The influence of uncertainty intolerance and gender on decision making in new venture creation; effectuation and causation – The case of German entrepreneurs

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Preface

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I would like to express my appreciation to my tutor, Dr. M.R. Stienstra for his constructive advice and assistance during the entire process of this thesis research. I would also like to extend my thanks to Drs. Patrick Bliek for his feedback. Finally, I would like to thank my family and friends for helping me through this process by giving me the opportunity to work non-stop on the project as well as their support when things were tough.

Pia Hohdorf,

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Abstract

The purpose of this paper is researching the effect of intolerance of uncertainty and gender on the decision-making processes of entrepreneurs. Firstly, the causation decision making approach which is a process where all decisions taken are informed by a clear goal set in the future. Secondly, the effectuation decision making approach, where entrepreneurs take actions seeking to control aspects of the unpredictable future and ultimately end up constructing the future with these actions. A cross-sectional design in a large-scale quantitative study is used to collect data. The unit of observation are individuals, 100 founders of German startups. Results show that intolerance of uncertainty is positively correlated with causation but not effectuation. The sub-construct prospective anxiety is negatively related to effectuation and positively related to causation. Inhibitory anxiety is negatively correlated with causation and positively correlated with effectuation. No significant effects based on gender are found. This study contributes to existing entrepreneurial literature. It provides a new view on the relationship between intolerance of uncertainty and decision making with regards to the entrepreneur's gender.

Keywords: new venture creation, gender, entrepreneurship, effectuation, causation, decision–making, uncertainty intolerance

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Introduction

An entrepreneur is a innovative and creative person, exploring the environment for new opportunities. These opportunities also concern the creation of new ventures, a central topic in entrepreneurial debates. Literature on new-venture creation has rapidly evolved in the past two decades (Shepherd et al., 2021). Entrepreneurship is a key topic in the existing literature on business administration, including inter alia new venture creation (Shane & Venkataraman, 2000). New venture creation depicts the creation of new organizations through planning, organizing, and establishing them (Gartner, 1985). It is at the core of the entrepreneurship domain (van Gelderen et al., 2015; Liñán and Fayolle, 2015). Research on new venture creation increases the understanding of the creation and emergence of organizations. Moreover, it is also informative to the broader field of management (Shepherd et al., 2021).

Building upon classical and neoclassical economic theories, a wide-ranging conceptual framework for entrepreneurship research is established. Theories include the opportunity-based entrepreneurship theory and resource-based entrepreneurship theory (Stevenson & Jarillo, 1990). According to the opportunity-based entrepreneurship theory, the entrepreneur does not cause change but rather exploits the opportunities created by change (Alum, 1986). The resource-based entrepreneurship theory, however, sees an organization's financial, social, and human resources as critical factors in new venture creation. In line with the opportunity-based entrepreneurship theory, recent research suggests a "creation theory" of entrepreneurship (Alvarez & Barney, 2007; Sarasvathy, 2001). The creation theory views opportunities as actively constructed by organizational participants and their mental models. Penrose (1959) defines an opportunity as an image in the entrepreneur's mind, driving new venture creation behavior. Supporting this definition, further research states that opportunities, under the creation theory, are seen as social constructions formed through the entrepreneurs' perceptions (Aldrich & Kenworthy, 1999). The focus of the creation theory lays on new venture creation resulting from an iterative "bricolage" process of action and reaction where the entrepreneur improvises to match perceived means and ends (Baker & Nelson, 2005; Sarasvathy, 2001). The discovery theory of entrepreneurship on the other hand, supports characteristics of the resource-based entrepreneurship theory. New venture creation according to the discovery theory results from fulfilling a set of predetermined resource requirements (Alvarez & Barney, 2007; Sarasvathy, 2001). This more traditional theory rather focuses on the objective characteristics of the entrepreneur and the environment. Sarasvathy (2001) refers to this traditional approach as causation (vs effectuation).

Sarasvathy's (2001) work on effectuation and causation decision making, sheds light on the role of an entrepreneur's perceptions and beliefs in new venture creation. Causation and effectuation are both about dealing with contingency. A contingency describes a situation that might take place, but the predictability is limited. The traditional, causation approach focuses on the predictable aspects of the future, assuming a linear environment. Causation is defined by Sarasvathy & Venkataraman (2011) as a process where all decisions taken are informed by a clear goal set in the future. In that way, one can predict the future (Sarasvathy & Venkataraman, 2011). On the contrary, the effectuation approach assumes a dynamic, nonlinear environment, creating an unpredictable future. An entrepreneur takes actions seeking to control aspects of the unpredictable future but ultimately ending up constructing the future with these actions (Sarasvathy, 2001). When it comes to new venture creation it can be said that an entrepreneur engaging in effectuation thinking, undertakes a set of actions to transform an opportunity perception into a firm. The entrepreneur creates the market, bringing together enough stakeholders to sustain the firm (Sarasvathy, 2001). The importance of risk taking as an entrepreneurial function has long been recognized (Knight, 1921).

Shaver and Scott (1992) suggest that certain cognitive factors of potential entrepreneurs are likely to affect their subsequent success. Meaning that, how entrepreneurs think about themselves and their situation will influence their willingness to persist towards the achievement of their goal. Further studies suggest that intolerance of uncertainty influences important cognitive functions, such as decision-making (Mosca et al., 2016, de Visser et al., 2010). Researchers found that highly anxious individuals, often suffering from intolerance of uncertainty, show a tendency to disregard long-term consequences. Moreover, it was found that these individuals only focus on the immediate future in their decisions (Miu et al., 2008; de Visser et al., 2010).

Uncertainty is one of the important challenges faced by entrepreneurs (McMullen & Shepherd, 2006; Sarasvathy, 2001). It is a central concept to entrepreneurship (Hebert and Link, 1989). As uncertainty is a fact of economic life, entrepreneurs need to take risks and innovate. Organizational risk taking literature proposes that innovation, entrepreneurship, and ultimately business success in a changing environment depends on managing uncertainty rather than avoiding it (Van den Bos & Lind, 2002). There are many different types of uncertainties that people can encounter (Van den Bos, 2009) and subsequently several different versions of personal uncertainty and related concepts (McGregor et al., 2001). On a personal level, uncertainty is about the entrepreneur's own entrepreneurial capacities (Jovanovic, 1982). It encounters the subjective sense of doubt or instability in self-views, worldviews, or the interrelation between the two (Oleson & Steckler, 2010).

Moreover, personal uncertainty describes the implicit and explicit feelings individuals experience from being uncertain about themselves (Van den Bos et al., 2006). Experiencing personal uncertainty constitutes an aversive feeling. Theory suggests that uncertainty may induce a state of psychological entropy in which individuals experience conflicting perceptual and behavioral possibilities (Hirsh et al., 2012). Here, anxiety and doubt often lead to avoidance behavior. According to Thurik et al. (1999), entrepreneurs stick to well-known strategies and routine behaviors instead of actively exploring their surroundings when faced with uncertain situations. This aligns with the behavior complementing intolerance of uncertainty. According to Carleton et al., (2007) Intolerance of uncertainty can be described as an individual's predisposition, reacting negatively to the presence of uncertainty in a situation.

In almost all countries, rates of early-stage entrepreneurial activity are higher for men than for women (Bosma and Levie, 2010). This is supported by the findings of Ahl and Marlow (2012), concluding that the social environment does not treat male and female entrepreneurs identically. Eddleston and Powell (2008) consider entrepreneurship a gendered process. Therefore, gender might influence the cognitive orientations of entrepreneurs, their entrepreneurial activities and their start-up success.

Entrepreneurship literature presents contradictory findings on the effect of gender in entrepreneurship (Brush 1992). Men and women are said to set different priorities when establishing a new business. Differences in the undertaken approaches to inter alia identify opportunities and form new companies are identified (DeTienne and Chandler, 2007). According to Brush (1992), female entrepreneurs follow different approaches to venture creation influenced by their different occupational, social, and educational experiences. Furthermore, flexible work life balance motivates female entrepreneurs to engage in new venture creation. In addition to that, researchers also found that the process of business founding varies amongst male and female entrepreneurs (Sexton & Bowman-Upton, 1990). However, other studies found that the need for achievement, independence, job satisfaction, and economic necessity are shared by men and women (Bowen & Hisrich, 1986).

Entrepreneurship is a fundamentally social process, adhering to normative standards depicted by society (Sullivan & Meek, 2012). It influences and is heavily influenced by the surrounding culture and social climate (Brush et al., 2009). Most entrepreneurial role models are men. This aligns with the fact that entrepreneurship is typically considered masculine.

Keeping that in mind, the controversy in literature raises the question whether gender-based expectancies, being among the most pervasive stereotypes in society (Eagly and Wood, 2012), might cause alterations in behaviour and self-assessment.

The importance of risk taking as an entrepreneurial function has long been recognized (Knight, 1921). Subsequent research identified a possible association between risk aversion and entrepreneurial choice (Segal et al., 2005; Shaver and Scott, 1991). Studies have looked at how the environment influences entrepreneurial actions and subsequent outcomes. However, to my knowledge, little empirical research has explicitly linked entrepreneurial perceptions as personal uncertainty to subsequent decision making in new venture creation. Furthermore, although gender differences in decision-making behavior have been observed in several disciplines, knowledge of whether distinctive variables of the entrepreneur's gender may moderate the decision-making process under uncertainty is yet underdeveloped.

Therefore, this paper strives to close the knowledge gap surrounding the role of uncertainty and gender in the context of effectuation research, contributing to academic literature on entrepreneurship. The study seeks to examine the interrelation among the entrepreneur's gender, intolerance of uncertainty, and effectuation-causation decision making. Overall, this paper aims to address the following research question:

> *To what extent do intolerance of uncertainty and the entrepreneur's gender determine the*
> *application of effectuation and causation decision making in the new venture creation?*

This research question serves as the main aspect of analysis. However, to fully answer the research question, a number of sub questions have been formulated. These are included to further delve into the topics of personal uncertainty, gender and effectuation/ causation decision making. This should give more rise to what the research goal encounters.

- *How does personal uncertainty affect the decision-making processes of entrepreneurs?*
- *How does the entrepreneur's gender affect the decision-making processes of entrepreneurs?*
- *What is the moderating effect of the entrepreneur's gender on the relationship between personal uncertainty and the decision-making process of effectuation/causation in entrepreneurship?*

The following section explains the theoretical framework of the topic. The concepts of effectuation and causation, intolerance of uncertainty and gender are described in greater detail. To then answer the research question in a structured way, further sections are arranged consecutively.

Hypotheses are drawn up based on the reviewed literature. The methods section presents a description of the research design and data collection. Then, study results are presented and discussed. Ultimately, the academic and practical contributions are summarized by reconsidering the research objectives. Moreover, limitations and future directions for research are described.

Theoretical Framework

Effectuation/ Causation

Causation and effectuation are two alternative approaches that entrepreneurs use in the new venture development process (Sarasvathy, 2001). Sarasvathy (2001) suggests that effectuation emphasizes the early stages of the process, whereas as the new firm emerges into a more predictable situation, causal strategies are more likely to be applied. With the causation approach, all efforts in new venture creation are directed at achieving a pre-envisioned state.

Causation refers to a more traditional perspective on entrepreneurship. Here, the decision-maker first sets a goal and then soughs means to achieve that goal in the most efficient way (Hauser et al., 2020). The focus lays on a predefined plan, overview of alternatives and complete information to engage in rational decision making. The causation theory finds it's grounds in the rational decision-making perspectives of neoclassical microeconomics (Chandler et al., 2011). Decisions are based on all possible information relevant to the decision. Causation is characterized as a process in which all decisions taken are informed by a clear goal set in the future (Sarasvathy & Venkataraman, 2011). When applying the causation approach, an individual will begin with a given goal, focus on expected returns, emphasize competitive analyses, exploit preexisting knowledge, and try to predict an uncertain future (Lindell & Perry, 2012). The entrepreneur is considered 'effect dependent' (Nielsen et al., 2012). Causation is consistent with planned strategy approaches. Here, outcomes have to be predictable through calculation or statistics in order to be able to develop fitting plans and analyses (Sarasvathy, 2001). Entrepreneurs engage in analysis and planning activities to exploit their pre-existing knowledge and resources. Systematic searches for entrepreneurial opportunities within developed industries are commonly used with the causation approach.

However, to improvise and adhere to change, the effectuation way of thinking becomes more popular. Effectuation theory focuses on the challenge of designing entrepreneurship with limited means available.

The theory was initially sketched by Sarasvathy (2001) and expanded upon by Sarasvathy and Dew (2005), and by Sarasvathy (2008). It roots in cognitive science. As an example, Read & Sarasvathy (2005) examine how entrepreneurs view inputs, perceive alternatives, and attend to constraints. "Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means" (Sarasvathy, 2001). Meaning that an individual will begin with a given set of means, focus on affordable loss, emphasize strategic alliances, exploit contingencies, and seek to control an unpredictable future when engaging in effectuation processes (Lindell & Perry, 2012). Entrepreneurs are more likely to make adjustments as necessary (Read & Sarasvathy, 2005) rather than trying to predict the future (Sarasvathy, 2001). Effectuation is based on the effects of resources, capabilities, entrepreneurial orientation, and learning on company performance (Hauser et al., 2020). Unpredictable situations and the absence of preexisting goals characterize the effectuation approach. Facing an unpredictable future, entrepreneurs may try different approaches before settling on a business model. Moreover, to have more control over the outcome, contributing mechanisms are set in place. Effectuation processes are consistent with emergent (Mintzberg, 1978) or non-predictive strategies (Wiltbank et al., 2006). Following the effectuation approach, the entrepreneur is considered 'actor dependent' (Nielsen et al., 2012).

Sarasvathy (2001) developed five behavioral principles that relate to effectuation and causation. The five sub-constructs include: (1) Basis for taking action: beginning with a given goal or a set of given means; (2) View of risk and resources: focusing on expected returns or affordable loss; (3) Attitude towards others: emphasizing competitive analysis or strategic alliances and recommitments; (4) Attitude towards unexpected events: exploiting preexisting knowledge or leveraging environmental contingencies; and (5) View towards the future: trying to predict a risky future or seeking to control an unpredictable future.

As a set of given means serves as the basis for action, entrepreneurs make important decisions by focusing on the resources under their control. They do not only focus on a predefined end goal. Here a key difference between causation and effectuation can be depicted. The effectuation approach focuses on short-term opportunities to identify business opportunities in an unpredictable future. With engaging in complementing activities, the entrepreneur allows goals to emerge and change when exploiting the given means. The causation approach, however, strives to predict an uncertain future by defining the final objective up front.

When focusing on affordable loss, decisions are based on what the entrepreneur is willing to lose. Moreover, a specific amount of resources is used, knowing that they may be lost (Chandler et al., 2011). Alternatively, resource allocation decisions based on probabilities and expected returns could be made. Here, another key difference can be identified.

Effectuation focuses on projects where the loss in a worst-case scenario is affordable whereas causation strives for maximizing expected returns.

When leveraging environmental contingencies such as strategic relationships, entrepreneurs focus on building partnerships rather than doing systematic competitive analysis. Here, causation and effectuation differ in the way that effectuation emphasizes pre-commitments and strategic alliances to control an unpredictable future. Causation on the contrary, predicts an uncertain future by accurate business planning and competitive analyses. However, entrepreneurs think about focusing more on whom they can work with rather than compete with.

By embracing unexpected events and turning them into profitable opportunities, entrepreneurs seek to control an unpredictable future. They strive for unanticipated outcomes as opposed to achieving a predefined goal. Effectuation includes the exploitation of environmental contingencies by remaining flexible and causation includes the exploitation of pre-existing capabilities and resources.

Causation and effectuation are two distinct logics of decision-making under uncertainty. Entrepreneurial environments are often highly dynamic, unpredictable, and ambiguous where entrepreneurs do not always have enough information to recognize and evaluate opportunities prior to exploitation. Moreover, under conditions of uncertainty, entrepreneurs adopt a decision logic that is different to that explicated by a traditional, more rational model of entrepreneurship. Therefore, Sarasvathy (2001) proposed the theory of effectuation, suggesting that greater levels of uncertainty can more effectively be handled by engaging in effectuation thinking.

Intolerance of uncertainty

Despite the crucial role of uncertainty in entrepreneurship, the characteristics of personal uncertainty still require investigation.

As described by Carleton (2007), Intolerance of uncertainty can be defined as a dispositional characteristic resulting from negative beliefs about uncertainty and its implications. Meaning that an individual reacts negatively on an emotional, cognitive, and behavioral level to an uncertain situation or event (Dugas, Buhr & Ladouceur, 2004), independent of its probability of occurrence and of its associated consequences. For the same uncertain situation, two individuals may have identical perceptions of both its probability of occurrence and consequences, however they differ amongst their threshold of tolerance.

Being intolerant of uncertainty, the individual evaluates the situation as being disturbing, even unacceptable. For this individual, uncertainty is negative and should be avoided. Difficulties in functioning in uncertain situations may occur (Buhr & Dugas, 2002).

Many situations even appear unbearable. The tendency to react negatively to uncertainty is likely to lead to heightened distress and worry.

An individual being tolerant of uncertainty, however, assesses the situation less disturbing. According to Dugas et al. (1998) intolerance of uncertainty plays a key role in the acquisition and maintenance of worries. In both nonclinical and clinical populations, intolerance of uncertainty has consistently emerged as the best predictor of the tendency to worry (Dugas et al., 1998). This finding is supported by several researchers, suggesting a strong link between intolerance of uncertainty and worry (Dugas et al., 1998). It has also been found that intolerance of uncertainty is further involved in the development of excessive worry, such as positive beliefs about the function of worry, negative orientation towards problem situations, and cognitive avoidance (Laugesen et al., 2003; Robichaud et al., 2003). In the face of uncertainty, reducing intolerance of uncertainty leads to less worry, whereas increasing intolerance of uncertainty leads to more worry (Ladouceur et al., 2000).

Krohne (1993) further suggests that intolerance of uncertainty is seen as a main variable underlying anxiety disorder. Deriving from that, two dimensions of intolerance of uncertainty can be identified – prospective anxiety and inhibitory anxiety. Prospective anxiety describes a fear of future events, revolving around the negative effects of unexpected events to the person. Inhibitory anxiety on the other hand is concerned with the inhibition of action or experiences due to uncertainty (Carleton et al., 2007).

Decision-making under risk and uncertainty has been a key topic in behavioral sciences, inspiring many researchers inter alia Starcke & Brand (2012). Almost every decision made by an individual involves consideration of uncertainty. Uncertainty describes the imperfect or unknown information relevant to a decision. Maner & Schmidt (2006) suggest that decision making plays an important role in the development and maintenance of anxiety. Results indicate that anxious participants show a preference for smaller rewards available with higher probabilities over larger rewards available with smaller probabilities. Referring to the risk-aversion hypothesis: Anxious individuals tend to make decisions to avoid uncertain or risky consequences. They are rather risk averse, engaging in avoidant behavior (Raghunathan & Pham, 1999). Anxious individuals prefer more certain monetary rewards even if there are larger, high-risk rewards available (Maner et al., 2007).

Gender

Eddleston and Powell (2008) argue that entrepreneurship is considered a gendered process. Furthermore, scholars conclude that the social environment does not treat male and female entrepreneurs identically (Ahl and Marlow, 2012). There are differences in the approaches that men and women take to inter alia identify opportunities and form new companies (DeTienne and Chandler, 2007). Moreover, they are said to set different priorities when establishing a new business. Based on this, it becomes obvious that gender theories are indeed highly applicable in the entrepreneurial domain. The process of starting and growing ventures is not equivalent across men and women.

However, it must be kept in mind that gender-based expectancies are among the most pervasive stereotypes in society (Eagly and Wood, 2012). Cross and Madson (1997) argue that men and women tend to build self-construals in unique manners and define self-construal how individuals put themselves in relation to others based on values and norms prevailing in the culture of society. With their research they explore the identification and structure of the self-concept of men and women. They distinguish between independent and interdependent self construals. Independent self-construals emphasize autonomy and demote relationships. Interdependent self construals are characterized by valuing interrelatedness and connectedness to others (Josephs et al., 1992). In each person, there are two self-construals. However, the more developed self-construal is influenced by the cultural background of the society (Markus & Kitayama, 2010). Cross and Madson (1997) found that men tend to create independent self-construals whereas women create interdependent self-construals. Society can be seen as a source for the differentiating construals. It depicts men as power focused and independent while women should form and sustain relationships. Bakan (1966) argues that men are said to prioritize the desire for independence whereas women tend to be oriented towards the care and empathy for others.

It is not surprising that entrepreneurship, a fundamentally social process adheres to these normative standards depicted by society (Sullivan and Meek, 2012). Entrepreneurship influences and is heavily influenced by the surrounding culture and social climate (Brush et al., 2009). It is typically considered rather masculine. Most entrepreneurial role models are men. The masculine characteristics describing entrepreneurs align with the underlying trait of male self-construals, namely, power focused, independent and autonomous (Twenge & Campbell, 2008).

Human decision making is affected by the beliefs about the characteristics that differentiate the sexes. However, these beliefs may be based on questionable criteria. Over the past years, social and labor equality between men and women has already increased. However, further psychological research can shed more light on whether there actually are sex differences in the importance that people allocate to factors that determine the decision process (Venkatesh, Morris, & Ackerman, 2000). Although some significant differences have been identified in earlier research, most of them are minimal.

Shaw et al., (2007) finds that women place greater emphasis on personal-, non-financial goals. They stay competitive by drawing high attention to the quality of the whole decision-making cycle. This is based on the fact that women are found to analyze and perceive situations more clearly as they listen more carefully to the information provided (Herbert, 1982). Women are more likely to focus on informal information, especially in their own social environment. Considering interactive relations when making decisions is highly valued by them as they think more in networks (Gill et al., 1987). Their preferred decision-making style is rather participative, enabling everyone to participate in the decision-making process (Tetlock & Manstead, 1985). Generally, it can be said that female entrepreneurs develop more creative ideas to solve problems in a way that satisfies all parties equally. However, when women make decisions concerning solely their own person, they tend to overlook certain information. Self-construals affect psychological processes in the life of the individual; inter alia cognition, emotion, motivation, and behavior in the life of the individual (Markus & Kitayama, 2010). The characteristics adhere to the underlying traits of the interdependent self construal, valuing interrelatedness and connectedness to others. Men rather overlook certain information when their decision concerns other individuals. This aligns with the characteristics of independent self-construals, emphasizing autonomy and demoting relationships.

It is assumed that women are more risk-averse than men (Brindley, 2005). They are more likely to avoid risky situations especially in financial concerns. Therefore, they attach more importance to the factor of uncertainty (de Acedo Lizárraga et al., 2007). On the contrary, as described in Sastre (2016), women only assess themselves as more risk-averse compared to males but not actually show more risk-averse behaviour facing uncertain decisions. Indicating that male and female entrepreneurs display similar risk propensity and differences in decisions are potentially non-existent (Croson and Gneezy, 2009). This finding supports the assumption that human decision making is affected by gender-based expectancies which are among the most pervasive stereotypes in society.

Research parts regarding the influence of gender on intolerance of uncertainty. Freeston et al. (1994) report no gender differences for intolerance of uncertainty. In line with preliminary findings, Bottesi et al. (2019) confirmed that there were no factorial differences in intolerance of uncertainty with regard to gender. Results by Robichaud et al., (2003) further substantiates the fact that gender was not significantly correlated with intolerance of uncertainty. However, a few studies have reported on gender differences with regard to intolerance of uncertainty. Eaton et al. (2012) states that gender differences in intolerance of uncertainty may be present due to higher endorsements of emotional symptoms among women compared to men. According to Robichaud et al. (2003) gender differences with regard to intolerance of uncertainty may be found as research findings are based on factor scores. These factor scores may underlie item level differences derived from responding patterns based on gender. Therefore, when assessing the above mentioned findings it should be kept in mind that individuals develop within the social environment. In this sense, they are products of the social system or culture (Meglino & Ravlin, 1998), (un)consciously adhering to pervasive stereotypes of society. On the basis of that, Carleton et al. (2012) calls for more extensive research on the topic.

Hypotheses

Based on the theoretical concepts, mentioned in earlier sections, the following hypotheses are stated. Figure 1 shows the model summary of the independent variable, the dependent variable, and the moderating variable.

Figure 1

Model summary
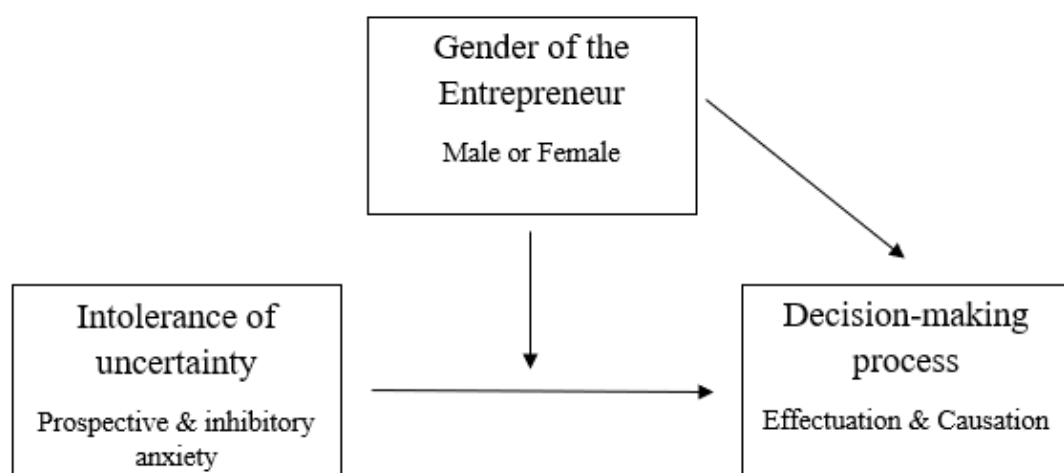
Under conditions of uncertainty, entrepreneurs adopt a decision logic that is different to that explicated by a traditional, more rational model of entrepreneurship, effectuation. With the causation approach however, the decision-maker first sets a goal and then soughts means to achieve that goal in the most efficient way (Hauser et al., 2020). Being intolerant of uncertainty, the individual evaluates the situation as being disturbing, even unacceptable. For this individual, uncertainty is considered negative and should be avoided. These characteristics fit the definition of an individual with inhibitory anxiety (Carleton et al., 2007). Therefore, it is assumed that entrepreneurs scoring high on inhibitory anxiety, are more likely to apply the causation approach.

H1a: A significant positive relationship exists between inhibitory anxiety and causation.

Baker & Welter, (2018) suggest that effectuation is the dominant decision-making strategy in uncertain environments. However, inhibitory anxiety as to fearing failure, reduces the likelihood that individuals expose themselves to situations characterized by risk (Hancock and Teevan, 1964). This leads to the assumption that entrepreneurs scoring high on inhibitory anxiety, are more likely to avoid the effectuation approach.

H1b: A significant negative relationship exists between inhibitory anxiety and effectuation.

Prospective anxiety describes a fear of future events, revolving around the negative effects of unexpected events to the person. Common characteristics with intolerance of uncertainty, such as the overappraisal of negative consequences are identified by Mosca et al., (2016). Similar to entrepreneurs with inhibitory anxiety, it is assumed that individuals with prospective anxiety are likely to avoid uncertain situations. Therefore, they are likely to prefer the causation approach.

H1c: A significant positive relationship exists between prospective anxiety and causation.

Dugas et al. (1998) found that entrepreneurs are more likely to avoid uncertain situations when being highly intolerant of uncertainty. Contrary to the characteristics of an individual with prospective anxiety, entrepreneurs following the effectuation approach, accept uncertainty (Reymen et al., 2017). This leads to the assumption that individuals with prospective anxiety are more likely to avoid decision making based on the effectuation approach.

H1d: A significant negative relationship exists between prospective anxiety and effectuation.

Effectuation processes are consistent with emergent (Mintzberg, 1978) or non-predictive strategies (Wiltbank et al., 2006). Following the effectuation approach, the entrepreneur is considered 'actor dependent' (Nielsen et al., 2012). This aligns with the underlying traits of male self-construals, especially being autonomous. Being autonomous is inter alia important for innovation (Hennessey and Amabile, 2009). Research has identified relationships between effectual decision making and innovative projects. Applying effectuation decision making, more autonomy is used to make resource decisions and pursue new opportunities. This leads to the assumption that male entrepreneurs are likely to prefer the effectuation approach.

H2a: A significant positive relationship exists between male entrepreneurs and effectuation.

With the causation approach, entrepreneurs engage in analysis and planning activities to exploit their pre-existing knowledge and resources. According to Herbert (1982) women are found to analyze and perceive situations more clearly than men. This is due to the fact that they better listen to and analyse the provided information. From this, it is assumed that female entrepreneurs are likely to prefer the causation approach.

H2b: A significant positive relationship exists between female entrepreneurs and causation.

Unpredictable situations and the absence of preexisting goals characterize the effectuation approach. It is assumed that women are more risk-averse than men (Brindley, 2005). They are more likely to avoid risky situations especially in financial concerns. This leads to the assumption that female entrepreneurs rather avoid effectuation decision making. Men, rather engaging in the effectuation approach, are assumed to consequently avoid causation decision making.

H2c: A significant negative relationship exists between female entrepreneurs and effectuation.
H2d: A significant negative relationship exists between male entrepreneurs and causation.

Research parts regarding the moderator effect of gender on decision-making behaviour under uncertainty (Freeston et al., 1994, Bottesi et al., 2019, Helsen et al., 2013, Robichaud et al., 2003). Nevertheless, the assumption is made that the effect of intolerance of uncertainty on the decision-making process is stronger for female entrepreneurs than for male entrepreneurs.

H3a: The relationship between prospective and inhibitory anxiety and the causation approach is moderated by the entrepreneur's gender.

H3b: *The relationship between prospective and inhibitory anxiety and the effectuation approach is moderated by the entrepreneur's gender.*

Methodology

The following chapter discusses the research approach and research design of this thesis. Firstly, the targeted sample and the data collection procedure is presented. After this, the variables and used measurements are discussed. The aim of this research is to explore the possible relationship between intolerance of uncertainty, gender, and effectuation/ causation. In order to do so, quantitative data was gathered and analyzed. This research consists of a large-scale quantitative study by using a cross-sectional design. Ten hypotheses, deriving from theoretical reasoning are tested. The concepts used in this thesis indicate suitability for large scale quantitative data collection. The level of analysis as well as unit of observation are individuals, founders of German startups.

Sample and data collection

As this paper aims to analyze the relationship of the decision-making process of entrepreneurs and their level of intolerance of uncertainty in new venture creation, it was indispensable to have answers from the founder of the companies.

Two separately gathered datasets build the basis for this research. The first set was gathered in June and July of 2020 in relation to the master thesis by Steffen Hillmer (Hillmer, 2020). Data was collected through an online questionnaire as well as hard copies of the questionnaire. German entrepreneurs were chosen for that study. Entrepreneurs were contacted through inter alia online channels, personal networks, the German Entrepreneur Association (Deutscher Gründerverband). This resulted in a total sample of 81 German entrepreneurs.

The second data set was gathered in March, April, May of 2021. The questionnaire was distributed online and applied multi-channel approaches such as social media (LinkedIn, Facebook, Instagram), e-mail, online events and company websites. After the distribution of the online questionnaire to possible respondents, they could decide whether they are willing to take part in the research (self-selective sampling). By this, it is ensured that respondents were not coerced to take part in the questionnaire. In order to maximize response rates and increase visual appeal to potential respondents, the electronic survey of Qualtrics was used. Both questionnaires were based on the same scales. Overall, 180 founders of start-ups were contacted to participate in this study. The total response consisted of 46 respondents. 27 respondents were removed due to incomplete questionnaires. The total dataset therefore contained 19 individuals.

Entrepreneurs were chosen based on the following characteristics: founder of a German start up, German citizen, above the age of 18. To better understand the data set, various control variables were included for further analysis.

Table 1

Sample Characteristic, n=100

	Frequency
Gender	Male: 79
	Female: 21
Age	0-25: 32
	26-35: 45
	36-45: 10
	46-71: 13
Nationality	German: 100
Education	Primary education: 0
	Secondary Education: 28
	Tertiary Education: 62
	Other: 10
Entrepreneurial	0-1: 29
Experience	2-3: 25
	4-6:31
	7-48:15
Age of founded venture	0-1: 39
	2-4: 28
	5-7:24
	8-10:9
Number of founded ventures	0-1: 64
	2-3:22
	4-12:14
Number of employees	0-4:57
	5-9:9
	10-14:28
	15-19:4
	20-500:2

In total 100 German entrepreneurs provided valid responses for this research. Their mean age was 26-35 years (SD = ,97). The descriptive statistics of the sample dispersion, adopted in Table 1, show that the sample contains significantly more men (79%) than woman (21%). Furthermore, the participants had on average 2-3 years (SD = 1,05) of entrepreneurial experience and have founded 2-3 ventures (SD = ,73). Most entrepreneurs (85%) have less than 7 years of entrepreneurial experience. A small part (15%) has up to 48 years of experience. The mean number of the age of the founded ventures is 2-3 years (SD=,99). The level of education indicates that 62% of the individuals completed tertiary education. 28% have a lower educational level than a bachelor's degree. Lastly, the mean number of employees in this sample of entrepreneurs was 5-9 employees (SD=1,086), ranging from 1 to 500 employees.

Variables and Measures

This research is investigating the relationship between the decision-making processes of causation and effectuation and intolerance of uncertainty. All applied measures and scales are adopted from original scales of authors from peer-reviewed journals in the field of entrepreneurship and management. This has been done because previous studies have shown that these methods are effective and yield significant results. The original scales are in English and were translated to German. The German scales were translated back to English by a third person to make sure that the content and meaning remained the same. All measurements are based on a Likert scale. Moreover, several control variables were added to see if different relationships are affected.

Control variables

For descriptive purposes of the sample, the questionnaire firstly collects information on gender, age and nationality. To understand the respondents better, their highest level of education was asked. Grouped into primary education, secondary education and tertiary education, response options were "Hauptschul Abschluss, Mittlere Reife, Gymnasium, Abgeschlossene Ausbildung, Bachelor, Master, Promotion, Andere". Additional questions include more specific entrepreneurial information of the respondent.

It was asked for their years of entrepreneurial experience, the age of their last created venture, the total number of created ventures and the number of people they employ. These control variables contribute to additional analysis within this study. For the regression analysis, dummy coding was used. Dummy variables were created for Gender and all categorical control variables, namely age, nationality, education, years of entrepreneurial experience, the age of last created venture, total number of created ventures and the number of employees.

DV: Effectuation and causation

In the theory section, a detailed explanation of the different types of decision-making processes was given. According to Sarasvathy there are two major decision-making patterns: causation and effectuation. These are further divided in sub dimensions: Means driven, affordable loss, partnership, leverage from unexpected, goals driven, expected return, competitive market analysis, avoiding the unexpected (Sarasvathy, 2001; Dew et al. 2009; Chandler et al. 2011). The items used in this study, were adopted from the effectuation measurement scale. It can be retrieved from the authors (Alsos et al., 2014). Due to lack of important validity problems of previous questionnaires, this survey considers five principles of causation and effectuation, resulting in a total number of 10 items as proposed by Chandler et al. (2011). Items are measured with a 5-point Likert scale, ranging from strongly agree to strongly disagree. Item 1-5 measure the causation approach of entrepreneurs whereas items 6-10 measure the effectuation approach. For the current study, Cronbach's alpha was .779 for the effectuation items and .593 for the causation items of the scale.

IV: Intolerance of uncertainty

Intolerance of uncertainty was measured with the Intolerance of Uncertainty Scale Short Form (IUS-12; Carleton et al., 2007). This scale is a shortened version of the original 27-item Intolerance of Uncertainty Scale (Freeston et al., 1994), measuring responses to uncertainty, ambiguous situations and future situations (Carleton et al., 2012). The shortened scale consists of two factors (Carleton et al., 2007; McEvoy & Mahoney, 2011), prospective anxiety (7 items) and inhibitory anxiety (5 items). Prospective anxiety expresses the tendency of individuals towards active information seeking. In that way uncertainty is reduced. Inhibitory anxiety refers to avoidance-oriented responses to uncertainty (Birrel et al., 2011; Carleton et al., 2007 & McEvoy & Mahoney, 2011). The items are scored on a 5-point Likert-type scale ranging from 1 (not at all characteristic of me) to 5 (entirely characteristic of me). The shortened scale was found to have a strong correlation with the original scale (r .96) and acceptable internal consistency (Carleton, Collimore, & Asmundson, 2010). In this particular study, the Cronbach's alpha for the IUS-12 was .848.

Multiple regression Assumptions

In order to test the stated hypotheses and to answer the main research question, a quantitative research method will be used. As this research aims to investigate the influence of intolerance of uncertainty and gender on the decision making processes of effectuation and causation, a Multiple Regression Analysis (MRA) will be used. Multiple regression aims to predict the dependent variable (Causation/ Effectuation) by using several independent variables (Intolerance of uncertainty, Gender).

Multiple regression helps to understand the relative contribution of each independent variable. Moreover, it shows how much of the variance is explained by the independent variables. In this study, it shows how effectuation/ causation decision making can be explained by the intolerance of uncertainty and gender of the entrepreneur. Control variables will also be accounted for by adding them into the model. Therefore, it can be ruled out that other variables interfere with the relationship between effectuation/ causation and gender and intolerance of uncertainty.

Using hierarchical regression, it is ensured that the control variables are accounted for while including the predictor variables. Prior to conducting a hierarchical multiple regression, the relevant assumptions of this statistical analysis were tested. Given two independent variables (Gender, Intolerance of uncertainty) to be included in the analysis (Tabachnick & Fidell, 2007), a sample size of 100 was considered decent.

In order to test multivariate normality, linearity and homoscedasticity, graphing a normal probability plot (normality) and the residual plots (linearity and homoscedasticity) is suggested by Hair et al., (2010). Linearity affects the purity of the model estimate. The data of this study is in line with recommendations by Hair et al., (2010). To test this assumption, a graphical analysis of the variables is conducted (see Appendix A).

By constructing a histogram and P-P plot for the dependent variable, normality of the error terms can be checked. In this study, the Shapiro Wilk test statistics, in conjunction with the graphical analysis are considered. Shapiro-Wilk's W test determines whether the underlying distribution is normal. Table 3 shows the results. For the dependent variables of causation and effectuation the null hypothesis is accepted (p> .05).

Table 2

Shapiro Wilk Statistics

	Statistic	df	Sig.
Causation	,990	100	,657
Effectuation	,990	100	,689
IU	,974	100	,049

The assumption that the error terms of an independent variable need to be of a constant range is referred to as homoscedasticity (Field, 2009). By checking a graphic analysis of the scatterplots, heteroscedasticity can be ruled out (Appendix A). In conclusion, scatter plots indicating the assumptions of normality, linearity and homoscedasticity are all satisfying (Hair et al., 2010; Pallant, 2001).

Next, it was checked for multicollinearity among the predictor variables. Table 4 and 5 show the VIF and tolerance levels for all independent variables (Appendix A). All VIF values are below 2. This supports the assumption that none of the independent variables show signs of multicollinearity. As the VIF scores are within accepted limits, the assumption of multicollinearity was met (Hair et al., 2010).

Independence of residuals is associated with the order of the cases. It occurs when a systematic change in the nature of respondents or the research procedure appears over time (Cohen, Cohen, West & Aiken, 2003). This assumption is checked by assessing the Durbin Watson statistic. It searches for the correlation between errors. The possible values can range between zero and four. A value of two indicates that the residuals are uncorrelated (Field, 2009). The Durbin Watson statistic in this study, indicates independent residuals (Table 3).

Table 3

Durbin Watson statistics

	Causation	Effectuation
Gender	1,554	1,668
Prospective anxiety	1,541	1,651
Inhibitory anxiety	1,543	1,648

Exploratory factor analysis

According to Hair, 2006 factor analysis provides the "tools for analyzing the structure of the interrelationships (correlations) among a large number of variables by defining sets of variables that are highly interrelated, known as factors" (Hair et al., 2010). Factors, conceding a number of variables that are highly related to one another, represent the core dimensions within large numbers of variables (Field, 2009).

For both scales, effectuation measurement scale and the intolerance of uncertainty scale, exploratory Factor Analysis (EFA) with orthogonal rotation was conducted to identify the dimensions of the multi-dimensional variables (Hair et al., 2010). According to Tabachnick & Fiddell (2007) the best way to decide between orthogonal and oblique rotation is to request oblique rotation with the desired number of factors and checking correlations amongst the factors. .32 depicts a cutoff point. In this study, a two- factor EFA followed by a direct oblimin rotation was run for both scales. The resulting correlation matrices for the factors are shown in Appendix B. As none of the correlations exceeds the Tabachnick and Fiddell (2007) threshold of .32 the solution remains nearly orthogonal. The EFA provides valuable information to the researcher as it helps to identify the underlying latent constructs (Fabrigar et al., 1999). The factor analysis is conducted to ensure construct validity. Bartlett test of sphericity was applied as means to measure the adequacy of the sample and its appropriateness. Another index is the contrast of Kaiser-Meyer-Olkin (KMO), whose purpose is to compare the correlation coefficients and partial correlation coefficients. For the factors extracted to be accurate, a KMO value between 0.5 and 1.0 should be recorded. Moreover, the Bartlett test has to be significant with a p-value <.05. When conducting the EFA, components with Eigen values >1 are retained. Initial Eigenvalues with a total value higher than one, typically indicate strong extraction. All values <0.1 are not indicated in the results as they are considered insignificant. The higher their relation is to one, the stronger the correlation. According to Hutton (1993), in sample sizes >= 100, loadings with a value of ± 0,3 or greater are considered meaningful. This rule will be applied in this study.

Parallel analysis

According to Raykov & Marcoulides (2010), parallel analysis helps researchers determine how many factors should be extracted when there is no theory for the number that should be extracted. For this study, the parallel analysis allows the data to "speak for themselves" and determine whether the underlying theories can be confirmed. With parallel analysis by Horn (1965), a factor analysis is performed on a random set of data that is of identical dimensions of the measures data. Using the Monte Carlo Simulation Technique, a random simulative data set is generated besides the real data set. For both data sets the estimated eigenvalues are calculated. When employing this method, the number of factors where the eigenvalue in the simulative sample is higher than that of the actual data is considered significant (Ledesma & Mora, 2007).

Results

The reliability of the scales was assessed using Cronbach's α (Appendix A). The effectuation measurement scale by Alsos et al. (2014) met the minimum lower bound (α = 0.663). The scales for prospective anxiety (α = 0.758) inhibitory anxiety (α = 0.844) and intolerance of uncertainty (α = 0.848) proved to be reliable. All scales meet the minimum bound of 0.6.

Table 4

Cronbach's Alpha

Scale	Number of items	Cronbach's Alpha
Prospective Anxiety	5	.844
Inhibitory Anxiety	7	.758
Intolerance of uncertainty	12	.848
Causation	5	.593
Effectuation	5	.779

Multiple regression findings

Two three stage hierarchical multiple regressions were conducted. Firstly, taking effectuation as the dependent variable, secondly causation was taken as dependent variable. The years of entrepreneurial experience, age of the last created venture, total number of created ventures and the number of employees were entered at stage one of the regression to ensure no interfere with the relationship between effectuation/ causation, gender and intolerance of uncertainty. The independent variables (Intolerance of uncertainty and gender) were entered at stage two and the hypothesized interaction effect at stage three. The constructed interaction term uses the male gender as dummy variable and is multiplied with the intolerance of uncertainty total average score. Intercorrelations between the multiple regression variables were reported in Figure 2 and the regression statistics are in Table 5 & 6.

Figure 2

Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12
Age	1											
Nationality	-,004	1										
Education	,188	,031	1									
EntExp	,529**	-,031	,174	1								
AgeVenture	,393**	-,003	,129	,787**	1							
NumbVenture	,326**	,069	,070	,511**	,352**	1						
NumbEmploy	,302**	,014	,083	,405**	,469**	,413**	1					
Causation	,123	-,027	-,099	-,046	-,008	-,001	-,025	1				
Effectuation	,018	,025	-,135	-,160	-,072	-,084	-,002	,083	1			
ProspAnxiety	-,060	,008	-,133	-,059	-,002	,056	,035	,167	-,171	1		
InhibAnxiety	-,123	-,111	-,088	-,090	,008	-,036	,056	,006	,138	,530**	1	
Gender	,131	-,052	-,092	,007	-,065	-,084	-,042	,086	-,140	,120	-,014	1

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

The first hierarchical multiple regression (Table 5) revealed that in model one, the control variables did not significantly contribute to the regression model (F= 1.206, p=.277). They however account for 21,1% of the variation in effectuation. The second model, including the predictor variables prospective anxiety (ß=-.576, p<.05), inhibitory anxiety (ß=.332, p<.05) and gender (ß=.338, p>.05), explains 32,1% of the variance. Although gender shows no significant coefficients, the overall model is significant (F= 1,756, p=.039).

This means that adding predictor variables to the model significantly contributes to explaining variance in effectuation. Model 3 includes the interaction effect of Gender and Intolerance of uncertainty (ß=-.063, p>.05). However, this does not increase the explained variance (r2 = .321). Moreover, no significant F statistic is provided (F= 1.657, p=.055). This implies that model 3 is not significant. Therefore, it can be said that the interaction effect has no significant effect on effectuation. Furthermore, it indicates that most of the variance in the outcome variable is explained by adding the predictor variables as direct effects.

Table 5

DV: Effectuation, hierarchical regression model

Variables	Model 1		Model 2		Model 3	
	ß	SE	ß	SE	ß	SE
Constant	4,452**	1,502	5,515**	1,547	5,373**	1,808
Age	-,218	,555	-,340	,540	-,346	,545
Nationality	-1,482	1,273	-1,789	1,210	-1,776	1,221
Education	,694	,480	,802	,456	,807	,460
Experience	,386	,719	,440	,681	,448	,687
AgeVenture	,176	,417	,098	,395	,103	,399
NumberVenture	,414	,444	,318	,426	,313	,429
Employees	-,967*	,467	-,974*	,447	-,967*	,452
ProspAnxiety			-,576**	,187	-,549*	,256
InhibAnxiety			,332*	,159	,355	,216
Gender			,338	,291	,500	1,088
InteractUncertXMale					-,063	,408
Adjusted r2	,036		,138		,127	
F	1,206		1,756*		1,657	
Change r2	,211		,110		,000	

* Correlation is significant at ρ < .05, two tailed

** Correlation is significant at ρ < .01, two tailed

The second hierarchical multiple regression (Table 6) revealed that the first model measures the effect of the control variables age, nationality, education, years of entrepreneurial experience, the age of last created venture, total number of created ventures and the number of employees. This model accounted for 19,2% of the explained variance with F= 1.072, p=.395. Introducing the predictor variables, prospective anxiety (ß=-.205, p>.05), inhibitory anxiety (ß=-,090, p>.05) and gender (ß=.003, p>.05), explained an additional 1,6% of variation in causation.

All predictor variables show no significant coefficients. In general, the second model is not significant (F= .978, p=.498). In Model 3 the interaction term was added (ß=.166, p>.05). This model explains 21,1% of the variance in the causation variable. However, it is not significant (F= .934, p=.553). Meaning that the interaction effect has no significant effect on causation.

Table 6

DV: Causation, hierarchical regression model

Variables	Model 1		Model 2		Model 3	
	ß	SE	ß	SE	ß	SE
Constant	5,207**	1,231	4,679**	1,354	5,052**	1,580
Age	-,420	,455	-,424	,472	-,408	,476
Nationality	-,373	1,043	-,256	1,059	-,289	1,067
Education	,039	,394	,014	,399	,001	,402
Experience	,744	,589	,716	,595	,695	,600
AgeVenture	,047	,342	,070	,346	,057	,349
NumberVenture	-,189	,364	-,133	,372	-,120	,375
Employees	-,318	,383	-,326	,391	-,343	,395
ProspAnxiety			,205	,164	,134	,224
InhibAnxiety			-,090	,139	-,149	,189
Gender			,003	,254	-,422	,951
InteractUncertXMale					,166	,356
Adjusted r2	,013		-,005		-,015	
F	1,072		,978		,934	
Change r2	,192		,016		,002	

* Correlation is significant at ρ < .05, two tailed

** Correlation is significant at ρ < .01, two tailed

Gender as a moderator

It was tested for a moderation effect by applying hierarchical linear regression analysis. An interaction term was created to add the third model of the hierarchical linear regression analysis. The interaction term was Uncertainty X Gender. Results show that there is no statistically significant moderation effect (ß=,166, p>,05) between prospective and inhibitory anxiety and the causation approach between the genders. Moreover, there is also no statistically significant moderation effect (ß=-,063, p>,05) for the effectuation approach.

Based on the gender differences assessed in the theoretical part of this study, it was further tested whether there is an existing moderation effect for gender. Two moderation analyses were conducted with PROCESS, to check whether the interaction-term (Uncertainty x Gender) is a significant predictor of the decision making processes, causation and effectuation.

First, to analyze Hypothesis 3a, Causation was put in the Outcome Variable (Y) box, Uncertainty was put in the Independent Variable (X) box and Gender was put in the Proposed Moderator W box. Secondly, to analyze Hypothesis 3b, Effectuation was put in the Outcome Variable (Y) box, Uncertainty was put in the Independent Variable (X) box and Gender was put in the Proposed Moderator W box. The results revealed that no moderation effect occurred (Appendix A), neither for the effectuation approach nor for the causation approach. The interaction between gender and the relationship between causation and uncertainty is the same for male and female. The interaction-term does not significantly predict causation/ effectuation and thus, does not moderate the relationship between intolerance of uncertainty and causation/ effectuation (Appendix A).

Factor analysis findings

Effectuation & Causation

As table 7 shows, the KMO test value is .689 and the value of the Bartlett's Test of Sphericity is .00, which is highly significant. This indicates that its probability is less than .05, implying that the correlation matrix produced by this data is not an identity matrix. Therefore, it is appropriate for factor analysis.

Table 7

KMO and Bartlett's test results

Scale	KMO	Bartlett's Test
Intolerance of uncertainty	,853	424,31; p<,001
Causation/ Effectuation	,689	239,39; p<,001

Table 11 (Appendix B) indicates that 19,56% of the variations on the ten factors are explained by extracting the two factors with Eigenvalues higher than unity (4.707, 1.555). Eigenvalues for the first three factors (Factor 1, λ = 2.945; Factor 2, λ = 1.956; Factor 3, λ = 1.120) are all above 1. However, the parallel analysis (Figure 10, Appendix B) indicated that the eigenvalue for the third extracted factor was less than the eigenvalue that could be expected by chance (λ = 1.227).

The results of this parallel analysis indicate that only two factors have eigenvalues greater than what can be expected by chance and suggest that two factors can be extracted from the data. This finding also supports Alsos et al. (2014) who developed the scale based on two factors, namely effectuation and causation.

Intolerance of uncertainty

As table 7 shows, the KMO test value is .853 and the value of the Bartlett's Test of Sphericity is .00. As this is considered highly significant it can be concluded that the correlation matrix produced by this data is also not an identity matrix. Therefore, factor analysis can be applied.

Table 15 (Appendix B) indicates that 52,18% of the variations on the twelve factors are explained by extracting the two factors with Eigenvalues higher than unity (4.707, 1.555). Eigenvalues for the first two factors (Factor 1, λ = 4.707; Factor 2, λ = 1.555; Factor 3, λ = 1.001) are all above 1. However, the parallel analysis (Figure 11, Appendix B) again indicated that the eigenvalue for the third extracted factor was less than the eigenvalue that could be expected by chance (λ = 1.302). The results of this parallel analysis indicate that only two factors have eigenvalues greater than what can be expected by chance and suggest that two factors can be extracted from the data. Similar to the scale developed by Carleton et al. (2007), the results of the factor analysis reveal that there is a total of two components, namely for prospective anxiety and inhibitory anxiety.

Hypothesis testing

Hypothesis 1b was partially supported, however, not as predicted. Results indicate a significant correlation between inhibitory anxiety and effectuation. However, a positive relationship instead of the proposed negative relationship is detected (ß=.332, p<,05). That is, the more anxiety an individual has around the inhibition of action or experiences due to uncertainty (Carleton et al., 2007), the more likely that person was to engage in effectuation decision making.

Hypothesis 1a is not supported. Causation is negatively correlated with inhibitory anxiety (ß=-.090, p>,05). Meaning that with more anxiety around the inhibition of action or experiences due to uncertainty (Carleton et al., 2007), the individual is less likely to engage in causation decision making. Results indicate no significance. Meaning that this study presents no significant relationship between inhibitory anxiety and causation.

Hypothesis 1c is not supported. Causation is positively correlated with prospective anxiety. Meaning that individuals with prospective anxiety are likely to avoid uncertain situations. Therefore, they are likely to prefer the causation approach (ß=.205, p>,05). The direction of the correlation is as predicted, however, results indicate no significance.

Hypothesis 1d was fully supported. Effectuation is negatively correlated with prospective anxiety (ß=-.576, p<,05). Meaning that individuals with prospective anxiety are more likely to avoid decision making based on the effectuation approach. Results indicate significance. Therefore, this study presents a statistically significant relationship between prospective anxiety and effectuation.

Hypothesis 2a is not supported. The male gender is positively correlated with effectuation. Meaning that male entrepreneurs would rather engage in effectuation decision making than females (ß=.338, p>,05). The direction of the correlation is as predicted; however, results indicate no significance. Meaning that this study presents no statistically significant relationship between male gender and effectuation.

Hypothesis 2c is not supported. The female gender is negatively correlated with effectuation. Meaning that female entrepreneurs would be less likely to engage in effectuation decision making (ß=-.338, p>,05). The direction of the correlation is as predicted, however, results indicate no significance. Meaning that this study presents no statistically significant relationship between female gender and effectuation.

Hypothesis 2b is not supported. The female gender is negatively correlated with causation (ß=-.003, p>,05). Meaning that female entrepreneurs would be less likely to engage in causation decision making. The direction of the correlation is not as predicted, and results indicate no significance. Meaning that this study presents no statistically significant relationship between female gender and causation.

Hypothesis 2d is not supported. The male gender is positively correlated with causation (ß=.003, p>,05). Meaning that male entrepreneurs would be more likely to engage in causation decision making. The direction of the correlation is not as predicted, and results indicate no significance. Meaning that this study presents no statistically significant relationship between male gender and causation.

Hypothesis H3a and H3b included the interaction effect between gender and intolerance of uncertainty. However, based on the hierarchical regression analysis, the interaction effect was not significant, with a β-coefficient of -,063 (p>.05) for effectuation and .166 (p>.05) for causation. For both dependent variables, the third model was not significant.

This implies that intolerance of uncertainty is not significantly different amongst gender. There is no moderation effect of gender for the relationship between prospective and inhibitory anxiety and the decision-making processes of causation and effectuation.

Table 8

Overview hypotheses

Hypothesis	Independent variable	Dependent variable	Relationship	Result
1a	Inhibitory anxiety	Causation	Negative	Rejected
1b	Inhibitory anxiety	Effectuation	Positive	Accepted
1c	Prospective anxiety	Causation	Positive	Rejected
1d	Prospective anxiety	Effectuation	Negative	Accepted
2a	Male gender	Effectuation	Positive	Rejected
2b	Female gender	Causation	Negative	Rejected
2c	Female gender	Effectuation	Negative	Rejected
2d	Male gender	Causation	Positive	Rejected
3a	Inhibitory anxiety/ prospective anxiety	Causation	Moderated	Rejected
3b	Inhibitory anxiety/ prospective anxiety	Effectuation	Moderated	Rejected

Conclusion

This study has the goal to answer the following research question:

To what extent do intolerance of uncertainty and the entrepreneur's gender determine the application of effectuation and causation decision making in the new venture creation?

The motivation for this goal was that intolerance of uncertainty and gender differences are considered relevant causation and effectuation decision making, and existing literature did not provide clearance on this relationship. Based on the theory used in this study, the predictors intolerance of uncertainty and gender appeared to be related to effectuation and causation decision making, subsequently the relationships were tested with statistical analysis. All respondents are German founders of startups, operating early on in the startup lifecycle.

Therefore, the outcomes of this study are relevant for entrepreneurs engaging in new venture creation as well as entrepreneurs operating in the early stages of the startup life cycle.

Although not significant, the main finding of this study is that effectuation and causation are two opposite logics which can exist simultaneously in a corporate context. When it comes to new venture creation, this study supported the fact that effectuation decision making is considered more representative. Successful firms are more likely to begin through effectuation decision making and then further grow through causal approaches, expanding and enduring over time.

The interaction effect between intolerance of uncertainty and gender on effectuation and causation decision making was not significant. No moderation effect was found. This can be traced back to the fact that instead of the gender of an entrepreneur, personality, self-efficacy and simply the individuals themselves are said to be great predictors of being an entrepreneur for both genders. Further research on this topic is suggested.

Although not for the causation approach, Intolerance of uncertainty, however, has a significant relationship with effectuation. The main finding regarding this relationship is that prospective anxiety does not necessarily have to be of negative influence. It instead can be helpful in decision-making. Entrepreneurs with high prospective anxiety are more focused on future consequences, helping in realizing possible long-term consequences for the startup.

Moreover, this study finds that, although high inhibitory anxiety might be faced, the effectual focus and view of an entrepreneur is as strongly embodied, that more advantageous choice behavior would still be engaged in.

Conclusively, the concept of uncertainty affects the decision-making logics of entrepreneurs to a great extent, while gender does not seem to have great influence.

Discussion

This study assumed that men consequently avoid causation decision making and engage in effectuation decision making. However, although not statistically significant, results of this study are unexpected and contrary to prior assumptions. The male gender is positively correlated with both, effectuation as well as causation. The results of this study support the findings of previous researchers. In line with Kolvereid (1996), this implies that men have high entrepreneurial intentions of creating new ventures. Additionally, Mazzarol et al. (1999), comes to a similar conclusion, stating that women are less likely to open new businesses than men.

Also contrary to prior assumptions (H2b, H2c), results of this study show that female entrepreneurs would neither engage in causation decision making, nor in effectuation decision making. This result can be explained by the difference of sample sizes between men (79%) and women (21%). As two independent variables (Gender, Intolerance of uncertainty) are included in the study, a sample size of 100 would produce decent results (Tabachnick & Fidell, 2001). As no significant results could be detected, it can be assumed that the sample size of 21, when only analyzing the females, is not decent to draw conclusion from.

Overall, it can be said that the above-mentioned findings of this study suggest that entrepreneurs do not use uniquely causation nor effectuation logic. Most of the time, they prefer a hybrid model that facilitates entrepreneurial decision-making through the combination of causal and effectual methods and practices. This is in accordance with Sarasvathy (2001), stating that "successful firms are more likely to have begun through an effectual logic and grown through causal approaches as they expand and endure over time". Furthermore, supporting the findings of this study, Read & Sarasvathy (2005), found that throughout the whole startup's lifecycle, entrepreneurs might shift from one decision-making logic to another or combine both at the same time. In addition to that, the results of this study find support in the findings of Dew and Sarasvathy (2005). They state that effectuation and causation are two opposite logics which can exist simultaneously in a corporate context.

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Although it was suggested that there is a significant relationship between inhibitory anxiety and prospective anxiety and effectuation and causation, in this study only two hypotheses (1b, 1d) showed significant results. Both hypotheses relate to the dependent variable of effectuation. They suggest a statistically significant relationship between inhibitory anxiety as well as prospective anxiety and effectuation. These results can be referred to the fact that the study especially focused on founders of German startups. With a mean number of the age of the founded ventures of 2-3 years (SD=,99), it can be assumed that most respondents are either in the initial phase of creating a new venture or engage at most in the initiation phase of the opportunity growth. Results show that entrepreneurs in this study, are more likely to engage in effectuation decision making when being in the early stages of the startup lifecycle. Therefore, more significance is detected for the dependent variable of effectuation. This is in line with the findings of other researchers, who found that that effectuation logic has its greatest value in the initiation phase of the opportunity growth and that over time, a company's strategy tends to shift from explorative effectuation to predictive causation (McMullen & Shepherd, 2006; Sarasvathy, 2001; Wiltbank, Read, Dew, & Sarasvathy, 2009). Fisher (2012), Wiltbank et al. (2009) and Chandler et al. (2011), state that effectuation is considered more representative of the activities of entrepreneurs during start-up and Sarasvathy (2001) argues that entrepreneurs practice effectual reasoning when creating a new venture. These findings are in line with the findings of this study, indicating that effectuation decision making is more widespread amongst entrepreneurs operating in the early stages of new venture creation.

This study assumed that entrepreneurs scoring high on inhibitory anxiety, are more likely to avoid the effectuation approach. A correlation between inhibitory anxiety and effectuation was found. However, contrary to the assumption, a positive relationship instead of the proposed negative relationship was detected. The results of this study were unexpected as inter alia Hancock and Teevan (1964), state that inhibitory anxiety reduces the likelihood that an individual exposes themselves to situations characterized by risk. According to Sternheim et al. (2015), high intolerance of uncertainty in general has been related to heightened anxiety. Additional studies found that individuals with high levels of anxiety tend to make less advantageous choices (de Visser et al., 2010). Contrary to these findings of prior researchers, results of this study show that that individuals with high inhibitory anxiety, suffering more from anxiety in general, still engage in more advantageous choice behavior.

Although entrepreneurs in this study might face high inhibitory anxiety, the effectual focus and view is that strongly embodied in them, that more advantageous choice behavior would still be engaged in. Theoretical support for this can be found in the behavioral principles of effectuation defined by Sarasvathy (2001). Taking the second dimension, "View of risk and resources" into account, it becomes obvious that when choosing effectuation decision making entrepreneurs already limit risk by understanding what they can afford to lose at each step. Moreover, they only choose goals and actions where there is upside even if the downside ends up happening. Secondly, the fifth dimension, "View towards the future", serves as support for the findings of this study. By mainly focusing on activities within their control, entrepreneurs know from the start that their actions will most likely result in the desired outcomes.

In this study, it was proposed that entrepreneurs with prospective anxiety prefer the causation approach. However, the contrary was found. Although not statistically significant, a positive correlation between prospective anxiety and causation was found. In line with this finding, various studies found that generally, highly anxious individuals show a focus on avoiding long-term losses (Hartley & Phelps, 2012; Mueller, Nguyen, Ray & Borkovec, 2010). Intolerance of uncertainty includes anxiety about the (unknown) future, namely prospective anxiety, possibly leading to an increased focus on long-term consequences.

This implies that prospective anxiety does not necessarily have to be of negative influence, but instead be helpful in decision-making. Consequently, meaning that entrepreneurs with high prospective anxiety are more focused on future consequences. This could, inter alia, help in realizing possible long-term consequences for the startup.

Furthermore, the assumption was made that the relationship between prospective and inhibitory anxiety and the causation as well as the effectuation approach is moderated by the entrepreneur's gender. However, neither for the causation approach, nor for the effectuation approach, a statistically significant moderating effect could be detected. These findings are in line with the findings of Díaz-García and Jiménez-Moreno (2010), arguing that self-efficacy was the most significant predictor of intention to become an entrepreneur for both genders. Additionally, more specific, this finding is in accordance with other research on gender and intolerance of uncertainty that failed to find a relationship (Buhr & Dugas, 2002; Robichaud et al., 2003).

Regarding the reliability of the scales in this study, the following can be discussed. Although there are five items for causation included, a slightly low Cronbach's alpha was detected for the causation scale of Alsos et al. (2014) (α = 0.593). Generally, this indicates that further development of scale items is required. In this study, the causation scale would meet the minimum bound of 0.6 when deleting question three. However, Alsos et al. (2014) proved the scale to be reliable. Moreover, when removing one item, the scale would be incomplete as each question corresponds with one principal of causation. In addition to that, the overall effectuation measurement scale (10 items) by Alsos et al. (2014) showed a Cronbach's alpha of (α = .663). Therefore, no items were deleted and the scale by Alsos et al. (2014) was used as proposed.

The factor analysis in this study is conducted to ensure construct validity. Based on the default method offered in SPSS, for both scales, Eigenvalues for the first three factors are all above 1. However, the conducted parallel analysis for the effectuation measurement scale by Alsos et al. (2014) as well as the intolerance of uncertainty scale by Carleton et al., (2007), indicated that the eigenvalue for the third extracted factor was less than the eigenvalue that could be expected by chance. Therefore, regarding the number of factors and the original scale, the parallel method has consistent results with the actual data set. This indicates that an accurate number of two factors has been determined for both scales, based on the parallel analysis. This result is consistent with findings from other researchers. Zwick and Velicer (1986), found that the parallel analysis gives the best results in determining the number of factors under different circumstances. Moreover, Humphreys and Montanelli (1975) concluded 100% accuracy of the number of factors applying the parallel analysis method. O'Connor (2000), examining the accuracy of the parallel analysis method in determining the number of factors under different circumstances, support these findings. Therefore, the parallel analysis method can be considered an eligible, consistent method in deciding the number of factors. However, the default method offered in SPSS has been demonstrated to be a less accurate method for solely determining how many factors to extract from the data (Bandalos & Boehm-Kaufman, 2008). Based on these findings, it would be advisable for researchers to use the parallel analysis next to the default method offered in SPSS as demonstrated in this study. Gathering convergent information from multiple sources might lead to more accurate factor retention decisions.

Practical implications

This study is complementary to the findings of Isenberg (2010). Isenberg (2010), suggests that governments need to create solid ecosystems, assisting entrepreneurs as well as increasing visibility and access to role models. This advice is transferable to German Government Institutions. Another important implication concerns social entrepreneurship. For example, traditionally (West) German society still understands entrepreneurship as a male phenomenon and ascribes a housebound, traditional role to women. Such societal values perceive women's entrepreneurship as not desirable. Low normative support on the governmental levels is provided (Baughn et al., 2006). As a result, local culture hampers entrepreneur's performance.

However, in general, an enabling environment takes on special importance in the context of entrepreneurship. It is essential for the German government to create more adequate political and socio-economic framework conditions. In the German context, the government has to provide even more regional support. In that way, social entrepreneurs can accomplish their honorable mission of coming up with solutions for better societal challenges.

For entrepreneurs, managerial implications are provided by this study. Especially in the early stages of new venture creation, effectuation logic has a significant impact. More innovative, even radical ideas can be created, applying the effectuation approach. However, it is also from high importance that effectuation logic does not replace causation logic. A great cohesion between the two approaches should be created to include the best of two parts in the early stages of founding a startup. This study points out that both causation and effectuation can co-exist within a company, as they have different problem space to solve. Effectuation has an important role toward fostering innovation, especially in the early stages of new venture creation. Causation logic, however, then adds to the organizational goals and helps the company achieve its value proposition on the long run.

Theoretical implications

This study contributes to the literature on effectuation, highlighting that the effectual way of thinking is predominantly used when the level of uncertainty is high, while causal thinking is preferentially used when processes are already established, the rules of the play are known and the level of uncertainty is relatively low (Sarasvathy, 2009; Read, Dew, et al., 2009; Wiltbank et al., 2009). However, the complete understanding of how both logics progress and exist over time is still underdeveloped, as well as when and why either logic is used over another.

This study provides an expansion on effectuation principles and their importance especially in the early stage of new venture creation.

Additionally, this study adds to the entrepreneurship literature by addressing the role of gender in entrepreneurial decisions. Results of this study showed no interaction effect of gender on the relation between intolerance of uncertainty and effectuation, contributing to existing literature of inter alia Frigotto & Della Valle (2018). Moreover, with this finding, the study adds to current literature by Buhr & Dugas (2002), Robichaud et al. (2003) and Bottesi et al. (2019), researching whether there are significant differences between the genders in the light of intolerance of uncertainty. Further research is suggested, especially in terms of a theoretical perspective of gender in entrepreneurship. Future research should help to understand the gendered actions and structures of women's individual enterprises and the accompanied differences to the male gender for this matter.

Moreover, deriving from the findings of this study, the existing literature lacks detailed insights in other areas of the entrepreneurs' persona. This study shows that societal impact and stereotyping seem to play an important role when it comes to gender in entrepreneurship. Future research should follow up on this more detailed approach to find out the precise role of gender stereotyping and societal expectations to expand the theory of effectuation.

Limitations

In this section I will discuss the limitations of the analysis, which has implications for the reliability of the results. One limitation of this study was its cross-sectional research design. Although, these research designs offer benefits in terms of time-efficiency and applicability to various target groups (Levin, 2006), they cannot assess causality between variables. It could therefore be valuable to set up the study with a longitudinal research design, assessing causality of variables.

Another limitation is the small sample size. It limits the possibility to compare and describe the degree of relationship between different variables. In that way, the generalizability of the results decreases. A larger sample size would have increased accuracy particularly for a quantitative method. Moreover, a larger sample size may also result in a higher reliability. However, the small size of the second dataset can be traced back to the general difficulty of collecting enough valid data through an online questionnaire as well as the Covid-19 pandemic. During the period of the data collection, it was not possible to meet entrepreneurs in person. Moreover, many of the approached entrepreneurs did not have the time nor the interest in participating in this study.

Regarding the use of the effectuation measurement scale by Alsos et al. (2014), it becomes obvious that a low Cronbach's alpha score is detected for the causation items. This indicates that the proposed instrument may not be measuring the intended construct of causation. Applying a scale, better suited to measure the intended construct, should be thought of when doing future measurements. A different choice of items might be more appropriate.

Lastly, the design of the questionnaire resulted in a low response rate. Too lengthy questions could have been the reason for noncooperation and distortion of data. Although, multiple methods were used to lower the response bias, the data could still be unreliable due to inaccurate and dishonest answers.

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Appendix

Appendix A

Figure 3

Linearity of the phenomenon, DV: Causation

Linearity of the Phenomenon
Dependent variable: Causation
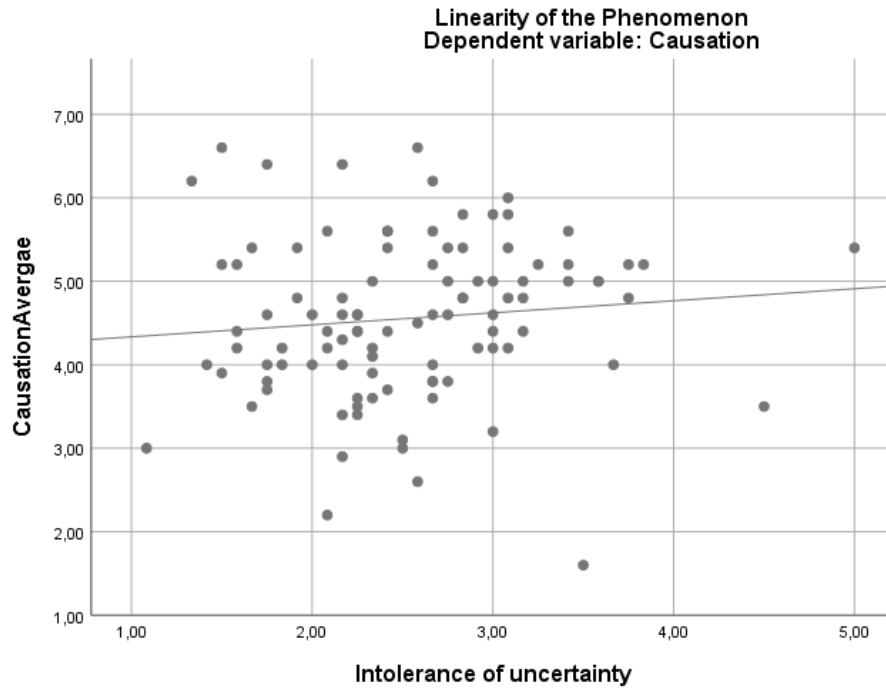
Figure 4

Linearity of the phenomenon, DV: Effectuation

Linearity of the phenomenon
Dependent variable: Effectuation
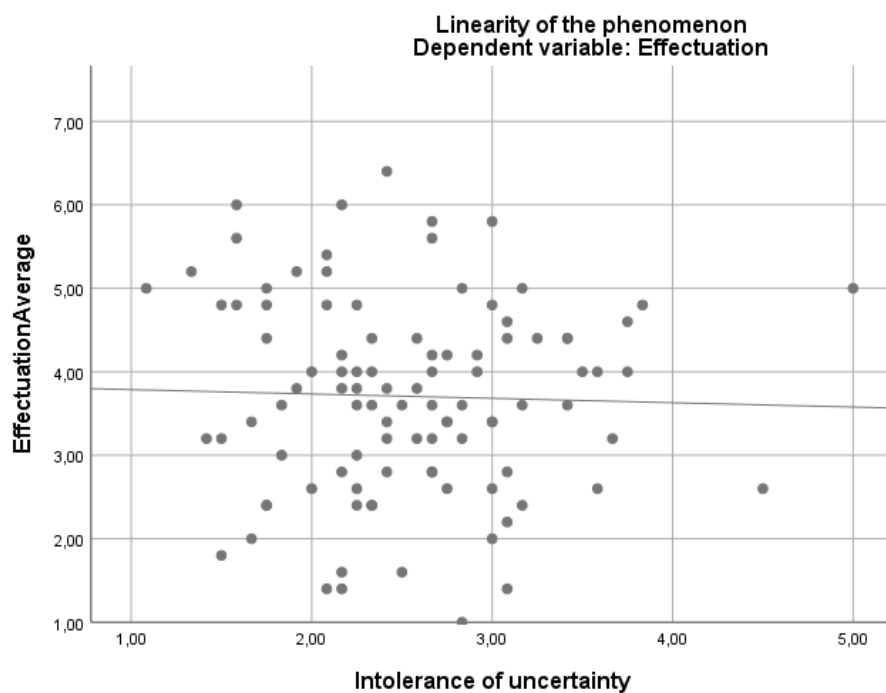
Figure 5

Homoscedasticity, DV: Effectuation, IV: Intolerance of uncertainty

Scatterplot
Dependent Variable: EffectuationAverage
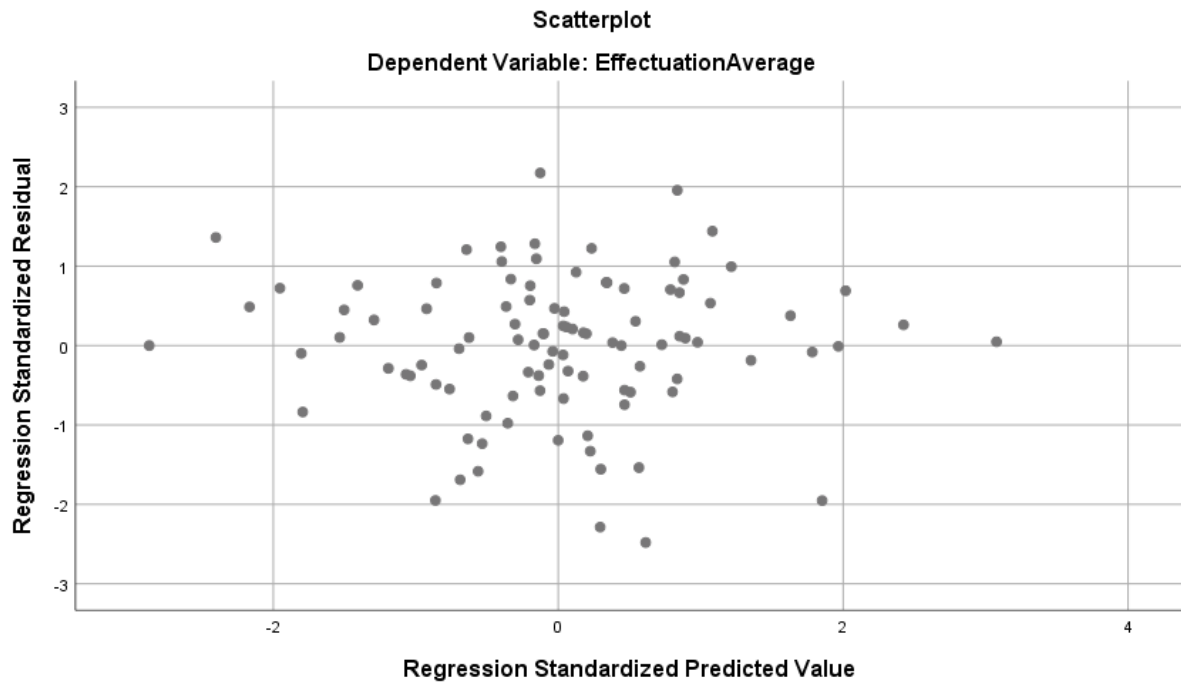
Figure 6

Homoscedasticity, DV: Causation, IV: Intolerance of uncertainty

Scatterplot
Dependent Variable: CausationAvergae
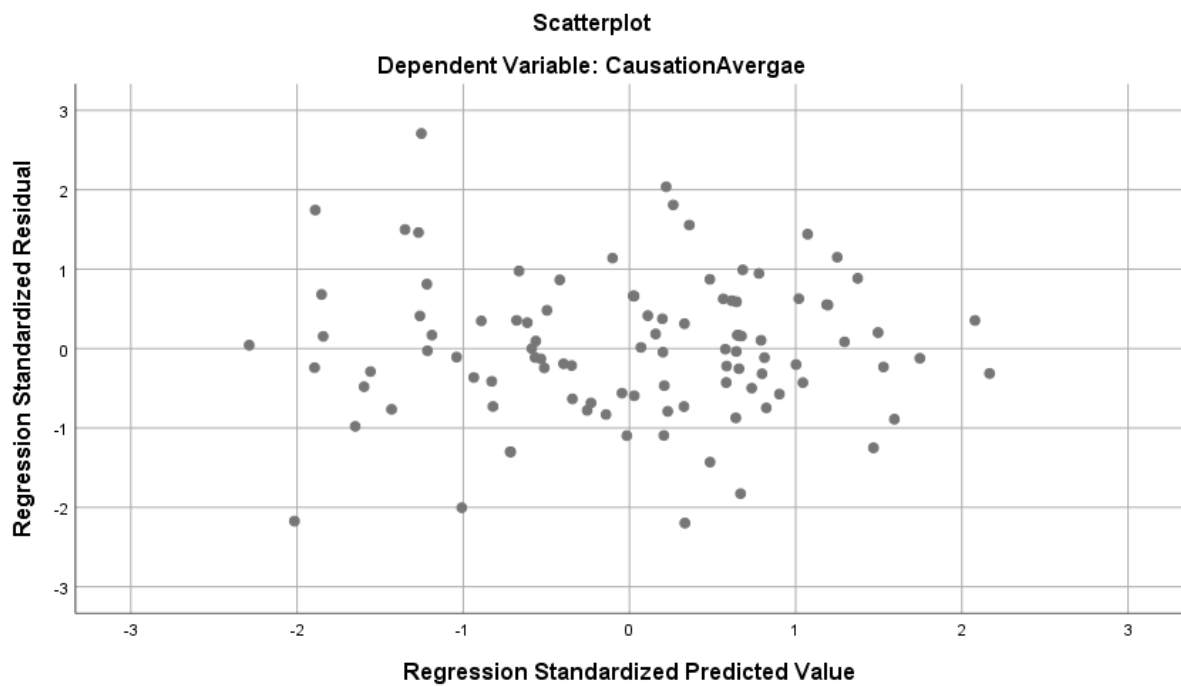
Figure 7

Normal distribution of the error terms IV: Intolerance of uncertainty

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: CausationAvergae
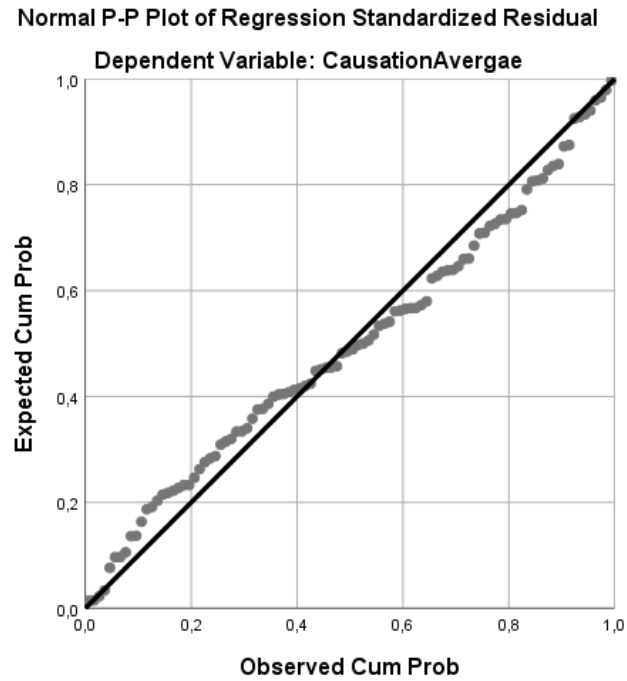
Figure 8

Normal distribution of the error terms IV: Intolerance of uncertainty

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: EffectuationAverage
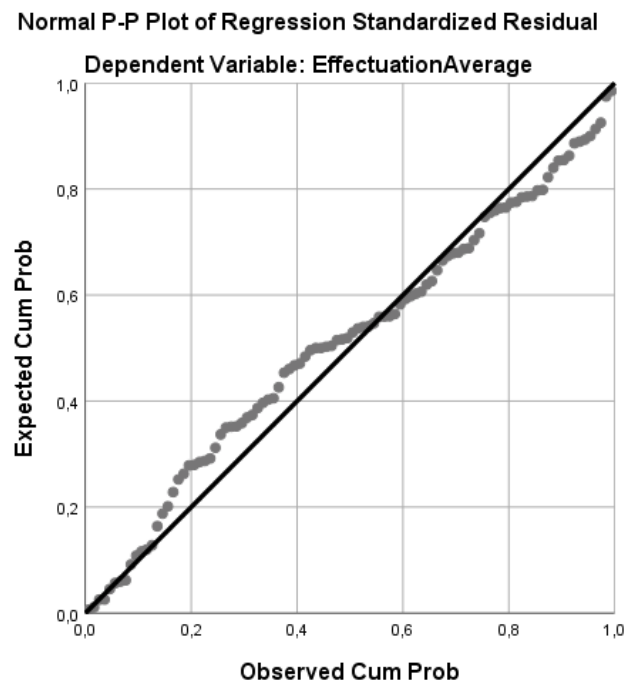
Table 8

Effectuation collinearity Statistics

Variable	VIF	Tolerance
Gender	1,159	,863
Prospective anxiety	1,129	,886
Inhibitory anxiety	1,240	,807

Table 9

Causation collinearity statistics

Variable	VIF	Tolerance
Gender	1,159	,863
Prospective anxiety	1,129	,886
Inhibitory anxiety	1,240	,807

Figure 9

Moderation effect PROCESS, DV: Causation

```
**************************************************************************
Model  : 1
    Y  : Causatio
    X  : Uncertai
    W  : Gender


Sample
Size:  100


**************************************************************************
OUTCOME VARIABLE:
 Causatio


Model Summary
          R        R-sq        MSE          F        df1        df2          p
      ,1359       ,0185       ,9117       ,6019     3,0000    96,0000       ,6153


Model
             coeff         se          t          p       LLCI       ULCI
constant    4,3257       ,3004    14,3979       ,0000     3,7293     4,9221
Uncertai     ,2749       ,4290       ,6407       ,5232     -,5767     1,1264
Gender       ,1920       ,2358       ,8143       ,4175     -,2760      ,6601
Int_1       -,1117       ,3279      -,3408       ,7340     -,7626      ,5391


Product terms key:
 Int_1    :       Uncertai x        Gender
```

Figure 10

Moderation effect PROCESS, DV: Effectuation

```
**************************************************************************
Model   : 1
    Y  : Effectua
    X  : Uncertai
    W  : Gender


Sample
Size:   100


**************************************************************************
OUTCOME VARIABLE:
 Effectua


Model Summary
          R        R-sq         MSE           F         df1         df2           p
      ,1483       ,0220      1,3834       ,7195      3,0000     96,0000       ,5428


Model
             coeff          se           t           p        LLCI        ULCI
constant    4,1945       ,3701     11,3333       ,0000      3,4598      4,9291
Uncertai    -,2601       ,5285      -,4922       ,6237     -1,3091       ,7889
Gender      -,4064       ,2905     -1,3992       ,1650      -,9830       ,1701
Int_1        ,1806       ,4039       ,4472       ,6557      -,6211       ,9824


Product terms key:
 Int_1    :         Uncertai x         Gender
```

Appendix B

Table 10

Factor analysis, communalities table, Effectuation measurement scale

	Initial	Extraction
Caus 1	1,000	,521
Caus 2	1,000	,480
Caus 3	1,000	,754
Caus 4	1,000	,678
Caus 5	1,000	,698
Effect1	1,000	,652
Effect2	1,000	,505
Effect3	1,000	,622
Effect4	1,000	,460
Effect5	1,000	,651

Table 11

Factor analysis, Total variance, Effectuation measurement scale

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,945	29,453	29,453	2,945	29,453	29,453
2	1,956	19,563	49,016	1,956	19,563	49,016
3	1,120	11,195	60,211	1,120	11,195	60,211
4	,894	8,938	69,149			
5	,731	7,313	76,462			
6	,650	6,501	82,963			
7	,564	5,641	88,604			
8	,483	4,832	93,436			
9	,350	3,504	96,940			
10	,306	3,060	100,000			

Table 12

Factor analysis, Component Correlation matrix, Effectuation measurement scale

Component	1	2
1	1,000	,054
2	,054	1,000

Note: Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization.

-> ,054 <.5, therefore orthogonal rotation

Table 13

Factor analysis, Rotated component matrix (Orthogonal rotation), effectuation measurement scale

	1	2
Effect3	,786	
Effect5	,758	
Effect1	,714	
Effect2	,701	
Effect4	,625	
Caus5		,812
Caus2		,656
Caus3		,586
Caus4		,540
Caus1		,469

Table 14

Factor analysis, Communalities table, IU scale

	Initial	Extraction
PA1	1,000	,597
PA2	1,000	,446
PA3	1,000	,602
PA4	1,000	,612
PA5	1,000	,446
PA6	1,000	,578
PA7	1,000	,611
IA1	1,000	,661
IA2	1,000	,781
IA3	1,000	,673
IA4.	1,000	,546
IA5	1,000	,709

Table 15

Factor analysis, Total variance, IU scale

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,707	39,227	39,227	4,707	39,227	39,227
2	1,555	12,954	52,181	1,555	12,954	52,181
3	1,001	8,340	60,521	1,001	8,340	60,521
4	,892	7,437	67,958			
5	,706	5,887	73,845			
6	,678	5,649	79,494			
7	,633	5,275	84,769			
8	,499	4,156	88,926			
9	,405	3,377	92,303			
10	,355	2,957	95,260			
11	,341	2,840	98,099			
12	,228	1,901	100,000			

Table 16

Factor analysis, component correlation matrix, IU scale

Component	1	2
1	1,000	,350
2	,350	1,000

Note: Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization.

-> ,350 < ,5, therefore orthogonal

Table 17

Factor analysis, rotated component matrix (orthogonal rotation), IU scale

Component	1	2
IA1	,880	
IA2	,785	
IA5	,756	
IA4	,716	
IA3	,647	
PA6	,468	,454
PA3		,749
PA2		,664
PA7		,654
PA1	,440	,605
PA5		,545
PA4		,421

Figure 10

Factor analysis, parallel analysis results, effectuation measurement scale

Component or Factor	Mean Eigenvalue	Percentile Eigenvalue
1	1.523728	1.706097
2	1.359696	1.455463
3	1.227237	1.322760
4	1.113264	1.187635
5	1.023711	1.075796
6	0.937887	1.014226
7	0.841840	0.927559
8	0.755844	0.836178
9	0.661840	0.744883
10	0.554953	0.665938

Figure 11

Factor analysis, parallel analysis results, IU scale

Component or Factor	Mean Eigenvalue	Percentile Eigenvalue
1	1.603397	1.780451
2	1.434187	1.573698
3	1.302009	1.384382
4	1.193426	1.260932
5	1.097960	1.160391
6	1.006487	1.077011
7	0.925576	0.986214
8	0.851610	0.913993
9	0.773211	0.830093
10	0.691385	0.758942
11	0.612098	0.689075
12	0.508655	0.608329