Extrove

b. Dependent Variable: AffordableLoss

Figure 20: Independence of the error term, DV: Affordable loss

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,027[a]	,001	-,010	,53297	2,232

a. Predictors: (Constant), Extrove

b. Dependent Variable: Flexibility

Figure 21: Independence of the error term, DV: Flexibility

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,030[a]	,001	-,009	,97584	1,907

a. Predictors: (Constant), Extrove

b. Dependent Variable: Precommitments

Figure 22: Independence of the error term, DV: Pre-commitments

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,046[a]	,002	-,008	,69364	2,034

a. Predictors: (Constant), Extrove

b. Dependent Variable: Causation

Figure 23: Causation (the subconstruct)

Appendix E: Linear regression with dummy variables

E1. Dummy for Gender

Table 6: Dummy for Gender

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,465	0,447	7,754	<0,001	
Extroversion	0,022	0,135	0,165	0,869	Non-significant
DummyGenderVrouw	-0,154	0,094	-1,627	0,107	Non-significant
a. Dependent variable: Effectuation					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,386	0,688	4,922	<0,001	
Extroversion	-0,019	0,207	-0,093	0,926	Non-significant
DummyGenderVrouw	**-0,39**	**0,145**	**-2,683**	**0,009**	**Significant**
a. Dependent variable: Causation					
* This is the caustion construct, consisting of causation and pre-commitments					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	1,823	0,679	2,687	0,009	
Extroversion	0,379	0,205	1,855	0,067	Non-significant
DummyGenderVrouw	-0,045	0,143	-0,311	0,756	Non-significant
a. Dependent variable: Experimentation					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	4,663	0,843	5,531	0,009	
Extroversion	-0,255	0,254	-1,002	0,319	Non-significant
DummyGenderVrouw	0,018	0,178	0,101	0,919	Non-significant
a. Dependent variable: Affordable loss					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,9	0,567	6,881	<0,001	
Extroversion	0,019	0,171	0,113	0,910	Non-significant
DummyGenderVrouw	-0,085	0,120	-0,715	0,477	Non-significant
a. Dependent variable: Flexibility					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,477	1,011	3,438	0,001	
Extroversion	-0,055	0,305	-0,182	0,856	Non-significant
DummyGenderVrouw	**-0,502**	**0,213**	**-2,352**	**0,021**	**Significant**
a. Dependent variable: Pre-commitments					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,296	0,727	4,533	<00,1	
Extroversion	0,017	0,219	0,076	0,940	Non-significant
DummyGenderVrouw	-0,277	0,153	-1,805	0,074	Non-significant
a. Dependent variable: Causation**					
** This is the causation subconstruct					

E2. Dummies for Age

Table 7: Dummies for Age

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,146	0,449	6,999	<0,001	
Extroversion	0,057	0,134	0,424	0,672	Non-significant
DummyAge2	0,141	0,163	0,863	0,390	Non-significant
DummyAge3	0,340	0,213	1,599	0,113	Non-significant
DummyAge4	0,085	0,189	0,450	0,564	Non-significant
DummyAge5	0,240	0,176	1,363	0,176	Non-significant
a. Dependent variable: Effectuation					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	2,801	0,696	4,021	<0,001	
Extroversion	0,132	0,208	0,637	0,526	Non-significant
DummyAge2	0,077	0,253	0,305	0,761	Non-significant
DummyAge3	0,237	0,330	0,720	0,474	Non-significant
DummyAge4	-0,386	0,293	-1,318	0,191	Non-significant
DummyAge5	-0,120	0,273	-0,439	0,662	Non-significant
a. Dependent variable: Causation*					
* This is the caustion construct, consisting of causation and pre-commitments					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	1,756	0,686	2,561	0,012	
Extroversion	0,384	0,204	0,188	0,064	Non-significant
DummyAge2	<0,001	0,249	0,001	0,999	Non-significant
DummyAge3	0,101	0,325	0,311	0,756	Non-significant
DummyAge4	0,053	0,289	0,182	0,856	Non-significant
DummyAge5	0,109	0,269	0,404	0,687	Non-significant
a. Dependent variable: Experimentation					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	4,756	0,825	5,767	<0,001	
Extroversion	-0,292	0,246	-1,187	0,238	Non-significant
DummyAge2	-0,143	0,300	-0,477	0,634	Non-significant
DummyAge3	0,143	0,290	0,367	0,715	Non-significant
DummyAge4	0,038	0,247	0,110	0,913	Non-significant
DummyAge5	0,369	0,324	1,142	0,257	Non-significant
a. Dependent variable: Affordable loss					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,538	0,546	6,480	<0,001	
Extroversion	0,008	0,163	0,048	0,962	Non-significant
DummyAge2	0,339	0,198	1,710	0,091	Non-significant
DummyAge3	**0,562**	**0,258**	**2,174**	**0,032**	**Significant**
DummyAge4	**0,669**	**0,230**	**2,908**	**0,005**	**Significant**
DummyAge5	0,323	0,214	1,507	0,135	Non-significant
a. Dependent variable: Flexibility					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	2,533	1,006	2,517	0,014	
Extroversion	0,113	0,300	0,426	0,671	Non-significant
DummyAge2	0,367	0,366	1,005	0,318	Non-significant
DummyAge3	0,555	0,477	1,164	0,248	Non-significant
DummyAge4	-0,418	0,424	-0,987	0,326	Non-significant
DummyAge5	0,160	0,395	0,406	0,686	Non-significant
a. Dependent variable: Pre-commitments					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,068	0,737	4,162	<0,001	
Extroversion	0,137	0,220	0,622	0,536	Non-significant
DummyAge2	-0,213	0,268	-0,795	0,429	Non-significant
DummyAge3	-0,080	0,349	-0,229	0,819	Non-significant
DummyAge4	-0,355	0,310	-1,142	0,256	Non-significant
DummyAge5	-0,400	0,289	-1,383	0,170	Non-significant
a. Dependent variable: Causation**					
** This is the causation subconstruct					

Note: No entrepreneurs were found in the groups DummyAge1 and DummyAge7

E3. Dummies for Educational Level

Table 8: Dummies for Educational Level

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	2,507	0,951	2,637	0,010	
Extroversion	0,078	0,216	0,362	0,718	Non-significant
DummyEduLevel2	0,393	0,778	0,505	0,615	Non-significant
DummyEduLevel3	0,720	0,711	1,013	0,314	Non-significant
DummyEduLevel4	0,363	0,681	0,532	0,596	Non-significant
DummyEduLevel5	0,276	0,741	0,373	0,710	Non-significant
DummyEduLevel6	0,545	0,687	0,792	0,430	Non-significant
a. Dependent variable: Causation*					
* This is the caustion construct, consisting of causation and pre-commitments					
Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	0,860	0,901	0,955	0,342	
Extroversion	0,368	0,205	1,794	0,076	Non-significant
DummyEduLevel2	0,917	0,738	1,243	0,217	Non-significant
DummyEduLevel3	0,777	0,674	1,154	0,252	Non-significant
DummyEduLevel4	1,030	0,646	1,596	0,114	Non-significant
DummyEduLevel5	0,790	0,702	1,124	0,264	Non-significant
DummyEduLevel6	1,053	0,651	1,616	0,109	Non-significant
a. Dependent variable: Experimentation					
Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	5,491	1,133	4,848	<0,001	
Extroversion	-0,266	0,258	-1,032	0,305	Non-significant
DummyEduLevel2	-0,889	0,927	-0,959	0,340	Non-significant
DummyEduLevel3	-0,720	0,847	-0,850	0,397	Non-significant
DummyEduLevel4	-0,812	0,811	-1,001	0,320	Non-significant
DummyEduLevel5	-0,454	0,883	-0,514	0,609	Non-significant
DummyEduLevel6	-0,835	0,819	-1,020	0,311	Non-significant
a. Dependent variable: Affordable loss					
Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	4,217	0,753	5,603	<0,001	
Extroversion	0,011	0,171	0,061	0,951	Non-significant
DummyEduLevel2	-0,500	0,616	-0,811	0,419	Non-significant
DummyEduLevel3	-0,390	0,563	-0,693	0,490	Non-significant
DummyEduLevel4	-0,320	0,539	-0,593	0,555	Non-significant
DummyEduLevel5	0,147	0,587	0,250	0,893	Non-significant
DummyEduLevel6	-0,356	0,544	-0,654	0,515	Non-significant
a. Dependent variable: Flexibility					
Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	2,267	1,365	1,661	0,100	
Extroversion	0,075	0,310	0,242	0,809	Non-significant
DummyEduLevel2	-0,167	1,117	-0,149	0,882	Non-significant
DummyEduLevel3	1,272	1,020	1,247	0,216	Non-significant
DummyEduLevel4	0,570	0,987	0,583	0,562	Non-significant
DummyEduLevel5	0,577	1,064	0,543	0,589	Non-significant
DummyEduLevel6	0,655	0,987	0,664	0,508	Non-significant
a. Dependent variable: Pre-commitments					
Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	2,747	0,967	2,841	0,006	
Extroversion	0,082	0,220	0,371	0,712	Non-significant
DummyEduLevel2	0,952	0,792	1,203	0,232	Non-significant
DummyEduLevel3	0,168	0,723	0,233	0,816	Non-significant
DummyEduLevel4	0,156	0,693	0,225	0,823	Non-significant
DummyEduLevel5	-0,024	0,754	-0,032	0,974	Non-significant
DummyEduLevel6	0,434	0,699	0,288	0,536	Non-significant
a. Dependent variable: Causation**					
** This is the causation subconstruct					
Note: No entrepreneurs were found in group DummyEduLevel1					

E4. Dummies for Years of Experience

Table 9: Dummies for Years of Experience

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,280	0,492	6,667	<0,001	
Extroversion	0,053	0,131	0,401	0,690	Non-significant
DummyYears1	0,046	0,300	0,153	0,879	Non-significant
DummyYears2	-0,132	0,313	-0,421	0,675	Non-significant
DummyYears3	0,326	0,328	0,993	0,323	Non-significant
a. Dependent variable: Effectuation					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,167	0,776	4,083	<0,001	
Extroversion	0,117	0,207	0,565	0,573	Non-significant
DummyYears1	-0,279	0,473	-0,590	0,556	Non-significant
DummyYears2	-0,713	0,393	-1,445	0,152	Non-significant
DummyYears3	-0,218	0,517	-0,422	0,674	Non-significant
a. Dependent variable: Causation*					
This is the causation construct, consisting of causation and pre-commitments					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	1,777	0,751	2,366	0,020	
Extroversion	0,366	0,201	1,825	0,071	Non-significant
DummyYears1	0,046	0,458	0,100	0,921	Non-significant
DummyYears2	0,011	0,478	0,024	0,981	Non-significant
DummyYears3	0,451	0,501	0,902	0,370	Non-significant
a. Dependent variable: Experimentation					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	4,885	0,924	5,289	<0,001	
Extroversion	-0,295	0,247	-1,195	0,235	Non-significant
DummyYears1	-0,170	0,563	-0,302	0,763	Non-significant
DummyYears2	-0,038	0,588	-0,064	0,949	Non-significant
DummyYears3	0,465	0,616	0,756	0,452	Non-significant
a. Dependent variable: Affordable loss					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,556	0,637	5,580	<0,001	
Extroversion	0,023	0,170	0,136	0,892	Non-significant
DummyYears1	0,301	0,389	0,775	0,440	Non-significant
DummyYears2	0,310	0,406	0,764	0,447	Non-significant
DummyYears3	0,395	0,425	0,930	0,355	Non-significant
a. Dependent variable: Flexibility					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	2,901	1,111	2,612	0,010	
Extroversion	0,116	0,297	0,392	0,696	Non-significant
DummyYears1	0,007	0,678	0,011	0,992	Non-significant
DummyYears2	-0,811	0,707	-1,147	0,254	Non-significant
DummyYears3	-0,010	0,741	-0,013	0,990	Non-significant
a. Dependent variable: Pre-commitments					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,432	0,826	4,156	<0,001	
Extroversion	0,118	0,221	0,534	0,594	Non-significant
DummyYears1	-0,566	0,504	-1,123	0,264	Non-significant
DummyYears2	-0,616	0,525	-1,172	0,244	Non-significant
DummyYears3	-0,427	0,551	-0,775	0,440	Non-significant
a. Dependent variable: Causation**					
** This is the causation subconstruct					

E5. Dummies for Amount of companies started by the entrepreneur

Table 10: Dummies for Amount of companies started by the entrepreneur

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,705	0,563	6,586	<0,001	
Extroversion	0,061	0,134	0,455	0,651	Non-significant
DummyAmount1	-0,482	0,428	-1,127	0,262	Non-significant
DummyAmount2	-0,309	0,432	-0,717	0,475	Non-significant
DummyAmount3	-0,316	0,446	-0,707	0,481	Non-significant
DummyAmount4	-0,899	0,597	-1,507	0,135	Non-significant
a. Dependent variable: Effectuation					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,705	0,900	4,118	<0,001	
Extroversion	0,105	0,214	0,493	0,623	Non-significant
DummyAmount1	-0,917	0,684	-1,340	0,184	Non-significant
DummyAmount2	-0,788	0,691	-1,141	0,257	Non-significant
DummyAmount3	-0,667	0,714	-0,934	0,353	Non-significant
DummyAmount4	-1,006	0,954	-1,055	0,294	Non-significant
a. Dependent variable: Causation*					

* This is the causation construct consisting of causation and pre-commitments

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	2,194	0,852	2,574	0,012	
Extroversion	0,377	0,202	1,864	0,066	Non-significant
DummyAmount1	-0,427	0,648	-0,659	0,512	Non-significant
DummyAmount2	-0,388	0,654	-0,593	0,555	Non-significant
DummyAmount3	-0,050	0,676	-0,074	0,941	Non-significant
DummyAmount4	-0,901	0,904	-0,996	0,322	Non-significant
a. Dependent variable: Experimentation					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	4,737	1,081	4,384	<0,001	
Extroversion	-0,263	0,257	-1,027	0,307	Non-significant
DummyAmount1	-0,058	0,822	-0,071	0,944	Non-significant
DummyAmount2	-0,030	0,830	-0,036	0,971	Non-significant
DummyAmount3	0,006	0,858	0,007	0,994	Non-significant
DummyAmount4	0,105	1,146	0,092	0,927	Non-significant
a. Dependent variable: Affordable loss					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	4,229	0,657	6,434	<0,001	
Extroversion	0,008	0,156	0,049	0,961	Non-significant
DummyAmount1	-0,481	0,500	-0,962	0,339	Non-significant
DummyAmount2	-0,029	0,505	-0,057	0,955	Non-significant
DummyAmount3	-0,204	0,522	-0,391	0,697	Non-significant
DummyAmount4	-1,253	0,697	-1,780	0,076	Non-significant
a. Dependent variable: Flexibility					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,660	1,320	2,772	0,007	
Extroversion	0,121	0,313	0,387	0,699	Non-significant
DummyAmount1	-0,963	1,004	-0,959	0,340	Non-significant
DummyAmount2	-0,791	1,014	-0,781	0,437	Non-significant
DummyAmount3	-1,014	1,048	-0,968	0,336	Non-significant
DummyAmount4	-1,549	1,400	-1,106	0,272	Non-significant
a. Dependent variable: Pre-commitments					

Model	Beta	S.E.	C.R. (t)	p-value	Status of hypotheses
(Constant)	3,750	0,914	4,102	<0,001	
Extroversion	0,089	0,217	0,212	0,682	Non-significant
DummyAmount1	-0,870	0,695	-0,252	0,214	Non-significant
DummyAmount2	-0,785	0,702	-1,119	0,266	Non-significant
DummyAmount3	-0,319	0,725	-0,439	0,661	Non-significant
DummyAmount4	-0,464	0,970	-0,479	0,663	Non-significant
a. Dependent variable: Causation**					

** This is the causation subconstruct

Appendix F: ANOVA table

Table 11: ANOVA Table

Independent variable	Dependent variable	F	p-value		Lev. Statistic	p-value	
				Analysis of Variance			
					Homogeneity of variance (Levene's test)		
Gender	Effectuation	2,906	0,091	Non-significant	0,319	0,574	Non-significant
Gender	**Caus***	**7,478**	**0,007**	**Significant**	**1,944**	**0,166**	**Non-significant**
Gender	Experimentation	0,481	0,489	Non-significant	3,544	0,063	Non-significant
Gender	Affordable loss	0,097	0,756	Non-significant	2,782	0,099	Non-significant
Gender	Flexibility	0,574	0,451	Non-significant	0,406	0,525	Non-significant
Gender	**Pre-commitments**	**5,646**	**0,019**	**Significant**	**1,202**	**0,276**	**Non-significant**
Gender	Causation**	3,493	0,065	Non-significant	0,433	0,512	Non-significant
Age	Effectuation	0,995	0,414	Non-significant	1,022	0,400	Non-significant
Age	Caus*	1,716	0,153	Non-significant	0,207	0,934	Non-significant
Age	Experimentation	0,179	0,949	Non-significant	2,240	0,071	Non-significant
Age	Affordable loss	1,571	0,189	Non-significant	2,372	0,058	Non-significant
Age	**Flexibility**	**2,591**	**0,042**	**Significant**	**0,389**	**0,816**	**Non-significant**
Age	Pre-commitments	2,198	0,075	Non-significant	0,926	0,452	Non-significant
Age	Causation**	0,690	0,601	Non-significant	0,535	0,710	Non-significant
EduLevel	Effectuation	0,531	0,752	Non-significant	0,953	0,437	Non-significant
EduLevel	Caus*	0,751	0,581	Non-significant	0,160	0,958	Non-significant
EduLevel	Experimentation	0,983	0,432	Non-significant	1,102	0,361	Non-significant
EduLevel	Affordable loss	0,418	0,835	Non-significant	0,439	0,780	Non-significant
EduLevel	Flexibility	0,977	0,436	Non-significant	0,417	0,796	Non-significant
EduLevel	Pre-commitments	1,350	0,251	Non-significant	1,028	0,397	Non-significant
EduLevel	Causation**	1,480	0,204	Non-significant	1,807	0,134	Non-significant
YearsExperience	Effectuation	2,444	0,069	Non-significant	1,451	0,233	Non-significant
YearsExperience	Caus*	2,293	0,083	Non-significant	0,606	0,613	Non-significant
YearsExperience	Experimentation	1,319	0,273	Non-significant	1,575	0,201	Non-significant
YearsExperience	Affordable loss	1,682	0,176	Non-significant	2,016	0,117	Non-significant
YearsExperience	Flexibility	0,314	0,815	Non-significant	0,420	0,739	Non-significant
YearsExperience	**Pre-commitments**	**3,544**	**0,018**	**Significant**	**0,220**	**0,882**	**Non-significant**
YearsExperience	Causation**	0,540	0,656	Non-significant	1,050	0,374	Non-significant
AmountCompanies	Effectuation	1,573	0,188	Non-significant	1,473	0,243	Non-significant
AmountCompanies	Caus*	0,794	0,532	Non-significant	1,978	0,144	Non-significant
AmountCompanies	Experimentation	1,075	0,373	Non-significant	1,641	0,199	Non-significant
AmountCompanies	Affordable loss	0,026	0,999	Non-significant	1,536	0,221	Non-significant
AmountCompanies	**Flexibility**	**5,357**	**0,001**	**Significant**	**0,477**	**0,616**	**Non-significant**
AmountCompanies	Pre-commitments	0,481	0,750	Non-significant	1,098	0,338	Non-significant
AmountCompanies	Causation**	1,739	0,138	Non-significant	1,992	0,142	Non-significant

* This is the caustion construct, consisting of causation and pre-commitments
** This is the causation subconstruct

Appendix G: ANOVA with sum of squares and Eta squared

Table 12: ANOVA with sum of squares and Eta squared

				ANOVA with sum of squares and Eta squared		
Causation by Gender	**Sum of squares**	**df**	**F**	**Sig.**	**Partial Eta Squared**	
Between groups	3,114	1	7,478	0,007	0,072	
Within groups	39,975	96				
Total	43,089	97				
Pre-commitments by Gender	**Sum of squares**	**df**	**F**	**Sig.**	**Partial Eta Squared**	
Between groups	5,082	1	5,082	0,019	0,056	
Within groups	86,418	96				
Total	91,500	97				
Flexibility by Age	**Sum of squares**	**df**	**F**	**Sig.**	**Partial Eta Squared**	
Between groups	2,736	4	2,591	0,042	0,100	
Within groups	24,552	93				
Total	27,289	97				
Causation by Gender	**Sum of squares**	**df**	**F**	**Sig.**	**Partial Eta Squared**	
Between groups	9,298	3	3,544	0,018	0,102	
Within groups	82,202	94				
Total	91,50	97				
Causation by Gender	**Sum of squares**	**df**	**F**	**Sig.**	**Partial Eta Squared**	
Between groups	5,111	4	5,357	0,001	0,187	
Within groups	22,178	93				
Total	27,289	97				