# THE EFFECT OF PERCEIVED STRESS (COVID-19) AND UNCERTAINTY INTOLERANCE ON THE ENTREPRENEURIAL DECISION-MAKING PROCESS; CAUSATION AND EFFECTUATION

**Author: D.W.L. (Wouter) Musters**
**Student number: S2184931**

**September 2021**

**Abstract:** Entrepreneurs are of vital importance for long-term wealth and the competitiveness of the economy. However, the outbreak of COVID-19 has not only generated uncertainty and stress, but also forced governments to enact anti-infection measures in order to prevent the virus from spreading. These factors influence entrepreneurs at a personal level and their ability to conduct business. This research aimed to identify the extent to which uncertainty intolerance has a mediating/moderating effect on the relationship between perceived stress (COVID-19) and the entrepreneurial decision-making process; causation/effectuation. On the basis of quantitative analysis of the survey data of 69 Dutch entrepreneurs can be concluded that uncertainty intolerance has a positive moderation effect on the relationship between perceived stress (COVID-19) and causation, but not on effectuation. In addition, it can be concluded that uncertainty intolerance has a small negative mediation effect on the relationship between perceived stress (COVID-19) and effectuation, but that there is no mediation effect on causation. The results therefore indicate that perceived stress and uncertainty intolerance are important factors to consider when studying the entrepreneurial decision-making process.

**Keywords:** uncertainty intolerance, intolerance of uncertainty, entrepreneurial decision-making, effectuation, causation, perceived stress, entrepreneurship, COVID-19

**EXAMINATION COMMITTEE**
First supervisor: Dr. M.R. Stienstra
Second supervisor: Dr. I. Skute

MSc Business Administration
NIKOS Department of Entrepreneurship, Innovation & Strategy (EIS)
Faculty of Behavioural, Management and Social Sciences

# Preface

*"I wanna thank me, I wanna thank me for believing in me, I wanna thank me for doing all this hard work, I wanna thank me for having no days off, I wanna thank me for, for never quitting"*

– Snoop Dogg

Where at first glance this quote may seem quite self-righteous, it perfectly describes the feeling that I have after finishing my thesis. During this period of my life, I was confronted with a number of circumstances that required me to realign myself, my planning and my goals. However, I can truly say that these experiences and the writing of my thesis have enriched me and my knowledge. But let's face it, oftentimes we are hard on ourself, being self-critical and pushing ourself to do better. So why not give yourself a little credit for your own accomplishments and personal development? And for that reason, I would first like to thank myself.

Next, I would like to thank dr. Martin Stienstra for his enthusiasm, flexibility and excellent guidance during the process. I really appreciated how you never put any pressure on me, and always took the time to discuss last-minute issues that came up. I would also like to thank dr. Igors Skute for reading and providing constructive and accurate feedback that helped to improve my thesis. Additional thanks go out to the 69 entrepreneurs who to took the time to fill in the survey, as without them this study literally would not have been possible.

My special thanks go out to Charlotte Röring for her excellent mentoring and counselling. Last but not least I would like to thank my girlfriend Hilde for her support.

D.W.L. (Wouter) Musters Enschede,
September 2021

# Table of contents

# List of tables



# List of Figures

# 1. Introduction

## 1.1 Background

### 1.1.1 Entrepreneurial decision-making process

Entrepreneurship in general is aimed at creating a venture throughout the process of finding and exploiting opportunities. Awareness of how entrepreneurs take actions and behave is critical for our understanding of entrepreneurship and the economy overall (Chandler, DeTienne, McKelvie, & Mumford, 2011). Hatak, Fink, Rauch, & Baranyi (2014) even argue that by studying entrepreneurial decision-making and identifying how it is affected by external factors one could improve long-term realization of economic potential, innovation, wealth and competitiveness of the economy. The environment in which entrepreneurs operate is uncertain and unpredictable (Buttner, 1992; Knight, 1921). Under these circumstances entrepreneurs are forced to make risky decisions – often based on limited information - that may influence the wellbeing of the firm and its employees (Buttner, 1992). Within the entrepreneurial decision making processes Eckhardt & Shane (2003, p336) define entrepreneurial and non-entrepreneurial decisions: where non entrepreneurial decisions distribute resources across previously developed opportunities, entrepreneurial decisions aim to create or identify new, undetected or underutilized opportunities.

Within the entrepreneurial decision making process Sarasvathy (2001, 2008) defines two different approaches: the 'traditional' goal-oriented causation approach, and the means-oriented effectuation approach. Whereas causation is a planned strategy approach that uses prediction and planning to arrive at the pre-specified end-state, effectuation determines the course of action on the basis of available means and throughout experimentation (Chandler et al., 2011; Dew, Read, Sarasvathy, & Wiltbank, 2009). Although these approaches differ, they overlap each other in the fact that they both have the same aspiration or goal, namely venture creation or opportunity exploitation (Sarasvathy, 2001a). The use of causation and effectuation is not mutually exclusive, as both can occur simultaneously in different contexts and on different decisions. When an approach is used may differ as a result of individual characteristics of the entrepreneur, external influences and situational circumstances.

### 1.1.2 Uncertainty intolerance

Personal characteristics influence the way people think, act and take decisions. Uncertainty intolerance, hereafter UI, is one of those characteristics. Uncertainty is inextricably linked to entrepreneurship, and can be described as the inability to accurately predict the outcomes of a decision (Knight, 1921; Lipshitz & Strauss, 1997; Mcmullen & Shepherd, 2006; Milliken, 1987). (Milliken, 1987). The extent to which one can tolerate or cope with this uncertainty is determined by the degree to which one is intolerant of uncertainty. Carleton (2016, p. 31) describes UI as *"an individual's dispositional incapacity to endure the aversive response triggered by the perceived absence of salient, key, or sufficient information, and sustained by the associated perception of uncertainty"*. Amongst others, UI influences experienced stress levels, worry and anxiety (Dugas et al., 2005; Greco & Roger, 2001; Laugesen, Dugas, & Bukowski, 2003). Studies have demonstrated that external factors may influence UI in both a positive and negative manner (Ladouceur, Gosselin, & Dugas, 2000; Mosca, Lauriola, & Carleton, 2016; Rosser, 2019). For example, cognitive behavioural therapy may decrease UI, whereas engagement in safety behaviours (e.g. mobile phone usage) may cause an increase in UI (R. N. Carleton, Desgagné, Krakauer, & Hong, 2019; Mahoney & McEvoy, 2012a). However, this study will mainly focus on the effect of external uncertainty and stressors on the entrepreneurs UI.

### 1.1.3 Stress

As Rauch et al. (2018) described: stress processes are an essential ingredient of the entrepreneurial process. Lazarus & Folkman (1984, p. 21) define stress as "*the relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being".* Decisions that are made under conditions of uncertainty are clearly related to subsequent stress reactions (Starcke & Brand, 2012). The novelty, uncertainty, unpredictability and uncontrollability of a situation elicits stress reactions (Mason, 1968). This stress reaction causes psychological, physiological (hormonal and neural) and behavioural reactions that are known to affect decision making (Peters, McEwen, & Friston, 2017; Rauch et al., 2018; Starcke & Brand, 2012). For example, stress is known to influence entrepreneurial decision making by affecting the entrepreneurs ability to process information and opportunity recognition (Ellis, 2006; Rauch et al., 2018). Unexpected and disruptive events such as a tsunami, financial crash or pandemic are examples of events that generate significant stress amongst the general populace (Hannah, Uhl-Bien, Avolio, & Cavarretta, 2009; Rajkumar, 2020; Wang et al., 2020).

## 1.2 Context (COVID-19)

On march 11, 2020, the World Health Organization (WHO) announced that the COVID-19 outbreak had turned into a global pandemic. In an attempt to combat the virus and prevent health-care services from being flooded, countries enacted infection control measures. In general, the following lockdowns and other infection control measures resulted in the closing of non-essential business, and brought economic activity to an abrupt halt (Kuckertz et al., 2020; Rijksoverheid, 2020b). In the Netherlands a lockdown and curfew were enacted and non-essential businesses were closed forcibly (Rijksoverheid, 2020c). At the same time uncertainty regarding the virus, anti-infection measures, insufficiency of financial compensation and unclear government policy have had a significant effect on entrepreneurs and their ability to conduct business. The COVID-19 pandemic can therefore be typed as an organizational crisis. Pearson & Clair's (1998) definition of an organizational crisis is the most commonly used definition in business, management and Entrepeneurship research (Doern, Williams, & Vorley, 2019; Williams, Gruber, Sutcliffe, Shepherd, & Zhao, 2017). They define an organizational crisis as *"An organizational crisis is a low-probability, high-impact event that threatens the viability of the organization and is characterized by ambiguity of cause, effect, and means of resolution, as well as by a belief that decisions must be made swiftly"* (Pearson & Clair, 1998, p60). Contrary to other crises that hit at a specific time or region (e.g. Hurricane Katrina, 2008 financial crisis), COVID-19 has - due to its infectious nature - not only seemingly emerged 'out of the blue', but also impacted entire economies at the same time due to its non-geographical binding (Ivanov & Das, 2020; Ivanov & Dolgui, 2020; Kuckertz et al., 2020). However, next to organizational and financial effects, COVID-19 also affects the mental health and wellbeing of the general population.

## 1.3 Research gap

The aim of this study is to contribute to scientific literature by filling in a number of gaps in the literature surrounding stress, UI and entrepreneurial decision-making. Below the current gap in literature will be discussed per subject.

First, this study will contribute to current literature on the entrepreneurial decision-making process by studying the effect of stress on causation and effectuation. It is the role of the entrepreneur to detect and exploit opportunities and to make decisions under uncertainty in a resource-constrained environment (Rauch & Frese, 2007). The entrepreneurs traits and characteristics are known to affect his/her decision-making (Baron, Franklin, & Hmieleski, 2016; Starcke & Brand, 2012), and the degree to which uncertainty is perceived as stressful. However, this perceived stress is also known to affect decision making in general (Peters et al., 2017; Rauch et al., 2018; Starcke & Brand, 2012). Nonetheless, the effect of stress exposure and reactions on decision-making in general is an understudied subject, let alone in the context of entrepreneurial decision making (Starcke & Brand, 2012). To illustrate, the current literature provides no understanding on how stress reactions affect the entrepreneur's usage of causation or effectuation. Therefore, this study aims to fill this gap by studying the effect of perceived stress on the entrepreneur's decision making, more specifically on his/her usage of causation or effectuation.

Second, this study will contribute to current literature on UI by studying how uncertainty intolerance may change as a result of perceived stress. How UI is affected by external factors is a relatively understudied subject. For example, extant literature on the manipulation of UI was mainly aimed at decreasing UI via treatment (Boelen & Reijntjes, 2009; Einstein, 2014; Mahoney & McEvoy, 2012b; Rosser, 2019), or experimentally increasing UI in a controlled environment via induced uncertainty (R. N. Carleton, Desgagné, Krakauer, & Hong, 2018; Ladouceur et al., 2000; Mosca et al., 2016). However, literature on manipulation of UI in a real world/non-experimental setting is non-existent, let alone on the effect of perceived stress on UI and its effect on a distinct group such as entrepreneurs. This study aims to fill this gap in literature by studying the manipulation of the entrepreneurs UI as a result of perceived stress, in a real life/uncontrolled setting.

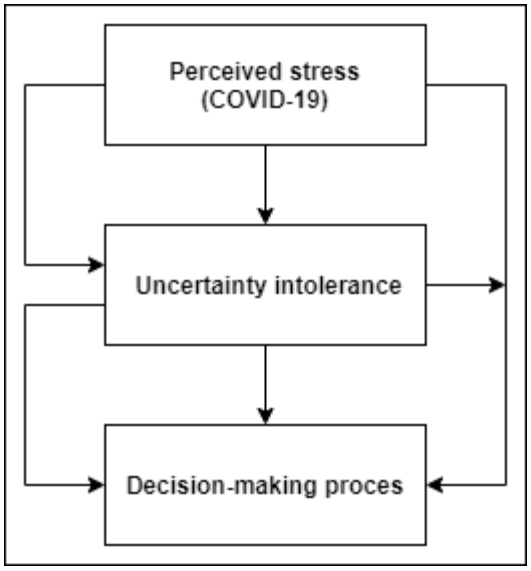
Third, this study will contribute to current literature by studying the effect of a crisis situation on the entrepreneur. Outbreaks of infectious diseases (.e.g. SARS & EBOLA) and periods of quarantine are known to cause stress amongst the general population (Bao, Sun, Meng, Shi, & Lu, 2020; Chua et al., 2004; Li et al., 2020; Quittkat et al., 2020). However, at the time of writing literature on the effect of an outbreak of an infectious disease on a distinct group such as entrepreneurs is non-existent, let alone in the context of COVID-19. Therefore, this study will contribute to the current literature by studying the perceived stressfulness of the COVID-19 outbreak and the effect of this stress on entrepreneurs specifically.

## 1.4 Research question

In order to extend existing literature, provide a deeper understanding of the effect of perceived stress (PS) on entrepreneurial decision making and the mediating and moderating effect of uncertainty intolerance on this relationship, the following research question has been formulated:

***"To what extent does uncertainty intolerance have a mediating/moderating effect on the relationship between perceived stress (COVID-19) and the entrepreneurial decision-making process?"***

**Figure 1: clarification of the research question**




This hypothesis will be tested using data that stems from the survey of 69 Dutch entrepreneurs throughout the Netherlands. In this survey the entrepreneurs were questioned about their perceived stress, uncertainty intolerance and their decision making-process. The hypothesized model (see figure 1) will be tested using hierarchical regression and a moderation and mediation analysis.

## 1.5 Research goals

The aim of this study is to fill in the previously mentioned gaps in literature and extend the literature on a number of points. First of all, this study aims to fill in the gap of how UI may change as a result of external uncertainty, specifically in the domain of entrepreneurs. Ladouceur et al. (2000) describe that by studying the manipulation of uncertainty intolerance this study helps to better identify UI and its interaction with other variables. Second, by studying the effect of PS on entrepreneurs we contribute to the literature by providing insight on how stressful situations affect entrepreneurs and their decision making (Rauch et al., 2018). As a result, we help to improve long-term realization of economic potential and overall well-being of entrepreneurs (Hatak et al., 2014).

## 1.6 Content thesis

This thesis starts with the theoretical framework in which the literature on causation, effectuation, PS and UI will be discussed and described. Next, the hypotheses are formulated on the basis of the theoretical framework, in order to demonstrate the hypothesized relationships and conceptual model. Then, the methodology section, which consists of the description of the methods used for data collection and analysis and the rationale behind them. Hereafter, in the result section the data is analysed and the hypothesis are tested. Thereafter, a conclusion will be draw, and finally, the practical and theoretical implications will be composed and limitations of the study will be described.

# 2. Theoretical framework

The theoretical framework consists of the description of concepts that are used and is based on pre-existing literature. In the following order the concepts will be described and discussed: first, the entrepreneurial decision-making process, second uncertainty tolerance, and finally COVID-19. Finally, on the basis of this framework hypothesis will be formulated.

## 2.1 The decision-making process in general

The human decision making process is often not based on calculations and strategic assumptions, but rather based on heuristics, biases and non-rational or intuitive tendencies (Starcke & Brand, 2012).

Epstein's (1994) cognitive-experiential self-theory (CEST) model describes that human information processing is based on two independent, parallel and interactive systems: the 'rational system' and the 'experiential system'. Pacini & Epstein (1999, p. 972) define the rational system as "*an inferential system that operates by a person's understanding of culturally transmitted rules of reasoning; it is conscious, relatively slow, analytical, primarily verbal, and relatively affect-free",* whereas they define the experiential system as *"a learning system that is preconscious, rapid, automatic, holistic, primarily nonverbal, intimately associated with affect* (p.972). From an evolutionary standpoint the 'experiential system' has been around for much longer than the 'rational system' (Denes-Raj & Epstein, 1994). The 'experiential system' is based on intuition and aimed at taking immediate action, whereas the 'rational system' is oriented towards delayed action and determines the course of action through logic and evidence (Burns & D'Zurilla, 1999). Under most circumstances both systems in unison, however individual differences and situational factors are known to affect this balance (Pacini & Epstein, 1999; Starcke & Brand, 2012). For example, Starcke & Brand (2012) describe that in highly uncertain situations the intuitive-experiential system plays a more dominant role compared to the rational-analytical system since the situation offers no cues offered for strategic decision making. Additionally, the rational system is associated with low levels of anxiety and stress (Epstein, 2004).

Sarasvathy (2001a) also distinguishes two parallel processes in entrepreneurial decision making that resemble the experiential and rational systems. To illustrate, causation resembles the rational system as it tries to find the right course of action through logic and evidence, whereas effectuation resembles the experiential system as it is more intuitive and aimed towards enactment (Arend, Sarooghi, & Burkemper, 2015)

## 2.2 The entrepreneurial decision-making process - Causation & Effectuation

The foundation of causation and effectuation was established by Sarasvathy (2001a, 2008). In her (2001a, p245) article Sarasvathy defined a clear difference in reasoning and in the decision making process of these approaches; "*Causation processes takes particular effect as given and focus' on selecting between means to create that effect"*; *"Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means*". The difference in underlying logic between causation and effectuation causes effectuation to be not a mere deviation from causation but a distinct mode of reasoning (Perry, Chandler, & Markova, 2012; Sarasvathy, 2001b). To illustrate, whereas causation is based on the logic of prediction *"to the extent that you can predict the future, you can control it*", effectuation is based on the logic of control *"to the extent that you can control the future, you do not need to predict it"* (S. D. Sarasvathy, 2001b, p1). The graphical depiction of both processes (see figure 2 for causation, and figure 3 for effectuation) gives a clear indication of the fundamental differences of the approaches.

The process of causation consists of causal or predictive reasoning and is also known as the MBA approach. Causation is a planned strategy approach that is based on prediction, planning and focus, and aimed at arriving at a pre-defined desired end-state (Chandler et al., 2011; Dew et al., 2009). Causation processes are primarily suited for situations in which uncertainty is low and future outcomes can be predicted (G. A. Alsos, Clausen, & Solvoll, 2014). However, causation process are only applicable in cases where the market is existent prior to exploitation (Fisher, 2012; Sarasvathy, 2001a). This is due to the fact that historical data must be present, as it serves as the basis for the assessment and evaluation of the opportunities and means required to enact the process of exploitation (Fisher, 2012).

Contrary to causation, effectuation processes are particularly suited for situations in which there is a high degree of uncertainty, such as operating or conducting entrepreneurial activities in highly innovative or new markets (Mcmullen & Shepherd, 2006; Wiltbank, Dew, Read, & Sarasvathy,

2006). In highly innovative or non-existent markets it is often difficult or nearly impossible to draw statistical inference and calculate expected returns on courses of action (Chandler et al., 2011; Grégoire & Cherchem, 2020). This is due to the fact that it is difficult to obtain valid information about customer segments, customer preferences, preferred distribution channels and pricing levels, as customers have not yet become acquainted with the product or innovation (Grégoire & Cherchem, 2020). Therefore, instead of selecting courses of action on the basis of expected return, the entrepreneur resorts to evaluating courses of action on the basis of affordable loss (Chandler et al., 2011; Sarasvathy, 2008a). Furthermore, the effectuator maintains his flexibility and utilizes experimentation to continuously determine the right course of action (Chandler et al., 2011). Instead of trying to control the future, the entrepreneur attempts to exert control on the future by establishing alliances and (pre-)committing stakeholders such as potential suppliers, competitors and customers (G. A. Alsos et al., 2014; Chandler et al., 2011). Sarasvathy (2001a, p. 260) argues that in general effectuators are more likely to fail and fail more often, but on the other hand also manage failure more effectively and on the long term manage to create larger and more successful firms. However, she also describes that in case of failure, firms created through effectuation fail earlier and at a lower level of investment than firms created through causation.

**Figure 2: Graphical depiction of the causation process (Fisher, 2012, p. 1024)**

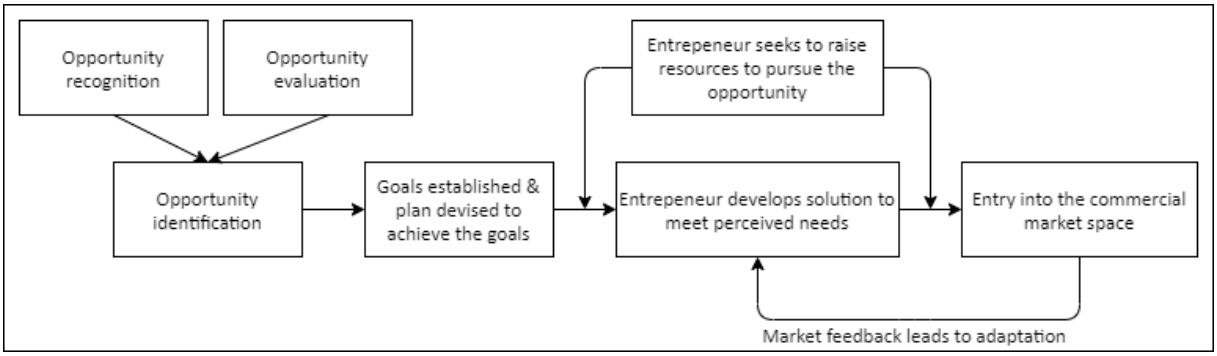
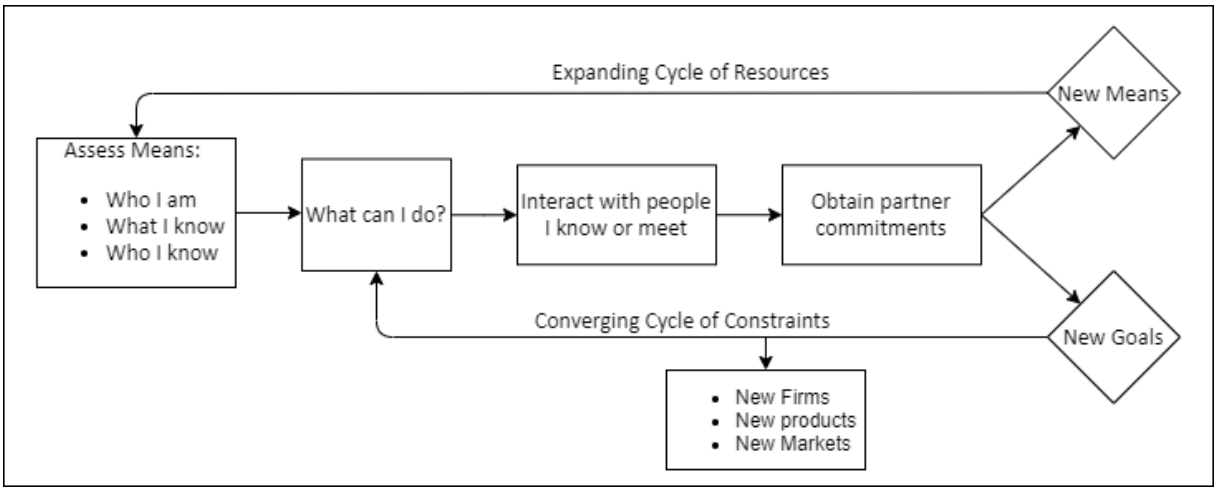



**Figure 3: Graphical depiction of the effectual process (Sarasvathy & Dew, 2005, p. 391)**




## 2.3 Contrasts between effectuation and causation:

Causation and effectuation processes differ from each other on a fundamental level. The framework drawn by Sarasvathy (2001, 2008) (see table 1) contains a brief description of the main differences between causation and effectuation. However, in order to get a clear and full understanding of their differences the following five principles will be described and discussed in order to get a clear

understanding of them: the basis for taking action, risk and resources, attitude towards outsiders, the attitude towards unexpected contingencies and the future outlook. (Dew et al., 2009; Sarasvathy, 2001a, 2008a).

**Table 1: Contrasts between Causation and Effectuation (Sarasvathy 2001, 2008)**

| Categories of Differentiation | Causation Processes | Effectuation processes |
|---|---|---|
| Givens | Effect is given | Only some means or tools are given |
| Decision-making selection criteria | Help choose between means to achieve the given effect<br>Selection criteria based on expected return<br>Effect dependent: Choice of means is driven by characteristics of the effect the decision maker wants to create and his or her knowledge of possible means | Help choose between possible effects that can be created with given means<br>Selection criteria based on affordable loss or acceptable risk<br>Actor dependent: Given specific means, choice of effect is driven by characteristics of the actor and his or her ability to discover and use contingencies |
| Competencies employed | Excellent at exploiting knowledge | Excellent at exploiting contingencies |
| Context of relevance | More ubiquitous in nature<br>More useful in static, linear, and independent environments | More ubiquitous in human action<br>Explicit assumption of dynamic, nonlinear, and ecological environments |
| Nature of unknowns | Focus on the predictable aspects of an uncertain future | Focus on the controllable aspects of an unpredictable future |
| Underlying logic | To the extent we can predict future, we can control it | To the extent we can control future, we do not need to predict it |
| **Outcomes** | Market share in existent markets through competitive strategies | New markets created through alliances and other cooperative strategies |

**1. Basis for action: Means versus ends.**

Causation processes are goal oriented, and is aimed at achieving a pre-defined goal or desired end-state. Sarasvathy (2001a, p. 245) describes the causation process as starting with a particular 'given' effect and then focussing on the selection of means in order or create the desired effect The aim of the causation process is to identify the most optimal (cheapest, fastest, most efficient) route to reach the pre-specified end-state (Sarasvathy, 2008b). Examples of causal reasoning are: choosing the market with the highest expected return, choosing to make or buy a product, choosing a portfolio with the lowest risk, etc (Sarasvathy, 2008b).

Effectuation is means-oriented instead of goal oriented. Sarasvathy (2001a, 2008) defined three categories of means that the entrepreneurs start with. First, the entrepreneur knows who he/she is and what his or her traits, tastes and abilities are. The second category is knowledge, which consists of what her or she knows – education, training, expertise, and experience. Third, his or her network, who they know - social and professional networks. As this 'given set of means' is used, and as the founders interact and develop aspirations goals start to emerge and change. So contrary to the causal process of thorough planning and subsequent execution, in the effectual process plans are made and revised during execution (Sarasvathy, 2008b).

**2. Risk and resources: affordable loss versus expected returns**

In a causation process the course of action is determined on the basis of expected returns, and therefore focussed on the upward potential. Sarasvathy (2001a, p. 252) describes this as *"Causation models focus on maximizing the potential returns for a decision by selecting optimal strategies*". To

illustrate, the creation of a new venture using the causation process consists of the pursuit of the (risk-adjusted) maximum opportunity, and finding the resources to pursue this opportunity (Sarasvathy & Dew, 2005).

In an effectuation process the course of action is based upon affordable loss, and therefore focussed on the downward potential. Fisher (2012, p. 1025) describes the affordable loss principle as *"Affordable loss entails making decisions based on what one is willing to lose, and committing a specific amount of resources to an endeavour with the understanding and acceptance that such resources may be lost"*. Read & Sarasvathy (2005) argue that the affordable loss principle can also be described as acceptable risk, as the focus is on limiting the downside potential. To illustrate, contrary to the causal process - which aim is the pursuit of the maximum risk-adjusted opportunity -, the effectual process consists of evaluating possible opportunities and determining the course of action on the basis of the resources that the entrepreneur is willing to lose (Dew, Read, Sarasvathy, & Wiltbank, 2008).

**3. Attitude towards outsiders: Competitive analysis versus stakeholder commitment**

Causation depends on the usage of competitive analysis over stakeholder commitment. From a causation standpoint the attitude towards relationships is driven by competitive analysis and limitation of dilution of ownership (Dew et al., 2009).

Effectual reasoning emphasises the creation of strategic alliances and stakeholder commitment rather than competitive analysis. On the usage of strategic alliances Sarasvathy (2001a, p. 252) argues that *"strategic alliances and pre- commitments from stakeholders serve as a way to reduce and/or eliminate uncertainty and to erect entry barriers".* Examples of pre-commitments can be provisions of resources and the agreement to buy a product that has not yet been produced (Arend et al., 2015).

**4. Attitude towards unexpected contingencies: Exploiting contingencies versus pre-existing knowledge**

Contingencies are unexpected influences on the process, that are impossible to plan for (Arend et al., 2015; Sarasvathy, 2001a). In case of causation the decision making is based on prediction, planning and focus on the desired end-state (Dew et al., 2009). Therefore, unexpected contingencies are seen as obstacles that have to be avoided at all cost.

Effectuation is aimed at leveraging unexpected contingencies. Instead of trying to predict an unpredictable future, effectuation is characterized by the rethinking of possibilities and continuous transformations of target goals (Dew et al., 2009; Sarasvathy, 2001a). Contingencies are approached as an opportunity for creation, and can therefore be leveraged (Dew et al., 2009). Fisher (2012, p. 1025) describes exploiting contingencies as *"embracing unexpected events and turning them into profitable opportunities, thereby getting unanticipated outcomes as opposed to achieving a predefined goal".*

**5. Future outlook: Predicting an uncertain future versus controlling an unpredictable future**

Causation is based on a predictive logic that *"to the extent that you can predict the future, you can control it"* (S. D. Sarasvathy, 2001b, p1). In causation the future is seen as a continuation of the past, and can therefore be predicted by making use of accurate forecasting and planning (Dew et al., 2009). Additionally, the logic behind causation dictates that entrepreneurial opportunities are objective and can be identified a priori (Fisher, 2012).

Effectuation is based on the logic of control *"to the extent that you can control the future, you do not need to predict it"* (S. D. Sarasvathy, 2001b, p1). Dew et al. (2009, p. 290) describe the effectual outlook on the future as being *"at least partially shaped by wilful agents"*, and therefore can be concluded that (following effectual logic) prediction is difficult and not useful (Dew et al., 2009). Furthermore, the effectual logic describes entrepreneurial opportunities as *"subjective, socially constructed and created through a process of enactment"* (Fisher, 2012, p. 1022). In other words, the entrepreneur develops opportunities through experimentation, while continuously determining and changing the course of action as new information emerges (Sarasvathy, 2008a).

## 2.3 Uncertainty intolerance

### 2.3.1 Uncertainty intolerance and the entrepreneurial decision-making process

Uncertainty is inextricably linked to the entrepreneurial decision-making process. Entrepreneurs operate in an uncertain and unpredictable environment and bear a significant responsibility for how their choices and actions impact them and their firm (Buttner, 1992; Knight, 1921). The extent to which one can tolerate or cope with uncertainty about the future is determined by the degree to which one is intolerant of uncertainty. Carleton's (2016, p. 31) widely used definition of uncertainty intolerance describes it as *"an individual's dispositional incapacity to endure the aversive response triggered by the perceived absence of salient, key, or sufficient information, and sustained by the associated perception of uncertainty"*. Rosen, Ivanova, & Knäuper (2014, p. 54) argue that uncertainty intolerance is a trait characteristic that stems from a negative bias towards uncertainty and the possible outcomes that may arise out of this uncertainty. Carleton, Norton, & Asmundson (2007) argue that the extent to which one is intolerant of uncertainty is determined by their experienced level of prospective- and inhibitory anxiety. Bottesi, Noventa, Freeston, & Ghisi (2019, p. 3) define prospective anxiety as "*expressing the propensity of individuals toward active information seeking as a way to reduce uncertainty/increase certainty",* whereas they define inhibitory anxiety as *"avoidance-oriented responses to uncertainty, i.e., an inhibition of actions or experience which is caused by uncertainty".* In other words, prospective anxiety consists of anxiety based upon future events, whereas inhibitory anxiety describes uncertainty that impedes action (R. N. Carleton et al., 2007). However, more recent research has questioned the distinctiveness of the two factor model and suggests unidimensional model (Hale et al., 2016; Lauriola, Mosca, & Carleton, 2016; Shihata, McEvoy, & Mullan, 2018).

Uncertainty intolerance negatively affects performance and cognition. The extent to which one is intolerant of uncertainty affects how they perceive, interpret and respond to uncertainty on a cognitive, emotional and behavioural level (Dugas et al., 2005). In addition, the degree of uncertainty intolerance affects experienced levels of stress, worry and anxiety (Dugas et al., 2005; Greco & Roger, 2001; Laugesen et al., 2003). Furthermore, uncertainty intolerance affects the interpretation of information, as people with a high uncertainty intolerance are significantly more likely to interpret ambiguous information as threatening than people that are tolerant of uncertainty. (Dugas et al., 2005; Hedayati, Dugas, Buhr, & Francis, 2003). Additionally, Dugas, Freeston, & Ladouceur (1997) found that a high uncertainty intolerance may impair problem solving skills, often resulting in passiveness or avoidance of ambiguous situations. For example, people that are highly intolerant of uncertainty experience uncertain situations and unexpected events as exceptionally stressful and upsetting, which stems out of their self-assumed inability to cope with this uncertainty (R. N. Carleton, 2016a; Dugas et al., 2005). In order to cope with this uncertainty and mitigate potentially aversive consequences they attempt to increase predictability and controllability (R. N. Carleton, 2016b). This often results in resorting to dysfunctional measures such as excessive information

seeking, avoidance or impulsive decision-making (Bottesi et al., 2019; Buhr & Dugas, 2002; N. R. Carleton et al., 2012).

The extent to which an individual is intolerant of uncertainty may change as a result of external and internal factors (Ladouceur et al., 2000; Mosca et al., 2016; Rosser, 2019). For example, most clinical studies on UI have been aimed at decreasing UI through cognitive behavioural therapy in order to relieve the patient from anxiety and (social)phobia (Einstein, 2014; Mahoney & McEvoy, 2012a; Mosca et al., 2016). In addition, studies that have aimed to increase UI have demonstrated that UI may be increased as a result of engagement in safety behaviours and increased external uncertainty. (R. N. Carleton et al., 2019; Ladouceur et al., 2000; Mahoney & McEvoy, 2012a). However, the exact effect of stress on UI has not yet been studied.

### 2.3.2 Uncertainty intolerance and stress processing

Uncertainty is known to be a major source of stress, and uncertainty intolerance affects the way in which stress is processed. The literature indicates that uncertainty is a major source of stress, and that decision making under uncertainty is ultimately associated with stress reactions (Greco & Roger, 2003; Peters et al., 2017; Rauch et al., 2018; Starcke & Brand, 2012). Lazarus & Folkman (1984, p. 21) define stress as "*the relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being".* Key triggers of stress reactions are the novelty of a situation, unpredictability of a situation, inability to control the situation and the expectation of adversity (Mason, 1968). Stress elicits psychological, physiological (hormonal and neural) and behavioural reactions that are known to affect decision making (Peters et al., 2017; Rauch et al., 2018; Starcke & Brand, 2012). Stress in general is known to have a negative effect on one's ability to process information (Ellis, 2006; Rauch et al., 2018), recognize opportunities (Rauch et al., 2018), to cloud rational thinking (Dilawar, Li, Ibrar, & Liu, 2018), and to negatively affect working memory (T Arnsten, 2009). On the supposed effect of stress on risky decision making, the literature remains inconclusive (Cote, L. P. & García, A. M., 2016; Porcelli & Delgado, 2009; Sokol-Hessner, Raio, Gottesman, Lackovic, & Phelps, 2016). However, the more recent study of Sokol-Hessner et al. (2016) indicates that there is no specific evidence for the effect of stress on risk attitude and loss aversion.

Starcke & Brand (2012, p. 1241) conclude that stress alters underlying mechanisms of decision making (e.g., strategy application, automated responses, feedback processing, and reward and punishment sensitivity). Additionally, they found that the presented degree of uncertainty affects the effect of stress on certain parts of the decision-making process. To illustrate, decisions with a moderate amount of uncertainty interfere with the balance between automated emotional responses and deliberate calculative responses, whereas decisions made under high uncertainty affect feedback-processing abilities (Starcke & Brand, 2012, p. 1233). Lazarus & Folkman (1984) argue that the degree to which a situation is interpreted as stressful depends on the process of cognitive appraisal, which consists of primary appraisal and secondary appraisal. During primary appraisal the individual assesses the degree to which the stressor is challenging (mastery or benefit) or threatening (harm or loss) (Folkman & et al, 1986). Secondary appraisal consists of the analysis of methods and resources that could be used to eliminate, minimize or tolerate the stressor. One's specific stress reaction to a situation varies based on the experienced degree of uncertainty and on individual characteristics (e.g. uncertainty intolerance and other biological and psychological factors) (Baron et al., 2016; Starcke & Brand, 2012). However, Porcelli, Delgado, Opin, & Author (2017) report a growing consensus in the literature on the fact that stress induces a shift from goal-directed systems towards habit-based system.

## 2.4 The COVID-19 epidemic

### 2.4.1 Psychological effects of outbreaks of infectious diseases

Outbreaks of infectious diseases (.e.g. COVID-19, SARS & EBOLA) and resulting periods of quarantine lead to increased stress and symptoms of mental illness amongst the general population (Bao et al., 2020; Chua et al., 2004; Li et al., 2020; Quittkat et al., 2020). To illustrate, Chua et al. (2004) studied the psychological effects that emerged as a result of the SARS epidemic, and found significantly increased stress levels amongst both healthy and infected individuals. In addition, Mcalonan et al. (2007) studied the immediate and sustained psychological effect on health care workers who were at high risk of contracting SARS, and found that they experience chronic stress and score higher on depression and anxiety.

In the case of the COVID-19 epidemic anxiety, depression and stress are the most common psychological reactions (Bao et al., 2020; Rajkumar, 2020; Wang et al., 2020). Gavin, Lyne, & McNicholas (2020) even argue that the peak of physical effects of the virus will be surpassed by the peak of psychological morbidity, which it also expected to endure for longer. In the study of (Wang et al., 2020) on the psychological responses during the initial stages of the COVID-19 epidemic (January and February of 2020), more than half of the respondents reported a moderate to severe psychological impact, and one-third of the respondents reported moderate-to-severe anxiety. Whereas during the initial stages of the pandemic a relatively mild increase in psychological health problems was reported, Gavin et al. (2020) anticipate that the real increase of psychological effects will arise mid- or post-pandemic. They expect that at this point in time the following effects of the pandemic collide: economic downfall, constrained mental-healthcare resources, a changed lifestyle (e.g. restricted movement/lockdown) and individual vulnerabilities (Gavin et al., 2020, p. 156).

Early research on COVID-19 and studies of previous outbreaks of infectious diseases found that distress and the most common psychological effects mainly stem out of: (1) personal health concerns, (2) fear of being infected and infecting others (3) fear of social contact, and (4) financial distress (Brooks et al., 2020; Chua et al., 2004; Li et al., 2020; Quittkat et al., 2020; Yu, Ho, So, & Lo, 2005). In addition, Brooks et al. (2020) studied the psychological impact of being quarantined during the outbreak of an infectious disease. They found the following factors as additional causes of significant distress: (1) the feeling of confinement, loss of routine and reduced social and physical contact (2) Insufficiency of basic necessities (food, water, clothes, etc) (3) Inadequate provision of information by the government and public health authorities on behavioural guidelines and the purpose of the quarantine in general (4) significant socioeconomic distress stemming from financial losses and the inability to plan professional activities (5) the perceived inadequacy of governmental financial compensation for lost income and expenses (Brooks et al., 2020). However, even after being released from an institute of care, patients may experience psychological trauma in the form of stress-related, depressive or anxiety disorders (Chua et al., 2004). Next to negative psychological effects, it also common for positive psychological effects to arise as a result of the outbreak of an infectious disease, which range from a sense of feeling united, a raised awareness of the physical state and hygiene and feeling an increased willingness to help others (Brooks et al., 2020; Chua et al., 2004). Although extant research is available on the effect of infectious diseases on patients and the general public, their effect on entrepreneurs specifically has not been studied.

### 2.4.2 The effect of COVID-19 on entrepreneurs

The COVID-19 pandemic significantly affects entrepreneurs on both the personal and entrepreneurial level. On a personal level the entrepreneur is at risk of being infected and infecting others, which - depending on their health situation - could lead to severe, and sometimes fatal pneumonia (RIVM, 2021b). Meanwhile at the entrepreneurial level uncertainty regarding the virus, anti-infection

measures, insufficient financial compensation and unclear government policy have had a significant effect on entrepreneurs and their ability to conduct business. The COVID-19 pandemic can therefore be typed as an organizational crisis. Pearson & Clair's (1998) definition of an organizational crisis is the most commonly used definition in business, management and Entrepeneurship research (Doern et al., 2019; Williams et al., 2017). They define an organizational crisis as *"An organizational crisis is a low-probability, high-impact event that threatens the viability of the organization and is characterized by ambiguity of cause, effect, and means of resolution, as well as by a belief that decisions must be made swiftly"* (Pearson & Clair, 1998, p60). Contrary to other crises that hit at a specific time or region (e.g. Hurricane Katrina, 2008 financial crisis), COVID-19 has - due to its infectious nature - not only seemingly emerged 'out of the blue', but also impacted entire economies at the same time due to its non-geographical binding (Ivanov & Das, 2020; Ivanov & Dolgui, 2020; Kuckertz et al., 2020). The resulting lockdowns and other infection control measures resulted in non-essential business being closed, and have brought economic activity to an abrupt halt (Kuckertz et al., 2020; Rijksoverheid, 2020b).

COVID-19 therefore poses a significant financial threat to entrepreneurs. Government compensation measures such as the Dutch 'Noodmaatregel Overbrugging voor Werkgelegenheid' (NOW) were called into action in order to compensate entrepreneurs and prevent a surge of bankruptcy and unemployment (Rijksoverheid, 2020a). However, not all entrepreneurs are eligible to receive this compensation, and in case of eligibility the reimbursement is often insufficient (le Clercq, 2020; Rijksoverheid, 2020a). Equally as worrying is that Brown, Rocha, & Cowling (2020) found that the COVID-19 uncertainty has a negative effect on entrepreneurial finance. They found a decline in the number of equity transactions, which is the primary source of capital for start-ups, with seed financing being the most heavily affected. At the same time, these entrepreneurs and firms are generally not eligible to apply for loans, as they generally do not meet the traditional criteria required (Bundesverband Deutsche Startups e.V., 2020; PWC, 2020). However, even if the lockdown and anti-infection measures would be lifted immediately, firms would still not be able to return to normal operations. As a result of the non-geographical binding of the virus supply chains, distribution-logistics centres and entire markets will continue to be sequentially disrupted (Ivanov & Das, 2020). We can therefore conclude that COVID-19 and the anti-infection measures have a significant effect on entrepreneurs.

## 2.5 Hypotheses

The basis of the hypothesis stems from the theoretical framework.

### 2.5.1 Uncertainty intolerance

Research indicates a negative association between uncertainty and causation (Chandler et al. 2011). People that are highly intolerant of uncertainty experience a self-assumed inability to cope with uncertain situations, and therefore experience them as upsetting and stressful, (R. N. Carleton, 2016a; Dugas et al., 2005). They therefore try to increase predictability and controllability in order to mitigate potentially aversive consequences (R. N. Carleton, 2016b). Therefore, a positive association between uncertainty intolerance and the causation approach is expected.

***$H_{1A}$:*** *There is a significant positive relationship between uncertainty intolerance and the causation approach*

Research indicates a positive association between uncertainty and effectuation (Chandler et al., 2011). People that are tolerant of uncertainty experience uncertain situations as less threatening, and are less aimed at increasing predictability and controllability (R. N. Carleton, 2016a; Dugas et al.,

2005). Therefore, is expected that there is a negative association between uncertainty intolerance and the effectuation approach.

***$H_{1B}$:*** *There is a significant negative relationship between uncertainty intolerance and the effectuation approach.*

### 2.5.2 Perceived stress (COVID-19)

Causation processes are primarily suited for situations in which uncertainty is low and future outcomes can be predicted (G. A. Alsos et al., 2014). COVID-19 has made the future highly uncertain, therefore making nearly impossible to make valid and reliable predictions about the future and offering no cues for strategic decision making (Starcke & Brand, 2012). Causation - being a planned strategy approach - relies on these predictions to determine the course of action (Chandler et al., 2011; Dew et al., 2009). Therefore, is expected that COVID-19 is negatively associated with the causation approach.

***$H_{2A}$:*** *There is a significant negative relationship between perceived stress (COVID-19) and the choice for the causation approach*

Contrary to causation, effectuation processes are particularly suited for situations in which there is a high degree of uncertainty (Mcmullen & Shepherd, 2006; Wiltbank et al., 2006). In addition, in highly uncertain situation the intuitive-experiential system is known to play a more dominant role than the rational analytical system, since the situation offers no cues for strategic decision-making (Starcke & Brand, 2012). It is therefore expected that PS (COVID-19) is positively associated to the effectuation approach.

***$H_{2B}$:*** *There is a significant positive relationship between perceived stress (COVID-19) and the choice for an effectuation approach*

### 2.5.3 Moderator/mediator

People with a high uncertainty intolerance experience uncertain situations and unexpected events as exceptionally stressful, whereas people with a low uncertainty intolerance will experience these same situations as far less stressful (R. N. Carleton, 2016a; Dugas et al., 2005). This higher degree of experienced stress stems out of their self-assumed inability to cope with this uncertainty (R. N. Carleton, 2016a; Dugas et al., 2005). In the case of COVID-19 the initial uncertainty of COVID-19 will not change as a result of one's uncertainty intolerance, however the degree to which the situation is perceived as stressful will differ. Therefore, the effect of the stress stemming out of COVID-19 on the entrepreneur's choice for either causation or effectuation is affected. It is therefore expected that the relationship between COVID-19 and the entrepreneur's choice for either causation or effectuation is moderated by uncertainty intolerance.

***$H_3$:*** *The relationship between perceived stress (COVID-19) and the preferred decision-making process is moderated by uncertainty intolerance.*

External influences are known to be able to change ones uncertainty intolerance in both a positive and negative manner (Ladouceur et al., 2000; Mosca et al., 2016; Rosser, 2019). Studies have demonstrated that as a result of increased external uncertainty one's uncertainty intolerance may increase (Ladouceur et al., 2000; Mosca et al., 2016). The outbreak of COVID-19 has generated significant uncertainty and as a result generated significant stress for entrepreneurs. It is therefore expected that perceived stress (COVID-19) increases the entrepreneur's uncertainty intolerance.

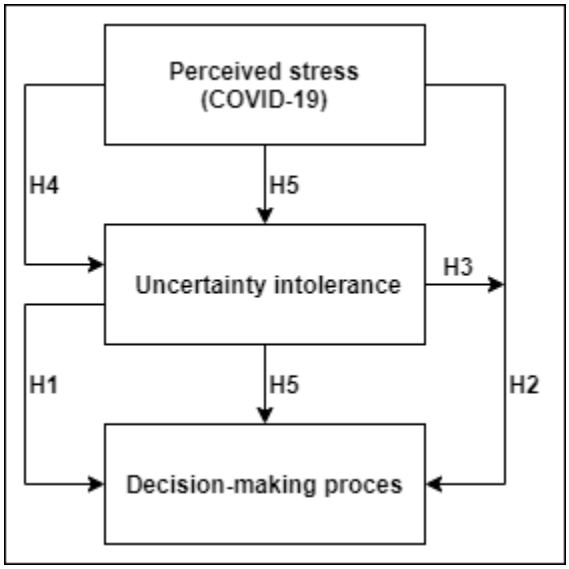
***$H_4$:*** *There is a significant positive relationship between perceived stress (COVID-19) and uncertainty intolerance.*

The outbreak of COVID-19 has caused significant uncertainty and stress. Ladouceur et al. (2000) and Mosca et al. (2016) demonstrated that as a result of increased external uncertainty one's uncertainty intolerance may decrease. However, the entrepreneur's uncertainty intolerance affects his or her natural preference for causation or effectuation. It may therefore be that the COVID-19 uncertainty may have decreased the entrepreneur's uncertainty intolerance, and that as a result of the changed uncertainty intolerance the entrepreneur's preference for causation or effectuation is influenced. It is therefore expected that the relationship between COVID-19 and the choice for causation or effectuation is mediated by uncertainty intolerance.

***$H_5$:*** *The relationship between perceived stress (COVID-19) and the preferred decision-making process is mediated by uncertainty intolerance.*

Figure 4 provides a graphical overview of the conceptual model and the hypothesis.

**Figure 4 – The conceptual model**




# 3. Methodology

## 3.1 Sampling and respondents

In order to assess the UI, PS and causation and effectuation of Dutch entrepreneurs the following methodology was used. Since the aim of this research is to study the effect of PS on the decision-making process of Dutch entrepreneurs, all data was gathered in the Netherlands. In order to ensure validity of the sample, and check for potential deviations, the author contacted entrepreneurs throughout different geographical locations of the Netherlands. In addition, the author strived to include both urbanized and more rural entrepreneurs.

Data was gathered from the 15th to the 29th of April. After the 29th of April the survey was closed in order to minimize deviations in the measurement period of perceived stress scale, which measures PS over the last month. All data was gathered online as a result of all non-essential businesses being closed forcibly in the Netherlands. Entrepreneurs were contacted through LinkedIn, local business associations or by mail. In total 16 groups of entrepreneurs were contacted which range from highly urbanized entrepreneurs' associations to more rural entrepreneurs' associations, and from associations of experienced and more network-oriented entrepreneurs towards associations aimed at starting entrepreneurs. All together 566 Dutch entrepreneurs were contacted which resulted in 69 fully completed surveys.

The distribution of the sample (table 2) shows that the sample consists of more male entrepreneurs (68.1%) than female entrepreneurs (31.9%). The average respondent is 43 years of age, has 11.46 years of experience as an entrepreneur and has founded 2 ventures. In addition, 66.6% of the respondents has a bachelor or master's degree of which 49.3% was business-oriented. The firm size, measured in FTE's indicates that the majority of the respondents (58%) is the only employee of the firm, whereas 42% of the respondents has at least 1 employee or more.

**Table 2: means, standard deviations and sample distribution of control variables**

| Descriptive Variable | Mean | Std. Deviation | Categories | Frequency | Percent |
|---|---|---|---|---|---|
| Age | 43,00 | 14,18 | | 69 | 100% |
| Sex | | | Male | 47 | 68,1% |
| | | | Female | 22 | 31,9% |
| Education level completed | | | Secondary school | 3 | 4,3% |
| | | | MBO | 13 | 18,8% |
| | | | Propedeuse | 7 | 10,1% |
| | | | Bachelor | 33 | 47,8% |
| | | | Master | 13 | 18,8% |
| Education orientation? | | | Business-oriented | 34 | 49,3% |
| | | | Non-business oriented | 12 | 17,4% |
| | | | Missing | 23 | 33,3% |
| Number of ventures founded | 2,03 | 1 | | | 100% |
| | | | | 69 | |
| Years of experience | 11,46 | 9 | | | |
| Amount of FTE's | | | 1 FTE's | 40 | 58,0% |
| | | | 2 FTE's | 4 | 5,8% |
| | | | 3-5 FTE's | 8 | 11,6% |
| | | | 6-10 FTE's | 4 | 5,8% |
| | | | 11-49 FTE's | 8 | 11,6% |
| | | | 50-249 FTE's | 4 | 5,8% |
| | | | 250 or more FTE's | 1 | 1,4% |

## 3.2 Sampling methods

In order to gather valid and reliable results in an effective manner, pre-existing scales were used. These scales are all common measures and have been previously tested to yield reliable and valid results. PS, UI and causation and effectuation will all be measured using a Likert scale.

### 3.2.1 Causation and effectuation

The scale of Alsos et al. (2014) is an improved version of the scale of Chandler et al. (2011), and will be used to measure the concepts of causation and effectuation using a seven-point Likert scale. Alsos et al., (2014) differentiate causation and effectuation on the basis of the same contrasting five principles of Sarasvathy (2001a) that were previously used in this study. Consistent with theory, Alsos et al., (2014) found correlations between the principles of causation and effectuation.

The measurement scale of Alsos et al. (2014) was translated to Dutch, since the goal of this research is to study entrepreneurs in the Netherlands of whom the majority is likely to be a native

Dutch speaker. In order to ensure the validity of the translated measurement scale the following steps were taken: first, two native Dutch speakers translated the measurement scale from English to Dutch, second the translated measurement scale was back-translated to English by two independent native English speakers, third, the back-translated versions were studied and compared to the initial measurement scale in order to resolve discrepancies and ambiguities of translation (Sousa & Rojjanasrirat, 2011).

Given the full length of the survey, the decision was made to omit one question per subconstruct. The decision on which questions to omit is based on the perceived accuracy of the translation and added value of the question. For causation this meant that question 3,6,9,12 and 13 were omitted, whereas for causation question 3,6,9,12 and 13 were omitted.

### 3.2.2 COVID-19

The effect of COVID-19 will be measured in the form of stress using the perceived stress scale (PSS-10) and a five-point Likert scale. Rauch et al., (2018, p. 350) emphasize that by only measuring uncertainty, and not accounting for underlying stress processes one may end up with 'mis specified theories' and 'spurious relationships. This rationale combined with the fact that uncertainty is known to be a major source of stress has led to the effect of COVID-19 being solely measured in the form of stress. The perceived stress scale of Cohen, Kamarck, & Mermelstein (1983) is a common measure to determine "*the degree to which situations in one's life are appraised as stressful"* (S. Cohen et al., 1983, p. 385). The PSS is a survey consisting of 10 questions that asses the level of stress by questioning respondents on the degree to which they perceive their life as unpredictable, uncontrollable and overloading (S. Cohen et al., 1983). The PSS has proven itself as a reliable measure of stress during previous studies on outbreaks of infectious diseases. To illustrate, the PSS was used by Chua et al. (2004) and Yu et al. (2005) during the 2003 SARS outbreak, and by Babore et al. (2020) during the earlier stages of the COVID-19 pandemic.

### 3.2.3 Measurement of uncertainty intolerance

Uncertainty intolerance will be measured using the Dutch short version of the intolerance of uncertainty scale (IUS) and a five-point Likert scale (Boelen, Vrinssen, & Van Tulder, 2010; R. N. Carleton et al., 2007). The initial IUS was developed by Freeston, Rhéaume, Letarte, Dugas, & Ladouceur (1994) and consists of a 27-item survey on *"emotional, cognitive and behavioural reactions to ambiguous situations, implications of being uncertain, and attempts to control the future"* (p. 791). Carleton et al. (2007) devised the short version of the IUS, which consists of 12 question based on 2 domains: prospective anxiety (5 questions), and inhibitory anxiety (7 questions). Helsen, Van Den Bussche, Vlaeyen, & Goubert (2013) conducted a study in which the Dutch 27-item IUS and 12-item IUS were compared, and found the IUS-12 to provide the best fit, have good internal consistency, and to be highly correlated to the original IUS.

Recent studies have questioned the empirical foundation and distinctiveness of the two factor model of Carleton et al. (2007). To illustrate, Hale et al., (2016) suggest a unidimensional model over the bifactor model of UI, as their results indicate higher reliability and more accounted for common variance than the bifactor model. Similarly, Lauriola, Mosca, & Carleton (2016) also found the general UI factor to be more reliable and to explain more common variance, and therefore recommend the use of the IUS-12 total score in clinical research and assessment. Moreover, Shihata, McEvoy, & Mullan (2018) verify the outcome of the previous studies that the general UI factor is reliable and valid, and therefore conclude that *"scores of the IUS-12 can be regarded as a primarily unidimensional representation of general trait UI"* (p. 25). As a result, in this study UI will be regarded as unidimensional.

### 3.3.4 Control variables

Control variables are elements that could influence the outcome of the study. These variables are kept constant throughout the study in order to control for their effect. First, a number of demographic factors were measured, which include *age and sex*. Regarding age, Chua et al. (2004) argue that age might be positively correlated to experienced stress levels, due to the fact that elder people experience a less favourable prognosis in case of infection. Second, the *highest completed level of education* was measured, combined with the *study direction* in the form of MBA and Non-MBA. Dew et al. (2009) demonstrated a preference for the causation approach over effectuation amongst MBA students. Furthermore, the respondent was asked about the number of started ventures, years of experience as an entrepreneur and the total number of employees. Dew et al. (2009) found that expert entrepreneurs prefer the use of effectuation, whereas novice entrepreneurs mainly use the causation approach.

## 3.3 Methods of analysis

The main goal of the data analysis and hypothesis testing is to provide a deeper insight in how PS influences the entrepreneurial decision-making process and how uncertainty intolerance affects this relationship. In order to achieve this goal, the analysis of the survey data and hypothesis testing was conducted using IBM's SPSS version 27. More specifically the mediation analysis was conducted using Hayes (2018) PROCESS macro. Prior to the data analysis the reliability of the scales was assessed and assumptions for analysis were tested.

### 3.4.1 Scale reliability

Before starting analysis of the data first the reliability of the scales must be assessed. Prior to calculating Cronbach's alpha PSS questions 4,5,7 and 8 were reverse coded, as to make a higher score indicate more PS. Cronbach's alpha was calculated for all of the scales that were used, see appendix D. The scores will be evaluated on the basis of the rule of thumb provided by George & Mallery (2003): >.9= excellent, >.8 is good, >.7 acceptable, >.6 is questionable, >.5=poor, <.5 is unacceptable (p.231). Following the rule of thumb Cronbach's alpha of Causation (α=.578) is poor, Effectuation (α=.761) and UI (α=.782) are acceptable and the PSS (α=.875) is excellent. The Cronbach's alpha of causation could be improved to .586 by removing item 1, however since the scale has previously been validated and tested the 'full' scale will be used. In addition the mean inter-item correlation is calculated, which provides an assessment of the degree to which the items on the scale asses the same concept (R. J. Cohen & Swerdlik, 2009). The mean inter-item correlation should be between .2 and .4 (Piedmont, 2014). The mean inter-item correlation for causation (M=.221), Effectuation (.375) and IUS (.234) all fall within the threshold. The PSS (.412) however exceeds the threshold, indicating that the item may only capture a small bandwidth of the construct (Piedmont, 2014).

### 3.4.2 Assumptions Factor analysis

In order to reduce the data a principal component analysis (PCA) is conducted. However, prior to conducting the actual factor analysis the rules of thumb of Hair, Jr., William C. Black, Barry J. Babin, (2014) will be used to test the assumptions (see appendix F). Appendix F provides a more elaborate overview of the assumptions that were tested. First, since all variables are of continuous or ordinal level the first assumption is met. Second, the sample size assumption is partially met since the minimum number of observations exceeds the minimum threshold of 50 and there are more observations than there are variables (Hair, Jr., William C. Black, Barry J. Babin, 2014). However, the desired ratio of 5 to 1 observation per variable is not met, which is aimed at minimizing overfitting of the data. As a consequence of the small sample size and low case-to-variable ratio (Hair, Jr., William C. Black, Barry J. Babin, 2014) argue that the findings should be interpreted cautiously as they may derive sample-specific factors that have little generalizability. Third, each variable should have

sufficient correlations over 0.3 in order to determine whether an underlying structure exists to group variables (Hair, Jr., William C. Black, Barry J. Babin, 2014; Tabachnick & Fidell, 2019). In order to test this assumption a correlation matrix was created and each variable was checked for having a minimum correlation of 0.3. Fourth, the sampling adequacy was tested by calculating a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. First, the KMO per item was calculated and reviewed. The items goal-orientation, competitive analysis, pre-commitments all score below the 0,5 threshold, whereas expected returns, pre-existing knowledge, contingencies and IUS-3 do not exceed the 0,6 threshold. The literature indicates that if individual items have a KMO below 0,5 they should be omitted or in case they are included the results should be interpreted with caution (Hair, Jr., William C. Black, Barry J. Babin, 2014). Second, the overall KMO, and KMO per variable were calculated, which all exceed the minimum value of 0.5 (Tabachnick & Fidell, 2019). Following Kaiser's (1974) classification the KMO of Effectuation UI and the overall KMO are 'middling', whereas the KMO of PSS is 'meritorious' and the KMO of causation is 'mediocre'. Next, Bartlett's test of sphericity was calculated in order to test whether the correlation matrix is an identity matrix. All outcomes of the Bartlett's test are significant ($p < .001$), indicating that the data is suitable for principal component analysis (PCA).

Since the assumptions have been met, the PCA was conducted. A VARIMAX rotation was used since it reduces the number of columns (factors), thereby minimizing the number of variables with high loadings on a factor and enhancing their interpretability (Hair, Jr., William C. Black, Barry J. Babin, 2014; Tabachnick & Fidell, 2019). Following the a priori criterion, the literature indicates a 4-factor outcome. Appendix F shows the results of the initial factor analysis which includes all variables. The initial outcome did not yield any conclusive and usable results due to heavy cross loading, thereby making it impossible to retain four stable and logical factors (Guadagnoli & Velicer, 1988). As a result, two separate PCA's were conducted: one with causation and effectuation and one with PS and UI (see appendix F). Again, the number of factors that are to be retained are based on the a priori criterion, meaning that each factor analysis yields a two-factor outcome. The factor analysis with causation and effectuation reveals a clear two-factor structure in line with theory. The items of effectuation load on factor one(effectuation), and all but one item of causation loading onto factor two (causation). On the other hand, the PCA of PS and UI reveals no distinct factor structure, and has some degree of cross loading. In order to check for potential outliers, a Mahalanobis distance was calculated and the results were compared to a Chi-square distribution (Leys, Klein, Dominicy, & Ley, 2018). The outcome revealed zero outliers, whereby indicating that the dataset can be used as a whole.

### 3.4.3 Assumptions multiple regression

In order to be able to test the hypotheses through a regression analysis the assumptions must first be checked. Appendix G provides a more elaborate overview of the assumptions and associated outcomes of the hypothesis testing.

The first and second assumption were throughout the process of recoding categorical variables into continuous or dummy variables. Third, the Durbin-Watson statistic was calculated in order to test the independence of observations. The outcome of the Durbin-Watson all fall within the range of 1.5 and 2.5, indicating that there is independence of the residuals (Garson, 2012). Fourth, the linearity of the relationship between the dependent variables and independent variables was tested. A scatterplot was made of the unstandardized predicted values and the studentized residuals, indicating a linear relationship for each variable. Fifth, the homoscedasticity of residuals was tested. Visual inspection of the plot of studentized residuals versus unstandardized predicted values revealed heteroscedasticity.

Sixth, the data was checked for signs of multicollinearity by calculating the variance inflation factor (VIF). The VIF threshold of 5 is violated by all five dummy variables that stem out of the FTE variable (Hair, Jr., William C. Black, Barry J. Babin, 2014). However, following the rationale of statistician and Emeritus Professor of sociology Paul D. Allison the issue of multicollinearity can be safely ignored in this case (Allison, 2012). This is due to the fact that the 5 variables with a high VIF are control variables - and will only be used in that manner-, and the variables of interest (causation, effectuation, PSS and IUS) do not have a high VIF. In addition, the 5 violating variables consist of dummy variables that represent a categorical variable with more than three categories, which will necessarily have a high VIF due to the small proportion of cases in the reference category (Allison, 2012).

Seventh, the data was checked for outliers, high leverage points and influential points (Leys et al., 2018). Visual inspection of the studentized residuals revealed one 'outlier'. Further inspection of the leverage points indicated 2 values higher than .5 and 36 between .2 and .5. Bagheri (2015) describes that the issue of high leverage points is highly related to the sample size of the study, which in this case is relatively small (n=69). Since the calculated cook's distance revealed zero influential points, no responses were removed from the analysis.

Eighth, the normality of the sample was assessed using Q-Q plots and a Shapiro-Wilk test. The Shapiro-Wilk test for Causation ($W=.984$, $p>.05$), and Effectuation ($W=.977$, $p>.05$) indicate a normal distribution, however the PSS ($W=0.921$, $p>0.001$) and IUS ($W=0.924$, $p>.001$) indicate a deviation from a normal distribution. However, since the skewness and kurtosis of the violating variables are between -1.96 and +1.96 a normal distribution can be assumed (George & Mallery, 2003; Gravetter & Wallnau, 2013).

# 4. Results

In this chapter the results of the study will be presented and discussed. First the descriptive statistics and correlation matrix will be discussed, whereafter the hypotheses will be addressed.

## 4.1 Descriptive statistics

Table 3 displays the descriptive statistics of the variables and the items. In addition, the minimum value, maximum value, mean and standard deviation are depicted. Causation and effectuation were measured using a 7-point Likert scale. Both causation and effectuation score higher than the average of the 7-point Likert scale. However, the mean and standard deviation of effectuation (mean = 4.37, SD = 1.026) are higher than those of causation (mean = 4.08, SD = .771), indicating that the respondents are more effectuation-oriented. Furthermore, the respondents seem to be more goal-oriented (mean = 5.36, SD = 1.234) than means-oriented (mean = 3.38, SD = 1.591).

The largest difference is found between contingencies (mean = 5.28, SD = 1.267) and pre-existing knowledge (mean = 2.72, SD = 1.045). Which indicates that the respondents are more aimed at exploiting unexpected events through flexibility, than aimed at avoiding unexpected contingencies through pre-existing knowledge. The smallest difference was found between unpredictable future (mean =4.10, SD = 1.516) and uncertain future (mean =4.11, SD = 1.548). Indicating that respondents are relatively indecisive between valuing future predictions, as well as trying to control an unpredictable future.

Contrary to causation and effectuation, PS and UI are measured using a five-point Likert scale. Both PS (mean = 2,08, SD = .585) and UI (mean = 2.35, SD = .511) score below the mean of the five-point Likert scale. The low mean of PS indicates that the respondents experienced a relatively low amount of perceived stress, whereas the low mean score of UI indicates that the average respondent is relatively tolerant towards uncertainty.

**Table 3 - Descriptive statistics**

| Minimum, maximum, Mean and Standard deviation of measured variables | | | | |
|---|---|---|---|---|
| | Minimum | Maximum | Mean | Std. Deviation |
| **Causation** | **2.20** | **6.50** | **4.08** | **.771** |
| Goal-oriented | 2 | 7 | 5.36 | 1.234 |
| Expected returns | 2 | 7 | 4.08 | 1.212 |
| Pre-existing knowledge | 1 | 6 | 2.72 | 1.045 |
| Competitive analysis | 1 | 7 | 4.12 | 1.229 |
| Uncertain future | 1 | 7 | 4.11 | 1.548 |
| **Effectuation** | **2.00** | **6.90** | **4.37** | **1.026** |
| Means-oriented | 1 | 7 | 3.38 | 1.591 |
| Affordable loss | 1 | 7 | 4.18 | 1.463 |
| Contingencies | 2 | 7 | 5.28 | 1.267 |
| Pre-commitments | 2 | 7 | 4.91 | 1.310 |
| Unpredictable future | 1 | 7 | 4.10 | 1.516 |
| **Perceived stress** | **1.10** | **3.60** | **2.08** | **.585** |
| PSS.1 | 1 | 4 | 1.80 | .778 |
| PSS.2 | 1 | 5 | 2.03 | 1.071 |
| PSS.3 | 1 | 5 | 2.46 | .979 |
| PSS.4REV | 1 | 5 | 2.04 | .812 |
| PSS.5REV | 1 | 5 | 2.35 | .744 |
| PSS.6 | 1 | 5 | 2.36 | .939 |
| PSS.7REV | 1 | 4 | 1.93 | .734 |
| PSS.8REV | 1 | 4 | 2.19 | .692 |
| PSS.9 | 1 | 4 | 2.09 | .836 |
| PSS.10 | 1 | 4 | 1.59 | .863 |
| **Uncertainty intolerance** | **1.25** | **3.75** | **2.35** | **.511** |
| IUS.1 | 1 | 4 | 2.13 | .873 |
| IUS.2 | 1 | 5 | 3.22 | 1.041 |
| IUS.3 | 1 | 5 | 3.46 | .867 |
| IUS.4 | 1 | 5 | 2.36 | 1.163 |
| IUS.5 | 1 | 5 | 2.43 | .947 |
| IUS.6 | 1 | 4 | 2.03 | .822 |
| IUS.7 | 1 | 4 | 2.43 | .931 |
| IUS.8 | 1 | 4 | 2.28 | 1.042 |
| IUS.9 | 1 | 4 | 1.71 | .750 |
| IUS.10 | 1 | 5 | 2.59 | 1.048 |
| IUS.11 | 1 | 5 | 1.81 | .827 |
| IUS.12 | 1 | 5 | 1.74 | .918 |

Table 4 contains the correlation matrix which indicates the correlations between the dependent, independent and control variables. First the associations of causation and effectuation will be discussed, whereafter PS stress and UI will be addressed. Causation is significantly negatively correlated with effectuation (R=-.341, p<.01) and sex (R=-.247, p<0.05), but has no significant correlations with PS and UI. Effectuation however, has a strong and highly significant correlation with PS (R=0,362, p<0.01) and UI (R=.332, p<0.05). This indicates that an effectuation-oriented entrepreneur has a higher UI and perceives more stress. Furthermore, effectuation has significant negative correlation with the number of founded businesses (R=-.250, p<.05) and number of

employees (R=-.302, p<0.05). PS has a strong and highly significant correlation with UI (R=.712, p<.01), indicating that higher PS is associated with a higher UI. Additionally, PS stress has a significant negative correlation with age (R=-,252, p<0.05, sex (R=.249) and experience (R=-.275, p<.05). UI has a significant negative correlation with experience (R=-.240, p<.05), which indicates that more experience is associated with lower uncertainty intolerance.

**Table 4 - Correlations of dependent, independent and control variables**

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Causation | 1 | | | | | | | | | | |
| 2. Effectuation | **-.341**** | 1 | | | | | | | | | |
| 3. PS | -.023 | **.362**** | 1 | | | | | | | | |
| 4. UI | .093 | **.332**** | **.712**** | 1 | | | | | | | |
| **Control variables** | | | | | | | | | | | |
| 5. Age | -.013 | -.233 | **-.252*** | -.230 | 1 | | | | | | |
| 6. Sex | **-.247*** | .173 | **.249*** | .202 | -.201 | 1 | | | | | |
| 7. Degree | -.023 | -.045 | -.024 | -.067 | .112 | .096 | 1 | | | | |
| 8. Study | -.102 | .125 | .064 | .051 | -.082 | **.257*** | **-.262*** | 1 | | | |
| 9. Businesses | .186 | **-.250*** | -.102 | -.107 | **.259*** | **-.316**** | .128 | -.128 | 1 | | |
| 10. Experience | -.044 | -.160 | **-.275*** | **-.240*** | **.668**** | -.235 | .156 | -.123 | **.413**** | 1 | |
| 11. Employees | .217 | **-.302*** | -.199 | -.233 | **.252*** | **-.362**** | **.267*** | -.212 | **.391**** | **.470**** | 1 |

N=69, *p<.05, **p<.01 (Sig. 2-tailed)

## 4.2 Hypothesis testing

In total 5 hierarchical regressions were conducted in order to test every hypothesis. The results of the hierarchical regressions can be found in table 5 to 11, whereas the outcomes of the hypothesis testing have been summarized in table 12.

***$H_{1A}$:*** *There is a significant positive relationship between uncertainty intolerance and the causation approach*

A hierarchical multiple regression was conducted in order to determine if the addition of UI increases the entrepreneur's preference towards causation (see table 5). The model of the control variables and independent variables to predict causation (model 2) is not statistically significant, $R^2$ = .348, F (16,49) = 1.636, p>.05, adjusted $R^2$=.135. The addition of the independent variables led to a significant change of $R^2$ between model 1 and model 2 $\Delta R^2$=.076, $\Delta$F (2,49) =2.838, p<.05. Furthermore, the model indicates that UI has a significant effect on the use of causation (β=.613, p<.05). Thus, providing clear evidence that a higher uncertainty intolerance leads to a higher use of causation. As a result, the null-hypothesis is rejected.

**Table 5 - Hierarchical multiple regression predicting causation from perceived stress (COVID-19) moderated by uncertainty intolerance**

| | Causation | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 3 | |
| Variable | β | T | β | T | β | T |
| (Constant) | 5.436 | **5.792**** | 5.118 | **5.381**** | 5.485 | **5.953**** |
| Age | .004 | .451 | .003 | .316 | .001 | .079 |
| Sex | .462 | 1.883 | .430 | 1.810 | .339 | 1.473 |
| Degree | | | | | | |
| Propedeuse | -.574 | -1.484 | -.561 | -1.500 | -.518 | -1.449 |
| Bachelor | .069 | .260 | .108 | .417 | .132 | .535 |
| Master | .144 | .416 | .130 | .372 | -.045 | -.133 |
| Study orientation | .082 | .348 | .125 | .546 | .131 | .597 |
| Founded businesses | .124 | 1.456 | .125 | 1.525 | .138 | 1.752 |
| Years of experience | -.036 | **-2.202*** | -.035 | **-2.186*** | -.033 | **-2.202*** |
| Firm size | | | | | | |
| 1 FTE | -1.823 | **-2.097*** | -1.949 | **-2.247*** | -1.491 | -1.754 |
| 2 FTE | -1.929 | **-2.078*** | -2.287 | **-2.479*** | -1.787 | -1.974 |
| 3 to 5 FTE | -1.549 | -1.789 | -1.877 | **-2.103*** | -1.570 | -1.821 |
| 6 to 10 FTE | -1.283 | -1.409 | -1.416 | -1.531 | -.842 | -.919 |
| 11 to 49 FTE | -1.923 | **-2.147*** | -1.920 | **-2.192*** | -1.555 | -1.829 |
| 50 to 249 FTE | -1.537 | -1.726 | -1.672 | -1.904 | -1.159 | -1.338 |
| PS | | | -.462 | -1.924 | -.556 | **-2.389*** |
| UI | | | .613 | **2.334*** | .369 | 1.364 |
| Moderator | | | | | .354 | **2.390*** |
| Model summary | | | | | | |
| $R^2$ | .273 | | .348 | | .417 | |
| F | 1.365 | | 1.636 | | **2.024*** | |
| $\Delta R^2$ | .273 | | .076 | | .069 | |
| ΔF | 1.365 | | 2.838 | | **5.713*** | |

Note. N=69 *p<0.05, **p<0.01 (Sig. 2-tailed)
*Variable secondary school is missing since it is a constant or has missing correlations

**$H_{1B}$:** There is a significant negative relationship between uncertainty intolerance and the effectuation approach.

Table 6 provides an overview of the hierarchical multiple regression that was conducted in order to test whether the addition of UI negatively influenced the entrepreneur's preference for effectuation. The model of the control variables and independent variables to predict effectuation (model 2) is not statistically significant, $R^2$ = .334, F (16,49) = 1.537, p>.05, adjusted $R^2$=.117. The addition of the independent variables led to a significant change of $R^2$ between model 1 and model 2 $\Delta R^2$=0.088, ΔF (2,49) =3.253, p<.05. Furthermore, the model indicates that UI has no significant effect on the use of effectuation (β=-.150, p>.05). Thus, providing no clear evidence that a lower uncertainty intolerance leads to a higher use of effectuation. As a result, the null-hypothesis cannot be rejected.

**Table 6 - Hierarchical multiple regression predicting effectuation from perceived stress (COVID-19) moderated by uncertainty intolerance**

| | Effectuation | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 3 | |
| Variable | β | T | β | T | β | T |
| (Constant) | 3.266 | **2.547*** | 2.609 | **2.023*** | 2.343 | 1.801 |
| Age | -.016 | -1.263 | -.013 | -1.043 | -.011 | -.914 |
| Sex | -.079 | -.235 | -.071 | -.219 | -.005 | -.014 |
| Degree | | | | | | |
| Propedeuse | .926 | 1.751 | .954 | 1.881 | .923 | 1.827 |
| Bachelor | .139 | .385 | .004 | .010 | -.014 | -.041 |
| Master | .501 | 1.059 | .195 | .413 | .322 | .669 |
| Study orientation | -.408 | -1.262 | -.404 | -1.298 | -.407 | -1.318 |
| Founded businesses | -.128 | -1.104 | -.120 | -1.078 | -.129 | -1.163 |
| Years of experience | .026 | 1.197 | .034 | 1.567 | .033 | 1.530 |
| Firm size | | | | | | |
| 1 FTE | 1.978 | 1.665 | 1.367 | 1.162 | 1.035 | .862 |
| 2 FTE | 2.091 | 1.649 | 1.771 | 1.416 | 1.409 | 1.102 |
| 3 to 5 FTE | 2.058 | 1.741 | 1.323 | 1.094 | 1.100 | .904 |
| 6 to 10 FTE | 1.376 | 1.107 | .538 | .429 | .122 | .094 |
| 11 to 49 FTE | 1.237 | 1.011 | .800 | .674 | .536 | .446 |
| 50 to 249 FTE | 1.443 | 1.186 | .966 | .811 | .594 | .486 |
| PS | | | .699 | **2.144*** | .767 | **2.332*** |
| UI | | | -.150 | -.422 | .026 | .069 |
| Moderator | | | | | -.256 | -1.227 |
| Model summary | | | | | | |
| $R^2$ | .246 | | .334 | | .354 | |
| F | 1.187 | | 1.537 | | 1.550 | |
| $\Delta R^2$ | .246 | | .088 | | .020 | |
| ΔF | 1.187 | | **3.253*** | | 1.506 | |

Note. N=69 *p<0.05, **p<0.01 (Sig. 2-tailed)
*Variable secondary school is missing since it is a constant or has missing correlations

***$H_{2A}$:*** *There is a significant negative relationship between perceived stress (COVID-19) and the choice for the causation approach*

A hierarchical multiple regression is conducted in order to determine if PS negatively influences the entrepreneur's preference towards causation (see table 5). As previously mentioned, the model of the control variables and independent variables (model 2) is not statistically significant, $R^2$ = .348, F (16,49) = 1.636, p>.05, adjusted R2=.135. The addition of the independent variables led to an insignificant change of $R^2$ between model 1 and model 2 $\Delta R^2$=.076, ΔF (2,49) =2.838, p<.05. The model indicates that PS has no significant effect on the use of causation (β=-.462, p>.05). Thus, providing no evidence towards increased usage of causation when the entrepreneur perceives high levels of stress. As a result, the null-hypothesis cannot be rejected.

***$H_{2B}$:*** *There is a significant positive relationship between perceived stress (COVID-19) and the choice for an effectuation approach*

In order to test whether the addition of PS positively influences the entrepreneur's preference for effectuation, another hierarchical multiple regression was conducted (see table 6). As previously mentioned, the model of the control variables and PS (model 2) is not statistically significant, $R^2$ = .332, F (15,50) = 1,655, p>.05, adjusted $R^2$=.131). The addition of the independent variables led to a significant change of $R^2$ between model 1 and model 2 $\Delta R^2$=0.088, ΔF (2,49) =3.253, p<.05. Furthermore, the model indicates that PS has a significant positive effect on the use of effectuation (β=.699, p<.05. Thus, providing clear evidence that higher PS leads to higher usage of effectuation. As a result, the null-hypothesis is rejected.

***$H_3$:*** *The relationship between perceived stress (COVID-19) and the preferred decision-making process is moderated by uncertainty intolerance.*

**Causation**

A hierarchical multiple regression was conducted in order to determine if UI has a moderating effect on the relationship between PS and the entrepreneur's preference towards causation (see table 5). The full model of the control variables, independent variables and moderator (model 3) is statistically significant, R2 = .417, F (1,48) = 2.024, p<.05, adjusted R2=.211). The addition of the moderator variable led to a significant change in R2 between model 2 and model 3 ΔR2=.069, ΔF (1,48) =5.713, p<.05. Furthermore, the model indicates a significant negative effect of PS (COVID-19) (β=-.556, p>.05) and a significant positive effect of the moderator variable (β=.354, p>.05). Therefore, providing clear evidence that uncertainty intolerance moderates the relationship between PS and the entrepreneur's choice for causation. As a result, the null-hypothesis is rejected.

**Effectuation**

In order to test whether the relationship between PS (COVID-19) and the entrepreneur's preference for effectuation is moderated by uncertainty intolerance, another hierarchical multiple regression was conducted (see table 6). The full model of the control variables, independent variables and moderator (model 3) is statistically insignificant, R2 = .354, F (17,48) = 1.550, p>.05, adjusted R2=.126). The addition of the moderator variable led to a significant change in R2 between model 2 and model 3 ΔR2=.020, ΔF (1,48) =3.253, p<.05. However, the effect of PS (COVID-19) is significant (β=.767, p<.05), whereas the effect of the moderator is statistically insignificant (β-.256, p>.05). Therefore, providing no evidence for the hypothesized moderation effect of UI on the relationship between PS and the entrepreneur's preference for effectuation. As a result, the null-hypothesis is not rejected.

***$H_4$:*** *There is a significant positive relationship between perceived stress (COVID-19) and uncertainty intolerance.*

A hierarchical multiple regression was conducted in order to determine if PS influences the entrepreneur's UI (see table 7). The full model of the control variables and PS (model 2) is statistically significant, $R^2$ = 0,576, F (1,54) = 6.668, p>0.01, adjusted $R^2$=0,490). The addition of PS led to a significant change in $R^2$ between model 1 and model 2 $\Delta R^2$=0.472, ΔF (1,54) =60.056, p>0.01. Furthermore, the model shows a highly significant positive effect of PS (β=0.707, p>0.01) on UI. Therefore, providing clear evidence that higher PS increases the entrepreneur's UI.

**Table 7 - Hierarchical multiple regression predicting uncertainty intolerance from perceived stress (COVID-19)**

| | UI | | | |
|---|---|---|---|---|
| | Model 1 | | Model 2 | |
| Variable | β | T | β | T |
| (Constant) | **2.809**** | 7.933 | **.991**** | 2.9153 |
| Age | -.004 | -.582 | .000 | .031 |
| Sex | -.071 | -.384 | .015 | .117 |
| Degree | | | | |
| Propedeuse | -.106 | -.356 | -.036 | -.174 |
| Bachelor | -.024 | -.116 | -.108 | -.761 |
| Master | .239 | .906 | -.028 | -.151 |
| Study orientation | -.006 | -.034 | -.010 | -.079 |
| Founded businesses | -.018 | -.294 | -.014 | -.324 |
| Years of experience | -.012 | -.981 | -.001 | -.091 |
| Firm size | | | | |
| 1 FTE | -.086 | -.442 | -.053 | -.392 |
| 2 FTE | -.017 | -.048 | .281 | 1.157 |
| PS | | | **.707**** | 7.7496 |
| Model summary | | | | |
| $R^2$ | .104 | | .576 | |
| F | .772 | | **6.668**** | |
| $\Delta R^2$ | .104 | | .472 | |
| ΔF | .641 | | **6.056**** | |

Note. N=69 *p<.05, **p<.01 (Sig. 2-tailed)
*Variable secondary school is missing since it is a constant or has missing correlations

***$H_5$:*** *The relationship between perceived stress (COVID-19) and the preferred decision-making process is mediated by uncertainty intolerance.*

A hierarchical regression was conducted in order to test the hypothesized mediation effect of uncertainty intolerance on the relationship between PS and the entrepreneur's preference for causation or effectuation. However, first another hierarchical regression was conducted on the effect of PS on UI. Thereafter, the mediation effect was tested using the bootstrapping method performed by the SPSS PROCESS macro developed by Hayes (Hayes, 2018). During the testing of the mediation effect the PROCESS macro generated error code #12417 and did not fully compute the models required to test the mediation effect. In an attempt to fix the issue, following the logic of Allison (2012) all categories above 2 FTE were merged and recoded into category FTE 3. However, even with the inclusion of the new recoded variable the PROCESS macro would not compute, indicating that the new variable consists of a linear or near linear dependency (singularity). As a consequence, the mediation analysis was conducted without specific dummy variables for all FTE categories higher than 3 FTE's.

**Causation**

The regression analysis of PS on UI (see table 8) shows that PS is a significant predictor for UI (β=.707, t=7.750, p<.01). However, the results of the mediation analysis (see table 9) indicate that, when controlling for the mediator (UI), PS is not a significant predictor of the usage of causation (β=-.477, t=-1.983, p>.05). The outcome of the 5000 bootstrap samples indicates that there is no significant

indirect relationship between PS and the usage of causation that is mediated by UI (a*b=0.392, Bootstrap $CI_{95}$=-.037 and .770). The mediator (UI) accounts for -461% of the total effect on the usage of causation [$P_m$= .392 / (-.085)]. However, the total effect model (direct and indirect effect) is not statistically significant (β -,085, t=-,497, p>.05). On the basis of these results can be concluded that there is there is no statistically significant mediation effect of uncertainty intolerance on the relationship between PS and the entrepreneur's preference towards causation. Therefore, the null hypothesis cannot be rejected.

**Table 8 – The mediating effect of uncertainty intolerance on the relationship between perceived stress (COVID-19) and causation**

| | Causation | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 3 | |
| Variable | β | T | β | T | β | T |
| (Constant) | **3.986**** | 8.672 | **3.657**** | 5.508 | **4.206**** | 6.575 |
| Age | .001 | .128 | .001 | .064 | .001 | .071 |
| Sex | .464 | 1.923 | .445 | 1.893 | .453 | 1.860 |
| Degree | | | | | | |
| Propedeuse | -.572 | -1.475 | -.560 | -1.486 | -.580 | -1.485 |
| Bachelor | .022 | .082 | .091 | .354 | .032 | .120 |
| Master | .240 | .703 | .288 | .853 | .273 | .778 |
| Study orientation | .098 | .422 | .104 | .460 | .098 | .421 |
| Founded businesses | .064 | .796 | .072 | .911 | .064 | .784 |
| Years of experience | -.025 | -1.614 | -.026 | -1.697 | -.026 | -1.664 |
| Firm size | | | | | | |
| 1 FTE | -.238 | -.944 | -.213 | -.866 | -.242 | -.952 |
| 2 FTE | -.362 | -.807 | -.554 | -1.240 | -.398 | -.870 |
| PS | | | -.477 | -1.983 | -.085 | -.497 |
| UI | | | **.555*** | 2.244* | | |
| Model summary | | | | | | |
| $R^2$ | .198 | | .304 | | .202 | |
| F | 1.357 | | 1.925 | | 1.239 | |

Note. N=69 *p<.05, **p<.01 (Sig. 2-tailed)
*Variable secondary school is missing since it is a constant or has missing correlations

**Table 9 - Mediation analysis causation: effect overview**

| Variable/effect | β | T | P | 95% CI | |
|---|---|---|---|---|---|
| PS→ CAU | -.477 | -1.983 | >.05 | -.960 | .006 |
| PS→ UI | **.707** | 7.750 | <0.01 | .524 | .890 |
| PS→ UI→ CAU | **.555** | 2.244 | <0.05 | .059 | 1.050 |
| Effects | | | | | |
| Direct effect | -.477 | -1.983 | >.05 | -.960 | .006 |
| Indirect effect | .392 | | >.05 | -.037 | .770 |
| Total effect | -.085 | -.497 | >.05 | -.430 | .259 |

Note. N=69 *p<.05, **p<.01 (Sig. 2-tailed)
*Based on 5000 bootstrap samples

**Effectuation**

The regression analysis of PS on UI (see table 8) shows that PS is a significant predictor for UI (β=.707, t=7.750, p<.01). The results indicate that, when controlling for the mediator (UI), PS is a significant

predictor of the usage of effectuation (β=.667, t=2.113, p<.05). The outcome of the 5000 bootstrap samples indicates that there is no significant indirect relationship between PS and the usage of effectuation mediated by UI (a*b=-.005, Bootstrap $CI_{95}$=-.528 and .497). The mediator (UI) accounts for -.76% of the total effect on the usage of causation [$P_m$= .392 / (-.085)]. The total effect model is statistically significant (β -,085, t=-,497, p>.05). On the basis of these results can be concluded that there is there is a small but statistically significant negative mediation effect of UI on the relationship between PS and the entrepreneur's preference towards effectuation. Therefore, the null hypothesis is rejected.

**Table 10 – The mediating effect of uncertainty intolerance on the relationship between perceived stress (COVID-19) and effectuation**

| | Effectuation | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 3 | |
| Variable | β | T | β | T | β | T |
| (Constant) | **4.933**** | 7.919 | **3.238**** | 3.720 | **3.231**** | 4.031 |
| Age | -.017 | -1.403 | -.013 | -1.145 | -.013 | -1.155 |
| Sex | -.155 | -.475 | -.074 | -.241 | -.075 | -.244 |
| Degree | | | | | | |
| Propedeuse | .902 | 1.718 | .968 | 1.958 | .968 | 1.978 |
| Bachelor | .065 | .183 | -.014 | -.041 | -.013 | -.040 |
| Master | .300 | .648 | .051 | .114 | .051 | .116 |
| Study orientation | -.308 | -.980 | -.312 | -1.055 | -.312 | -1.065 |
| Founded businesses | -.111 | -1.016 | -.108 | -1.042 | -.107 | -1.051 |
| Years of experience | .023 | 1.084 | .033 | 1.649 | .033 | 1.665 |
| Firm size | | | | | | |
| 1 FTE | .417 | 1.221 | .448 | 1.392 | .448 | 1.408 |
| 2 FTE | .499 | .821 | .781 | 1.332 | .779 | 1.358 |
| PS | | | **.667*** | 2.113 | **.662**** | 3.076 |
| UI | | | -.007 | -.022 | | |
| Model summary | | | | | | |
| $R^2$ | .182 | | .271 | | .304 | |
| F | 1.220 | | 1.641 | | **2.140*** | |

Note. N=69 *p<0.05, **p<0.01 (Sig. 2-tailed)
*Variable secondary school is missing since it is a constant or has missing correlations

**Table 11 - Mediation analysis effectuation: effect overview**

| Variable/effect | β | T | P | 95% CI | |
|---|---|---|---|---|---|
| PS→ EFF | **.667** | 2.113 | <.05 | .034 | 1.300 |
| PS→ UI | **.707** | 7.750 | <.01 | .524 | .890 |
| PS→ UI→ EFF | -.007 | -.022 | >.05 | -.657 | .643 |
| Effects | | | | | |
| Direct effect | **.667** | 2.113 | <.05 | .034 | 1.300 |
| Indirect effect | -.005 | | >.05 | -.528 | .497 |
| Total effect | **.662** | 3.076 | <.01 | .230 | 1.093 |

Note. N=69 *p<.05, **p<.01 (Sig. 2-tailed)
*Based on 5000 bootstrap samples

## 4.3 Hypothesis overview

Table 13 provides a summary of the outcomes of the hypothesis testing. Hypothesis $H_{1A,}$ $H_{2B}$ and $H_4$ have been fully accepted, whereas only the moderating effect of PS on causation and the mediator effect on effectuation have been accepted. All other hypotheses have been rejected.

**Table 12 - Hypothesis overview**

| | Hypothesized | | | | Results | |
|---|---|---|---|---|---|---|
| **H** | **Predictor** | **Dependent variable** | **Direction** | **Beta** | **Significance** | **Hypothesis** |
| $H1_A$ | UI | Causation | + | .613 | **Significant (p<.05)** | **Accepted** |
| $H1_B$ | UI | Effectuation | - | .364 | Insignificant | Rejected |
| $H2_A$ | PS | Causation | - | -.085 | Insignificant | Rejected |
| $H2_B$ | PS | Effectuation | + | .699 | **Significant (p<.05)** | **Accepted** |
| $H_3$ | Moderator UI | Causation | +- | .354 | **Significant (p<.05)** | **Accepted** |
| | Moderator UI | Effectuation | +- | -.256 | Insignificant | Rejected |
| $H_4$ | PS | UI | + | .707 | **Significant (p<.01)** | **Accepted** |
| $H_5$ | Mediator UI | Causation | +- | -.085 | Insignificant | Rejected |
| | Mediator UI | Effectuation | +- | .662 | **Significant (p<.01)** | **Accepted** |

## 4.4 Additional findings

In addition to the hypothesis testing, this study also resulted a number of additional findings. These additional findings consist of the influence of control variables on the conducted regression analysis. First the influence of experience as a control variable will be discussed. The theory dictates that more experienced entrepreneurs are less likely to use causation as they are more confident in their own abilities (Dew et al., 2009). This study did not find any significant effect of experience as a control variable on the usage of effectuation. However, in all regression analysis but the mediation analysis this study found a significant negative effect of experience of the entrepreneur on the usage of causation (see table 14). The findings of this study are therefore in line with theory as they indicate that higher entrepreneurial experience decreases the use of causation.

Second, the effect of firm size on the use of causation and effectuation. This study did not find a significant effect of firm size on the usage of effectuation. However, in all regression analysis but the mediation analysis this study found a number of significant FTE control variables on the usage of causation (see table 13). However, there is no clear upward or downward trend of the effect of firm size on the usage of causation (e.g., that the effect increases or decreases as the firm size changes). In addition, since the FTE variables have a high VIF, indicating multicollinearity, the outcomes should be interpreted with caution (Allison, 2012).

**Table 13 – Significant control variables**

| | | Causation | | | | | |
|---|---|---|---|---|---|---|---|
| | | Model 1 | | Model 2 | | Model 3 | |
| Full analysis | Control variable | β | T | β | T | β | T |
| Table 5 | Experience | -.036 | **-2.202*** | -.033 | **-2.009*** | -0.033 | **-2.202*** |
| | Firm size (in FTE) | | | | | | |
| Table 5 | 1 FTE | -1.823 | **-2.097*** | -2.105 | **-2.374*** | | |
| | 2 FTE | -1.929 | **-2.078*** | -2.232 | **-2.358*** | | |
| | 3 to 5 FTE | | | -1.982 | **-2.167*** | | |
| | 6 to 10 FTE | | | | | | |
| | 11 to 49 FTE | -1.923 | **-2.147*** | -2.075 | **-2.318*** | | |
| | 50 to 249 FTE | | | | | | |

# 5. Discussion

Extant literature provided a general degree of understanding on the fact that: outbreaks of infectious diseases generate uncertainty and stress, stress affects decision-making in general, uncertainty intolerance affects the perceived stressfulness of uncertainty, and that uncertainty intolerance affects entrepreneurial decision-making. However, the impact of an infectious disease on the entrepreneur's uncertainty intolerance and its effect on the entrepreneurial decision-making process had not been studied, let alone in the context of COVID-19. Studying this relationship is highly relevant since the WHO states that it is not a matter 'if' but a matter of 'when' a new pandemic will erupt (World Health Organisation, 2021). The findings of this study provide insight on the degree to which the COVID-19 pandemic was experienced as stressful, and how this stress affects the entrepreneur's uncertainty intolerance and his/her entrepreneurial decision-making process; causation, effectuation.

This study was conducted with a relatively small sample size of N=69, that is skewed towards small entrepreneurs with 63.8% of the respondents having a 2 FTE or smaller sized firm. Of this sample, the average entrepreneur is: relatively tolerant of uncertainty, more effectuation oriented than causation oriented, and perceived relatively little stress. These findings are in line with theory, which suggests that lower intolerance of uncertainty is associated with a higher effectuation orientation and lower perceived stress. Contrary to expectations, this study found a negative correlation between age and PS ($r = -0.252$ $p>0.05$). One would expect a positive correlation between age and PS since the older one gets the more one is at risk of serious health consequences of a COVID-19 infection. This deviation from expectation might be the result of the fact that the sample consists of relatively young entrepreneurs (mean age = 43 years, median = 42 years), whilst according to the Dutch institute of Public Health and the Environment people older than 70 of age are at serious risk of COVID-19 (RIVM, 2021a).

The main findings of this study are as follows. First, in line with the hypothesis this study found that an entrepreneur with a higher UI is more likely to use causation. However, the results also suggest that a lower uncertainty intolerance does not affect the entrepreneur's preference for effectuation. These findings are in line with the findings of Tran (2020) but contradict the results of Essen (2019), whose findings indicate that lower UI is related to the usage of effectuation. The difference in outcomes can be accounted for by the fact that Essen (2019) did not treat UI as a unidimensional model, but used the 2 factor distinction of distinction of Carleton et al. (2007).

Second, contrary to the hypothesized relationship of PS lowering the entrepreneur's preference for causation, this study only found a significant positive effect of PS on the entrepreneur's usage of effectuation. The positive effect of PS on effectuation is in line with theory as effectuation is particularly suited for situations in which there is a high degree of uncertainty (Mcmullen & Shepherd, 2006; Wiltbank et al., 2006), and following the logic of Rauch et al. (2018) uncertainty at the level of the individual entrepreneur is ultimately associated with stress. Following this rationale, effectuation processes would be particularly suited for stressful conditions. Concerning the hypothesized negative effect of PS on causation, this study found a negative, but non-significant effect of PS. Although non-significant, this result is in line with the hypothesis that there is some form of a negative association between PS and causation.

Third, this study found a significant positive moderation effect of UI on the relationship between PS and causation. The significant positive moderation effect indicates that UI positively influences the initially negative effect of PS on the entrepreneur's usage of causation. In other words, as the entrepreneur has a higher UI, the initial negative effect of PS diminishes and his usage of

causation increases. This finding is in line with the theory of R. N. Carleton, (2016b) which suggests that, although the situation might not offer any cues for strategic decision making, people with a high UI convulsively attempt to increase predictability and controllability in uncertain situations in order to mitigate possible aversive consequences of this uncertainty. This reflex might stem from their self-assumed inability to cope with uncertainty (R. N. Carleton, 2016a; Dugas et al., 2005). Contrary to the hypothesis, this study found an insignificant negative moderation effect of UI on the relationship between PS and effectuation. Although insignificant, this result is line with the rationale that an entrepreneur with a high UI is able to deal with uncertainty and stress to a lesser degree and as a result is less likely to use effectuation (Gry Agnete Alsos, Clausen, Hytti, & Solvoll, 2016; R. N. Carleton, 2016a).

Fourth, in line with the hypothesis this study found that perceived stress increases the entrepreneur's uncertainty intolerance. The results of this study confirm the findings of Ladouceur et al. (2000) and Mosca et al. (2016) that UI may change as a result of external influences.

Fifth, contrary to the hypothesis, this study found no significant mediation effect of UI on the relationship between PS and the entrepreneur's usage of causation. However, in line with the hypothesis, this study did find a significant negative mediation effect of UI on the relationship between PS and the entrepreneur's usage of effectuation. This finding is in line with literature, which dictates that external influences may affect one's UI and that UI affects the entrepreneurs preference for effectuation (Ladouceur et al., 2000; Lauriola et al., 2016; Sarasvathy, 2001a).

## 5.1 Theoretical contributions

This study makes a number of contributions to the current literature. First, this study contributes to the literature on stress and its effect on entrepreneurial decision-making; causation and effectuation. Current literature provided a general insight in how traits and characteristics influence the way how decisions are made (Baron et al., 2016; Starcke & Brand, 2012). Additionally, studies found that stress elicits psychological, physiological, and behavioural reactions that affect decision making in general (Peters et al., 2017; Rauch et al., 2018; Starcke & Brand, 2012). However, the effect of stress exposure and reactions on decision making is a relatively understudied subject, let alone on the effect of stress on entrepreneurial decision making (Rauch et al., 2018; Starcke & Brand, 2012). As a result, there was a lack of understanding in how stress influences entrepreneur's decision-making process (causation/effectuation). The findings of this study contribute to the literature by demonstrating that that perceived stress has a positive effect on the usage of effectuation. By studying the moderation and mediation effects of stress on decision-making this study provides additional understanding in how the paths of stress affect decision making (Starcke & Brand, 2012). In addition, this study contributes to the literature by providing empirical evidence on the effect on stress on entrepreneurial decision making, and more specifically on causation and effectuation.

Second, this study contributes to the literature on uncertainty intolerance and how it is affected by external factors. How uncertainty intolerance is affected by external factors is a relatively understudied subject. Whereas most clinical studies were aimed at treating and decreasing UI (Boelen & Reijntjes, 2009; Einstein, 2014; Mahoney & McEvoy, 2012b; Rosser, 2019), only a number of studies have demonstrated an increase of UI as a result of increased external uncertainty (R. N. Carleton et al., 2018; Ladouceur et al., 2000; Mosca et al., 2016). Previous studies such as Ladouceur et al. (2000) and Mosca et al. (2016) found that UI may change as a result of external uncertainty, but were conducted in a controlled environment, with a relatively small sample size and not aimed at entrepreneurs. This study contributes to literature by providing empirical evidence, in a non-clinical setting, that perceived stress increases the entrepreneurs UI, thereby helping to better identify the construct and its interactions with other variables (Ladouceur et al., 2000).

Third, this study contributes to the literature by extending the knowledge on the perceived stressfulness of infectious diseases (and crisis situations) and more specifically on how it affects entrepreneurs and their decision making. The opportunity to study an event with as far-reaching consequences as a global pandemic is not presented often. Whereas current literature provided insight in how previous outbreaks of infectious diseases (e.g. COVID-19, SARS & EBOLA) cause stress amongst the general population, the effect on entrepreneurs specifically had not yet been studied (Bao et al., 2020; Chua et al., 2004; Li et al., 2020; Quittkat et al., 2020). By providing an understanding of entrepreneurial behaviour during crisis situations one contributes to the development of prevention and coping strategies. In turn the development of these strategies may help entrepreneurs to become more resilient by providing them with the right tools at the right time. This study therefore contributes to literature by providing additional empirical evidence of the degree to which outbreaks of infectious diseases cause stress, and more specifically how Dutch entrepreneurs perceived COVID-19 as stressful.

Fourth, this study and its dataset of 69 Dutch entrepreneurs provides a contribution to the existing empirical data on Dutch entrepreneurs with regard to effectuation and causation. In addition, this study provides an indication of the degree to which Dutch entrepreneurs perceived stress during a specific period of the COVID-19 pandemic.

## 5.2 Practical contributions

A practical implication of this study is that by identifying the effect of stress and the extent to which it changes behaviour during crisis situations, we have helped to identify the effect of crisis situations and contributed to the development of government policy and prevention and coping strategies. To illustrate, this study has set a baseline of the degree to which entrepreneurs perceived a certain part of the COVID-19 pandemic as stressful, but also provided a general insight of the factors that may influence the entrepreneurs perceived stress levels (financial insecurity, unclear government policy, personal health risks, etc). The identification of these factors and the effect of stress on entrepreneurial decision making may help policy makers to provide entrepreneurs with the right (financial) tools and policy and help in order to increase their resilience and ability to handle crisis situations. This will not only benefit the entrepreneurs, but society and the economy as a whole (Ehrenhard & Hatak, 2017; Hatak et al., 2014). In addition, the results can be used to educate entrepreneurs in order to raise awareness of how stressful situations affect their decision-making.

Another practical implication of this study is that by identifying possible stressors and the effect of perceived stress on UI, the results of this study can be used to help the development of stress and burn-out prevention strategies (Hatak et al., 2014; Rauch et al., 2018; Starcke & Brand, 2012). To illustrate, this study clearly demonstrated that perceived stress increases the entrepreneur's UI, and as his/her UI rises he/she will experience uncertainty to be even more stressful. Therefore, measurement of UI and treatment of UI should be considered an integral part of stress prevention and treatment strategies. These strategies could not only be used to prevent detrimental effects of stress but also to improve the physical and mental health of the entrepreneur. Hatak et al. (2014) even argue that these prevention strategies may improve long-term realization of economic potential, innovation, wealth and economic competitiveness.

## 5.3 Limitations

Despite the contributions of this study and the authors attempt to produce unbiased results some limitations have to be taken into account. First of all, the relatively small sample size is the result of the restricted period of data gathering and relatively low willingness amongst entrepreneurs to fill in the questionnaire. The window of time in which data was gathered was deliberately limited to two

weeks in order to prevent deviations of outcomes as a result of differing measurement periods. To illustrate, during the pandemic there have been many and rapid developments surrounding the virus (e.g., new variants) and changes in government policies (e.g., lockdowns, changes in funding, etc) which cause deviations in uncertainty and associated perceived stress. By collecting the data within two weeks every respondent reported over a more or less comparable situation, which outweighs the importance of a larger sample size with responses that were measured under incomparable circumstances. As a consequence, the results may not be generalizable for the entire pandemic, but they are a representative and reliable depiction of the effects during the period of measurement.

Second, there are a number of limitations regarding the measurement scales. Alsos et al.'s (2014) scale for causation and effectuation was shortened in order to reduce the length of the survey. The shortening of the scale (10 items instead of 15) contributes to the relatively low Cronbach's alpha of causation ($\alpha$=0.578), as a limited number of items per scale is known to have a negative effect on Cronbach's alpha (Gleim & Gleim, 2003). In addition to Cronbach's alpha the mean inter-item correlation was calculated. Only the PSS exceeded the threshold of 0.4, indicating that the item may only capture a small bandwidth of the construct (Piedmont, 2014). This may be an indication that some of the items do not provide any additional information in relation to the other items of the scale.

Third, the generalizability of the study may be affected by the VIF statistic of the FTE dummy variables, which all exceed the threshold of 5, indicating multicollinearity. Following the rationale of Allison (2012) the issue could be safely ignored since the violating variables are control variables, and the variables of interest do not have a high VIF. The high VIF statistic may be caused by the fact that the FTE variable was recoded into dummy variables that represent a small proportion of cases, which will necessarily have a high VIF statistic (Allison, 2012). However, as a result of the high VIF statistic the FTE variables should be interpreted with caution. Contrary to the moderation analysis, the mediation analysis was conducted with only 2 FTE control variables as a result of the error of the PROCESS macro. Instead of omitting all FTE variables, 1 FTE and 2 FTE were included as they could still contribute to the analysis as a control variable.

Fourth, as a result of the sample size the preferred ratio for factor analysis of 1 variable to 5 responses was not met. Although the KMO's per variable all exceeded the threshold of 0.5, a number of individual items KMO's did not meet this threshold (see appendix F). The literature indicates that in case the threshold is not met the variables should either be dropped or the outcomes should be interpreted with caution (Tabachnick & Fidell, 2019). Hair, Jr., William C. Black, Barry J. Babin (2014) describe that the low KMO values may stem out of a small sample size and a low number of items that were included in the variable. The latter may explain the low KMO values for the items of causation, as the total number of questions was reduced from 15 to 10 in order to prevent survey-fatigue. Furthermore, the outcome of the combined factor analysis was inconclusive due to severe cross loading and did not reveal a practical factor solution. Osborne, Costello, & Kellow (2011) describe that in case of several cross loaders the a priori factor structure might be flawed or the underlying (scale) items may have been written poorly.

Fifth, self-reported data survey measurement of cognitive processes is known to be prone to self-reported bias. Self-reported bias is a type of measurement error that consists of a deviation between the self-reported value and the true value (Bauhoff, 2014). This deviation may be caused by respondents being unaware of the true answer or by cognitive processes, social desirability and survey conditions (Bound, Brown, & Mathiowetz, 2001). The deviations between the self-reported and true value may lead to spurious relationships. However, in order to study behaviour and decision-making one has to rely on self-reporting. In the case of this study should be noted that

respondents were aware of the fact that all results were anonymized and that neither surveyor or respondent would gain benefit from filling in anything other than the truth. Thereby approximating the truth as close as possible.

## 5.4 Implications for future research

Based on the theoretical implications and limitations of this study avenues for future research are suggested. The first implication for future research is to replicate the current study during the different periods throughout a (future) pandemic in order to test whether different 'phases' of the pandemic (outbreak, first lockdown, end of lockdown, vaccines, etc.) lead to differences in entrepreneurial behaviour. In case of replication should be noted that a comparable period of measurement is of greater importance than a larger sample size. In addition, the current study could also be replicated during the ongoing COVID-19 pandemic with a larger sample size, that meets the desired ratio of 5 to 1 observation per variable for factor analysis. In that case the outcome of the factor analysis could be converted to regression coefficients which may serve as input for the regression analysis, instead of the scale averages that were used in this study. Furthermore, additional research is needed on the proposed factor structure. A study with a larger sample size could help to determine whether the a priori factor structure could be improved or if individual items have been written poorly as Osborne et al. (2011) suggest. Another implication is to replicate this study after the pandemic, using the impact of events scale – revised (IES-R) instead of the PSS-10, in order to assess the effect of COVID-19 on their mental health, as was done by Mcalonan et al. (2007) after the outbreak of SARS. The impact of events scale measures psychological impact of an event, and has previously been used to measure the impact of a infectious disease (Mcalonan et al., 2007; Wang et al., 2020).

In order to overcome sample size issues, future researchers could consider doing qualitative research. For example, in-depth interviews could offer insights on the experiences and perceptions of entrepreneurs in relation to the stressful event, and thereby help to answer the underlying 'why' question. Pursuit of the 'why' behind entrepreneurial behaviour could provide an in-depth understanding of underlying reasons, attitudes and motivations that drive the type of entrepreneurial behaviour (Rosenthal, 2016).

When correctly used self-reporting may help future studies to interpret a wider range of response than other collection methods (Althubaiti, 2016). In addition (Althubaiti, 2016) suggests that self-reported bias, and more specifically social desirability bias, can be overcome by conducting an additional validation study that uses random and objective sampling to validate initial results. In case of stress research validation studies could consist of surveying one's circle of influence or a clinical study of cortisol values in the respondent's blood.

Ideally, future studies could include any of the following variables in their analysis, which may affect perceived stress levels in case of an outbreak of an infectious disease. One variable is risk perception, as experienced stress levels increase as the respondent is at higher risk of the infectious disease (Chua et al., 2004; Peacock & Wong, 1990). Although Yu et al. (2005) found that risk perception is not predictive of depression and stress, it was correlated with psychological distress. Furthermore, Chua et al. (2004) found that infected respondents experience significantly more stress and other psychological effects than non-infected respondents. As a result, respondents should be asked whether they are or have been infected with COVID-19 (or other virus of interest). Moreover, Alon, Farrell, & Li (2020) found that the type of regime (democracy or authoritarian regime) and the reaction of the regime to the virus influences the public's reaction to the infectious disease and their perceived stress. In addition, stress levels are also influenced by the degree to which one experiences

the governments preventative health measures as being sufficient or not, in which a perceived insufficiency is indicative of higher stress levels (Yu et al., 2005).

# 6. Conclusion

This research aimed to identify the extent to which uncertainty intolerance has a mediating/moderating effect on the relationship between perceived stress (COVID-19) and the entrepreneurial decision-making process; causation/effectuation. On the basis of quantitative analysis of the survey data of 69 Dutch entrepreneurs can be concluded that uncertainty intolerance has a positive moderation effect on the relationship between PS and causation, and that there is no moderation effect of UI on the relationship between PS and effectuation. In addition, it can be concluded that uncertainty intolerance has a small negative mediation effect on the relationship between perceived stress (COVID-19) and effectuation, and that there is no mediation effect of UI on the relationship between PS and causation. The results therefore indicate that perceived stress and uncertainty intolerance are important factors to consider when studying the entrepreneurial decision-making process.

While the sample size may limit the generalizability of the results, this approach provided valuable insight in how Dutch entrepreneurs perceived a part of the COVID-19 pandemic as stressful and how it affected them and their decision making. Whereas this research clearly illustrated a moderation effect of UI on the relationship between PS and causation, it also raises the question as to why UI was not found to moderate the relationship with effectuation. In the same manner, this study found a mediation effect of UI on the relationship between PS and effectuation, but did not find a mediation effect of UI on the relationship with causation.

Further empirical research is needed to study the moderating and mediating effects of UI on PS and entrepreneurial decision-making, in order to extend the current body of knowledge, test the findings of this study in other contexts (different countries) and extend the generalizability of outcomes. More specifically future studies should focus on determining whether there truly is no moderation effect of UI on the relationship between PS and causation, and no mediation effect of UI on effectuation. Future researchers could consider replicating the current study with a larger sample size, or conducting a qualitative study in order provide insight in the underlying reasons, attitudes and motivations that drive entrepreneurial decision-making under stressful conditions.

This study provided insight in the degree to which entrepreneurs perceived the COVID-19 pandemic as stressful, and how this stress affected the entrepreneur's uncertainty intolerance and the entrepreneurial decision-making process. In doing so this study has provided valuable contributions to the literature on the manipulation of UI and the effect of stress on entrepreneurial decision-making. The findings of this study emphasize the importance of uncertainty intolerance and perceived stress as antecedents of entrepreneurial decision-making.

# 7. References


Allison, P. (2012, September 10). When Can You Safely Ignore Multicollinearity? | Statistical Horizons. Retrieved June 30, 2021, from https://statisticalhorizons.com/multicollinearity

Alon, I., Farrell, M., & Li, S. (2020). Regime Type and COVID-19 Response. *FIIB Business Review*, *9*(3), 152–160. https://doi.org/10.1177/2319714520928884

Alsos, G. A., Clausen, T. H., & Solvoll, S. (2014). Towards a Better Measurement Scale of Causation and Effectuation. *Academy of Management Proceedings*, *2014*(1), 13785–13785. https://doi.org/10.5465/ambpp.2014.13785abstract

Alsos, Gry Agnete, Clausen, T. H., Hytti, U., & Solvoll, S. (2016). Entrepreneurs' social identity and the preference of causal and effectual behaviours in start-up processes. *Entrepreneurship and Regional Development*, *28*(3–4), 234–258. https://doi.org/10.1080/08985626.2016.1155742

Althubaiti, A. (2016). Information bias in health research: Definition, pitfalls, and adjustment methods. *Journal of Multidisciplinary Healthcare*, *9*, 211–217. https://doi.org/10.2147/JMDH.S104807

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

Babore, A., Lombardi, L., Viceconti, M. L., Pignataro, S., Marino, V., Crudele, M., … Trumello, C. (2020). Psychological effects of the COVID-2019 pandemic: Perceived stress and coping strategies among healthcare professionals. *Psychiatry Research*, *293*(July), 113366. https://doi.org/10.1016/j.psychres.2020.113366

Bao, Y., Sun, Y., Meng, S., Shi, J., & Lu, L. (2020). 2019-nCoV epidemic: address mental health care to empower society. *The Lancet*, *395*(10224), e37–e38. https://doi.org/10.1016/S0140-6736(20)30309-3

Baron, R. A., Franklin, R. J., & Hmieleski, K. M. (2016). Why Entrepreneurs Often Experience Low, Not High, Levels of Stress: The Joint Effects of Selection and Psychological Capital. *Journal of Management*, *42*(3), 742–768. https://doi.org/10.1177/0149206313495411

Bauhoff, S. (2014). Self-Report Bias in Estimating Cross-Sectional and Treatment Effects. *Encyclopedia of Quality of Life and Well-Being Research*, 5798–5800. https://doi.org/10.1007/978-94-007-0753-5_4046

Boelen, P. A., & Reijntjes, A. (2009). Intolerance of uncertainty and social anxiety. *Journal of Anxiety Disorders*, *23*(1), 130–135. https://doi.org/10.1016/j.janxdis.2008.04.007

Boelen, P. A., Vrinssen, I., & Van Tulder, F. (2010). Intolerance of uncertainty in adolescents: Correlations with worry, social anxiety, and depression. *Journal of Nervous and Mental Disease*, *198*(3), 194–200. https://doi.org/10.1097/NMD.0b013e3181d143de

Bottesi, G., Noventa, S., Freeston, M. H., & Ghisi, M. (2019). Seeking certainty about intolerance of uncertainty: Addressing old and new issues through the intolerance of uncertainty scale-revised. *PLoS ONE*, *14*(2), 1–24. https://doi.org/10.1371/journal.pone.0211929

Bound, J., Brown, C., & Mathiowetz, N. (2001). Measurement error in survey data. *Handbook of Econometrics*, *5*, 3705–3843. https://doi.org/10.1016/S1573-4412(01)05012-7

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet*, *395*(10227), 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

Brown, R., Rocha, A., & Cowling, M. (2020). Financing entrepreneurship in times of crisis: Exploring the impact of COVID-19 on the market for entrepreneurial finance in the United Kingdom. *International Small Business Journal: Researching Entrepreneurship*, *38*(5), 380–390. https://doi.org/10.1177/0266242620937464

Buhr, K., & Dugas, M. J. (2002). The intolerance of uncertainty scale: Psychometric properties of the English version. *Behaviour Research and Therapy*, *40*(8), 931–945. https://doi.org/10.1016/S0005-7967(01)00092-4

Bundesverband Deutsche Startups e.V. (2020). Ein ganzheitlicher Schutzschirm für Startups: Liquiditätsengpässe verhindern, Zukunftsperspektiven erhalen.

Burns, L. R., & D'Zurilla, T. J. (1999). *Individual differences in perceived information-processing styles in stress and coping situations: Development and validation of the perceived modes of processing inventory*. *Cognitive Therapy and Research* (Vol. 23). https://doi.org/10.1023/A:1018799700207

Buttner, E. (1992). Entrepreneurial stress: is it hazardous to your health? *Journal of Managerial Issues*, *4*(2), 223–240.

Carleton, N. R., Mulvogue, M. K., Thibodeau, M. A., McCabe, R. E., Antony, M. M., & Asmundson, G. J. G. (2012). Increasingly certain about uncertainty: Intolerance of uncertainty across anxiety and depression. *Journal of Anxiety Disorders*, *26*(3), 468–479. https://doi.org/10.1016/j.janxdis.2012.01.011

Carleton, R. N. (2016a). Fear of the unknown: One fear to rule them all? *Journal of Anxiety Disorders*, *41*, 5–21. https://doi.org/10.1016/j.janxdis.2016.03.011

Carleton, R. N. (2016b). Into the unknown: A review and synthesis of contemporary models involving uncertainty. *Journal of Anxiety Disorders*, *39*, 30–43. https://doi.org/10.1016/j.janxdis.2016.02.007

Carleton, R. N., Desgagné, G., Krakauer, R., & Hong, R. Y. (2018). Increasing intolerance of uncertainty over time: the potential influence of increasing connectivity. https://doi.org/10.1080/16506073.2018.1476580

Carleton, R. N., Desgagné, G., Krakauer, R., & Hong, R. Y. (2019). Increasing intolerance of uncertainty over time: the potential influence of increasing connectivity. *Cognitive Behaviour Therapy*, *48*(2), 121–136. https://doi.org/10.1080/16506073.2018.1476580

Carleton, R. N., Norton, M. A. P. J., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. *Journal of Anxiety Disorders*, *21*(1), 105–117. https://doi.org/10.1016/j.janxdis.2006.03.014

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

Chua, S. E., Cheung, V., McAlonan, G. M., Cheung, C., Wong, J. W. S., Cheung, E. P. T., … Tsang, K. W. T. (2004). Stress and psychological impact on SARS patients during the outbreak. *Canadian Journal of Psychiatry*, *49*(6), 385–390. https://doi.org/10.1177/070674370404900607

Cohen, R. J., & Swerdlik, M. (2009). *Psychological Testing and Assessment - An Introduction to Tests & Measurement* (8th ed.).

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*(4), 385–396. https://doi.org/10.2307/2136404

Cote, L. P., L. P., & García, A. M., A. M. (2016). Estrés como factor limitante en el proceso de toma de decisiones: una revisión desde las diferencias de género. *Avances En Psicología Latinoamericana*, *34*(1), 19–28. https://doi.org/10.12804/apl34.1.2016.02

Denes-Raj, V., & Epstein, S. (1994). Conflict Between Intuitive and Rational Processing: When People Behave Against Their Better Judgment. *Journal of Personality and Social Psychology*, *66*(5), 819–829. https://doi.org/10.1037/0022-3514.66.5.819

Dew, N., Read, S., Sarasvathy, S. D., & Wiltbank, R. (2008). Outlines of a behavioral theory of the entrepreneurial firm. *Journal of Economic Behavior and Organization*, *66*(1), 37–59. https://doi.org/10.1016/j.jebo.2006.10.008

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

Dilawar, S. M., Li, X., Ibrar, M., & Liu, Z. G. (2018). Moderated impact of stress on decision making styles, a conceptual framework. *Proceedings of the 31st International Business Information Management Association Conference, IBIMA 2018: Innovation Management and Education Excellence through Vision 2020*, 3884–3889.

Doern, R., Williams, N., & Vorley, T. (2019). Special issue on entrepreneurship and crises: business as usual? An introduction and review of the literature. *Entrepreneurship and Regional Development*, *31*(5–6), 400–412. https://doi.org/10.1080/08985626.2018.1541590

Dugas, M. J., Freeston, M. H., & Ladouceur, R. (1997). Intolerance of uncertainty and problem orientation in worry. *Cognitive Therapy and Research*, *21*(6), 593–606. https://doi.org/10.1023/A:1021890322153

Dugas, M. J., Hedayati, M., Karavidas, A., Buhr, K., Francis, K., & Phillips, N. A. (2005). Intolerance of uncertainty and information processing: Evidence of biased recall and interpretations. *Cognitive Therapy and Research*, *29*(1), 57–70. https://doi.org/10.1007/s10608-005-1648-9

Eckhardt, J. T., & Shane, S. A. (2003). Opportunities and Entrepreneurship. *Journal of Management*, *29*(3), 333–349. https://doi.org/10.1177/014920630302900304

Ehrenhard, M., & Hatak, I. (2017). LEADING EFFECTIVELY IN A VUCA WORLD: A CHANGING CONSTELLATION OF LEADERSHIP AND PERSONALITY CHARACTERISTICS. Unpublished Working Paper. LEADING EFFECTIVELY IN A VUCA WORLD: A CHANGING CONSTELLATION OF LEADERSHIP AND PERSONALITY CHARACTERISTICS.

Einstein, D. A. (2014). Extension of the Transdiagnostic Model to Focus on Intolerance of Uncertainty: A Review of the Literature and Implications for Treatment. *Clinical Psychology: Science and Practice*, *21*(3), 280–300. https://doi.org/10.1111/cpsp.12077

Ellis, A. P. J. (2006). System breakdown: The role of mental models and transactive memory in the relationship between acute stress and team performance. *Academy of Management Journal*, *49*(3), 576–589. https://doi.org/10.5465/AMJ.2006.21794674

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, *49*(8), 709–724. https://doi.org/10.1037/0003-066x.49.8.709

Epstein, S. (2004). Cognitive-experiential self-theory: A dual-process personality theory with implications for diagnosis and psychotherapy. In *Empirical perspectives on the psychoanalytic unconscious.* (pp. 99–140). American Psychological Association. https://doi.org/10.1037/10256-004

Essen, B. van. (2019). Influence of uncertainty intolerance and entrepreneurial passion on the approach for decision-making in venture creation; causation or effectuation ? The case of South Africa. Retrieved from http://essay.utwente.nl/79892/

Fisher, G. (2012). Effectuation, causation, and bricolage: A behavioral comparison of emerging theories in entrepreneurship research. *Entrepreneurship: Theory and Practice*, *36*(5), 1019–1051. https://doi.org/10.1111/j.1540-6520.2012.00537.x

Folkman, S., & et al. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology*, *50*(5), 992–1003. https://doi.org/10.1037//0022-3514.50.5.992

Freeston, M. H., Rhéaume, J., Letarte, H., Dugas, M. J., & Ladouceur, R. (1994). Why do people worry? *Personality and Individual Differences*, *17*(6), 791–802. https://doi.org/10.1016/0191-8869(94)90048-5

Garson, G. D. (2012). Testing statistical assumptions: Blue Book Series. *Asheboro: Statistical Associate Publishing*, 12, 15, 16–20, 24, 31, 41–43, 44, 46–48, 50. Retrieved from https://www.researchgate.net/profile/Jurandy_Penitente-Filho/post/What_is_the_best_statistical_method_to_correlate_immunohistochemestry_and_rt-pcr/attachment/59d61d9879197b807797853c/AS:271755204071424@1441802897825/download/assumptions.pdf

Gavin, B., Lyne, J., & McNicholas, F. (2020). Mental health and the COVID-19 pandemic. *Irish Journal of Psychological Medicine*, *37*(3), 156–158. https://doi.org/10.1017/ipm.2020.72

George, D., & Mallery, P. (2003). SPSS for Windows step by step: A simple guide and reference. 11.0 update.

Gleim, J. A., & Gleim, R. R. (2003). Calculating, interpreting and reporting Cronbach's alpha reliability coefficient for Likert-type scales. *Proceedings of the Midwest Research to Practice Conference in Adult, Continuing and Community Education*, 82–88.

Gravetter, F. J., & Wallnau, L. B. (2013). *Essentials of Statistics for the Behavioral Sciences*. Retrieved from www.cengagebrain.com

Greco, V., & Roger, D. (2001). Coping with uncertainty: The construction and validation of a new measure. *Personality and Individual Differences*, *31*(4), 519–534. https://doi.org/10.1016/S0191-8869(00)00156-2

Greco, V., & Roger, D. (2003). Uncertainty, stress, and health. *Personality and Individual Differences*, *34*(6), 1057–1068. https://doi.org/10.1016/S0191-8869(02)00091-0

Grégoire, D. A., & Cherchem, N. (2020). A structured literature review and suggestions for future effectuation research. *Small Business Economics*, *54*(3), 621–639. https://doi.org/10.1007/s11187-019-00158-5

Guadagnoli, E., & Velicer, W. F. (1988). Relation of Sample Size to the Stability of Component Patterns. *Psychological Bulletin*, *103*(2), 265–275. https://doi.org/10.1037/0033-2909.103.2.265

Hair, Jr., William C. Black, Barry J. Babin, R. E. A. (2014). *Multivariate Data Analysis* (Vol. 7).

Hale, W., Richmond, M., Bennett, J., Berzins, T., Fields, A., Weber, D., … Osman, A. (2016). Resolving uncertainty about the intolerance of uncertainty scale-12: Application of modern psychometric strategies. *Journal of Personality Assessment*, *98*(2), 200–208. https://doi.org/10.1080/00223891.2015.1070355

Hannah, S. T., Uhl-Bien, M., Avolio, B. J., & Cavarretta, F. L. (2009). A framework for examining leadership in extreme contexts. *Leadership Quarterly*, *20*(6), 897–919. https://doi.org/10.1016/j.leaqua.2009.09.006

Hatak, I., Fink, M., Rauch, A., & Baranyi, A. (2014). "A Framework to Study Start-Up Conditions, Burn-Out and Start-Up Success." *Academy of Management Proceedings*, *2014*(1), 13868–13868. https://doi.org/10.5465/ambpp.2014.13868abstract

Hayes, A. F. (2018). *Introduction to mediation - A regression based approach* (2nd ed.). Guilford Publications.

Hedayati, M., Dugas, M. J., Buhr, K., & Francis, K. (2003). the Relationship Between Intolerance of Uncertainty and the Interpretation of Ambiguous and Unambiguous Information. *Behaviour*.

Helsen, K., Van Den Bussche, E., Vlaeyen, J. W. S., & Goubert, L. (2013). Confirmatory factor analysis of the Dutch Intolerance of Uncertainty Scale: Comparison of the full and short version. *Journal of Behavior Therapy and Experimental Psychiatry*, *44*(1), 21–29. https://doi.org/10.1016/j.jbtep.2012.07.004

Ivanov, D., & Das, A. (2020). Coronavirus ( COVID-19 / SARS-CoV-2 ) and supply chain resilience : a research note, *13*(1), 90–102.

Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. *International Journal of Production Research*, *58*(10), 2904–2915. https://doi.org/10.1080/00207543.2020.1750727

Kaiser, H. F. (1974). AN INDEX OF FACTORIAL SIMPLICITY*.

Knight, F. (1921). Risk, Uncertainty and Profit, 1921. *University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship*. https://doi.org/10.1017/CBO9781107415324.004

Kok, A. (2019, December). Dutch Perceived Stress Scale. Retrieved February 4, 2021, from https://www.lasa-vu.nl/themes/emotional/perceived-stress.htm

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

Ladouceur, R., Gosselin, P., & Dugas, M. J. (2000). Experimental manipulation of intolerance of uncertainty: A study of a theoretical model of worry. *Behaviour Research and Therapy*, *38*(9), 933–941. https://doi.org/10.1016/S0005-7967(99)00133-3

Laugesen, N., Dugas, M. J., & Bukowski, W. M. (2003). Understanding adolescent worry: The application of a cognitive model. *Journal of Abnormal Child Psychology*, *31*(1), 55–64. https://doi.org/10.1023/A:1021721332181

Lauriola, M., Mosca, O., & Carleton, R. N. (2016). Hierarchical factor structure of the Intolerance of Uncertainty Scale short form (IUS-12) in the Italian version. *TPM - Testing, Psychometrics, Methodology in Applied Psychology*, *23*(3), 377–394. https://doi.org/10.4473/TPM23.3.8

Lazarus, R. S., & Folkman, S. (1984). *Stress, Appraisal, and Coping*. New York: Springer Publishing Company, Inc.

le Clercq, P. (2020). "Geen maatwerk bij coronasteun, meer ondernemers vallen buiten de boot" | RTL Nieuws. Retrieved February 2, 2021, from https://www.rtlnieuws.nl/economie/business/artikel/5203262/ondernemers-corona-

lockdown-zzp-ikvalbuitendebootnl

Leys, C., Klein, O., Dominicy, Y., & Ley, C. (2018). Detecting multivariate outliers: Use a robust variant of the Mahalanobis distance. *Journal of Experimental Social Psychology*, *74*(March 2017), 150–156. https://doi.org/10.1016/j.jesp.2017.09.011

Li, J. Bin, Yang, A., Dou, K., Wang, L. X., Zhang, M. C., & Lin, X. Q. (2020). Chinese public's knowledge, perceived severity, and perceived controllability of COVID-19 and their associations with emotional and behavioural reactions, social participation, and precautionary behaviour: a national survey. *BMC Public Health*, *20*(1), 1–14. https://doi.org/10.1186/s12889-020-09695-1

Lipshitz, R., & Strauss, O. (1997). Coping with uncertainty: A naturalistic decision-making analysis. *Organizational Behavior and Human Decision Processes*, *69*(2), 149–163. https://doi.org/10.1006/obhd.1997.2679

Mahoney, A. E. J., & McEvoy, P. M. (2012a). Changes in intolerance of uncertainty during cognitive behavior group therapy for social phobia. *Journal of Behavior Therapy and Experimental Psychiatry*, *43*(2), 849–854. https://doi.org/10.1016/j.jbtep.2011.12.004

Mahoney, A. E. J., & McEvoy, P. M. (2012b). Trait versus situation-specific intolerance of uncertainty in a clinical sample with anxiety and depressive disorders. *Cognitive Behaviour Therapy*, *41*(1), 26–39. https://doi.org/10.1080/16506073.2011.622131

Mason, J. W. (1968). A review of psychoendocrine research on the pituitary-adrenal cortical system. *Psychosomatic Medicine*, *30*(5), 576–607. https://doi.org/10.1097/00006842-196809000-00020

Mcalonan, G. M., Lee, A. M., Cheung, V., Cheung, C., Tsang, K. W., Sham, P. C., … Wong, J. G. (2007). *Immediate and Sustained Psychological Impact of an Emerging Infectious Disease Outbreak on Health Care Workers*. *The Canadian Journal of Psychiatry* (Vol. 52).

Mcmullen, J. S., & Shepherd, D. A. (2006). Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *A Psychological Approach to Entrepreneurship: Selected Essays of Dean A. Shepherd*, *31*(1), 3–23. https://doi.org/10.4337/9781783479801.00007

Milliken, F. J. (1987). Three Types of Perceived Uncertainty About the Environment: State, Effect, and Response Uncertainty. *Academy of Management Review*, *12*(1), 133–143. https://doi.org/10.5465/amr.1987.4306502

Mosca, O., Lauriola, M., & Carleton, R. N. (2016). Intolerance of uncertainty: A temporary experimental induction procedure. *PLoS ONE*, *11*(6), 1–15. https://doi.org/10.1371/journal.pone.0155130

Osborne, J. W., Costello, A. B., & Kellow, J. T. (2011). *Best Practices in Exploratory Factor Analysis*. *Best Practices in Quantitative Methods*. https://doi.org/10.4135/9781412995627.d8

Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, *76*(6), 972–987. https://doi.org/10.1037/0022-3514.76.6.972

Peacock, E. J., & Wong, P. T. P. (1990). The stress appraisal measure (SAM): A multidimensional approach to cognitive appraisal. *Stress Medicine*, *6*(3), 227–236. https://doi.org/10.1002/smi.2460060308

Pearson, C. M., & Clair, J. A. (1998). Reframing crisis management. *Academy of Management Review*, *23*(1), 59–76. https://doi.org/10.5465/AMR.1998.192960

Perry, J. T., Chandler, G. N., & Markova, G. (2012). Entrepreneurial Effectuation: A Review and Suggestions for Future Research. *Entrepreneurship: Theory and Practice*, *36*(4), 837–861.

https://doi.org/10.1111/j.1540-6520.2010.00435.x

Peters, A., McEwen, B. S., & Friston, K. (2017). Uncertainty and stress: Why it causes diseases and how it is mastered by the brain. *Progress in Neurobiology*, *156*, 164–188. https://doi.org/10.1016/j.pneurobio.2017.05.004

Piedmont, R. L. (2014). Inter-item Correlations. In *Encyclopedia of Quality of Life and Well-Being Research* (pp. 3303–3304). Springer Netherlands. https://doi.org/10.1007/978-94-007-0753-5_1493

Porcelli, A. J., & Delgado, M. R. (2009). Acute stress modulates risk taking in financial decision making. *Psychological Science*, *20*(3), 278–283. https://doi.org/10.1111/j.1467-9280.2009.02288.x

Porcelli, A. J., Delgado, M. R., Opin, C., & Author, B. S. (2017). Stress and Decision Making: Effects on Valuation, Learning, and Risk-taking HHS Public Access Author manuscript. *Curr Opin Behav Sci*, *14*, 33–39. https://doi.org/10.1016/j.cobeha.2016.11.015

PWC. (2020). *Finanzielle Unterstützung in der Covid-19 Krisenlage Factsheet für Startups und KMUs*.

Quittkat, H. L., Düsing, R., Holtmann, F.-J., Buhlmann, U., Svaldi, J., & Vocks, S. (2020). Perceived Impact of Covid-19 Across Different Mental Disorders: A Study on Disorder-Specific Symptoms, Psychosocial Stress and Behavior. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.586246

Rajkumar, R. P. (2020). COVID-19 and mental health: A review of the existing literature. *Asian Journal of Psychiatry*, *52*(March), 102066. https://doi.org/10.1016/j.ajp.2020.102066

Rauch, A., Fink, M., & Hatak, I. (2018). Stress processes: An essential ingredient in the entrepreneurial process. *Academy of Management Learning and Education*, *17*(3), 340–357. https://doi.org/10.5465/amp.2016.0184

Rauch, A., & Frese, M. (2007). Let's put the person back into entrepreneurship research: A meta-analysis on the relationship between business owners' personality traits, business creation, and success. *European Journal of Work and Organizational Psychology*, *16*(4), 353–385. https://doi.org/10.1080/13594320701595438

Read, S., & Sarasvathy, S. D. (2005). Knowing What to Do and Doing What You Know: Effectuation as a Form of Entrepeneurial Expertise. *Journal of Private Equity*, *9*(1), 45–62.

Rijksoverheid. (2020a). Algemene informatie over NOW3 (vanaf 1 oktober 2020) | Coronavirus: financiële regelingen | Rijksoverheid.nl. Retrieved February 2, 2021, from https://www.rijksoverheid.nl/onderwerpen/coronavirus-financiele-regelingen/overzicht-financiele-regelingen/now/algemene-informatie-over-now3-vanaf-oktober-2020

Rijksoverheid. (2020b). Temporary tightening of partial lockdown. Retrieved November 27, 2020, from https://www.government.nl/latest/news/2020/11/03/temporary-tightening-of-partial-lockdown

Rijksoverheid. (2020c, December 14). Lockdown om contacten tot een minimum te beperken | Nieuwsbericht | Rijksoverheid.nl. Retrieved January 6, 2021, from https://www.rijksoverheid.nl/actueel/nieuws/2020/12/14/lockdown-om-contacten-tot-een-minimum-te-beperken

RIVM. (2021a). Risicogroepen en COVID-19 . Retrieved September 30, 2021, from https://www.rivm.nl/coronavirus-covid-19/risicogroepen

RIVM. (2021b, January 6). De ziekte COVID-19. Retrieved January 8, 2021, from

https://www.rivm.nl/coronavirus-covid-19/ziekte

Rosen, N. O., Ivanova, E., & Knäuper, B. (2014). Differentiating intolerance of uncertainty from three related but distinct constructs. *Anxiety, Stress and Coping*, *27*(1), 55–73. https://doi.org/10.1080/10615806.2013.815743

Rosenthal, M. (2016). Qualitative research methods: Why, when, and how to conduct interviews and focus groups in pharmacy research. *Currents in Pharmacy Teaching and Learning*, *8*(4), 509–516. https://doi.org/10.1016/J.CPTL.2016.03.021

Rosser, B. A. (2019). Intolerance of Uncertainty as a Transdiagnostic Mechanism of Psychological Difficulties: A Systematic Review of Evidence Pertaining to Causality and Temporal Precedence. *Cognitive Therapy and Research*, *43*(2), 438–463. https://doi.org/10.1007/s10608-018-9964-z

Sarasvathy, S. D. (2001a). Causation and Effectuation: Toward a Theoretical Shift from Economic Inevit...: *The Academy of Management Review, 4/1/2001, Vol. 26, Issue 2*, *26*(2), 243–263. https://doi.org/10.5465/AMR.2001.4378020

Sarasvathy, S. D. (2001b). Effectual Reasoning in Entrepreneurial Decision Making: Existence and Bounds. *Academy of Management Proceedings*, *2001*(1), D1–D6. https://doi.org/10.5465/apbpp.2001.6133065

Sarasvathy, S. D. (2008a). Effectuation: Elements of entrepreneurial expertise. https://doi.org/10.4337/9781848440197

Sarasvathy, S. D. (2008b). What makes entrepreneurs entrepreneurial? *Political Science*. Retrieved from http://www.effectuation.org/sites/default/files/documents/what-makes-entrepreneurs-entrepreneurial-sarasvathy.pdf

Sarasvathy, S. D., & Dew, N. (2005). Entrepreneurial logics for a technology of foolishness. *Scandinavian Journal of Management*, *21*(4 SPEC. ISS.), 385–406. https://doi.org/10.1016/j.scaman.2005.09.009

Shihata, S., McEvoy, P. M., & Mullan, B. A. (2018). A bifactor model of intolerance of uncertainty in undergraduate and clinical samples: Do we need to reconsider the two-factor model? *Psychological Assessment*, *30*(7), 893–903. https://doi.org/10.1037/pas0000540

Sokol-Hessner, P., Raio, C. M., Gottesman, S. P., Lackovic, S. F., & Phelps, E. A. (2016). Acute stress does not affect risky monetary decision-making. *Neurobiology of Stress*, *5*, 19–25. https://doi.org/10.1016/j.ynstr.2016.10.003

Sousa, V. D., & Rojjanasrirat, W. (2011). Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: A clear and user-friendly guideline. *Journal of Evaluation in Clinical Practice*, *17*(2), 268–274. https://doi.org/10.1111/j.1365-2753.2010.01434.x

Starcke, K., & Brand, M. (2012). Decision making under stress: A selective review. *Neuroscience and Biobehavioral Reviews*, *36*(4), 1228–1248. https://doi.org/10.1016/j.neubiorev.2012.02.003

T Arnsten, A. F. (2009). Stress signalling pathways that impair prefrontal cortex structure and function. https://doi.org/10.1038/nrn2648

Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics*. Retrieved from https://lccn.loc.gov/2017040173

Tran, T. (2020). INTOLERANCE OF UNCERTAINTY AND CULTURAL TIGHTNESS-LOOSENESS: TWO ANTECEDENTS OF EFFECTUATION-CAUSATION Evidence from South Africa.

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health*, *17*(5). https://doi.org/10.3390/ijerph17051729

Williams, T. A., Gruber, D. A., Sutcliffe, K. M., Shepherd, D. A., & Zhao, E. Y. (2017). Organizational response to adversity: Fusing crisis management and resilience research streams. *Academy of Management Annals*, *11*(2), 733–769. https://doi.org/10.5465/annals.2015.0134

Wiltbank, R., Dew, N., Read, S., & Sarasvathy, S. D. (2006). What to do next? The case for non-predictive strategy. *Strategic Management Journal*, *27*, 981–998. https://doi.org/10.1002/smj

World Health Organisation. (2021, September 29). The next flu pandemic: a matter of 'when', not 'if.' Retrieved September 29, 2021, from http://www.emro.who.int/pandemic-epidemic-diseases/news/the-next-flu-pandemic-a-matter-of-when-not-if.html

Yu, H. Y. R., Ho, S. C., So, K. F. E., & Lo, Y. L. (2005). Short communication: The psychological burden experienced by Hong Kong midlife women during the SARS epidemic. *Stress and Health*, *21*(3), 177–184. https://doi.org/10.1002/smi.1051

# 8. Appendix

## Appendix A: Measurement scale of causation and effectuation

| **Measurement scale of causation and effectuation by** (G. A. Alsos et al., 2014) |
|---|
| **CAUSATION: ENDS ORIENTATION** |
| 1.We gebruiken het lange-termijndoel dat we hebben vastgesteld aan het begin en streven ernaar om middelen te verkrijgen die we nodig hebben om dit doel te bereiken.<br>2. We focussen op de doelen die we hebben gesteld – het maakt ons niet uit of we momenteel de benodigde competenties hebben (we kunnen competenties verwerven als we ze nodig hebben)<br>3. Onze doelen voor de onderneming zijn duidelijk en relatief onveranderd tijdens het opstartproces van het bedrijf. |
| **CAUSATION: EXPECTED RETURN** |
| 1. Het besluit over hoeveel er wordt geïnvesteerd in het bedrijf is gebaseerd op de mogelijke opbrengst, zonder rekening te houden hoeveel kapitaal we zelf beschikbaar hebben.<br>2. Een evaluatie van de mogelijke winst van het bedrijf is doorslaggevend bij het besluit over hoeveel we investeren.<br>3. We hebben de investering, die nodig is om de dingen te krijgen die we willen, berekend en proberen de nodige financiering hiervoor te krijgen. |
| **CAUSATION: PRE-EXISTING KNOWLEDGE** |
| 1. We volgen een langetermijnstrategie en willen geen nieuwe mogelijkheden aangrijpen waarvan we niet weten hoe die zich ontwikkelen.<br>2. We werken systematisch om lange-termijndoelen te bereiken en overwegen geen korte-termijnkansen<br>3.We hebben een gedetailleerd plan gemaakt, voor het opstarten van het bedrijf, waar we ons aan houden zonder significante veranderingen. |
| **CAUSATION: COMPETITIVE ANALYSIS** |
| 1. We analyseren het aanbod van de concurrerende markt en positioneren onze producten en prijzen dienovereenkomstig<br>2. We proberen onze ideeën zo lang mogelijk geheim te houden om te voorkomen dat iemand ze kopieert of steelt<br>3. We baseren onze samenwerking met anderen op formele afspraken die de samenwerking regelen |
| **CAUSATION: PREDICTION** |
| 1. We hebben aandacht voor marktanalyses en opvattingen van experts over hoe de markt zich ontwikkelt en gebruiken deze informatie om onze producten te ontwikkelen<br>2. We maken analyses en budgetten om een zo compleet mogelijk beeld te krijgen over hoe het bedrijf zich zal ontwikkelen in de toekomst<br>3. We baseren onze strategische besluiten op grondige analyses over hoe de markt en concurrentiepositie zich ontwikkelen in de toekomst |
| **EFFECTUATION: MEANS ORIENTATION** |
| 1. We ontwikkelen het bedrijf op basis van de middelen die we hebben, zonder een duidelijk beeld over hoe het bedrijf er op het einde uit zal zien<br>2. We ontwikkelen het bedrijf gebaseerd op onze huidige competenties en hopen dat we winst halen uit het bedrijf.<br>3. We passen onze bedrijfsdoelen continue aan op basis van de middelen die we op dat bepaalde moment hebben |
| **EFFECTUATION: AFFORDABLE LOSS** |
| 1. In plaats van te berekenen hoeveel winst we zullen halen als we investeren, investeren we gebaseerd op de middelen die we tot onze beschikking hebben |

2. Toen we begonnen met investeren in de onderneming hadden we geen duidelijk beeld over hoe winstgevend de onderneming zou worden
3. We besteden veel tijd aan het vinden van manieren om dingen te doen zonder meer geld te investeren; we investeren liever tijd dan geld.

**EFFECTUATION: CONTINGENCIES**

1. Als een onverwachte, maar interessante kans zich voordoet, grijpen we deze, zelfs als dit betekent dat we onze bedrijfsstrategie moeten aanpassen
2. We passen onze doelen en plannen continue aan als dingen zich ontwikkelen
3. We passen onze voorstelling van het bedrijf continue aan; 'we plannen de route onderweg'

**EFFECTUATION: PRE-COMMITMENT**

1. We ontwikkelen producten op basis van waar we goed in zijn; we houden meestal geen rekening met wat onze concurrentie doet
2. We praten openlijk over ons bedrijfsplan; als resultaat hiervan krijgen we nieuwe impulsen
3. We baseren onze samenwerking met anderen op informele afspraken, welke worden aangepast afhankelijk van wat zij te bieden hebben

**EFFECTUATION: CONTROL**

1. Het is niet zinvol om bestaande markten te analyseren omdat ons aanbod substantieel afwijkt van wat momenteel wordt aangeboden op de markt
2. We laten het bedrijf stap voor stap ontwikkelen en hebben geen duidelijk beeld over hoe het er in de toekomst uit zal zien
3. We maken onze strategische keuzes door te kiezen tussen de opties die we hebben, gebaseerd op onze huidige competenties en middelen die beschikbaar zijn.

## Appendix B: Measurement scale of perceived stress

**Dutch Perceived Stress Scale by** (S. Cohen et al., 1983)**, translated by (Kok, 2019)**

1. In de afgelopen maand, hoe vaak was u overstuur vanwege iets dat onverwacht gebeurde?
2. In de afgelopen maand, hoe vaak voelde u dat u niet in staat was controle te hebben over de belangrijke dingen in uw leven?
3. In de afgelopen maand, hoe vaak voelde u zich nerveus en gestrest?
4. In de afgelopen maand, hoe vaak voelde u zich zelfverzekerd over uw vermogen om met persoonlijke problemen om te gaan?
5. In de afgelopen maand, hoe vaak voelde u dat dingen gingen zoals u wilde?
6. In de afgelopen maand, hoe vaak voelde u dat u niet kon omgaan met (of het hoofd kon bieden aan) alle dingen die u moest doen?
7. In de afgelopen maand, hoe vaak kon u uw irritaties in uw leven onder controle houden?
8. In de afgelopen maand, hoe vaak voelde u dat u greep had op de dingen?
9. In de afgelopen maand, hoe vaak was u boos omdat dingen buiten uw controle waren?
10. In de afgelopen maand, hoe vaak voelde u dat moeilijkheden zich zo hoog opeen stapelden dat u ze niet kon overwinnen?

## Appendix C: Measurement scale of uncertainty intolerance

**Dutch version of the IUS-12 measurement scale of uncertainty intolerance by Carleton, Norton, & Asmundson (2007)**

1. Onvoorziene gebeurtenissen brengen mij ernstig van slag.
2. Ik vind het frustrerend om niet over alle benodigde informatie te beschikken.
3. Men moet altijd vooruitkijken om verrassingen te voorkomen.
4. De kleinste onvoorziene gebeurtenis kan alles verpesten, ondanks de beste planning.
5. Ik wil altijd weten wat de toekomst in petto heeft voor me.

6. Ik kan er niet tegen om verrast te worden.
7. Ik zou in staat moeten zijn om alles vooraf te organiseren.
8. Onzekerheid belet mij om het beste uit het leven te halen.
9. Als ik in actie moet komen, voel ik me verlamd door onzekerheid.
10. Als ik onzeker ben, kan ik niet goed functioneren.
11. Zelfs de kleinste twijfel kan mij ervan weerhouden tot actie over te gaan.
12. Ik moet alle onzekere situaties vermijden.

## Appendix D: Cronbach's Alpha

| Scale | Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|---|
| Causation | .578 | .587 | 5 |
| Effectuation | .761 | .750 | 5 |
| Perceived stress | .875 | .874 | 10 |
| Uncertainty intolerance | .782 | .786 | 12 |

## Appendix E: Item total statistics

**Item-Total Statistics**

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Squared Multiple Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|
| **Causation** | | | | | |
| CA1 | 15.03 | 11.543 | .215 | .092 | .586 |
| CA2 | 16.30 | 9.678 | .494 | .280 | .435 |
| CA3 | 17.67 | 11.475 | .325 | .116 | .532 |
| CA4 | 16.26 | 10.490 | .360 | .221 | .510 |
| CA5 | 16.28 | 9.408 | .323 | .105 | .541 |
| **Effectuation** | | | | | |
| EF1 | 18.47 | 15.573 | .655 | .564 | .669 |
| EF2 | 17.67 | 15.998 | .700 | .557 | .654 |
| EF3 | 16.57 | 21.088 | .312 | .116 | .784 |
| EF4 | 16.94 | 21.019 | .299 | .141 | .789 |
| EF5 | 17.75 | 15.593 | .704 | .614 | .650 |
| **Perceived stress** | | | | | |
| PSS.1 | 19.04 | 28.601 | .603 | .510 | .863 |
| PSS.2 | 18.81 | 25.420 | .709 | .589 | .854 |
| PSS.3 | 18.38 | 26.738 | .645 | .506 | .860 |
| PSS.4REV | 18.80 | 29.399 | .473 | .321 | .872 |
| PSS.5REV | 18.49 | 29.371 | .533 | .438 | .868 |
| PSS.6 | 18.48 | 26.812 | .672 | .503 | .857 |
| PSS.7REV | 18.91 | 29.492 | .526 | .344 | .868 |
| PSS.8REV | 18.65 | 29.142 | .616 | .463 | .863 |
| PSS.9 | 18.75 | 28.659 | .544 | .405 | .867 |
| PSS.10 | 19.25 | 27.424 | .670 | .527 | .858 |
| **Uncertainty intolerance** | | | | | |
| IUS.1 | 26.07 | 31.186 | .580 | .451 | .751 |
| IUS.2 | 24.99 | 32.603 | .329 | .294 | .777 |
| IUS.3 | 24.74 | 35.784 | .103 | .293 | .795 |

| | | | | | |
|---|---|---|---|---|---|
| IUS.4 | 25.84 | 30.842 | .419 | .324 | .768 |
| IUS.5 | 25.77 | 31.828 | .457 | .551 | .763 |
| IUS.6 | 26.17 | 32.793 | .439 | .435 | .765 |
| IUS.7 | 25.77 | 31.240 | .528 | .413 | .755 |
| IUS.8 | 25.93 | 29.745 | .596 | .497 | .746 |
| IUS.9 | 26.49 | 32.812 | .493 | .678 | .761 |
| IUS.10 | 25.61 | 33.301 | .265 | .286 | .784 |
| IUS.11 | 26.39 | 33.359 | .373 | .533 | .771 |
| IUS.12 | 26.46 | 31.223 | .540 | .348 | .754 |

Appendix F: Factor analysis

| Causation - item correlations | | | | | |
|---|---|---|---|---|---|
| | C1 | C2 | C3 | C4 | C5 |
| C1 | 1 | | | | |
| C2 | .259* | 1 | | | |
| C3 | .130 | .294* | 1 | | |
| C4 | .026 | .425** | .239* | 1 | |
| C5 | .160 | .250* | .187 | .238* | 1 |

*P<.05, **P<.01

| Effectuation - item correlations | | | | | |
|---|---|---|---|---|---|
| | E1 | E2 | E3 | E4 | E5 |
| E1 | 1 | | | | |
| E2 | .635** | 1 | | | |
| E3 | .296* | .234 | 1 | | |
| E4 | .153 | .326** | .209 | 1 | |
| E5 | .711** | .703** | .228 | .255* | 1 |

*P<.05, **P<.01

| Perceived stress - item correlations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| PSS.1 | 1 | | | | | | | | | |
| PSS.2 | .413** | 1 | | | | | | | | |
| PSS.3 | .550** | .534** | 1 | | | | | | | |
| PSS.4REV | .247* | .303* | .307* | 1 | | | | | | |
| PSS.5REV | .302* | .541** | .260* | .413** | 1 | | | | | |
| PSS.6 | .465** | .560** | .551** | .423** | .343** | 1 | | | | |
| PSS.7REV | .309** | .414** | .457** | .326** | .343** | .359** | 1 | | | |
| PSS.8REV | .318** | .608** | .390** | .299* | .499** | .482** | .404** | 1 | | |
| PSS.9 | .525** | .441** | .399** | .276* | 0.234 | .353** | .418** | .404** | 1 | |
| PSS.10 | .576** | .538** | .505** | .424** | .429** | .565** | .278* | .401** | .376** | 1 |

*P<.05, **P<.01

| Uncertainty intolerance - item correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| IUS.1 | 1 | | | | | | | | | | | |
| IUS.2 | .292* | 1 | | | | | | | | | | |
| IUS.3 | -.023 | .245* | 1 | | | | | | | | | |
| IUS.4 | .387** | .043 | -.082 | 1 | | | | | | | | |
| IUS.5 | .215 | .380** | .270* | .269* | 1 | | | | | | | |
| IUS.6 | .302* | .250* | .332** | .189 | .532** | 1 | | | | | | |
| IUS.7 | .309** | .234 | .275* | .273* | .550** | .368** | 1 | | | | | |
| IUS.8 | .429** | .215 | -.046 | .451** | .235 | .248* | .314** | 1 | | | | |
| IUS.9 | .486** | .025 | -.265* | .308* | .097 | .038 | .183 | .594** | 1 | | | |
| IUS.10 | .316** | .042 | -.114 | .159 | -.086 | .133 | .138 | .306* | .429** | 1 | | |
| IUS.11 | .442** | .048 | -.143 | .286* | -.044 | -.078 | .127 | .402** | .669** | .250* | 1 | |
| IUS.12 | .282* | .276* | .191 | .269* | .335** | .303* | .376** | .384** | .359** | .133 | .341** | 1 |

*P<.05, **P<.01

| Mean inter-item correlations per scale | |
|---|---|
| Causation | .221 |
| Effectuation | .375 |
| Perceived stress | .412 |
| Uncertainty intolerance | .234 |

| KMO and Bartlett's Test | | | | | | |
|---|---|---|---|---|---|---|
| | | Overall | Causation | Effectuation | PSS | IUS |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .710 | .651 | .744 | .858 | .730 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1159.025 | 32.922 | 111.929 | 265.502 | 259.491 |
| | df | 496 | 10 | 10 | 45 | 66 |
| | Sig. | .000 | .000 | .000 | .000 | .000 |

| KMO per item | |
|---|---|
| Variable | KMO |
| Goal oriented | .495 |
| Expected returns | .54 |
| Pre-existing knowledge | .476 |
| Competitive analysis | .454 |
| Uncertain future | .788 |
| Means oriented | .719 |
| Affordable loss | .641 |
| Contingencies | .572 |
| Commitments | .423 |
| Unpredictable future | .786 |
| PSS.1 | .834 |
| PSS.2 | .778 |
| PSS.3 | .795 |
| PSS.4REV | .676 |
| PSS.5REV | .723 |
| PSS.6 | .846 |
| PSS.7REV | .739 |
| PSS.8REV | .757 |
| PSS.9 | .769 |
| PSS.10 | .786 |
| IUS.1 | .786 |
| IUS.2 | .623 |
| IUS.3 | .476 |
| IUS.4 | .789 |
| IUS.5 | .71 |
| IUS.6 | .643 |
| IUS.7 | .781 |
| IUS.8 | .72 |
| IUS.9 | .724 |
| IUS.10 | .766 |
| IUS.11 | .592 |
| IUS.12 | .7 |

**Initial factor analysis**

**Rotated Component Matrix[a]**

| | Component | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| CA1 | | | | -.583 |
| CA2 | | .399 | -.384 | |
| CA3 | | | | |
| CA4 | | | -.497 | |
| CA5 | | | -.758 | |
| EF1 | | | .677 | |
| EF2 | | | .744 | |
| EF3 | .388 | | | -.531 |
| EF4 | | | .620 | -.504 |
| EF5 | | | .701 | |
| IUS.1 | .427 | .504 | | |
| IUS.2 | .813 | | | |
| IUS.3 | .576 | | | |
| IUS.4 | .521 | | | |
| IUS.5 | .656 | | | |
| IUS.6 | .675 | | | |
| IUS.7 | .598 | | | |
| IUS.8 | .678 | | | |
| IUS.9 | .408 | .461 | | |
| IUS.10 | .618 | .364 | | |
| IUS.11 | .494 | | | |
| IUS.12 | | .556 | | .410 |
| PSS.1 | | .644 | | |
| PSS.2 | .611 | | | |
| PSS.3 | | .773 | | |
| PSS.4REV | | .708 | | |
| PSS.5REV | | .637 | | |
| PSS.6 | .543 | | | |
| PSS.7REV | .662 | | | .368 |
| PSS.8REV | .520 | | | |
| PSS.9 | .503 | | | .361 |
| PSS.10 | | .401 | | .559 |

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

**Re-run factor analysis Causation/Effectuation**

| Rotated Component Matrix[a] | | |
|---|---|---|
| | Component | |
| | Effectuation | Causation |
| CA1 | | |
| CA2 | | .768 |
| CA3 | | .563 |
| CA4 | | .775 |
| CA5 | -.700 | .385 |
| EF1 | .837 | |
| EF2 | .853 | |
| EF3 | .482 | |
| EF4 | .400 | -.428 |
| EF5 | .852 | |

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

**Re-run factor analysis PSS and IUS**

| Rotated Component Matrix[a] | | |
|---|---|---|
| | Component | |
| | 1 | 2 |
| PSS.1 | .497 | .540 |
| PSS.2 | .762 | |
| PSS.3 | .607 | .389 |
| PSS.4REV | .477 | |
| PSS.5REV | .564 | |
| PSS.6 | .731 | |
| PSS.7REV | .493 | .361 |
| PSS.8REV | .664 | |
| PSS.9 | .405 | .526 |
| PSS.10 | .618 | .405 |
| IUS.1 | .566 | |
| IUS.2 | | .594 |
| IUS.3 | | .600 |
| IUS.4 | .566 | |
| IUS.5 | | .792 |
| IUS.6 | | .741 |
| IUS.7 | | .618 |
| IUS.8 | .636 | |
| IUS.9 | .774 | |
| IUS.10 | .569 | |
| IUS.11 | .628 | |
| IUS.12 | | .441 |

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

## Appendix G: Assumptions for multiple regression

**Assumption #1 – dependent variable is of continuous level**

Ensured via recode variable command.

**Assumption #2- Independent variables measured at the continuous or nominal level**

Ensured via recode variable command.

**Assumption #3 – Independence of observations (i.e., independence of residuals)**

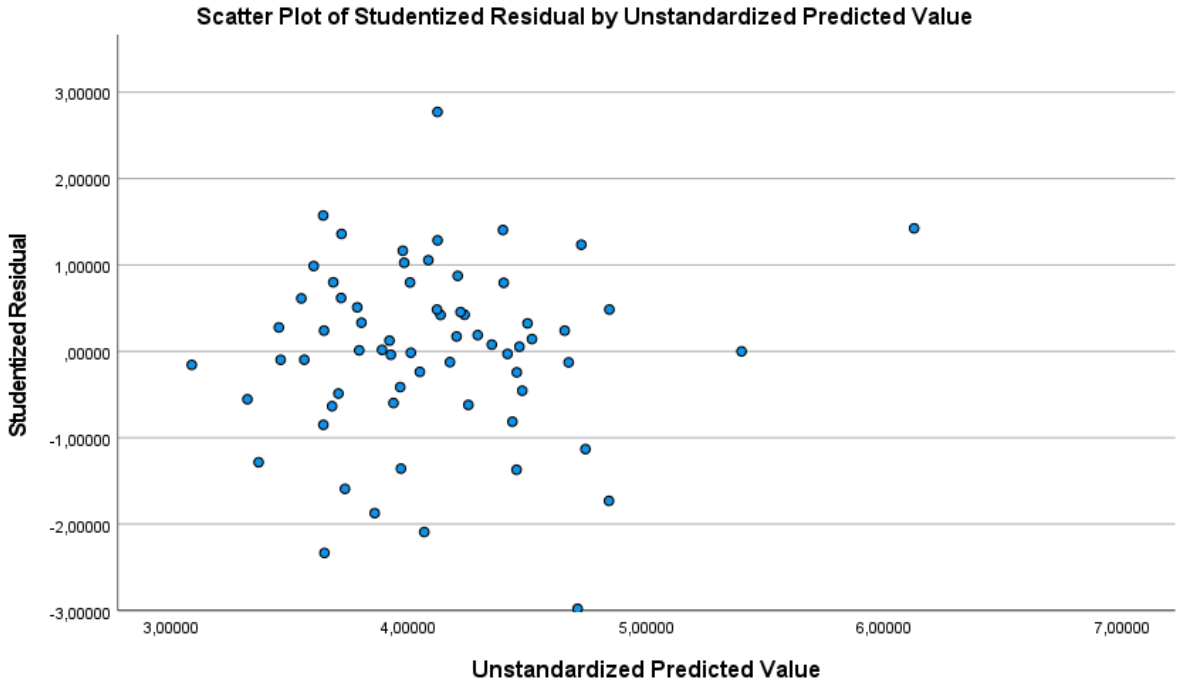
Criterion: Durbin-Watson statistic must be between 1.5 and 2.5 (Garson, 2012).

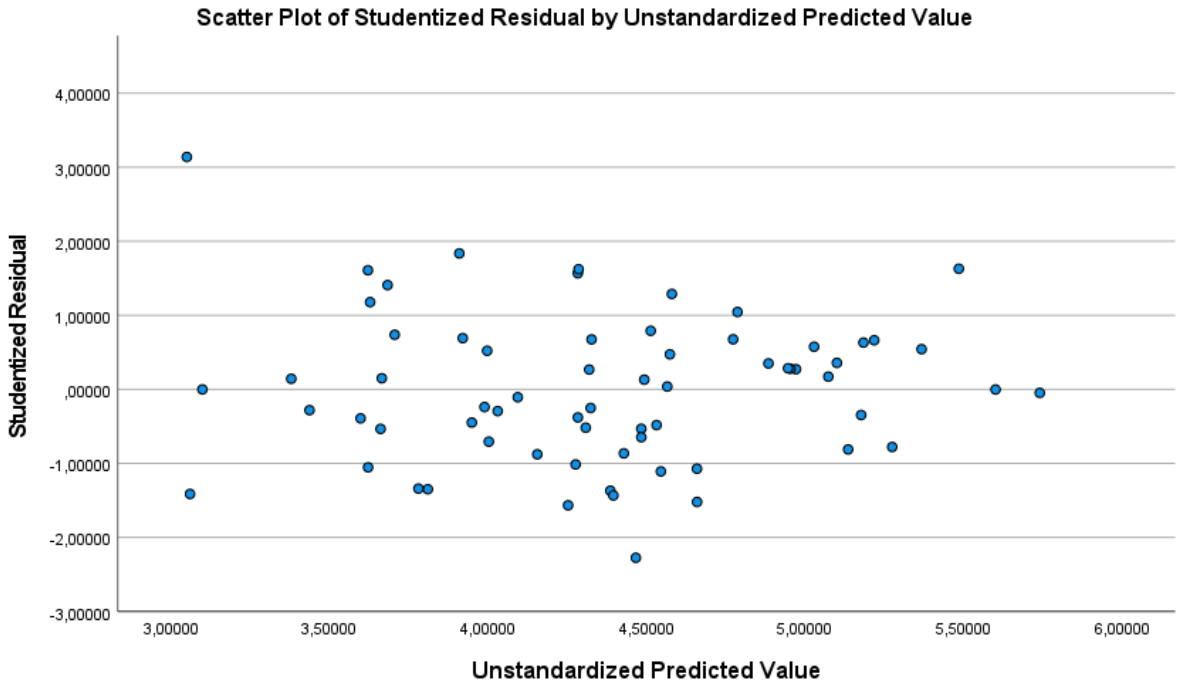
| Durbin-Watson statistic | | | |
|---|---|---|---|
| Dependent variable | IUS | Causation | Effectuation |
| Predictor variable | | | |
| PSS | 1.962 | 1.829 | 2.364 |
| IUS | | 1.922 | 2.285 |
| Moderator | | 1.807 | 2.416 |

*Note: Control variables were always included in the model*

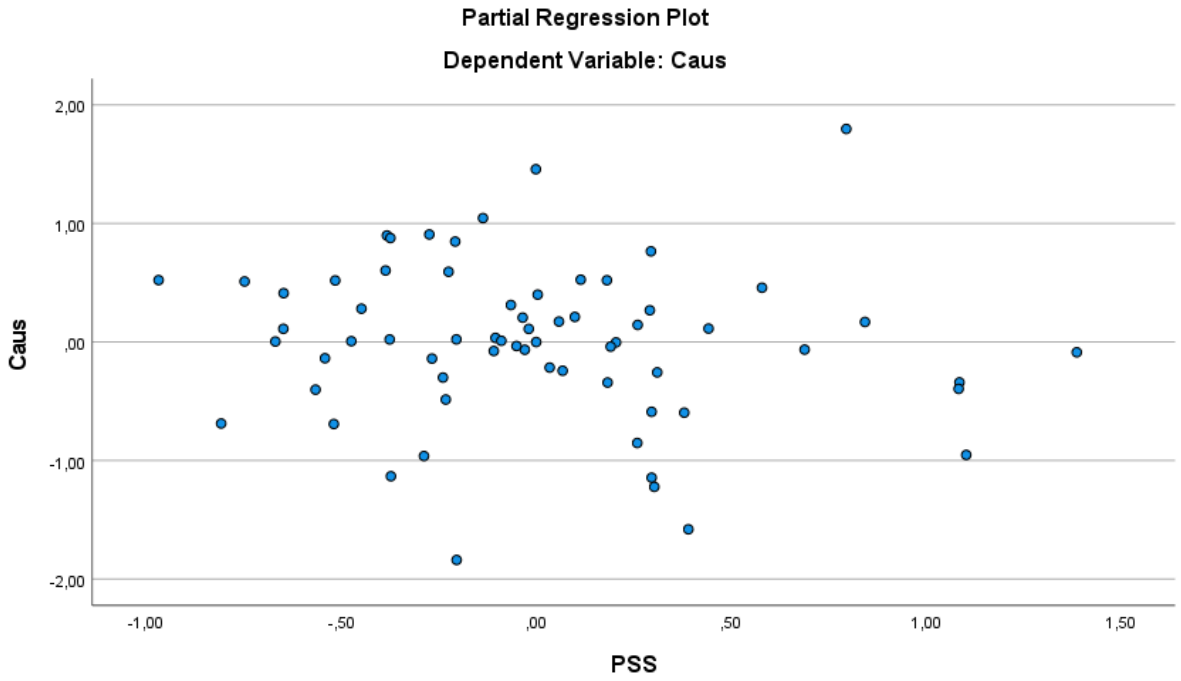
**Assumption #4 – Linear relationship between predictor variables (and composite) and the dependent variable**

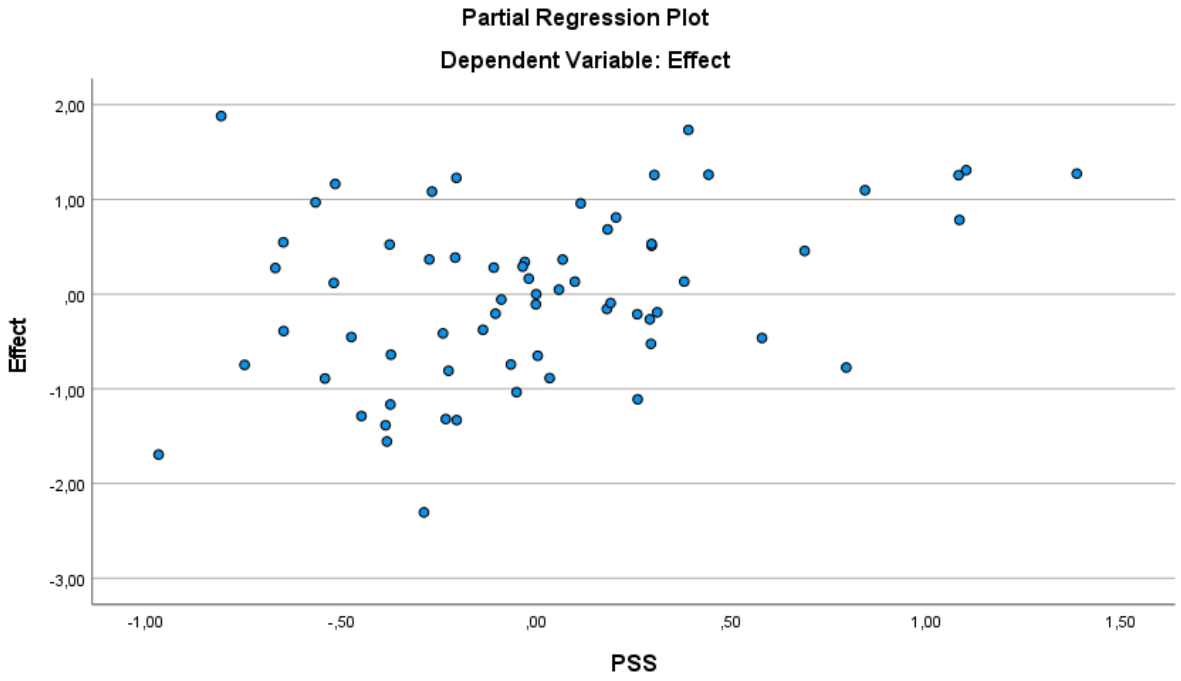
**Criterium 1:** There is a linear relationship between the dependent and independent variables collectively

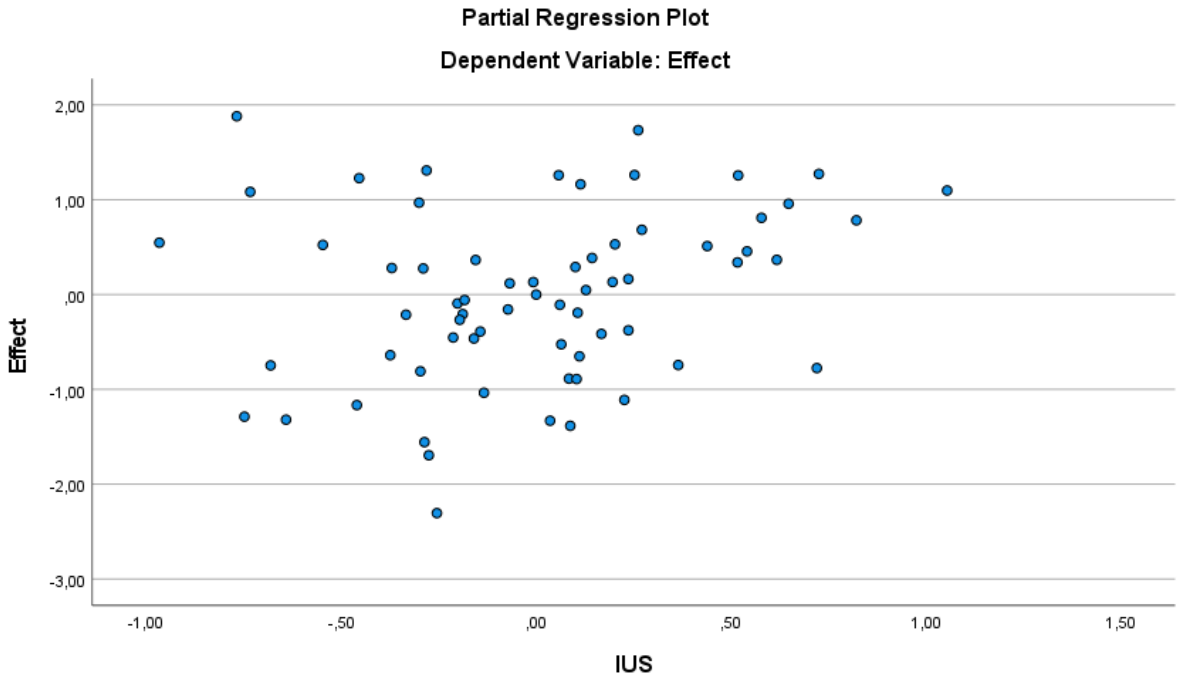


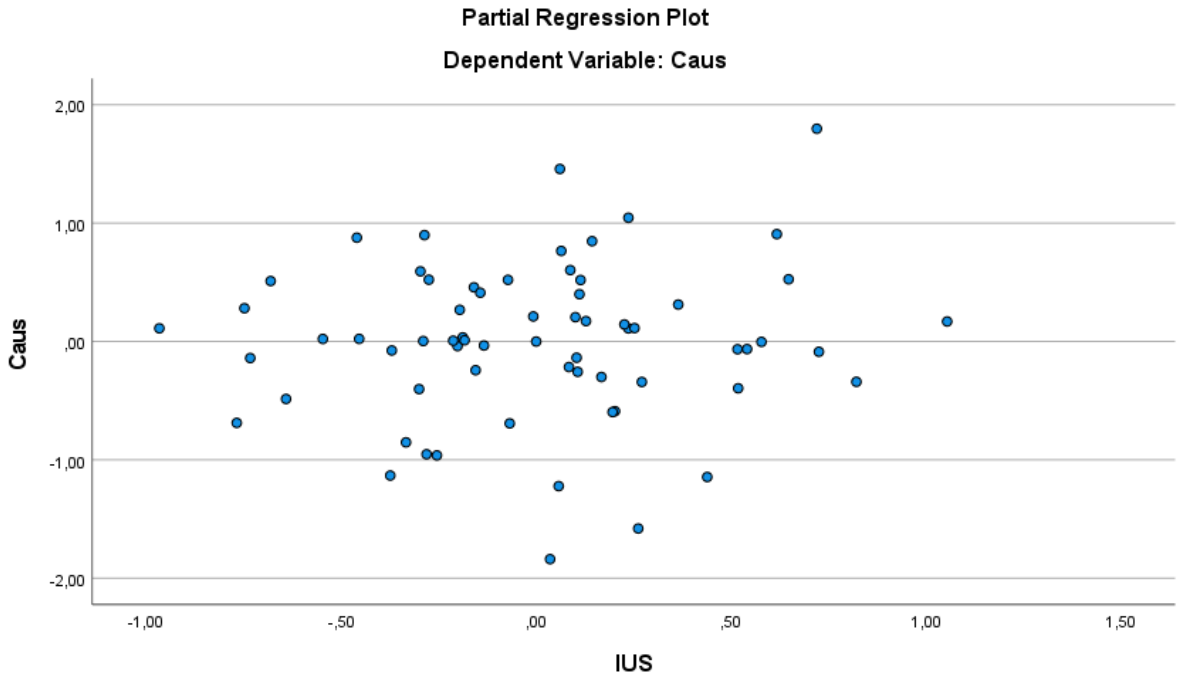


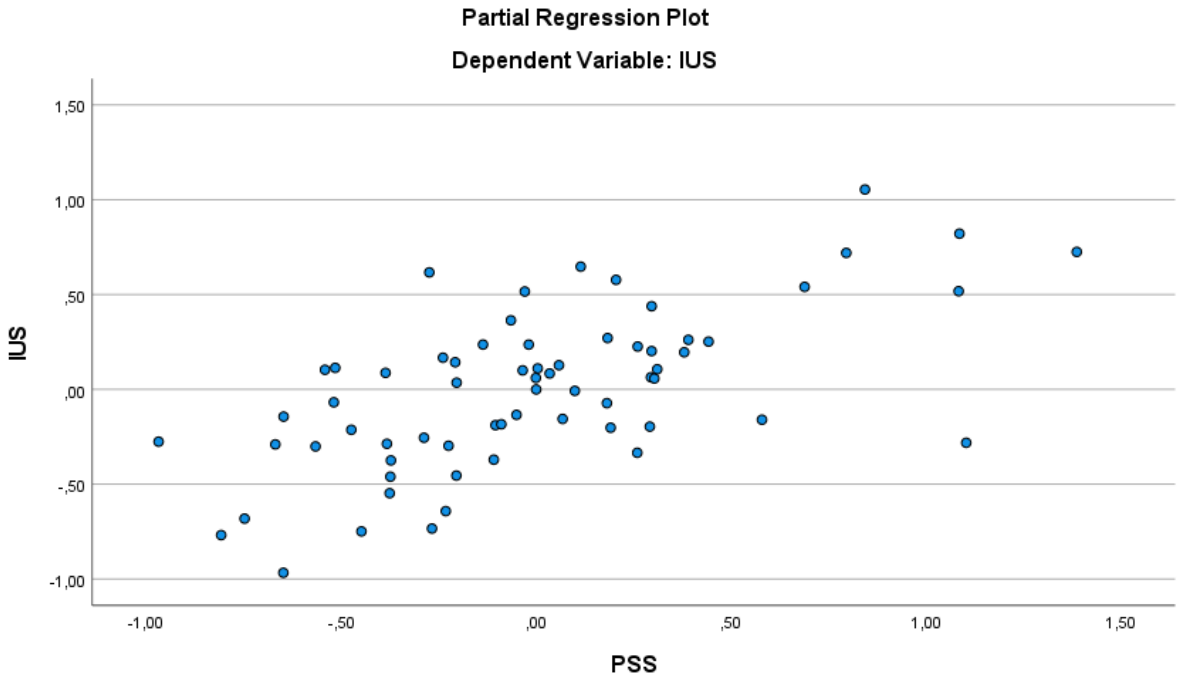

**Criterium 2: There is a linear relationship between the dependent variable and each of the independent variables**




Partial Regression Plot
Dependent Variable: Effect
Effect
2,00
1,00
,00
-1,00
-2,00
-3,00
-1,00
-,50
,00
,50
1,00
1,50
PSS


Partial Regression Plot
Dependent Variable: Effect
Effect
2,00
1,00
,00
-1,00
-2,00
-3,00
-1,00
-,50
,00
,50
1,00
1,50
IUS




**Assumption #5 - There should be homoscedasticity of residuals (equal error variances)**

Visual inspection of the plot of studentized residuals versus unstandardized predicted values (See assumption #4 criterium 1) revealed heteroscedasticity.

**Assumption #6 – There should be no multicollinearity**

Criterium: VIF should be below 5. All FTE variables exceed the threshold of 5 but following the criteria of Paul Allison the violation of multicollinearity can be ignored (Allison, 2012).

| Collinearity Statistics | | | | |
|---|---|---|---|---|
| | Causation[a] | | Effectuation[a] | |
| Model | Tolerance | VIF | Tolerance | VIF |
| CV.1.AGE | 0.484 | 2.065 | 0.484 | 2.065 |
| CV_Sex_Male | 0.627 | 1.596 | 0.627 | 1.596 |
| CV_DEGREE_Propedeuse | 0.594 | 1.684 | 0.594 | 1.684 |
| CV_DEGREE_Bachelor | 0.471 | 2.124 | 0.471 | 2.124 |
| CV_DEGREE_Master | 0.391 | 2.556 | 0.391 | 2.556 |
| Business_oriented | 0.711 | 1.406 | 0.711 | 1.406 |
| CV.5.BUSINESSES | 0.625 | 1.599 | 0.625 | 1.599 |
| CV.6.EXPERIENCE | 0.376 | 2.660 | 0.376 | 2.660 |
| FTE_1 | 0.042 | 23.715 | 0.042 | 23.715 |
| FTE_2 | 0.158 | 6.328 | 0.158 | 6.328 |
| FTE_3_5 | 0.105 | 9.483 | 0.105 | 9.483 |
| FTE_6_10 | 0.155 | 6.459 | 0.155 | 6.459 |
| FTE_11_49 | 0.107 | 9.379 | 0.107 | 9.379 |
| FTE_50_249 | 0.173 | 5.774 | 0.173 | 5.774 |
| PSS | 0.394 | 2.538 | 0.394 | 2.538 |
| IUS | 0.398 | 2.516 | 0.398 | 2.516 |
| Moderator | 0.573 | 1.745 | 0.573 | 1.745 |

a. Dependent Variable: Causation

b. Dependent Variable: Effectuation

*Variable secondary school is missing since it is a constant or has missing correlations

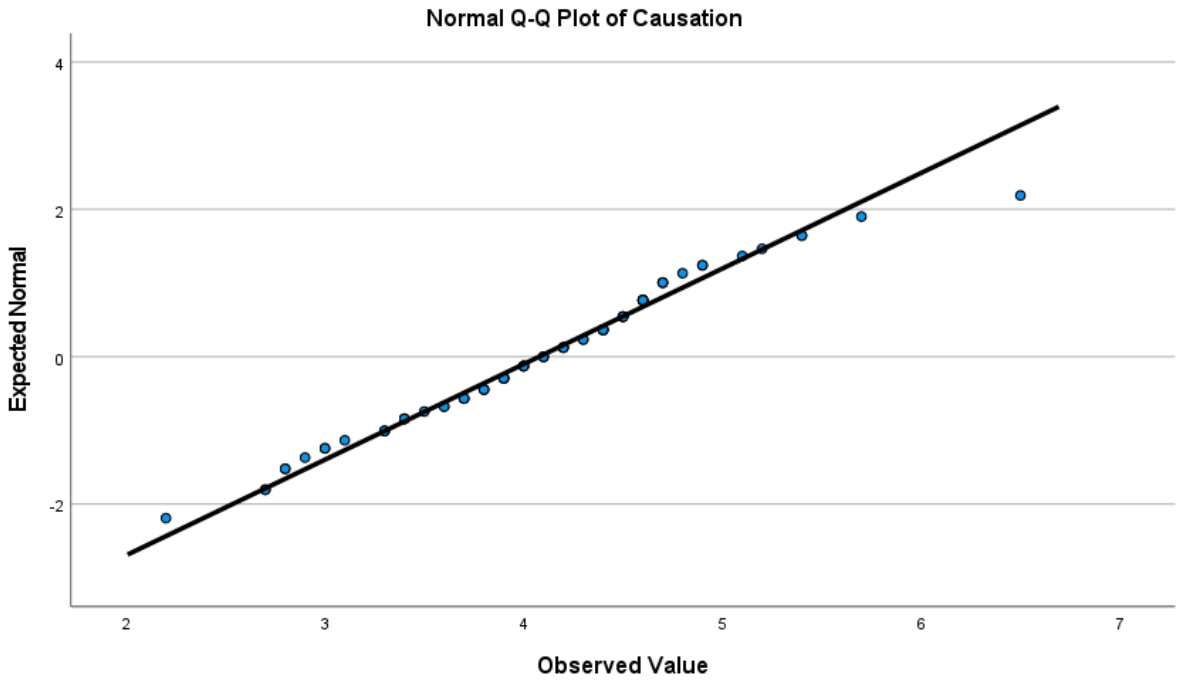
**Assumption #7 – There should be no significant outliers, high leverage points or highly influential points**

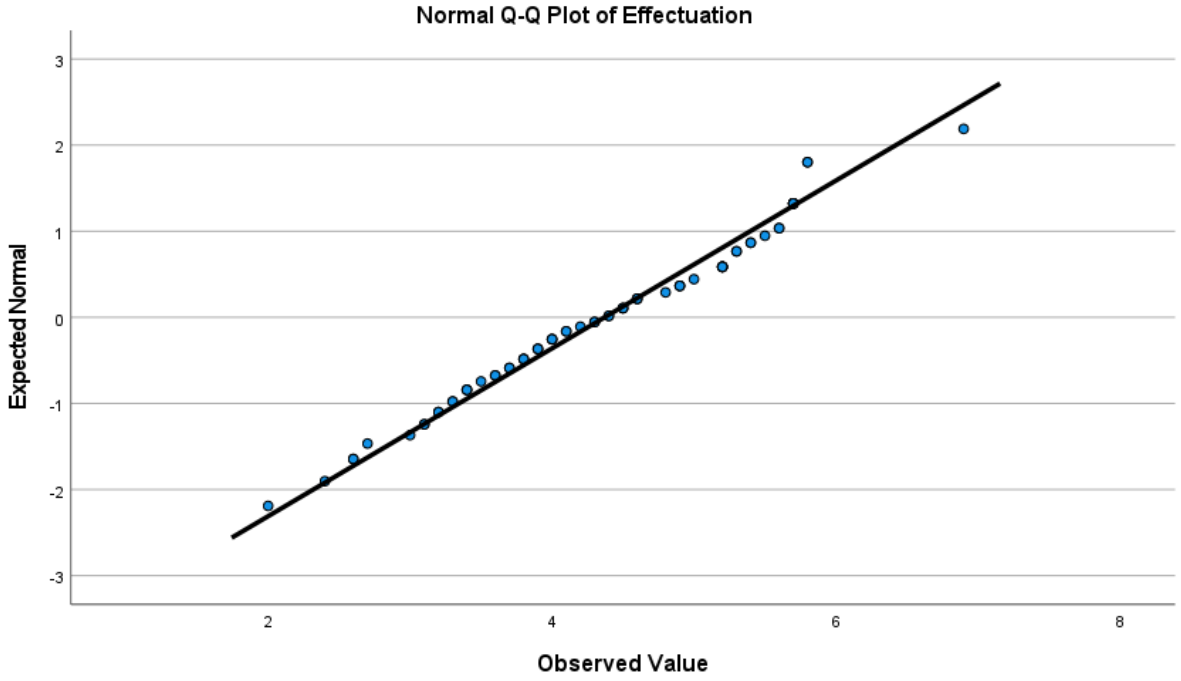
Visual inspection of the studentized deleted residuals revealed 1 'outlier', whereas the analysis revealed 2 leverage points over 0.5, and 36 between 0.2 and 5.0. However since, the analysis of the Cook's distance revealed zero influential points no responses were removed from the analysis.

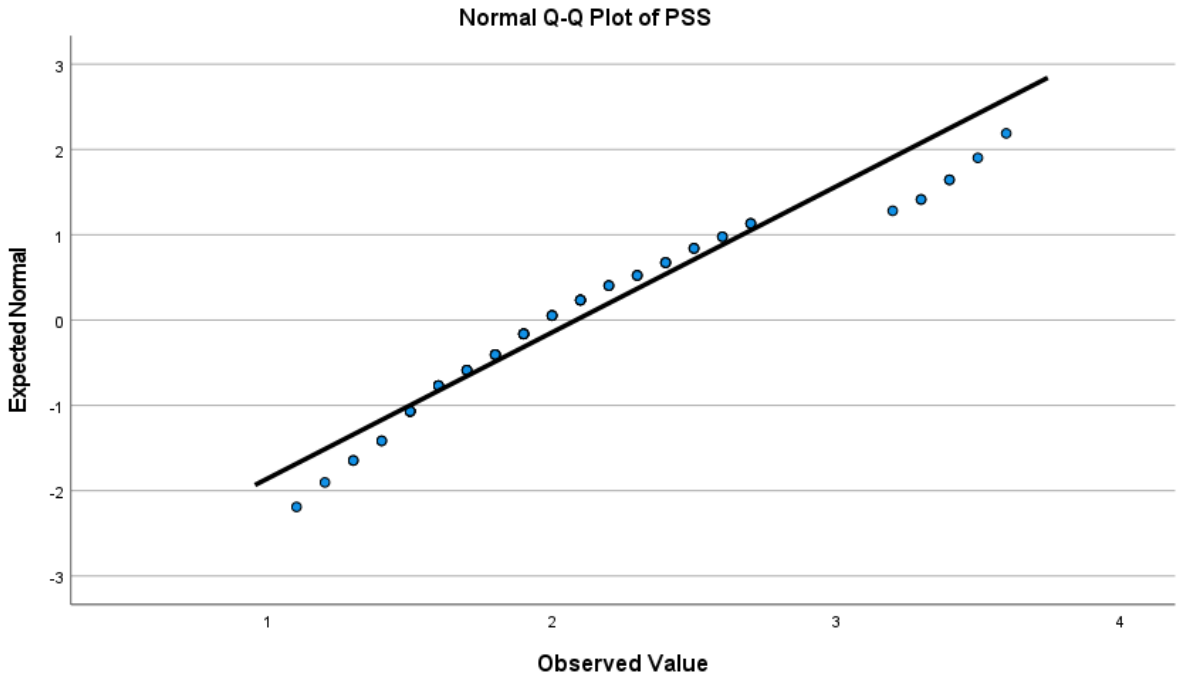
**Assumption #8 – The errors (residuals) should be approximately normally distributed**

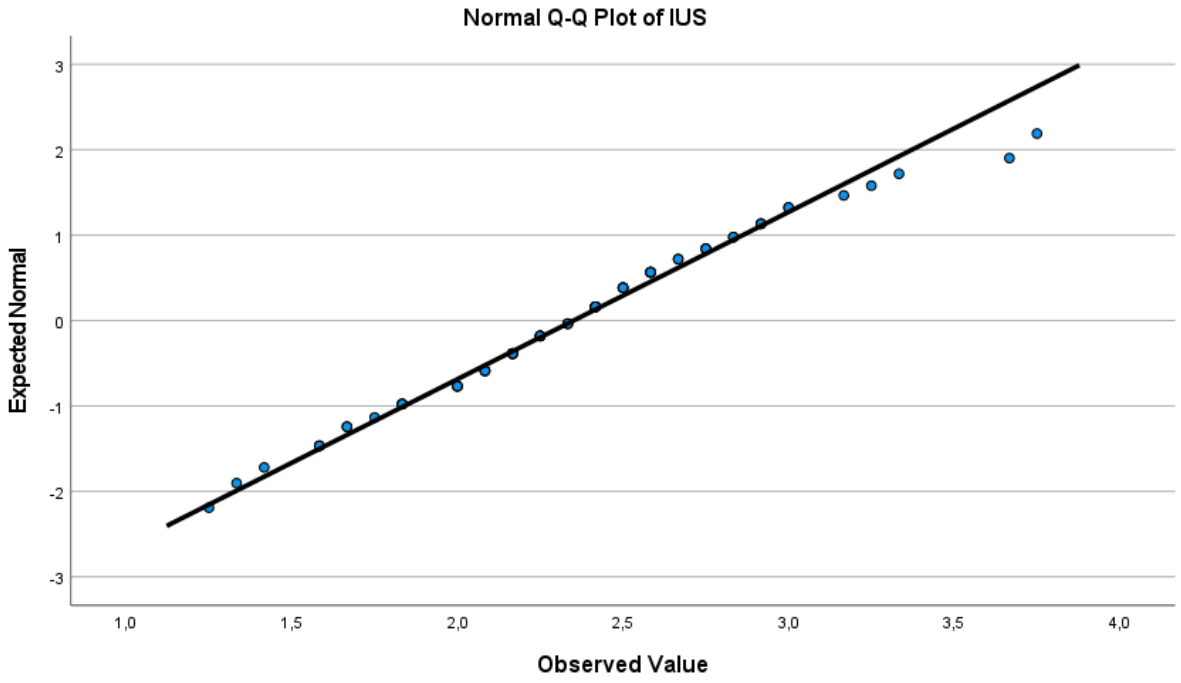
Assessed through Shapiro-Wilk and Q-Q plots. Shapiro wilk indicates that PSS shows a deviation from a normal distribution. However, the skewness and kurtosis are within -1 and +1 and can therefore be seen as normal (George & Mallery, 2003; Gravetter & Wallnau, 2013).

| | Shapiro-Wilk | | | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | Std. Error | Statistic | Std. Error |
| Causation | .984 | 69 | .550 | .170 | .287 | .721 | .570 |
| Effectuation | .977 | 69 | .234 | -.078 | .289 | -.597 | .570 |
| PSS | .930 | 69 | .001 | .887 | .289 | .406 | .570 |
| IUS | .985 | 69 | .560 | .301 | .289 | .404 | .570 |


Normal Q-Q Plot of Causation
Expected Normal
4
2
0
-2
2
3
4
5
6
7
Observed Value


Normal Q-Q Plot of Effectuation
Expected Normal
3
2
1
0
-1
-2
-3
2
4
6
8
Observed Value


Normal Q-Q Plot of PSS
Expected Normal
3
2
1
0
-1
-2
-3
1
2
3
4
Observed Value


Normal Q-Q Plot of IUS
Expected Normal
3
2
1
0
-1
-2
-3
1,0
1,5
2,0
2,5
3,0
3,5
4,0
Observed Value