

Entrepreneurship under radical uncertainty: A cognitive perspective  
on experimenting in the unknown.



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18-03-2022

## Acknowledgements



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## 1.0 Introduction

Is it simpler to be aware of that what you *know*, or that what you *don't know*? The standpoint of this dissertation is that the latter is nearly impossible to be exactly explored. People are not destined to have a complete awareness of their ignorance, and this may be particularly true for entrepreneurs, since they often move on unknown ground while relying on incomplete, non-objectively decision-making processes under uncertain and complex circumstances (e.g. Forbes, 2005; McMullen & Dimov, 2013; Packard et al., 2017).

Understanding how individuals make decisions has become a major scientific topic over the past several decades, and is nowadays spread across many disciplines. Indeed, this cognitive process of judgment and decision-making is at the heart of entrepreneurship. The person central within this process is the entrepreneur – “someone who specializes in taking responsibility for and making judgmental decisions that affect the location, the form, and the use of goods, resources or institutions” (Hebert & Link, 1988, p. 155).

For a great deal, entrepreneurial activities are nowadays considered to be affected by “knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth” (Mitchell et al., 2002, p. 97). Attempts to explain variation between *why* some individuals are capable to identify and utilize entrepreneurial opportunities, while others are not, have led entrepreneurship researchers to move away from the so-called ‘trait-approach’, and acknowledge the importance of individual mental processes. In this dissertation, I focus on what is nowadays seen as a (or perhaps *the*) main asset for entrepreneurs to explain success: their *cognition*. Cognition is traditionally seen as one of the main components of the mind, and describes the mental processes involved in acquiring knowledge and awareness (Thagard, 2005). A focus on the individual mind implies the importance of cognitive characteristics - thinking patterns that support entrepreneurs to make sense of a complex, dynamic, and often unknown environment to come to reasonable judgments and decisions in their journey of start-up launch and growth.

*“Cognitive science is the interdisciplinary study of mind and intelligence, embracing philosophy, psychology, artificial intelligence, neuroscience, linguistics, and anthropology. Its intellectual origins are in the mid-1950s when researchers in several*

*fields began to develop theories of mind based on complex representations and computational procedures.”*

Thagard, 2005, p. ix

The cognitive approach is considered to have much potential in entrepreneurship because it serves as a process lens through which to “re-examine the people side of entrepreneurship”, by investigating memory, learning, problem identification, and decision-making abilities of entrepreneurs (Mitchell, et al., 2002, p. 93). It is widely recognized as an important key to comprehending entrepreneurial success. As a result, cognition and entrepreneurial activities are deeply interwoven. Indeed, understanding entrepreneurial behaviour requires consideration of mental representations of the individual, and the interaction the person has with the economic environment (Grégoire et al., 2011).

The key elements of *entrepreneurial cognition* are knowledge structures and decision-making, that collectively define the larger context of the domain of entrepreneurship, namely, opportunity evaluation, venture creation, and growth (Mitchell et al., 2007). These contextual conditions are represented by *uncertainty*, and can be defined as “the decision-maker’s judgments of the propensity for each of the conditioning events to occur” (Hastie, 2011, p. 657). The research field of *judgment and decision-making* – the process of identifying and choosing one of the possible alternatives – has consequently become a significant area in studying entrepreneurial activity (Grégoire et al. 2011; Mitchell et al., 2014).

Judgments are, naturally, cognitive by nature and “the (largely tacit) ability to make, under conditions of structural uncertainty, decisions that turn out to be reasonable or successful *ex post*” (Langlois, 2007, p. 1112). From a cognitive perspective, entrepreneurs have a rather unique approach due to their innate capacity to deal with external factors such as high levels of uncertainty, ambiguity, time pressure and emotional stress. They depend, as a result of these non-optimal conditions, on non-objectively decision-making strategies. This is because under uncertain conditions, outcomes of entrepreneurial decisions cannot be known a priori (Knight, 1921).

To piece together previously unconnected information, entrepreneurs heavily rely on their mental models to overcome these limitations, reduce uncertainty, and keep moving forward (Alvarez & Barney, 2004; Shepherd et al., 2007). For example, entrepreneurs reduce uncertainty by trial-and-errors, identifying the most crucial uncertainties by experimenting in a manner that resolves their greatest proportion effectively (Kerr et al., 2014).

On the one hand, cognitive processes may enable superior performance because they assist entrepreneurs to adapt to their dynamic environment (Dew et al., 2015). These regulative processes are known to serve entrepreneurs in, for example, developing an accurate self-perception about one's decisions, a significant condition in the decision-making processes of entrepreneurs (Sadler-Smith, 2016). Thinking of thinking, or *metacognition*, is such a process (Flavell, 1979). This is because metacognition is a higher-order process that systematizes what individuals know and recognize about themselves and tasks. It refers to an individuals' understanding and knowledge of one's own cognition, and helps entrepreneurs to reduce uncertainty in decision-making situations that involve outcomes and variables that are unknowable (Haynie et al., 2010). Specifically, metacognition is a source to better understand:

*“why people differ in their cognitive strategies, but also why an individual may use different cognitive strategies when facing different contexts and different motivational states and after experiencing different types of feedback. The entrepreneurship literature has not yet incorporated these ideas.”*

Haynie et al., 2010, p. 226

At the same time, cognitive processes may be distorted in the mind of the decision-maker (Busenitz & Barney, 1997). This is because entrepreneurs are rationally bounded (Simon, 1955). When entrepreneurs make decisions, fast-and-frugal, intuitive strategies serve as an efficient guide to simplify information, and to make sense of uncertain and complex situations more quickly (Mitchell et al., 2007). Specifically, entrepreneurs are prone to certain types of *cognitive biases* - systematic deviations from rationality or norms in judgment and decision making (Kahneman & Tversky, 1996; Baron, 2007). These cognitive, simplifying processes may particularly lead to biases in highly unpredictable entrepreneurial environments (Gilbert-Saad et al., 2018).

While these deviations can be both beneficial (Hayward et al., 2010) and harmful (Hayward et al., 2006) in the decision-making process (Sarasvathy & Berglund, 2010), entrepreneurs generally move on a challenging path of becoming *aware* that a cognitive bias may have pushed them away from the original intention.

However, when relying on their intuition, individuals face difficulties to become aware of the flaws in their decision-making process. When entrepreneurs mentally apply fast strategies, they ignore parts of the information in their decision-making processes to make sense of their “incomplete knowledge of the world”, and about the link between their “present actions and their future outcomes” (Kay & King, 2020, p. 24). These uncertainties eventually represent *ignorance* – a lack of information, knowledge, or awareness of the entrepreneur in the decision-making environment (Bastian & Zucchella, 2022).

Ignorance in the decision-making process of entrepreneurs may cause limitations because it may appear in an invisible stage where some potential outcomes might not (even/yet) be identified. The awareness of these limitations to access information and acquire knowledge in order to make sound decisions is essential in identifying the ‘known knowns’ – information and knowledge that entrepreneurs have and *know that they have* – and the ‘known unknowns’ – information and knowledge that entrepreneurs do not have and *know that they lack* (Dunning, 2011).

For example, when Patagonia changed leadership in 1979, The CEO later admitted that: “I had no business experience so I started asking people for free advice. I just called up presidents of banks and said, “I’ve been given these companies to run and I’ve no idea what I am doing. I think someone should help me.” And they did. If you just ask people for help – if you just admit that you don’t know something – they will fall all over themselves trying to help. So, from there I began building the company” (Chouinard, 2016, p. 38).

Once recognized, ignorance may lead to sound judgment, decisions, and action (Gilovich, 1991; Shepherd et al., 2007). However, research has shown that one’s misinformed, subjective mind often prevents recognition (Hayward et al., 2006; Kruger & Dunning, 1999). As a consequence, ignorance exists in forms that are rather invisible in entrepreneurs’ decision-making process: Decisions or solutions that an entrepreneur might arrive at if only the decision-maker knew of its existence.

From a cognitive perspective, entrepreneurs find themselves continuously in a process in which they ‘don’t know’. Take the example of a team of entrepreneurs who are overconfident “at the beginning of the process because they do not understand what they do not know” (Niittymies and Pajunen 2019, p. 6). It is by the process of discovery and experimentation that entrepreneurs perceive their ignorance and translate these unknown matters into knowns.

The ‘unknown unknowns’ – information that is relevant to the project but that entrepreneurs *do not know they lack* – is information that is not questioned because it lies outside an entrepreneurs’ cognitive scope. It may frequently refer to essential project information such as potential problems, risks, actions and strategies (Dunning, 2011). For example, entrepreneurs may be unaware of data because they lack the skills to make sense of it, or because it is not brought to their attention (Hayward et al., 2006). This implies that problems entrepreneurs try to solve, and the alternatives they try to test, are often unknown at the outset (Hatchuel, 2001; Garud et al., 2008). Entrepreneurs may overcome these knowledge gaps with the help of, for instance, experimentation, in which the unknowns are represented by variables that are not known a priori (Gillier & Lenfle, 2019).

However, this additionally implies that entrepreneurial cognition does not just include the study to understand how entrepreneurs make use of their knowledge structures, but furthermore how they become aware of unknown matters in order to overcome their ignorance (Shepherd et al., 2007).

## 1.1 *Problem area of the research*

The following two sub-chapters represent the identified problematic areas:

### 1.1.1 *Lack of understanding of the role of unknowns in entrepreneurship*

*“All you need in this life is ignorance and confidence, then success is sure.”*

Twain, 1887

Generally, entrepreneurs do not know *precisely* what to do with scenarios with unknown outcomes. That is because these scenarios represent forms of ignorance, such as ill-defined problems, complexity, volatility, vagueness, and ambiguity. Nowadays, the decision-making environment is becoming increasingly challenging for entrepreneurs. Unknown, unimagined, (and as a consequence) unanticipated events are on the rise in a competitively growing world,

requiring entrepreneurs to make decisions under tremendous time constraints and immense pressure. Crises; political, human, environmental or health, and the more recent COVID-19 pandemic and Russian-Ukrainian conflict, have shown that most people do not consider, nor do they know how to interpret, issues that are radically uncertain since these answers are beyond anticipation, hidden in a set of unknowns.

*Radical uncertainty* represents increased forms of ignorance in which individuals do not know what will happen and do “do not even know the kind of things that *might* happen” (Kay & King, 2020, p. 24). This is because radical uncertainty is full of unforeseen, unpredictable, and unexpected changes, which makes adaptation and fast action impracticable (Ehrig & Foss, 2021). Bearing in mind that entrepreneurs nevertheless cope with these complexities and, at the same time, face high venture failure rates (Cooper et al. 1988; Wu & Knott, 2006), it is probable that some beliefs that founders have in their decision-making abilities are comparable to that of their judgment about their market expectations; cognitively distorted and incomplete (Hayward et al., 2006).

This is because much is not known, and cannot be known, under radical uncertainty *a priori*, hindering entrepreneurs to reliably plan and anticipate their steps in the venture creation process. These unknown unknowns, such as the first months of the COVID-19 pandemic, may cause additional difficulties when entrepreneurs need to make decisions. For example, when “the future is cloudy”, and individuals recognize their ignorance about a particular circumstance, “they are frequently frozen with indecision and in a state of complete inaction” (Roy & Zeckhauser, 2015, p. 70). Similarly, human judgments is generally poorly correlated with actual performance because this process relies on many unknown factors within the mental model of the individual. As a result, one’s knowledge and one’s awareness are frequently weakly correlated (Radecki & Jaccard, 1995).

For example, when individuals tend to show overly optimistic self-evaluations, they miss seeing the ‘bigger picture’ because their lack of cognitive tools deprives them of objectively analysing their own actual performance (Arkes et al., 1987; Hacker et al., 2000; Fischhoff et al., 1977; Moreland et al., 1981; Pallier et al., 2002). Ultimately, individuals remain largely *unaware of what they don’t know*, and this directly influences judgments, decisions, and performance (Kruger and Dunning, 1999).

Despite the fact that most of the studies above find their foundations in psychology, entrepreneurship and the topic of ignorance show many similarities. For example, the process of uncovering opportunities, an important assumption in entrepreneurship cognition, “is based on notions of complete ignorance (i.e., “I don’t know what it is that I don’t know”). That is, the individual is not consciously investigating the phenomenon and may even be involved in alternative activities that engage his or her attention, thereby preventing recognition of a third-person opportunity” (McMullen & Shepherd, 2006, p. 145-146). Here, entrepreneurs find themselves in the attention stage that represents ignorance about the opportunity to exist. When entrepreneurs move from what they don’t know towards what they know, they may do so with the help of *experimentation*.

Specifically, “experimentation in the unknown is carried out without even knowing the successful set of experimental variables” (Gillier & Lenfle, 2019, p. 450). During radical uncertainty, entrepreneurs experiment in unknown situations to solve complex puzzles, and achieve innovations (Feduzi & Runde, 2014; Loch et al., 2006). Different from traditional hypothesis testing, ignorance may not accommodate experimentation on well-structured problems. Rather, when most information is absent, entrepreneurs experiment based on ill-defined problems (Simon, 1973), covering explorative, divergent cognitive processes to move forward (Gillier & Lenfle, 2019).

Although the degree to which entrepreneurs ‘do not know what they do not know’ parallels with entrepreneurial phenomena such as decision bias (Forbes, 2005), discovery (McMullen & Shepherd, 2006) and opportunity beliefs (Shepherd et al., 2007), it is unclear what this process implies for entrepreneurs and their cognitive structures. Empirical evidence about knowledge acquisition processes in entrepreneurship cognition is elusive (Zucchella, 2021). For example, while knowledge, such as entrepreneurial expert scripts, can bias entrepreneurs (Mitchell et al., 2008), ignorance similarly interacts “in significant ways” with biases and heuristics (Roy & Zeckhauser, 2015, p. 67). Alvensson and Spicer (2012) noted that in management, “the K word is often part of a confidence-trick”, and that this “fetishistic interest in knowledge and intelligence can in some cases drive ignorance and poor judgement” (p. 33 – 40).

Entrepreneurial cognition, in its definition, underlines the presence of ‘knowledge structures’ to make sense of judgments and decisions (Mitchell et al., 2002). While the acquisition of new knowledge is typically seen as something beneficial for entrepreneurs as “the most strategically important of the firm’s resources” (Grant, 1996, p. 110), new knowledge, by definition, leads to new perspectives of what is unknown. Indeed, people never reach complete knowledge as long as new knowledge is discovered, since “the unknown is not diminished by new discoveries. Quite the contrary: the realm of the unknown is magnified” (Gross & McGoey, 2015, p. 1). Besides, the procedure of knowing what individuals know and what they don’t know is a metacognitive process (Haynie et al., 2010). While this raises the perhaps uncomfortable debate to incorporate the antithesis of knowledge, entrepreneurship cognition scholars rather follow the tendency to systematically ignore the topic of ignorance (Ungar, 2008). I identify this to be a problematic area, since only one side of the blade is currently fully recognized:

*“Herbert Simon (1999) argues that behavior is shaped by the two blades of a pair of scissors, one blade representing cognition and the other symbolizing the decision environment. To recognize the potential presence of ignorance, both blades should be deployed.”*

Roy & Zeckhauser, 2015, p. 71

Specifically, the discussion of ignorance from a cognitive perspective is significant, since it is an inescapable widespread phenomenon and prevalent in everyday life (Smithson, 1993). Non-entrepreneurship scholars have called for moving “one step further and show that ignorance needs to be understood and theorized as a regular feature of decision-making in general, in social interactions and in every communication” (Gross & McGoey, 2015, p. 4). However, the topic attracted little interest so far (Roberts, 2013). This lack of attention is recognized to be “hardly surprising considering the current focus on knowledge creation and organizational learning (e.g. Cohen & Levinthal, 1990; Gold et al., 2001; Spender, 1996) underpinning the “grandiose” claims of a knowledge society (Alvesson, 2013)” (Schaefer, 2014, p. 236). In this dissertation, I define ignorance as a lack of information, knowledge, or awareness (Bastian & Zucchella, 2022). Throughout the next chapters, it will become clear that my positioning of ignorance is diverged from more commonly, specific used terms such as (un)aware (in)competence, perceived behavioural control, or self-efficacy, which, respectively, resemble learning, perceptions, and task-specific confidence (e.g. Bandura, 1977; Hayward et

al., 2010). Rather, I will demonstrate that ignorance has a broader, centralized function in entrepreneurs' (meta)cognitive operations in their uncertain decision-making, as illustrated by Figure 1.

From a Socratic perspective, acknowledged ignorance is considered to belong to wisdom, while Foucault (1972) questioned the legitimacy of knowledge in his essays. In entrepreneurship, scholars have systematically, or perhaps strategically, ignored the topic of ignorance. On the other hand, just very recently, while writing this dissertation, special issues edited by Alvarez and colleagues (2018) in *Academy of Management Review* and Foss and colleagues (2021) in *European Management Review*, acknowledged that current work on limited knowledge and decision-making under radical uncertainty is fragmented. Indeed, this dissertation identifies this to be a problematic issue, particularly because the recognition of ignorance brings precisely those benefits that entrepreneurs strive for; innovation, opportunities, and creativity (Smithson, 1993).

### 1.1.2 *Lack of explorative understanding of metacognitive processes in the decision-making process*

To cope with ignorance, entrepreneurs follow a path in which they become aware of their judgments, decisions, and actions (Shepherd et al., 2007). The cognitive processes that underline these assumptions, such as perceiving, noticing, processing, and retrieving, explain variations within individuals and their differences in context. However, the underlying mechanisms that explain not only how knowledge structures lead to the completion of activities, but additionally clarify how these activities will processual be performed in the mind of the entrepreneur, is in the need of more explorative research (Shepherd et al., 2014), and particularly in the decision-making process (Haynie et al., 2012). In general, awareness mechanisms such as self-control, impulsive regulation and metacognition are key but underdeveloped areas (Baron, 2014; Haynie et al., 2010).

I identify the lack of explorative works in this area to be problematic. In behavioural science, metacognition has been argued to be a process in which individuals *overcome their ignorance* because it promotes accurate judgment, and helps to identify heuristics and biases in the decision-making process (Kruger & Dunning, 1999). Earley and Ang (2003) additionally argued that individuals who employ metacognitive processes do more cognitively adapt to an

uncertain environment. One promising direction here is research on neutralizing biases in order to improve the decision-making process (Cossette, 2014).

At the same time, recognizing the prevalence of biases is a challenging task (Milkman et al., 2009). This is because people are usually not aware of the flaws in their decision-making process, most of it passes unrecognized. Metacognition may be a way out of this process because:

*“In a sense, metacognition serves as a psychological mechanism that bridges the divide between the biases embedded in individuals’ cognitive mechanisms, and a state of cognitive adaptability that facilitates functioning in a dynamic environment. Metacognition can help individuals compensate for limitations to decision making brought on by heuristics and biases in decision making. This compensating effect of metacognition may be especially important for entrepreneurs who often need to access different cognitive strategies given their dynamic and challenging environment.”*

Haynie & Shepherd, 2009, p. 708

Metacognition in particular is a key area of research, since it supports entrepreneurs to overcome their general limited awareness of the decision-making process by promoting accurate judgment through a higher-order mental process (Rosi et al., 2019). However, this process has not yet been addressed in entrepreneurship yet, explorative work in metacognitive studies is absent. For example, while Haynie et al. (2012) suggested metacognition to be a source of answering by some individuals are better adapting to uncertain environments than others, empirical evidence is elusive. This dissertation connects the rich studied entrepreneurial cognition field, with its research on how individuals identify and act upon entrepreneurial opportunities, and on the other hand, metacognition, how individuals formulate strategies based on a set of cognitive mechanisms (De Winnaar & Scholtz, 2019; Haynie et al., 2010).

While cognition research has focused on “how certain cognitive heuristics and biases produce decisions that deviate from the precepts of classical rationality”, metacognition studies generally concentrated on how individuals adapt cognitive processes to empower performance (Dew et al., 2015; Sarasvathy & Berglund, 2013, p. 166). However, although neglected by entrepreneurship scholars, metacognition serves a wider range of different cognitive applications. It may “serve as an alarm that activates analytic forms of reasoning that asses and

sometimes correct the output of more intuitive thinking” (Alter et al., 2007, p. 569) and counteract “the pernicious tendencies that drive people’s behavior” (Colombo et al., 2010, p. 446).

In entrepreneurship research, these processes have been overlooked so far. Metacognition has, thus far, mainly been conceptualized as an adaptive feature as part of the entrepreneurial mindset (Haynie et al., 2010), and shown to increase consistent decisions (Mitchell et al., 2011) and feedback adaptation (Haynie et al., 2012), with little contextual explorations in which these processes of moving from unknowns towards knowns unfold in the decision-making process. For example, while metacognitive processes do not only require the awareness of the self during interactions, but also of others, little is known about metacognition and the role of the social environment for entrepreneurs during the start-up creation process. Additionally, fields different from entrepreneurship have demonstrated that metacognitive training increases one’s decision-making ability, a crucial condition for entrepreneurs to, for example, overcome cognitive biases and heuristics.

However, research in this direction is remarkably absent in entrepreneurship cognition research (Zhang & Cueto, 2017), “experimenting in the unknown remains rather underexplored” (Gillier & Lenfle, 2019, p. 465). This is peculiar for entrepreneurship researchers, since entrepreneurs can better diminish their biases by thoroughly considering, validating, and hypothesizing customer needs with the help of experiments (Camuffo et al., 2020; Shepherd et al., 2014).

This dissertation proposes an alternative perspective on these matters, supporting the idea that metacognition can complement entrepreneurship cognition, and its research on uncertainty and biases, in the decision-making process of entrepreneurs. Specifically, the focus of entrepreneurship cognition researchers on the identification of certain cognitive biases and heuristics *exclusively*, although valuable, is proposed to be problematic. This is because the process of identifying biases and heuristics shows just one side of the coin, that is, its existence, with little clarification on how these biases, if feasible, may be best overcome (e.g. Busenitz & Barney, 1997; Forbes, 2005). In other words, research on the identification of cognitive biases says little about the process of how entrepreneurs cope with these in their venture creation process. As a consequence, this dissertation overcomes the old-fashioned approach of

*identifying* cognitive biases and heuristics, and shifts towards a process of *neutralizing*, hence providing practical insights into the decision-making process of entrepreneurs.

## 1.2 *Research aims*

Since entrepreneurial cognition research is about understanding how entrepreneurs use simplifying mental models to piece together previously unconnected information, to identify and invent new products or services, and to assemble the necessary resources to start and grow businesses (Mitchell et al., 2002), this dissertation provides a cognitive perspective on how entrepreneurs guide their projects from the unknowns towards the knowns. Thus, the general aim of this dissertation is to give theoretical and practical arguments by answering the main research question: *How do entrepreneurs move their projects from their unknowns towards their knowns in the context of radical uncertainty?* The aim of this dissertation is to analyse these processes from different perspectives with the help of three essays. On the one hand, this work elucidates that ignorance is a cognitive function. Specifically, the proposition of my dissertation is that entrepreneurial cognition theories are insufficiently taking into account the significance of ignorance as a topic.

I argue that the study of ignorance is a *hidden assumption* (Alvesson & Sandberg, 2020) in entrepreneurship research, there are clear indications that confirm its relevance (Bastian & Zucchella, 2022). Indeed, entrepreneurs are on a continuous journey in which they shift between their knowns and unknowns, and these “cognitive activities involve taking risks and deal with uncertainty, which deal, ultimately, with forms of ignorance” (Arfini, 2019, p. 11). More precisely, the source of systematic deviations in the decision-making process of entrepreneurs may be derived from ignorance (Roy & Zeckhauser, 2017). These processes have not been analysed by scholars yet. The first research aim is to investigate ignorance as a crucial component of entrepreneurial cognition that influences, passively or actively, beliefs, abilities and behaviours in *Essay 1*. I will shed light on this matter by analysing firstly, ignorance in a specific decision context, by answering “*What is the role of ignorance for entrepreneurs and their decision to enter a foreign market?*”

To overcome their ignorance, entrepreneurs use cognitive tools to become aware of how one is performing, when one is likely to be accurate in judgment and when one is likely to make

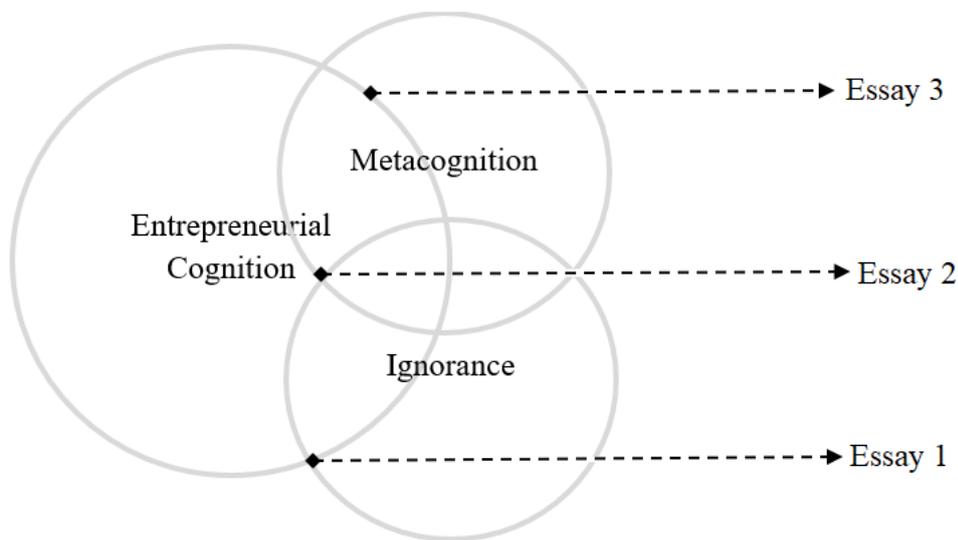
errors in their decision-making process (Everson & Tobias, 1998). Specifically, entrepreneurs engage in cognitive trial-and-error processes in which they become aware of their choices and behaviours through metacognitive processes.

While experimentation serves entrepreneurs to explore unknown situations and to perceive their lack of knowledge, it also offers a powerful tool for researchers to explore “the qualitative richness of entrepreneurship phenomena” (Hsu et al., 2017, p. 2). Consequently, in order to explore how metacognition can be used in an experimentation process for the purpose of improving entrepreneurial decision-making processes, the research aim of *Essay 2* is to analyse the process in which entrepreneurs become aware of their ignorance by examining “*What is the effect of a metacognitive treatment on an entrepreneurs’ tendency to make biased decisions?*” Hence, the second part of this dissertation studies the deeper processes of an individual’s understanding and recognition of one’s own cognition. Specifically, my dissertation proposes that metacognition may help entrepreneurs in their decision-making process to become aware of the influence of cognitive biases, a topic that is notably missing in entrepreneurial cognition research (Zhang & Cueto, 2017).

Metacognition has received attention by entrepreneurship scholars only recently, our understanding of the topic is incomplete. Current studies lack explorative approaches, and particularly miss contextualizing circumstances in which start-up creation processes unfold (Haynie et al., 2012). In fact, most metacognitive studies make use of quantitative methods (e.g. Haynie et al., 2012; Mitchell et al., 2006; Mitchell et al., 2011), while more research is needed in exploring “metacognitive aspects on entrepreneurial decision-making” (Shepherd, 2014, p. 24), using an explorative lens since “much can be understood about cognition and its metacognitive regulation through qualitative analysis” (Pressley, 2000, p. 261).

*Essay 3* answers “*How do entrepreneurs use the understanding of their cognition to develop their start-ups?*”, and explores how metacognitive processes influence the start-up creation process of nascent entrepreneurs, comparing a context of uncertainty with a context of radical uncertainty. As a matter of fact, considering that the data collection and writing phase of the last essay has been conducted during the early COVID-19 stages, as a researcher, I found myself too in a process of coping with radical uncertainty. *Figure 1* represents the intersection of the research areas with the corresponding essays.

**Figure 1:** *Positioning of the dissertation*



### 1.3 *Structure of the dissertation*

This dissertation integrates three specific sections as illustrated by *Figure 1*. What will follow firstly is an extensive literature review about the above mentioned problematic areas. Next, the methodological section portrays philosophical commitments, a justification of the study strategy, and an explanation of the data collection and data analysis process. Then, this dissertation is based upon the collection of three essays, with each of them serving a specific sub-purpose to fulfil the research question:

- *Essay 1, Ignorance and international entrepreneurship. Two sides of a blade in the decision to enter a foreign market*, explores the role of ignorance in a specific decision context. Through a cognitive, explorative lens, the essay problematizes the role of ignorance in International Entrepreneurship. A link between ignorance and the role of judgment and decision-making is made, analysed both from a problematic and beneficial side for entrepreneurs. Finally, several ways to cope with ignorance are discussed. It has been published in Springer's *The international dimension of international entrepreneurial decision-making: cultures, contexts, and behaviours*.

- *Essay 2, To be aware or not to be? The impact of metacognition on entrepreneurial decisions*, measures the causal relationship between metacognition and decision-making improvement. Specifically, the essay explores the role of a specific cognitive bias with particular relevance under radical uncertainty, namely the status-quo bias. This bias describes the tendency of entrepreneurs to (1) stick with a previously made decision, or (2) to do nothing at all. Since most individuals dislike uncertainty and are in a need of control, this bias has a significant impact under radical uncertainty, where these conditions are excessively present. With a series of experiments, the essay provides methodological and theoretical insights about the role of metacognition in the process of decision-making for entrepreneurs. It has been presented at several workshops and conferences, such as *CEER 2021 & 2022* organized by the Centre of Entrepreneurship of the University of Groningen, *4PDS* organized by the University of Sevilla, the *ENTERYNG* workshop, jointly organized by the Universities of Napoli, Bergamo, and Pavia, *ESU 2021* in Groningen, and *ACERE 2022*, organized by the Australian Centre for Entrepreneurship Research QUT Business School.
  
- *Essay 3, Entrepreneurial metacognition. A study on nascent entrepreneurs*, empirically explores the process in which nascent entrepreneurs employ their metacognition during two phases, namely the start-up intention and start-up creation process. Comparing contexts that represent uncertainty on the one hand, and radical uncertainty on the other hand, the essay emphasizes the role of social capital when entrepreneurs think about their thinking. Specifically, the social context appears to have a crucial role in the development of metacognitive processes for entrepreneurs and their teams. Consequently, these processes support entrepreneurs and their teams in improving their decision-making processes, for example, in the heterogeneity of the team composition. The outcomes of the findings highlight a dynamic model in which these relationships emerge. The essay is forthcoming in the *Special Issue “Dancing between intuition and rationality”* by the *International Entrepreneurship and Management Journal*. Different versions of the essay have been presented at several workshops and conferences, such as *EURAM 2020 & 2021*, the *51st Annual Conference of the Decision Sciences Institute*, and *ACERE 2021*, organized by the Australian Centre for Entrepreneurship Research QUT Business School.

Table 1 highlights an overview of the essays in this dissertation. The last section of this dissertations outlines the main conclusions and implications of the research, limitations, and presents future research directions.

**Table 1:** *Overview of the essays in this dissertation*

<i>How do entrepreneurs move their projects from their unknowns towards their knowns in the context of radical uncertainty?</i>			
	<i>Essay 1</i>	<i>Essay 2</i>	<i>Essay 3</i>
<b>Title</b>	Ignorance and international entrepreneurship. Two sides of a blade in the decision to enter a foreign market.	To be aware or not to be? The impact of metacognition on entrepreneurial decisions.	Entrepreneurial metacognition. A study on nascent entrepreneurs.
<b>Research question</b>	<i>What is the role of ignorance for entrepreneurs and their decision to enter a foreign market?</i>	<i>What is the effect of a metacognitive treatment on an entrepreneurs' tendency to make biased decisions?</i>	<i>How do entrepreneurs use the understanding of their cognition to develop their start-ups?</i>
<b>Method</b>	Conceptual	Experimental	Qualitative

## 1.4 *Intended contributions*

The present dissertation intends to provide contributions based on the identified problematic areas of the research, answering how entrepreneurs guide their project from the unknown towards the known in the context of radical uncertainty. Firstly, the research has the ambition to produce a contribution by considering the phenomenon of ignorance as a cognitive function in entrepreneurship.

*Essay 1* aims to develop a theoretical contribution by intersecting entrepreneurship and decision-making literature with ignorance. Arguments that will support the intended contribution are made by underlining that entrepreneurship theories tend to be knowledge obsessed, highlighting the idea that firms do not necessarily follow a process of knowledge acquisition. Specifically, the decision to start operating in foreign markets depends on many unknown factors in the decision-making that imply degrees of ignorance, particularly in the knowledge structures entrepreneurs use to make sense of, for example, cognitive shortcuts.

Further, *Essay 2* proceeds with these arguments and demonstrates that ignorance in the decision-making process can be overcome by entrepreneurs. Specifically, *Essay 2* aspires a contribution to the entrepreneurship cognition literature by showing why some cognitive biases can be overcome by increasing awareness of one's decision-making process, while others cannot. While previous studies have generally focused on the identification of cognitive biases, *Essay 2* desires to offer novel contributions on neutralizing cognitive biases. From a theoretical point of view, *Essay 2* combines different literature streams, explaining why metacognition may improve the decision-making processes of entrepreneurs, why this occurs on specific cognitive biases, and what are the mechanisms that explain this relationship. From a methodological perspective, *Essay 2* contributes to the literature because it will offer and test self-developed decision-making scenarios that can be used in subsequent de-bias studies. Additionally, the study aims to contribute by highlighting specific training instructions that may be implemented pragmatically. As a result, the study offers additional practical contributions to the field. Particularly, the contribution that a metacognitive intervention may overcome ignorance about the decision-making process is precious for entrepreneurship educators, incubators, and other practitioners involved in entrepreneurial activities.

Then, *Essay 3* intends to contribute to uncovering the understudied role of metacognition in the decision-making process of entrepreneurs. Specifically, entrepreneurs relatively new to the venture creation process will be analysed using an explorative methodology, while operating under different degrees of uncertainty. The use of a qualitative approach is a substantial contribution, it is one of the first to do so and offers novel possibilities for explorative works to advance knowledge about the antecedents and consequences of metacognition in the entrepreneurial process.

*Essay 3* offers novel contextual contributions in the process in which entrepreneurs make use of their metacognition. Particularly, the role of social capital is found as an important antecedent to reinforce metacognitive processes. The comparison between particular research contexts provides additional significant insights into how differences in the use of social capital lead to different metacognitive responses, and how these processes emerge towards entrepreneurs and their teams in the decision-making process. Consequently, *Essay 3* intends to contribute to a new theory by highlighting that these metacognitive processes generate important outcomes for entrepreneurs to move beyond the status-quo, expand their ecosystems, and stimulate the growth of an entrepreneurial mindset.

## 2.0 *Literature Background*

*"It seems that I am wiser to this small extent, that I do not think I know what I do not know"*

Apology of Socrates 29b, Plato.

Entrepreneurship researchers have worked for decades on one essential question: how do some entrepreneurs launch successful firms while others don't? The perspective of this dissertation is that entrepreneurship must be seen as a journey; an unidentified road full of unknown elements, to be discovered and exploited by those who expose themselves to the risk of failure. This literature review focuses on the act of initiating a business from an individualistic drive to pursue new challenges. Specifically, I focus on what is nowadays seen as a (or perhaps *the*) main asset for entrepreneurs to explain success: their *cognition*. A focus on the individual mind implies the importance of cognitive characteristics - thinking patterns that support entrepreneurs to make sense of a complex, dynamic, and often unknown environment to come to reasonable judgments and decisions in their journey of start-up launch and growth.

### **Illustration 1:** *The entrepreneurial journey of Walter Bonatti*

Take the example of Walter Bonatti, a famous Italian mountain climber that dedicated himself to extreme climbing. Bonatti shocked the world multiple times for his stunning and pioneering climbs in the Alps and Himalayas, that were at that time not only largely unknown areas, but moreover seen as impossible to be done. For Bonatti, climbing was a truly human activity, a way to overcome his limits, to aim at new heights in order to discover the impossible with respect for the unknown. Bonatti possessed awareness and acceptance of the risks of climbing (in fact, four of the climbers of his team died during a tragic Mont Blanc expedition), combined with the humility to abandon and restart his projects that as born from 'not knowing' (enough). This risk, or adventure, was seen by Bonatti as a condition to truly live, to know oneself and to see failure as a part of learning. When faced with unexplored territories, Bonatti did not plan his undertaking, but rather considered them critically while being in action, resulting in reflexivity to explore what it was that he did not know yet. On one of his unexplored summits on the Mont Blanc, Bonatti found himself in an unfavorable situation: out of resources, with weather conditions worsening and no place to seek shelter. These extreme environmental uncertainties made Bonatti question the 'how'. Starting from his humility in which he admitted that he did not know, he then used his imagination and experimented his way out.

After several failed attempts, Bonatti eventually opened a way through an insuperable strait by attaching a rope in a crack, swung it to the other side, and as a result managed to conclude his ascent with a movement previously unknown to him.

The creativity and imagination in Bonatti's way of thinking illustrates that many factors cannot be anticipated *ex ante*. Bonatti found himself, like he experienced during different expeditions at different locations, to be unaware of these unpredictable circumstances, but managed to overcome these unknowns. For Bonatti, this was a natural consequence of exposing and experimenting to new ground and depths. What mattered in the experiences of Bonatti is the drive to overcome his limitations, and the journey in creating self-awareness to know when to turn resources into something for growth, and when to stop to make it down alive.

Walter Bonatti - *The Mountains of My Life* (2010).

## 2.1 *What is entrepreneurship?*

Entrepreneurship as a topic is highly relevant to study because it serves most new employments, new industries, innovations, and solutions to social and environmental problems (Shepherd et al., 2020). New ventures are important drivers of economic development since they heavily contribute to competition, innovation, and job creation (Forbes, 1999). Scholars in the field of entrepreneurship are struggling to agree on a commonly accepted unifying definition (Shepherd et al., 2018). Generally, entrepreneurship involves the initiation, engagement, and performance of entrepreneurial endeavours embedded in environmental conditions, where an entrepreneurial endeavour is the investment of resources (i.e., cognitive, behavioural, financial, and/or other resources) into the pursuit (exploration and/or exploitation) of a potential opportunity (Shane and Venkataraman, 2000; Venkataraman, 1997) or others' over time across multiple contexts (e.g., Busenitz et al., 2003; Davidsson, 2003; Gartner, 1985; Shane, 2003; Wiklund et al., 2011).

### 2.1.1 *The entrepreneur*

The individual central in this process is, with or without others, the entrepreneur. Early efforts to define the entrepreneur have described the person concerned as "someone who specializes in taking *judgemental decisions* about the coordination of scarce resources" (Casson, 1982, p. 23) and "someone who specializes in taking responsibility for and making *judgmental decisions* that affect the location, the form, and the use of goods, resources or institutions" (Hebert & Link, 1988, p. 155).

### 2.1.2 *Characteristics of the entrepreneur*

Entrepreneurs are heterogeneous in a variety of characteristics, such as, just to name a few, motivation, the way of perceived experiences, imagining opportunities, and affective responses. This implies that entrepreneurs do not follow preset, causal, linear paths in their start-up creation process (Lichtenstein et al., 2007). However, in many universities interestingly enough, entrepreneurship courses are designed around the causal creation of a business plan, with a rather homogeneous format to follow. During the last two decades, entrepreneurship researchers have moved away from the so-called ‘trait-approach’ and moved towards research of individual *mental processes*. These mental processes involved in acquiring knowledge and awareness are known as cognition (Thagard, 2005). Main topics that are studied in cognitive psychology and acknowledged to be appropriate for entrepreneurship studies are knowledge, intelligence, heuristics, and cognitive biases (Frese, 2009; Frese & Gielnik, 2014).

## 2.2 Original theoretical assumptions<sup>1</sup>

In 1955, Herbert Simon published a somewhat provocative article in *The Quarterly Journal of Economics* with the title: ‘A Behavioural Model of Rational Choice.’ Reading Simon’s first paragraph (p. 99) demonstrates that established assumptions of his colleagues were rather naïve. “Traditional economic theory postulated an ‘economic man,’ who, in the course of being ‘economic’ is also ‘rational.’ This man is assumed to have knowledge of the relevant aspects of his environment which, if not absolutely complete, is at least impressively clear and voluminous. He is assumed also to have a well-organized and stable system of preferences, and a skill in computation that enables him to calculate, for the alternative course of action that are available to him, which of these will permit him to reach the highest attainable point of this preference scale.”

Simon questioned the idea that humans are narrowly self-interested, rational agents with the main goal to maximize outcomes. Even though Simon warned his colleagues that these “recent developments in economics, and particularly in the theory of the business firm, have

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<sup>1</sup> It is my purpose to highlight a selective spectrum of these developments, mainly to emphasize my research context rather than demonstrating an extensive historical context, for the modest reason that such overview would be more appropriate within a monography.

raised great doubts as to whether this schematized model of economic man provides a suitable foundation on which to erect a theory”, many of his associates stubbornly kept following mainstream theories and neglected the possible presence of irrationality in economic individual activities. While theoretical developments in psychology suggested that mental processes, such as perceptions of the self and others, were part of social human activity and affected behaviour (Festinger, 1954), it would take another twenty years before economists would embrace the idea that individuals involved in economic decisions may make decisions based on irrationality. Meanwhile, the field of psychology developed rapidly with Neisser’s (1967) integration of higher-order thinking processes, and Skinner’s (1974) behaviourism – though later partly rejected.

Most psychologists however paid little attention to economics. This changed with the influential collaboration between Amos Tversky and Daniel Kahneman, who rejected the idea that people were believed to be conservative ‘Bayesians’<sup>2</sup>. They were instead, to their view, not statisticians of any kind. Kahneman and Tversky demonstrated in a series of influential papers (1971, 1972, 1974) that economists had been blinded by dominant faulty theories. In their early works, Kahneman and Tversky demonstrated that humans rationality is challenged by risk aversion in choices involving sure gains. Simply put, they argued that, when individuals are faced with a problem, they do not think like a statistician. As opposed to the laws of chance, which would imply rationality, individuals are constantly faced with uncertainty and use ‘rules of thumb’ to decide, based on information that is most representative and available to the mind. These rules of thumb are habits that consequently lead to systematic mistakes in our judgment.

Tversky and Kahneman theorized that people often do not know what they don’t know, and that our judgments are flawed by our own ignorance. Some of these mental habits that lead to systematic mistakes are *anchoring* – the habit when a first piece of information influences consecutive information, *availability* – we estimate the likelihood that an event will happen based on the ease that we can think about examples of that event, and *framing* – we tend to prefer options that are presented more positively. In economics, the realization of the relevance and applicability of these works came a few years later, with e.g. prospect theory (Kahneman & Tversky, 1979), and subsequently with the introduction of successful topics such as the endowment effect, loss aversion and status-quo bias (Kahneman et al., 1991; Thaler, 1980).

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<sup>2</sup> Decision-making based on the probability of an outcome, where the probability is informed by prior and new evidence of the decision-maker.

From that time, more economists started to question the general belief that people represent so-called *homo oeconomicus*. Inspired by the ideas that traditional economic models might be flawed, behavioural economics stood up as an emerging field.

### 2.2.1 *Current theoretical assumptions*

It would take until the late '80's however, before entrepreneurship emerged as a field and integrated these ideas. Classical examples are Cooper's findings (1988), where 1/3<sup>rd</sup> of 2994 recently business owners estimated their chances to succeed with 100% while failure rates as much higher, the psychology of new venture creation of Shaver and Scott (1991), and McCarthy's et al., (1993) findings of the escalation of commitment bias in investment decisions of entrepreneurs. Works on other cognitive biases, such as overconfidence (Busenitz & Lau, 1996; Camerer & Lovallo, 1999), and particularly *why* entrepreneurs think differently from others, either because entrepreneurial cognitions are characteristics of the self (Busenitz & Barney, 1997) or because entrepreneurial cognition is at least partly a function of contextual factors (Baron, 1998), took entrepreneurship and cognition to a definite recognized field. With following influential papers of cognitive biases on decisions (Simon et al., 2000; Simon & Houghton, 2002), opportunity evaluation (Keh et al., 2002; Shane & Venkataraman, 2000) and the highly influential effectuation theory where entrepreneurs are suggested to use a set of heuristics in their decision making (Sarasvathy, 2001), the topic moved toward the need for more theory (Mitchell et al., 2002) and secured its own distinctive and inclusive domain (Mitchell et al., 2007; Krueger, 2003).

## 2.3 *Entrepreneurial cognition*

Entrepreneurship scholars have suggested cognition to have much potential in that it can serve as a process lens through which to "re-examine the people side of entrepreneurship", by investigating memory, learning, problem identification, and decision-making abilities of entrepreneurs (Mitchell, et al., 2002, p. 93). This recognition has brought forth the introduction of *entrepreneurial cognition*, "the knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth" (Mitchell et al., 2002, p. 97). Central questions of entrepreneurial cognition research that scholars tried to answer were, "how do entrepreneurs think?" (Mitchell et al., 2007; Sadler-Smith, 2004) and "why?" (Baron, 2004).

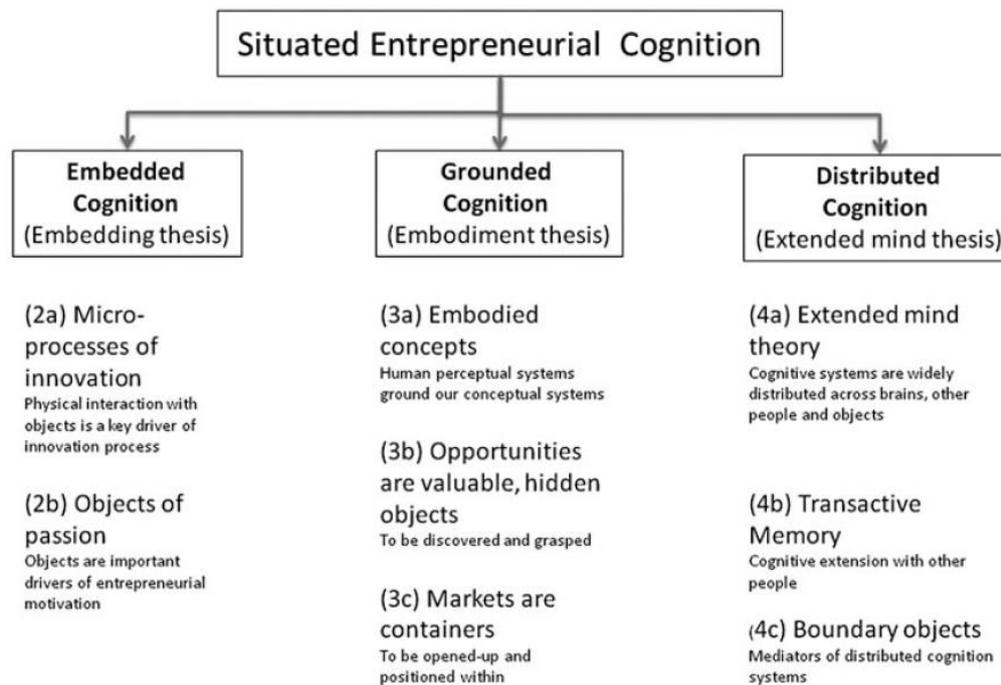
Entrepreneurial cognitions represent the mental operations that underlie start-up activities, are rooted in the founders' judgment of information, and wrapped in the founder's cognitive model (Shepherd et al., 2020). The field nowadays "plays a key role in virtually every aspect of entrepreneurship we wish to study and to understand" (Baron, 2014, p. 62). The emergence of a cognitive approach is, retrospectively, a logical consequence of Casson's, Hebert's (1988), and Link's agreement (1982) to see the entrepreneur as someone who makes *judgmental decisions*. Mitchell et al. (2007, p. 2) additionally clarify that these judgmental decisions are *affected by cognitive processes* in that in defining entrepreneurial cognition "the key elements: knowledge structures (whether heuristical or scripted) and decision making (including assessment and judgment) are set within the larger context of entrepreneurship's distinctive *and* inclusive domain/situation (Mitchell et al., 2004) of opportunity evaluation, venture creation, and growth."

### 2.3.1 *Entrepreneurship socially situated cognition*

An extension of the topic followed when Mitchell et al. (2011) initiated that cognition additionally occurs in social environments that require action to be theorized, with the introduction of *socially situated cognition* as illustrated in *Figure 2*, following that the "mind is much more a matter of what we do within environmental and social possibilities and bounds" (van Gelder, 1995, p. 380):

- *distributed* between social agents and the environment
- *embodied* between the brain and body to shape the mind
- *action-oriented* capturing evaluations or motivations towards an object or subject
- *situated* in terms of communicational, relational and group context between cognition and action (Smith & Semin, 2004).

**Figure 2:** *Situated entrepreneurial cognition unraveled, extracted from Dew et al. (2015)*



This is because Mitchell and colleagues (2014) argued that “if cognition is context-specific, than moment-to-moment interactions with the social environment profoundly impact it. And if cognition is distributed, then social objects enable and support it. Social objects therefor not only constitute the content of thought, but also shape the process underlying thoughts and behavior” (p. 10 - 11). As a result, entrepreneurial situated cognitions lead to concrete behaviour to identify and exploit opportunities, and this relationship relies on the co-construction between the entrepreneur, and the inputs of others in the social system (Dew et al., 2015; Shepherd, 2015). For example, entrepreneurs use experimentation to solve problems within their range of identified opportunities, searching adaptively through trial-and-error learning (Gillier & Lenfle, 2019). Situated cognition has also been linked with pattern recognition, scripts, and *metacognitive* processes in the development of entrepreneurial expertise to enable superior performance. The latter occurs because the entrepreneurial context necessitates entrepreneurs to additionally engage in thinking about thinking processes (Haynie et al., 2012).

### 2.3.2 Metacognition

*“metacognition may represent an important resource for entrepreneurs—above and beyond prior knowledge—given that often they are required to perform dynamic and novel tasks (Hill & Levenhagen, 1995). Given the dynamism and uncertainty of many entrepreneurial tasks, metacognition can be a source of a better understanding as to why some entrepreneurs cognitively adapt to their dynamic context while others do not or are slow in doing so.”*

Haynie et al., 2012, p. 256

Metacognition, or *thinking about thinking*, is a relevant topic for entrepreneurs since it plays an important role in, inter alia, problem-solving, attention, oral communication and comprehension, memory, social cognition, self-regulation and diverse sorts of self-control (Flavell, 1979). It represents a learned process, not a trait, and can be strengthened by experience and training (Nelson, 1996). Metacognition describes a higher-order cognitive process that systematizes what individuals know and recognize about themselves and tasks. It refers to an individuals' understanding and knowledge of one's own cognition. To think 'metacognitively' describes such activities as “to be self-aware, to think aloud, to reflect, to be strategic, to plan, to have a plan in mind, to know what to know, to self-monitor” (Guterman, 2002, p. 285). The concept is characterized by an ability to reflect upon, understand, and control cognitive processes to a concrete goal or objective (Flavell, 1976; Schraw & Dennison, 1994). Indeed, it represents an awareness of cognition *and* understanding to change these. These conditions make that these processes in an entrepreneurial setting facilitate understanding and control of one's own entrepreneurial cognition.

Since the process is situated partly within a social context, we also know that it organizes what an actor comprehends about their uncertain situations and dynamic environment in order to adapt to efficient ways of learning (Flavell, 1987; Jost et al., 1998)<sup>3</sup>. Individuals that effectively apply metacognition to their skills create self-benefits such as seeking out alternative explanations and exploring the consequences of these alternatives (Graber et al., 2012). On the other hand, decision-makers that are restricted in their metacognitive abilities are less probable

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<sup>3</sup> Metacognition has over the years, despite conceptual differences, termed variously, such as meta-memory and meta-comprehension (Klin et al., 1997; Maki et al., 1994) and knows additional different notions. This dissertation will, for the sake of uniformity, refer to Flavell's (1979) most straightforward conceptualization of metacognition as 'thinking about thinking'.

to adapt alternative strategies and less likely to show cognitive flexibility within a changing environment (Earley & Ang, 2003).

Meta-cognition belongs, along with self-control, to the family of self-regulation. While self-control involves components such as the management of emotions and impulses, to be focused and persistence on key goals, and the performance and refraining of actions to fulfill specific goals, meta-cognition gives insights about self-knowledge and helps individuals recognize what they know and don't know (Baron, 2014). The inclusion of self-regulation in entrepreneurship theories, such as metacognition, is fundamental since it is a main factor to influence entrepreneurial success (Baumeister et al, 2007). Indeed, self-regulation has the possibility to be strengthened by practice, and can be considered as a promising pragmatic success factor on entrepreneurial success (Baumeister & Tierney, 2011).

Just very recently, metacognitive studies have reached the attention of entrepreneurship scholars, because it suggests several promising entrepreneurial outcomes, such as the ability to cognitive adapt, the entrepreneurial mindset, strategic decision-making accuracy, and strengthened feedback adaptation. Firstly, the metacognitive lens in entrepreneurship focused on designing a measure and model for the ability to manage dynamic and uncertain task environments within one's cognitive processing, a context similar to that of entrepreneurs (Haynie et al., 2009). When entrepreneurs make decisions, they start from a higher-order activity with a set of alternative strategies framed. This is metacognitive awareness, an interrelated process consisting of goal orientation, metacognitive knowledge, metacognitive experience, metacognitive control and monitoring.

Decision-makers who are metacognitively aware are more responsive to feedback from the environment. They are also better in evaluating alternatives to process a task (Melot, 1998). The greater the awareness, the greater the benefit from *cognitive adaptability*<sup>4</sup> enabled by metacognition, embracing the notion that dynamic sense making and decision processes are central to success in an entrepreneurial environment (Ireland et al., 2003). Under these conditions, a decision-maker will self-generate, engage and select multiple frameworks and consequently effectively interpret, plan, and implement an assortment of personal, social and environmental goals in a changing environment.

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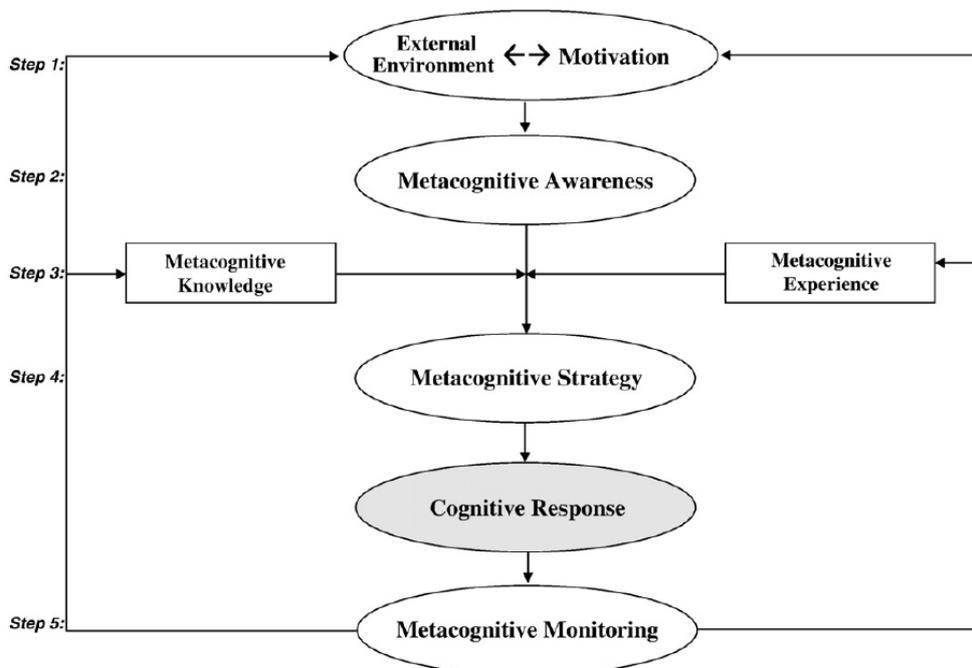
<sup>4</sup> The ability to effectively and appropriately evolve or adapt decision policies (i.e. to learn) given feedback (inputs) and from the environmental context in which cognitive processing is embedded (Haynie et al., 2009).

### 2.3.2 Metacognition as part of the entrepreneurial mindset

Metacognition has consequently been developed into an *entrepreneurial mindset* framework – the ability to sense, act, and mobilize under uncertain conditions (Ireland et al., 2003, p. 936 - 989), since foundations of the entrepreneurial mindset are metacognitive in nature (Haynie et al., 2010). This framework shows that contextual factors in entrepreneurs' environment are essential for their cognitive interpretation of the decision-making process. The metacognitive model represents an inter-related combined adaptive process of metacognitive functioning, because entrepreneurial success factors are known to be determined by adaptability (Ireland et al., 2003; Shepherd et al., 2007).

This proposed process begins prior to the opportunity identification and consequently flows through the entrepreneurship action stages. Stepwise, the conceptualization merges the (1) environmental context and motivation, then activates (2) metacognitive awareness, (3) metacognitive knowledge and metacognitive experience, formulates a (4) metacognitive strategy and (5) metacognitive monitoring and performance feedback in an iterative process, as illustrated in *Figure 3*.

**Figure 3:** A metacognitive model for entrepreneurs, extracted from Haynie et al. (2010)



This process illustrated by *Figure 3* is not necessarily required to follow a chronological order. Understanding and activating one's metacognitive resources play a key role to move from awareness to the formulation of metacognitive strategies. These resources are known as metacognitive knowledge and metacognitive experience and are crucial elements opening up the entrepreneurship cognition 'black box', since it helps explaining why individuals *differ* and why individuals apply *different* cognitive strategies experiencing different types of feedback (Haynie et al., 2010).

Haynie et al. (2012) consequently argued that entrepreneurs need to embrace cognitive adaptable decision-making tools. Applying this allows individuals to be both self-reflective and self-regulatory in their decision-making process (Hitt, 2000; McGrath & MacMillan, 2000). The authors specified the mechanisms how information is processed in an iterative decision-making process and demonstrated with the help of an experiment that individuals with higher metacognitive knowledge use cognitive feedback more effectively than individuals who have less metacognitive knowledge. Since prior knowledge has positive outcomes in entrepreneurship (Shane, 2000), the authors suggest "metacognitive ability as an attribute that might mitigate the seemingly negative consequences of a knowledge deficit" in order to promote decision-making processes for entrepreneurs (p. 239).

To mitigate the challenges of these deficits in effective entrepreneurial decision making, individual differences in metacognitive ability, such as cognitive adaptability, may offer a way out because it allows individuals to better use feedback than others and effectively adapt to rapid, substantial, and discontinuous change (Hitt, 2000). These adaptations are aligned when cognitive tasks and strategies are focused on self-reflection, such as, what one believes to be true about markets and the organization (Ireland et al., 2003). The findings also contributed to capture some of the cognitive origins of the entrepreneurial mindset, since knowledge learned in one context may lead to problem-solving in another context when metacognitive resources are employed.

Lastly, metacognition in a decision-making context may explain when and why managers' strategic decisions are likely to be erratic (Mitchell et al., 2011). Not surprisingly, decisions lead to reduced performance when undertaken erratic. Given that differences in decision-making processes are linked with experience (Forbes, 2005), the authors conceptualized metacognitive experience in their study.

Reasoning that metacognitive processes may mitigate erratic strategic decisions, and that “like other errors in thinking (Wilson & Brekke, 1994), erratic decisions can result from erroneous beliefs about cognition and inadequate awareness of one’s decision-making processes”, Mitchell et al. (2011) hypothesized that managers with higher metacognitive experience would make less erratic strategic decisions than those with lower metacognitive experience (p. 686). Indeed, their findings indicated that the extent that managers are inconsistent in their judgments is decreased by metacognitive experience.

*“The act of evaluating the correctness of one’s (or anyone else’s) response draws upon the exact same expertise that is necessary in choosing the correct response in the first place”*

Dunning, 2011, p. 261

### **Illustration 2:** *The Dunning-Kruger effect*

In 1999, psychologists David Dunning and Justin Kruger asked themselves the following question: *Do less competent individuals have more difficulty recognizing their flawed judgments than more competent individuals?* The assumption that this hypothesis may hold comes from the idea that in many social and intellectual domains, individuals who score inferior on tests often heavily *overestimate* their performance a priori (Fischhoff et al., 1977). Specifically, Kruger and Dunning argued that incompetence may not only cause poor performance, but also the inability for someone *to recognize* that one's performance is poor. Across their studies, participants were asked to (1) take tests such as logical reasoning and intellectual expertise and were then asked to (2) estimate their overall performance related to their peers. They were also asked to (3) indicate which specific items they thought to have answered correctly, and (4) reassess their test after seeing the results of their peers. The results demonstrated that, when individuals are not competent enough in the strategies they trust on, they do not just make unfortunate choices, but also miss the ability to realize it.

What was the reason why these individuals maintained to be blind confident about their poor performance? Kruger and Dunning explained an unfortunate relationship in that the same knowledge that underlies the *ability to produce* correct judgment is also the knowledge that underlies the *ability to recognize* correct judgment. Simply put: individuals with particular expertise are more likely to be accurate in their judgments about that subject, than those who are less knowledgeable. Indeed, people’s impressions of their skills are often poorly correlated with objective performance (Hacker et al., 2000). As a consequence, individuals highly overestimate their judgments, being unaware of their poor performance. Thus, it is someone’s ignorance that robs one from the ability to recognize inaccurate judgments.

If people wouldn't know that they missed the awareness to make accurate judgments, how would they become aware of their ignorance? Kruger and Dunning demonstrated that, after a training session, participants showed less inflated self-views, and linked this to the ability to reason *metacognitively*.

## 2.4 *Entrepreneurial judgment and decision-making*

Judgment and decision making – the processes of identifying and choosing one of the possible alternatives – is a significant area of study within entrepreneurship cognition research (Grégoire et al. 2011; Mitchell et al., 2014). Reviews made by entrepreneurship scholars generally separate decision making (e.g. Cossette, 2014; Zhang & Cueto, 2017) from cognition (e.g. Gregoire et al., 2011; Mitchell et al., 2002; 2004; 2007; Randolph-Seng et al., 2015), with accompanying topics such as opportunities and judgment about left in the middle (Shepherd et al., 2014; Shepherd, 2015). However, the subjects are interconnected, substantial amounts of work on entrepreneurship cognition follow the early works of Kahneman and Tversky and are “explorations of bounded rationality in the context of entrepreneurial decision-making” (Sarasvathy & Berglund, 2010, p. 166). Indeed, the primary question at the base of entrepreneurial cognition research is how entrepreneurs *think and make efficient decisions* accordingly (Mitchell et al., 2004; Sadler-Smith, 2004).

*Judgment* is acknowledged by many major scholars, such as Knight (1921), as part of the theory of the firm and entrepreneurship. In their book, Foss & Klein (2012, p. 78) note that judgment “is residual, controlling decision-making about resources deployed to achieve some objectives; it is manifest in the actions of individual entrepreneurs; and it cannot be bought and sold on the market, such that its exercise requires the entrepreneur to own and control a firm.” Inspired by Schumpeter (1911), Knight (1921) and Kirzner (2009), the authors debate entrepreneurship to be consisting of judgmental decision-making under conditions of *uncertainty*. The inclusion of uncertainty in defining entrepreneurial judgment can count on support from other scholars, such as Hastie (2001, p. 657), who defines judgment as “the components of the larger decision-making process that are concerned with assessing, estimating, and inferring what events will occur and what the decision makers’ evaluative reactions to those outcomes will be” and that it is uncertainty that represents “the decision-maker’s judgments of the propensity for each of the conditioning events to occur.”

*Decision-making* can be described as the “entire process of choosing a course of action” (Hastie, 2001, p. 657). Activities that describe entrepreneurial decision-making include, but are not limited to, opportunity assessment decisions, entry decisions, decisions about exploiting opportunities, and exit decisions (Shepherd et al, 2015). These decisions are additionally influenced by the *characteristics* of the decision-maker and the *environment* that represents uncertainty as a decision context. For example, entrepreneurs are heterogeneous in their degree of experience, risk assessment, and emotional reaction. Entrepreneurs also differ from each other in perception of their environment, since experienced interactions with the external environment are formed by entrepreneurs’ behaviours and activities (Shepherd, 2014). Since these differences in experiences represent unclear scenarios, each “individual endeavour is also engaged in a process of experimentation” to make decisions about the continuation of the project (Kerr et al., 2014, p. 27).

When entrepreneurs rely on their judgment, they do not rely on a constant analytic, systematic processing of information for each decision that they encounter (Bingham & Eisenhardt, 2011; Manimala, 1992). That is because entrepreneurs, when making decisions, rely on a dual-process mechanism when processing information. System 1 is known as the fast, intuitive system of thought that works automatic. System 2 on the other hand involves effortful, slow, and rational processing of information. Most of what individuals think and do happens in System 1. System 2 on the other hand, comes into play when System 1 runs into difficulty (Kahneman, 2011; Stanovich & West, 2000). These difficulties are known as systematic deviations from rationality; mental shortcuts that entrepreneurs use to decide quickly and efficiently. These *heuristics and biases* may occasionally come into play when entrepreneurs think and decide, particularly with an environment that is characterized by complexity and uncertainty (Grégoire et al. 2011; Packard et al., 2017).

## 2.5 *Heuristics and cognitive biases*

Heuristics come into play when rather quick judgmental shortcuts must be made by entrepreneurs. They refer to simplifying fast and frugal mental shortcuts or principles that entrepreneurs use for information processing and problem solving (Baron, 2007; Kahneman & Tversky, 1982).

Founders' cognitions, that refer "to the mental operations underlying the co-construction of potential opportunities for starting up a new venture" (Shepherd et al., 2020, p. 10) are influenced by cognitive style, a "higher-order heuristic that individuals employ when they approach, frame and solve problems" (Brigham et al., 2007, p. 31). The use of heuristics are an efficient and effective guide to make decisions since they aid entrepreneurs to apply fast strategies and simplify information (Busenitz & Barney, 1997). Heuristics additionally enable entrepreneurs to make sense of uncertain and complex situations more quickly (Mitchell et al., 2007). They represent "actionable simple rules that synthesize the entrepreneur's subjective knowledge, expectations, and vision, and for which optimal outcomes cannot be determined by mathematical methods" (Gilbert-Saad et al., 2018, p. 76).

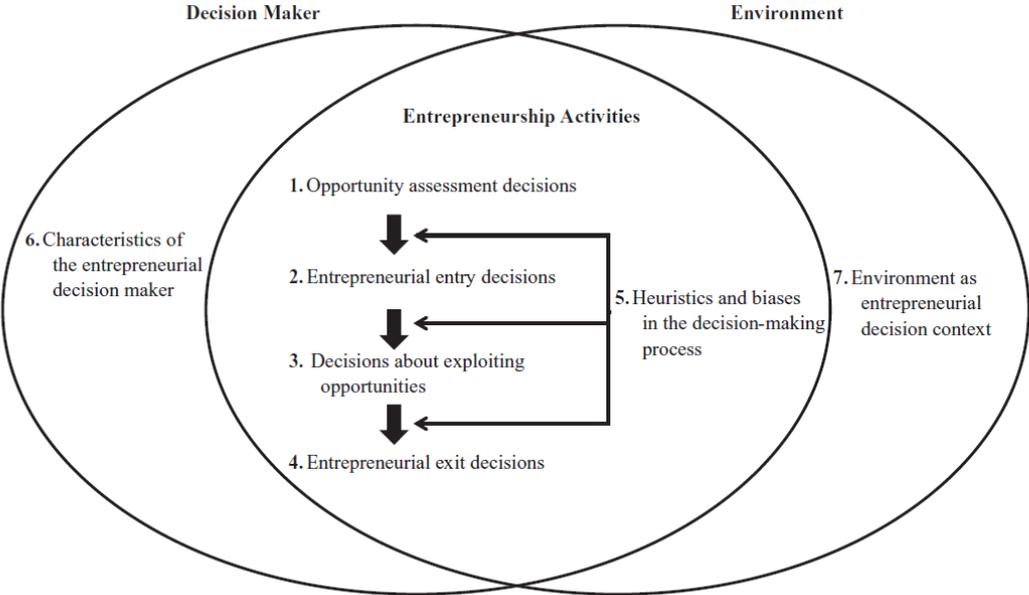
An example is Sarasvathy's research (2008) on effectuation with the application of entrepreneurial planning heuristics. A distinction can be made between decision heuristics, which are adapted to decision making under risk when alternatives can be selected, and design heuristics, which are adapted to judgment under absolute uncertainty with expectations about an imagined future (Gilbert-Saad et al., 2018).

These simplifying processes of information occasionally lead to cognitive errors. Specifically, while decision heuristics may lead to biases in highly unpredictable entrepreneurial environments, design heuristics lead to biases in rather predictable environments (Gilbert-Saad et al., 2018). These cognitive biases - systematic deviation from rationality or norms in judgment and decision making (Kahneman et al., 1982; Gilovich et al., 2002) - arise because heuristics simplify or ignore part of the information processing when individuals reason intuitively. For example, individuals generally tend to value a potential loss higher than an equal gain, avoid the costs to analyse alternatives, and fear going against the consensus of a popular option, all leading to a status-quo bias (Roy & Zeckhauser, 2017).

Because of time constraints, most of what individuals do and think happens in an intuitive mode, while the analytic mode corrects and replaces these processes (Stanovich & West, 2000). For example, entrepreneurs may overcome employment decision issues, such as following one's intuition to hire a known application, with scientific, experimental like approaches, that reduce false positives and false negatives (Camuffo et al., 2017). Research on heuristics and cognitive biases has become an important area of study because it provides practical and empirical perspectives in entrepreneurial decision making, as illustrated by *Figure 4* (Zacharakis & Shepherd, 2001; Krueger, 2005).

The topic is nowadays considered to be a widespread phenomenon in the field (Zhang & Cueto, 2017). That is because entrepreneurs, under certain circumstances, display cognitive biases (Busenitz & Barney, 1997). Scholars have also linked entrepreneurs with, to name a few, egocentric bias, status-quo bias, representativeness bias, overconfidence and escalation bias (Burmeister & Schade, 2007; Forbes, 2005; Koellinger et al., 2007; McCarthy et al., 1993; Moore & Cain, 2007).

**Figure 4:** *Entrepreneurial decision-making research, extracted from Shepherd et al. (2015)*



There is no general agreement among scholars whether these systematic deviations rather aid or obstruct entrepreneurs. The first highly influential works on judgment and decision making under uncertain circumstances position cognitive biases as an error (Tversky & Kahneman, 1974). Other scholars challenge this assumption, bias in decision-making under uncertainty are here suggested as a necessity to reduce errors because of evolutionary progress (Gigerenzer et al., 1988). This school of thought points to human’s adaptation to a changing environment as part of a survival process, rather than the internal properties of the problem solving process (Gigerenzer & Gaissmaier, 2011). Recent theoretical developments demonstrate however that Gigerenzer’s heuristics are used in the context of predictable risk, and not absolute (Knightian) uncertainty, as is more common in entrepreneurship (Gilbert-Saad et al., 2018).

The reality is that there is no consensus. For example, some studies have suggested heuristics to provoke entrepreneurial decision-making because it would stimulate a sense to see new opportunities, innovation and faster learning (Alvarez & Busenitz, 2001; Busenitz & Barney, 1997; Holcomb et al., 2009). Additionally, some cognitive biases help entrepreneurs (Busenitz & Lau, 1996; Gudmundsson & Lechner, 2013; Hayward et al., 2010; Koellinger et al., 2007), while others scholars point out the rather negative consequences (Camerer & Lovallo, 1999; Hayward et al., 2006; Hmieleski & Baron, 2009; Lowe & Ziedonis, 2006; Wu & Knott, 2006).

To sum up, research in entrepreneurial judgment and decision-making is a suitable research context to learn more about knowledge structures, opportunities, heuristics and biases, environments, and other (meta)cognitive frameworks (Shepherd et al., 2015). Additionally, these “cognitive activities involve taking risks and deal with uncertainty, which deal, ultimately, with forms of ignorance” (Arfini, 2019, p. 11). However, ignorance, inextricably coupled to knowledge is “a crucial, if a somewhat neglected, aspect of contemporary thought within management studies” (Roberts & Armitage, 2008, p. 351; Ungar, 2008). In entrepreneurship, ignorance is represented in cognitive structures because it emphasizes, besides what entrepreneurs ‘know’, what they guess, believe to know, are not sure about and so forth (Arfini, 2019). For example, metacognition represents a process in which individuals ‘know when they don’t know’, while cognitive biases assume a lack of knowledge or awareness in the decision-making process. Above all, entrepreneurial cognition in the context of opportunity beliefs is “the mental process of overcoming ignorance to inform a third-person opportunity belief and/or reducing doubt to inform a first-person opportunity belief” (Shepherd et al., 2007, p. 76). The next section will clarify why and how ignorance must not solely be considered as a crucial component in entrepreneurs’ formation of opportunity beliefs, but as a wider cognitive structure in their decision-making process.

## 2.6 *Ignorance*

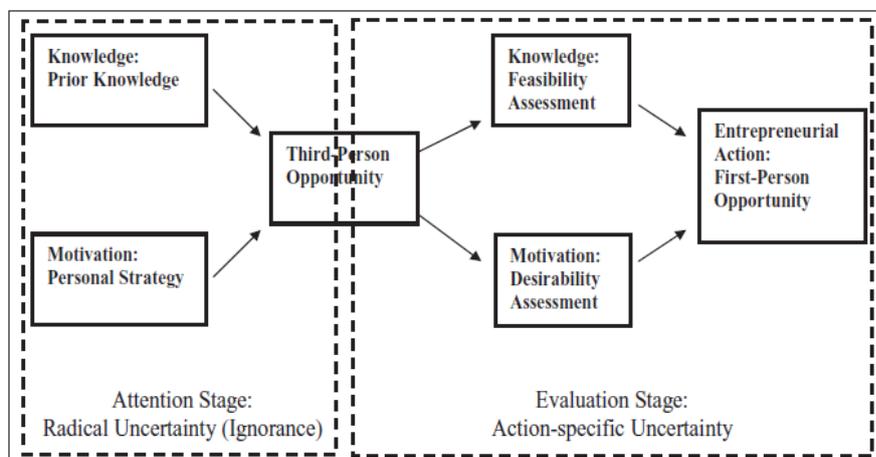
### 2.6.1 *Ignorance: a hidden assumption in entrepreneurship*

Ignorance, a lack of information, knowledge or awareness (Bastian & Zucchella, 2022; Roberts & Armitage, 2008), is widespread in everyday life and, moreover, inevitable. This is because it is nearly impossible for someone, relying on his own tools, to know *exactly* what one

does now know (Dunning, 2011). The assumption that ignorance is generic comes from the idea that any sense of certainty caused by the discovery of new knowledge inevitably generates uncertainties about other matters. For example, during the belief formation in which entrepreneurial opportunities may eventually impact the likelihood of action, a lack of information “may be attributable to temporal or spatial distance between the environment in which the opportunity exists and the environment in which the entrepreneur operates”, while a lack of awareness “results from the method by which information is recognized, scanned, and processed for action” (Shepherd et al., 2007, p. 77). *Figure 5* illustrates this process in which individuals, with the necessary knowledge, eventually escape ignorance and move from radical uncertainty to the formation of opportunity beliefs.

Indeed, “uncertainty is the result of our incomplete knowledge of the world, or about the connection between our present actions and their future outcomes”, while radical uncertainty represents increased forms of ignorance in which individuals do not know what will happen and do “do not even know the kind of things that *might* happen” (Kay & King, 2020, p. 24). In entrepreneurship, any change, whether that is in the entrepreneurial environment, the market, or in technology, generates new uncertainties and new degrees of ignorance accordingly (McMullen & Shepherd, 2006). Uncertainty additionally arises because of the “myriad of independent agents mak[ing] decisions whose impacts are aggregated into outcomes that emerge over a range of tomorrows” (Minsky, 1996, p. 360). This is the assumption of bounded rationality, and creates uncertainty due to the fact that individual decision-makers are unable to fully predict the decisions and behaviours of others (Magnani & Zucchella, 2018).

**Figure 5:** A model of entrepreneurial action, extracted from Shepherd et al. (2007)

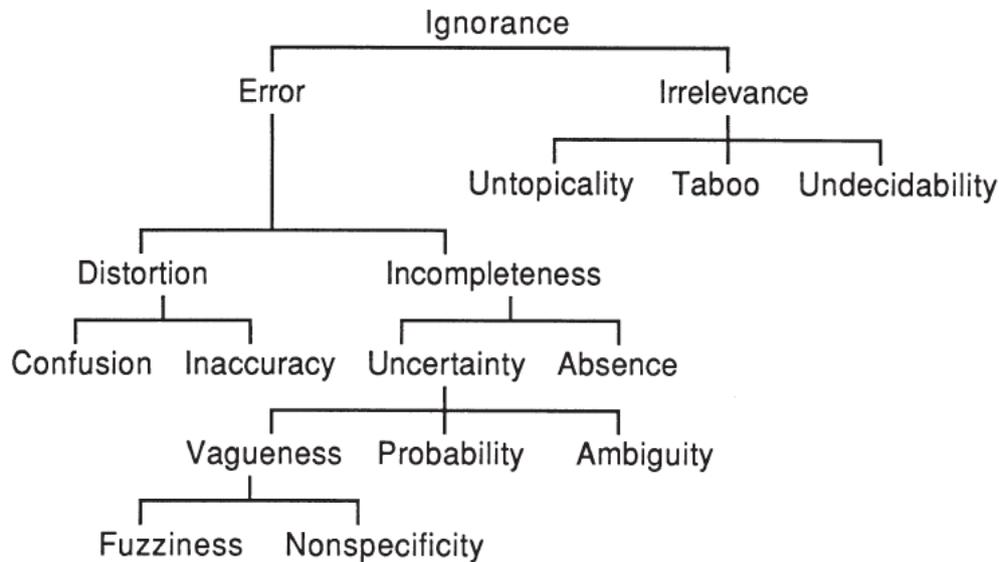


Indeed, ignorance represents a process that cannot be diminished by new discoveries, since new knowledge and more information constantly lead to new unknowns. Considering that the exact borders between ‘knowing’ and ‘not knowing’ can, in almost all cases, not be exactly defined, ignorance as a topic, should be embraced within entrepreneurship literature. This operation, however, is challenging, first and foremost, because the topic may evoke negative connotations (Schaefer, 2014). After all, a lack of information, knowledge, or awareness suggests an absence of thinking structures, and an unwillingness to learn, contradictory to cognitive structures in mainstream entrepreneurship literature. Nevertheless, entrepreneurship cognition goes shoulder to shoulder with ignorance, as the next sub-chapters will illustrate.

### 2.6.2 *A taxonomy of ignorance*

Ignorance as a sociology has been introduced by Smithson (1989) in an overview that is now known as a classic work in the field. His work as illustrated in *Figure 6* proposes a framework that is multiple with distinct levels. Its different levels can (at least) be divided into conscious ignorance – knowing that one does not know, and meta-ignorance – not knowing that one does not know. The first distinction is the difference between an *error* and *irrelevance*. The first refers to a passive state, meaning that an individual ‘is ignorance’, while the second hints at an active state in which individuals, possibly deliberately, ‘ignore’ something. Crucially, this distinction has consequences for the type of strategy to use in order to deal with “threats to established cognitive order.” The negative strategy refers to ‘ignoring the issue’, resulting in exclusion, while the positive strategy refers to revision, in which individuals include anomaly. Assuming that ignorance derives from an erroneous cognitive state, it may arise from either (1) distortion, (2) incompleteness, or both. The first contains confusion or inaccuracy (i.e. bias), while the latter covers absence and, in degrees, uncertainty.

**Figure 6:** A taxonomy of ignorance, extracted from Smithson (1989)



### 2.6.3 *Knowns and unknowns in entrepreneurship*

Ignorance is, in the same vein as knowledge and cognition, socially constructed, it is made possible by social interaction and forms the basis for social arrangements and knowledge differentials. From a cognitive perspective, two main sources of ignorance can be identified. Firstly, an *absence of knowledge*, that indicates a state of ignorance that applies to all members of the start-up at a specific point in time, or “an awareness that certain knowledge is beyond that known” by the start-up and its members (Roberts, 2015, p. 363). Secondly, ignorance may appear *about existing knowledge*, which indicates a state of ignorance that is unrecognized or emerged from limited entrepreneurial attention and their bounded rationality (Roberts, 2015; Simon, 1955).

Ignorance in the decision-making process of entrepreneurs may cause limitations because it may appear in an invisible stage where some potential outcomes might not (even/yet) be identified. The awareness of these limitations to access information and acquire knowledge in order to make sound decisions is essential in identifying the ‘known knowns’ – information and knowledge that entrepreneurs have and *know that they have* – and the ‘known unknowns’ – information and knowledge that entrepreneurs do not have and *know that they lack* (Dunning, 2011).

For example, when an entrepreneur, new to the entrepreneurial process, develops a technology and consults experts to bring this to the market, the ‘knowns’ refer to the technology and the ‘unknowns’ refer to the awareness to request external expertise. However, entrepreneurs often act under different degrees of uncertainty, with time pressure and emotional stress hindering circumstances in which such rational behaviour may ideally occur. For example, individuals involved in the start-up creation process may be aware that most projects fail but simultaneously believe that they can beat the odds of breakdown, therefore *ignoring* the information and ‘taking the risk for granted’ (Hayward et al., 2006).

Additionally, access to more information may lead to increasing levels of overconfidence – an individual’s overstatement of the correctness of their responses to difficult questions, highlighting that entrepreneurs are highly rationally bounded because they “do not know what they don’t know” (Forbes, 2005, p. 624; Hayward et al., 2006). For example, “firms can be overconfident at the beginning of the process because they do not understand what they do not know” (Niittymies and Pajunen 2019, p. 6). As a consequence, ignorance exists in forms that is rather invisible in an entrepreneurs decision-making process: Decisions or solutions that an entrepreneur might arrive at, if only the decision-maker knew of its existence. The ‘unknown unknowns’ – information that is relevant to the project but that entrepreneurs *do not know they lack* – is information that is not questioned because it lies outside an entrepreneurs’ cognitive scope. It may frequently refer to essential project information such as potential problems, risks, actions and strategies (Dunning, 2011). For example, entrepreneurs may be unaware of data because they lack the skills to make sense to them, or because they are not brought to their attention (Hayward et al., 2006).

The latter is the main problem with unknown unknowns, they may go unrecognized until people got informed. For example, Fischhoff and colleagues (1977) argued that people cannot critically evaluate and distinguish inferred knowledge when they are unaware of the nature of their perception.

In their studies, Kruger and Dunning (1999) found this *meta-ignorance*<sup>5</sup> to especially harm individuals that have less experience and knowledge, “not only does their incomplete and misguided knowledge lead them to make mistakes but those exact deficits also prevent them from recognizing when they are making mistakes and other people choosing more wisely” (Dunning, 2011, p. 24). Frequently, a reference point helps individuals to become aware about what they did not know before. For example, entrepreneurs may be overconfident while pitching their business plan in front of a panel of business angels. It would take until the investors’ feedback session for most individuals to come to a more accurate self-view of performance because the external information serves as a reference point to increase awareness of the thinking process.

This is consistent with entrepreneurs entering an unknown foreign market, in which the lack of information and knowledge is decreasing over time since, since later in the decision-making process, entrepreneurs “start to understand what they do not know and perceive their lack of knowledge. In the final stage of the process, they understand what they know and what there is to know about the foreign markets” (Niittymies & Pajunen, 2019). This process is known as experimentation, in which the so-called ‘new-to-the-world’ products or services are discovered starting from a process where the experimental variables needed for success are unknown a priori. “When experimenting in the unknown, the course of the project is unpredictable; experimenters face unexpected changes and surprising events” (Gillier & Lenfle, 2019, p. 450). Consequently, the use and, eventually, search for information sources, activate metacognitive processes in which different cognitive strategies are re-evaluated to manage a changing environment (Haynie et al., 2010).

Unknown unknowns may refer to a decision makers’ possible strategy *if only* the individual would be aware of its existence. An absence of knowledge, information, or awareness is disguised in the domain of these unknowns (Dunning, 2011). A way out of these unknowns may be represented by metacognition, the ability to know when you know and when you don’t know. Metacognition has, for instance, a positive effect on monitoring accuracy (Schraw, 1994).

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<sup>5</sup> Meta-ignorance knows various terms, such as ‘unknown unknowns’ (Gross, 2010; Roberts, 2013), ‘complete ignorance’ (Haas & Vogt, 2015), ‘inscrutable ignorance’ (Firestein, 2012) and ‘ignorance of ignorance’ a.k.a. ‘ignorance-squared’ (Ravetz, 1993). For the sake of consistency, this work refers to Dunning’s (2011) ‘double burden’ conceptualization.

This is a significant finding for entrepreneurs and their decision-making process, since “metacognitive monitoring allows the entrepreneur to reflect on how, why, and when to use certain strategies (as opposed to others), given a changing environment and his or her own motivations” (Haynie et al, 2010, p. 223). Consequently, this process supports entrepreneurs in a recognition process to, for example, perceive the complexity of opportunities, since the information processed through the monitoring function leads to cognitive adaptability to re-evaluate one’s performance.

#### 2.6.4 *Sources of unknowns*

Unknown unknowns, or meta-ignorance, can be camouflaged in various ways. This is because “the same knowledge that underlies the ability *to produce* correct judgment is also the knowledge that underlies the ability *to recognize* correct judgment” (Kruger & Dunning, 1999, p. 1121). For example, when entrepreneurs evaluate a foreign market as a potential new market, the act of assessing depends on the same know-how needed to enter that foreign market. Unknowns are hidden because people do not manage to identify the information, risks, and strategies that are relevant to their project and as such should be anticipated. It is information that a decision-maker does not even conceive of, precautions that an individual should have taken but have no conception of, solutions that a decision-maker would have made if only they could be perceived. There is such an absence of essential information that it is beyond one’s anticipation (Dunning, 2005). These unknown unknowns may not be recognized by the decision-maker until they get informed. Such information may consequently be compared with a reference point.

For example, if entrepreneurs would consider multiple alternatives in their foreign market entry decision, each of the outcomes would be compared relatively to a reference point, such as, cultural distance. Entrepreneurs, however, often miss the relevant information *and* knowledge that may be compared with a reference point, since they are unknown. Additionally, reference points may add kinks in the slope such as cognitive biases, and may shift across contexts, resulting in inconsistent judgment (Kahneman, 2003). As a matter of fact, ignorance has important consequences in terms of expected value lost from inadequate and poor decision making “as problems get murkier along the spectrum from risk to uncertainty to ignorance, the challenges to effective decision making mount, and biases and heuristics play an ever-greater role” (Roy & Zeckhauser, 2015, p. 67). This is because ignorance interacts “in significant ways” with biases and heuristics, such as overconfidence (Zeckhauser & Roy, 2017).

For example, loss aversion – the tendency for individuals to maintain a feeling of fear of loss over gains, causes entrepreneurs to prefer a *known* certainty over an *unknown* uncertainty, and as a consequence to become status-quo biased (Burmeister & Schade, 2007; Samuelson & Zeckhauser, 1988).

Unknown unknowns may also be disguised by domain-specific misbeliefs. For example, overconfidence in knowledge or prediction is likely to be found in cases where the evidence appears strong, while in reality is weakly predictive (Koehler et al., 2002). This is because people have a tendency to bet on events in which they *feel* to be more knowledgeable or competent (Heath & Tversky, 1991). Entrepreneurs may be particularly sensitive to this, since specific knowledge of areas related to entrepreneurial tasks is more important for success than general knowledge. Additionally, a lack of domain-specific knowledge predicts business failure (Shepherd, 2003; Song et al., 2008; Unger et al. 2011).

Lastly, ignorance may be camouflaged by ‘reach-around knowledge’. Alvensson and Spicer (2012, p. 5) argued how people might confuse superficial familiarity with a deeper comprehension of the subject. “A belief in mastery and knowledge, then, hides a ‘deeper’ level of ignorance.” For example, individuals may think to have accurate knowledge in a domain, while they have many unconscious misconceptions. Often, this is because individuals reconstruct knowledge from just some fragments, which then ‘feels’ confident enough to inappropriately claim it as knowledge. These misunderstood claims frequently create deviations, such as overestimation, into the output of a thinking process due to a lack of self-awareness (Gilovich, 1991; Fischhoff et al., 1977). Avoiding these forms of ignorance is relevant for entrepreneurs, since the comprehension of new information, and separating it from fragments, is essential to ‘connect the dots’ and discover new opportunities in an entrepreneurial context (Mitchell et al., 2007).

Additionally, when entrepreneurs obtain deeper comprehension, it creates mental corridors that influence the way new information is interpreted, and these different interpretations lead to different opportunity discoveries (Shane, 2000). Many erroneous beliefs can be located to one’s imperfective capacity to process information and draw conclusions because they seem at hand the most reasonable to conclude. It is not an *uninformed* mind of information that causes inconsiderate judgments, but a mind filled with *misinformed* facts, theories and strategies.

Thus, these erroneous beliefs occur both to experienced professionals and nascent entrepreneurs. For example, Thomas Gilovich (1991, p. 2) explained how questionable and erroneous beliefs are learned and maintained in the study of human judgment and reasoning. He argued that judgment inconsistencies are not made due the absence of evidence, nor because individuals miss the intellect, rather “our questionable beliefs derive primarily from the misapplication or overutilization of generally valid and effective strategies for knowing. Just as we are subject to perceptual illusions in spite of, and largely because of, our extraordinary perceptual capacities, so too are many of our cognitive shortcomings “closely related to, or even an avoidable cost of, [our] greatest strengths” (Nisbett & Ross, 1980).

#### 2.6.5 *Closing the circle: Metacognition to cope with ignorance*

To cope with ignorance, one should recognize its presence, by gradually moving from unknown unknowns towards known unknowns and known knowns. Specifically, ignorance taken as a cognitive function can be overcome by means of the same roots. Ignorance in the decision-making process causes individuals not only to have a lack of awareness of the quality of their decisions, but moreover a lack of awareness of suspecting the existence of possible misleading biases that drive behaviour. For example, Alvesson and Spicer (2012) argued that ignorance itself has little to say about the limits of actively using cognitive and intellectual capabilities. To cope with these issues, gaining simply knowledge is not enough because it is a form of treating the symptoms. Rather, individuals, when faced with unknowns, tend to overlook the broader issues, that come with a lack of reflection or questioning. “In fact, one can assume that better choices would follow from the increase of the level of awareness of one’s own mental processes and from the acquisition of more adequate knowledge about such processes. Both awareness and knowledge of the psychological mechanisms underlying decisions are manifestations of metacognition and contribute to the enhancement of control over one’s mental activity, and consequently over actual behaviour (Dinsmore et al, 2008)” (Colombo et al., 2010, p. 446).

Previous research suggests that metacognition underlies individuals recognition of when to persist in performing a given task through a particular strategy and when, instead, to withdraw because the probability of success by using that strategy is low (McFarlin et al., 1984).

This is because metacognition, or thinking about thinking, consists of knowledge about cognition and self-regulatory mechanisms that help entrepreneurs in their learning process to plan, monitor, and reflect (Fust et al., 2018; Mitchell et al., 2007). Additionally, improvement strategies for decision-making have pointed to the distinction between the intuitive and automatic System 1, and the slow and analytic System 2 (Stanovich & West, 2000) to be a useful framework to confront ignorance (Kahneman, 2011; Milkman et al., 2009). For example, metacognition operates as a cognitive “alarm that activates analytic forms of reasoning that assesses and sometimes corrects the output of more intuitive thinking” (Alter et al., 2007, p. 569). Moreover, the conscious process to become aware of the extent of one’s ignorance has important implications on revising beliefs and reducing confidence, with the help of, for example, one’s intellectual humility (Whitcomb et al., 2015). The latter operation may be particularly interesting for entrepreneurs to recognize the existence of cognitive biases and heuristics (Bastian & Zucchella, 2022).

## 3.0 Research Design

*In dynamic fields—and entrepreneurship and entrepreneurial cognition both qualify—new discoveries and new ways of discovering often challenge the “state of the art.” It then becomes a key issue to combine respect for the current state of knowledge (and the art and science that produced it), with the open-mindedness to accommodate new perspectives on the knowledge discovery process.*

Hindle, 2004, p. 576

### 3.1 *Philosophical commitments*

The point of departure of this research process has been the articulation of paradigmatic standpoints and philosophical commitments. This thinking process is essential in understanding how the researcher perceives reality and how this shapes the main research question. The research paradigm, the area of the generic philosophical approach in which researchers see themselves operating, influences the philosophical quarter of the inquirer (Bryman, 2004; Hindle, 2004). *Axiology* – the values that are appropriate to the process of knowing, *epistemology* - how things can be known, *logic-of-inquiry* - how well the inquiry was conducted, and *ontology* - what can (and should) be known.

Hindle (2004, p. 581) distinguishes three paradigms: “*Positivism* is the set of approaches defining social science as an organized method for combining deductive logic with precise empirical observations of individual behaviour in order to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity. The *interpretive* approach embraces the systematic analysis of socially meaningful action through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds. *Critical social science* (CSS or “critical theory”) defines social science as a critical process of inquiry that goes beyond surface illusions to uncover the real structures in the material world in order to help people change conditions and build a better world for themselves.” Besides, different paradigms exist, such as *post-positivism*, in which reality is assumed to exist but imperfectly, because of flaws in human intellectual ability.

Furthermore, the post-positivist assumption is that there is no independence of the knower from reality, but ideal objectivity. Research is conducted in more natural settings, using situational information with discovery as an investigation element (Lincoln & Guba, 1994). My personal point of view towards a specific paradigm is blended, somewhere between interpretivism and post-positivism. Reflection should not limit itself towards research topic, but additionally towards research domains, in order to enter an interparadigmatic field to critically assume between different positions. This is because the essays in this dissertations have not followed a specific research method, but have rather been related to a specific research problem, combining different research areas and methods, and its consequential research question.

I specifically follow here Alvesson and Skoldberg (2018), who debate that “the strong tendency for researchers to get stuck in a particular paradigm and to be captivated by their own language games is not an inevitable fact of nature; it can, at least to a certain degree, be reduced. Different disciplines at different times are characterized to varying degrees by tendencies towards dominance or pluralism. When the latter prevails it is not unusual for researchers to read up on various other fields and thus to acquire a certain understanding of perspectives other than their own. One way of strengthening such inclinations is to uphold metamethodological ideals which imply that the researcher’s own position is not totalized” (p. 375).

### 3.2 *Logic of inference*

The logic of inference in a research process can be inductive, deductive, or abductive. An *inductive* approach moves from practice to theory, it “proceeds from a number of single cases and assumes that a connection that has been observed in all these is also generally valid” (Alvesson & Skoldberg, 2018, p. 4). Induction is frequently used in qualitative studies with the aim to understand or interpret a phenomena. Thus, inductive research is a process, starting with the presentation of empirical observations, in which single facts emerge towards a general truth, that can be represented by new, or extended, theory.

On the contrary, a *deductive* approach “proceeds from a general rule and asserts that this rule explains a single case”, with the help of hypotheses formulation and testing (Alvesson & Skoldberg, 2018, p. 4). Deduction is frequently used in quantitative studies such as experiments. Specifically, experimental studies have a distinguished role in deductive research,

creating “rigorous scientific and theoretical insights” with the identification of causal effects, rather than correlations (Williams et al., 2019, p. 216).

The above two models “are usually regarded as exclusive alternatives, but it would be difficult to force all research into them” (Alvesson & Skoldberg, 2018, p. 4). *Abduction*, an approach to theory-driven empirical research, assumes constant interaction between theory and empirics, thus rejecting a purely inductive or deductive approach. Importantly, abduction should not be seen as a mix between induction and deduction, since it adds new specific elements. “During the process, the empirical area of application is successively developed, and the theory (the proposed overarching patterns) is also adjusted and refined. In its focus on underlying patterns, abduction also differs advantageously from the two other, shallower models of explanation. The difference is, in other words, that it includes *understanding* as well” (Alvesson & Skoldberg, 2018, p. 4).

In this dissertation, each essay has the purpose to generate new theory by extending existing knowledge on entrepreneurial cognition with the help of reflection and problematization. As a consequence, *Essay 1* follows a conceptual approach, exploring the conceptualization of a relatively unknown phenomenon in entrepreneurship, with the help of a theory development approach. *Essay 2* on the other hand, utilizes an explanatory model in which deductively is shown how a certain cause leads to a particular effect, while disqualifying alternative explanations as to the cause (Williams et al., 2019). Lastly, *Essay 3* follows an abductive approach, where a phenomenon is empirically explored while constantly adjusted with theory. Specifically, the latter contribution offers a strong theoretical contribution with the help of the development of an empirical model that extends existing knowledge on entrepreneurship cognition.

### 3.3 *Justification of study strategy*

Hindle (2004) noted that “anyone attempting to supply research methods guidelines in any area of social research is caught between the rock of technical detail (the “how to do it” issue) and the hard place of methodological debate (the “how to justify it” issue)” (p. 580). In this dissertation, each essay follows a different ‘how to’, thus, favoring a specialization in a research topic over a specialist in a specific research method. Moreover, the dissertation does not engage into further polarization of the often unproductive debate between the advantages or disadvantages of qualitative and quantitative methods (Deetz, 1996). My point of view is that the choice between methods must be made based on the *research question*. As a result, this dissertation follows two methods in particular.

On the one hand, the Gioia methodology has been chosen for *Essay 3* to response to calls that “qualitative methods are demonstrably underrepresented in both entrepreneurship research, generally, and entrepreneurial cognition research, specifically” and that moreover, “unless entrepreneurship generally and entrepreneurial cognition particularly begin to embrace higher volumes of higher caliber qualitative research, the relevance and potency of the entrepreneurial canon will be severely compromised by a lack of the methodological variety that is so strongly displayed” (Hindle, 2004, p. 577). Indeed, the Gioia methodology allows analyzing social and psychological processes, through the understanding of individual experiences and the processes by which it unfolds (Gioia et al., 2013; Langley, 1999). Specifically, *Essay 3* addresses the ‘how’, by answering: *How entrepreneurs use the understanding of their cognition to develop their start-ups*, which is more appropriate for a qualitative, explorative type of study (Patton, 2002). The study strategy also overcomes an absence of explorative studies on the studied phenomenon, responding to Pressley (2000) who remarked that “much can be understood about cognition and its metacognitive regulation through qualitative analysis” (p. 261).

On the other hand, an experimental design has been chosen as the methodological toolkit in *Essay 2*. Entrepreneurship represents a socially-constructed field, and causal relationships “can enhance the argument that one’s research is novel” in the meaning-making of the community of entrepreneurship researchers since “entrepreneurship is a complex phenomenon that evokes unique challenges for use of experimental methods” (Williams et al., 2019, p. 216).

Specifically, this dissertation emerges the explorative findings of *Essay 3* into theoretical and practical advantages in *Essay 2*, yielding convincing evidence of the causal relationship of the topic under investigation (Grégoire et al., 2019). Specifically, *Essay 2* inductively addresses: *What is the effect of a metacognitive treatment on an entrepreneurs' tendency to make biased decisions?* The fit of the research question matches with the relatively scarce available contributions on entrepreneurial cognition research since “although long used in the natural sciences and in other social sciences, experimental designs have only recently been taken up by researchers in the field of entrepreneurship” (Frederiks et al., 2019, p. 7). An experimental design also fits with the research topic under investigation, cognitive bias. Cossette (2014) for example notes that the topic is remarkably absent and that “one of the most interesting avenues for future research would be to take an experimental process and test different programs, awareness and training exercises aimed at making entrepreneurs more aware of the potential dangers of their heuristics and cognitive biases” (p. 492).

### 3.4 *Research data sets and settings*

Below, the data sets and settings of *Essay 2* and *Essay 3* will be discussed. *Essay 1* is conceptual and did not use specific empirics.

#### 3.4.1 *Essay 2: To be aware or not to be? The impact of metacognition on entrepreneurial decisions*

*Research question:* What is the effect of a metacognitive treatment on an entrepreneurs' tendency to make biased decisions?

*Method:* Experimental

Units of analysis have been debated in entrepreneurship experimental research, and particularly, the appropriateness of the use of student samples in *Essay 2*. While the use of student samples is common in other fields, this is not yet the norm in entrepreneurship. Recently, scholars have debated the trade-offs and concluded, that under some conditions, student samples might be more suitable than entrepreneur samples. (Hsu et al., 2017). *Essay 2* conducts two experiments, a pilot study and a main study, using a total sample of 77 students who were enrolled in an entrepreneurship course at universities in Italy and the Netherlands. Hsu and colleagues (2017) furthermore noted that student samples are appropriate when: (1) “students are or resemble the population of interest,” (2) “when the manipulation is likely to be

confounded by the professional experience of the participants,” and (3) “when the relationships under investigation are grounded in a broad theory” (p. 385). Indeed, university students show characteristics of nascent entrepreneurs who are involved in start-up intentions. Moreover, Haynie et al. (2012) showed in their metacognitive study that a sample with no prior experience is an important characteristic of the entrepreneurial process, “because such prior knowledge would likely confound the true nature of the theoretical construct, which is the focus of our investigation; that is, the concomitant role that metacognition and feedback type play in facilitating cognitive adaptability” (p. 239). Thus, the manipulation of the experiment could have been confounded by previous experience and knowledge, confirming the use of students as the unit of analysis to be appropriate in *Essay 2*. *Table 2* and *Table 3* show the descriptive statistics of the pilot study and the main study respectively.

Furthermore, “the impact of the selected setting for an experiment on the study’s internal and external validity depends on the research question.” These experimental settings can be conducted in natural experiments, field experiments, or laboratory settings. In natural experiments, “the impact of variations in naturally occurring exogenous variables” is examined, while in field experiments, researchers “address concerns about the external validity of entrepreneurial behaviours in controlled settings. ” The pilot and main studies have been conducted as classroom experiments that represent a laboratory setting, since it fits best with the purpose of the study, such as, “reducing noise factors such as environmental influences.” (all from Hsu et al., 2017, p. 6 – 7).

Moreover, experiments can be divided to the degree in which design impacts participants actively or passively, and the extent in which the design of the experimental scenario represents a real-life or hypothetical context (Aronson et al., 1998; Mixon, 1977). The pilot study uses a design in which participants are impacted passively, while the main study actively impacts participants to the treatment condition. With regard to context, the manipulation of both studies has been role-playing, in which participants imagined themselves to be entrepreneurs and have been asked to make several business decisions (Lévesque & Schade, 2005). *Essay 2* provides more rationale why the studies have typology differences.

**Table 2:** *Descriptive statistics of pilot study*

	<i>Variable</i>	<i>M</i>	<i>SD</i>
	<i>Gender</i>	1.68 <sup>6</sup>	0.53
	<i>Age</i>	25.54	4.59
	<i>Education</i>	1.11	0.39
	<i>Experience A (N attended business classes)</i>	2.92	1.57
	<i>Experience C (currently a founder)</i>	1.86	0.35

**Table 3:** *Descriptive statistics of main study*

	<i>Variable</i>	<i>M</i>	<i>SD</i>
	<i>Gender</i>	1.13 <sup>6</sup>	0.34
	<i>Age</i>	24.49	2.01
	<i>Education</i>	1.10	0.38
	<i>Experience A (N attended business classes)</i>	1.23	1.48
	<i>Experience B (ever started a business)</i>	0.15	0.37
	<i>Experience C (currently a founder)</i>	0.08	0.27

### 3.4.2 *Essay 3: Entrepreneurial metacognition. A study on nascent entrepreneurs*

*Research question:* How do entrepreneurs use the understanding of their cognition to develop their start-ups?

*Method:* Qualitative

Sample size in qualitative works has been debated widely without a clear consensus (Guest et al., 2006). *Essay 3* follows Kuzel (1992, p. 41) who recommends working with cases between twelve to twenty “when looking for disconfirming evidence or trying to achieve maximum variation”. The sampling procedure that was used for this study can be identified as purposeful sampling, an appropriate technique when studying individual discovery processes in entrepreneurship “information rich” studies (Patton, 1990, p. 169). Specifically, the entrepreneurs that participated in the study of *Essay 3* survived two preliminary rounds of a

<sup>6</sup> Note. M and SD represent mean and standard deviation. Gender (1=male, 2 = female), Education (1 = bachelor, 2 = graduate), Exp A (0 = none, 4 = four or more), Exp B & C (0 = No, 1 = Yes).

start-up competition with three jury experts as external evaluators, and were selected as the most promising candidates to participate and succeed in the competition. *Table 4* illustrates a summary of the interviewed entrepreneurs that differed in the type of ‘the to be launched’ start-up, and varied, among other factors, in their market focus, sector, and previous experience.

Furthermore, the use of the Gioia methodology is appropriate for the context of *Essay 3* because it allows the researcher to (1) take advantage of emergent unpredictable issues, and (2) create an opportunity to dynamically respond, and elaborate upon, participants’ answers while generating new conceptual insights (Anderson et al., 2009; Cannatelli et al., 2019). The study setting of *Essay 3* is characterized by an emerging process of the researcher, that assumes constant changes in the interaction between the mind and the environment, and can be divided into two distinct phases (Bruner, 1990; Fiske & Taylor, 2017). The first phase refers to a start-up competition (SUC), in which nascent entrepreneurs present their intentions to start a business.

The second phase represents the period after the SUC, in which entrepreneurs launched and expanded their businesses. Specifically, this process has emerged from a continuous comparison of categories that emerged from the interviews (Gioia et al., 2013), a crucial condition for the studied phenomenon since “cognitive research places a noted emphasis on how, when, and why interactions between mind and environment play a role in the development, transformation, and use of mental representations and other cognitive constructs, and on how, when, and why these elements come to influence (and be influenced by) human action” (Grégoire et al., 2011, p. 1146 - 1147). Additionally, this second phase represented radical uncertainty because the interviews have been conducted during the early stages of the COVID-19 pandemic. During this phase, participants did not know what was happening, nor could they anticipate what would happen, since this period was dominated by unexpected changes and unpredictability (Kay & King, 2020; Ehrig & Foss, 2021). However, although challenging, this unexpected contextual change did provide the study empirical richness, which is summarized in the Conclusions and Implications.

**Table 4:** Profile of the interviewed participants in Essay 3

<i>Case</i>	<i>Type</i>	<i>Sector</i>	<i>Market</i>	<i>Description</i>
<i>C1</i>	Start-up	Sustainable Energy	B2B	A device capable of obtaining energy from vehicular traffic.
<i>C2</i>	Academic spin-off	Food & Beverage	B2B & B2C	Sensors for naked-eye monitoring of meat spoilage.
<i>C3</i>	Academic spin-off	Life Science	B2C	A system for large-scale kinetic analysis.
<i>C4</i>	Start-up	Consumer Goods	B2C	A compact dishwasher that washes dishes with 4 liters of water in 1.2 min.
<i>C5</i>	Academic spin-off	Automation & ICT	B2B	Optimized machine learning algorithms with quantum speedups.
<i>C6</i>	Academic spin-off	Biotech	B2B	A cryptographic technique based on protein folding.
<i>C7</i>	Start-up	Digital Media	B2C	A platform and an app whose purpose to find caregivers and services.
<i>C8</i>	Start-up	Eco-Solutions	B2B	A recycling process for sustainable development.
<i>C9</i>	Start-up	Food & Beverage	B2B	Sustainable sake in Europe.
<i>C10</i>	Start-up	Food & Beverage	B2B	An IoT platform for digitalized monitoring of beer drafting.
<i>C11</i>	Start-up	Web & Digital	B2C	An e-commerce site requesting and offering unusual products.

### 3.5 *Data collection and analysis process*

Below, the process in which data was collected and analysed for *Essay 2* and *Essay 3* will be discussed. *Essay 1* is conceptual and did not use specific empirics.

#### 3.5.1 *Essay 2: To be aware or not to be? The impact of metacognition on entrepreneurial decisions*

*Research question:* What is the effect of a metacognitive treatment on an entrepreneurs' tendency to make biased decisions?

*Method:* Experimental

The data collection process of *Essay 2* took place in group settings during several university classes, at different universities. The study was briefly introduced as a study on entrepreneurial decision-making, and the participants were informed that participation was not compulsory or related to their final evaluation in the course. Additionally, participants were instructed to bring their laptop to the class and to fill out the survey without discussion with others. Then, the questionnaires were sent out randomly to each of the participants. Firstly, data of a pilot study has been collected during an entrepreneurship course of 1.5 hours, in which participants have filled out an online survey ( $M$  time to complete = 25.5 min) and were then debriefed during the same lecture. Importantly, in this study setting, all participants were in the same (online) classroom. The data of the main study has been collected during 4 different university courses, where both the experimental and control group received a total of 105 minutes of training ( $M$  time to complete survey = 18.3 min). Details about the experimental designs of the pilot study and the main study can be found in *Essay 2*.

In the pilot study, one participant failed to finish the survey and had to be removed ( $N = 37$ ). In the main study, I had to exclude the data of two subjects who did not participate in the last course, ending up with 39 ( $N = (B1) 22 + (B2) 17$ ) participants. The data that has been collected for the studies was collected with the use of Qualtrics, a widely used online survey tool, and has been saved on a private hard drive. During the pilot study, demographic data and control variables were collected in the course of the experiment, while in the main study, participants were sent an additional survey between A and B. Details about both studies can be found in *Table 5*.

Consequently, the data analysis for both studies has been conducted with the help of Stata, a statistical software tool. In order to analyse the experimental data, it had to be converted into numeric values firstly.

Some variables were modified towards a binary number, for example, when variables would represent a ‘wrong’ or ‘no’ answer, resulting in the value 0. Respondents were also completely anonymized by a given number. Then, several analyses have been conducted. Firstly, the reliability for each scale, on item and group level, has been validated. “Reliability means that a measure (or in this case questionnaire) should consistently reflect the construct that it is measuring. One way to think of this is that, other things being equal, a person should get the same score on a questionnaire if they complete it at two different points in time. Another way to look at reliability is to say that two people who are the same in terms of the construct being measured should get the same score” (Field, 2018, p. 1044). Cronbach (1951) introduced the Cronbach alpha scores to conceptualize this. As a consequence, the Cronbach alpha scores for each scale have been calculated.

Then, the mean scores of each item have been calculated and compared with the experimental and control group, with the help of t-tests. The t-test is a common application to test the difference between two means. Specifically, if the observed difference between the sample means is relatively large, relative to the standard error, “the two sample means differ because of the different testing conditions” (Field, 2018, p. 590 – 591). The standard error is small when the sample means have an expected similar mean, and large when there expected difference is larger than expected.

Next, analysis of variance, or ANOVA, has been conducted over the six dependent variables. Specifically, ANOVA is a variant of regression analysis, and helps researchers to test the fit of a linear model with group means. At every stage of ANOVA, variation is assessed from a particular model, which is then calculated into the fit of the model that represents the hypothesis (Field, 2018). By using this procedure, it should become clear whether the results of the experiment are significant. Further details about these analyses can be found in *Essay 2*.

**Table 5:** Data collection process of Essay 2

<i>Pilot study</i>	<i>Main study</i>
<i>Unit of Analysis:</i> 37 students enrolled in an entrepreneurship course at the University of Pavia	<i>Unit of Analysis:</i> 39 students enrolled in an entrepreneurship course at the University of Groningen
Entrepreneurship course (experimental group and control group in the same class, $N = 37$ )  <i>Duration:</i> 90 minutes, May '21	Entrepreneurship course A1 (control group, $N = 24$ )  <i>Duration:</i> 45 minutes training, September '21
	Entrepreneurship course A2 (experimental group, $N = 17$ )  <i>Duration:</i> 45 minutes training, September '21  Online survey sent out, mid-October '21
	Entrepreneurship course B1 (control group, $N = 22$ )  <i>Duration:</i> 60 minutes training, end of October, '21
	Entrepreneurship course B2 (experimental group, $N = 17$ )  <i>Duration:</i> 60 minutes training, end of October, '21

### 3.5.1 Essay 3: Entrepreneurial metacognition. A study on nascent entrepreneurs

*Research question:* How do entrepreneurs use the understanding of their cognition to develop their start-ups?

*Method:* Qualitative

The data collection method used for *Essay 3* has been the use of semi-structured interview. Details about the entrepreneurs and their start-ups can be found in *Table 4*. *Essay 3* has adopted a longitudinal approach, where entrepreneurs have been interviewed in two rounds throughout the process of launching a business. Specifically, eleven entrepreneurs were initially interviewed, who all participated in a start-up competition. Before every interview, the open-ended format of the interview questions were prepared based on additional data that was found, illustrated by *Table 6*.

In order not to constrain participants, they were not exposed to preconceived definitions or explanations of the phenomenon under study. As a result, each interview protocol was tailored based on the collected data. The questions that were asked during the interviews of this study emphasized the relationship with the phenomenon under study. Additionally, to obtain deeper insights, participant's answers were frequently followed up with questions such as: 'can you give me an example to make me understand that better?' or 'could you tell me a bit more about that?' During the interview process, entrepreneurs were observed and data was constantly compared back and forth between theory and empirics. This is also where the informal data analysis was initiated, in the form of immediate reflections on the received information by the researcher.

With the help of field notes (Birks et al., 2008), the data became richer in contextualization and then was triangulated between observations and facts (Gioia et al. 2013). For example, when data from the interview contained surprises or contradictions, notes helped the data analysis of this study to gain deeper empirical insights. The conducted interviews of the first round were accompanied by field notes and lasted, on average, 53 minutes each. This process resulted in a total of 63 pages of interview transcripts. In a second interview round, seven entrepreneurs of the same sample agreed to be interviewed again, while four dropouts were noted. These interviews have been conducted online, since the entrepreneurs found themselves under conditions of radical uncertainty in which they were not even allowed to leave their house. The second set of interviews had an average duration of 76 minutes and resulted in a total of 64 pages of interview transcripts. Each respondent was sent his or her interview transcript after it was conducted. In total, 18 interviews were conducted for this study.

The data for *Essay 3* was primarily drawn from (1) observation, and (2) semi-structured interviews. *Table 6* additionally illustrates the process in which the study integrated different sources, such as application data, pitch videos, presentations, email updates, and field notes, that all supported the process of data collection. After each interview, the transcript has been written within a 24 hours timeframe as Gioia studies suggest (Rindova et al., 2011). Importantly, the interview transcripts were written while comments in a separate file were made in parallel. Examples of these notes were, for instance, about the body language of the participant, his or her voice volume, or additional words that have been said while the recorder has been switched off.

During this process, parts of the text that appeared to be relevant for the study were highlighted in different colors, initiating the step from raw data towards 1<sup>st</sup> order concepts (Corley & Gioia, 2011). This process of data reduction refined the data collection and analysis process in order to craft a more available final assembly of the phenomenon under study (Miles, 1979). Simultaneously, the theory of *Essay 3* has been under a constant comparison with the empirical results, confirming 2<sup>nd</sup> order theoretical assumptions on the one hand, and searching for additional theory on the other hand. This process resulted in the eventual creation of aggregate dimensions which is illustrated in more detail in *Essay 3*.

**Table 6:** Details on the data collection process of Essay 3

<i>Source of data</i>	<i>Type of data</i>
<i>Observations</i>	Collected during three events: (1) a Start-up competition fair, (2) a ‘Smart Building’ Expo, and (3) a Start-up competition final
<i>Interviews</i>	1 <sup>st</sup> round: September – December, 2019: 11 interviews have been conducted 2 <sup>nd</sup> round: March – May, 2020: 7 interviews have been conducted
<i>Additional data</i>	Application data of the start-up competition: Data was collected from a total of 99 start-ups that expressed their interest to take part in the program, namely: age, industry, nationality, emails, LinkedIn profiles, areas of expertise, key competence, patent, and website, idea description, main results, and relevance of the idea  Updates via emails: Regular email traffic has been maintained between the researchers and the entrepreneurs.  Pitch videos: 10 videos (1 entrepreneur could not make it) have been produced where the interviewee briefly introduce their start-up  Presentations: Videos of the pitch event and final event were analysed.

### 3.6 Quality of the research

In this dissertation, the quality of the research is determined by different factors, since they are grounded both in quantitative and qualitative research. While validity, the degree to which conclusions can be accepted confidently, is “at the heart of experimental research”, reaching objectivity with the same precision in qualitative research is challenging, because it should be evaluated with paradigmatic assumptions within an epistemological context (Kvale, 1989). Specifically, *Essay 2* is mostly concerned with the reliability of causal inferences (internal validity), generalizability (external validity), and construct validity (Grégoire et al., 2019; Hsu et al., 2017). Experiments in entrepreneurial settings must, to obtain convincing causal dynamics, align the theoretical effects with the real-life phenomenon under study (Davidsson, 2006; Grégoire et al., 2010). *Internal validity*, firstly, is high when effects from other external, unintended causes can be excluded, a typical advantage of laboratory experiments, as conducted in *Essay, 2* due to their ability to manipulate all desired factors in a controlled environment. “However, laboratory experiments are also highly synthesized with the possible danger that respondents react artificially (low external validity)”, thus emphasizing the crucial role of external validity components in entrepreneurial experiments (Kraus et al., 2016, p. 959).

*External validity*, which represents a set of questions about generalizability, “concerns the extent to which an experiment’s findings can be generalized across populations, settings, manipulations and outcomes” (Grégoire et al., 2019). This set of questions concerns, firstly, robustness and replication, which can be best ensured by the replication of an experiment with, preferably, different samples, tasks, and procedures. The main study has been a replication of the pilot study in which the above criteria have been covered. Specifically, the first study has served as a pilot-test to examine if the data collection process and materials caused no difficulties or misunderstandings. To ensure the level of effort and motivation, timers have been used that prevented participants from immediately moving towards the end of the survey. For the representativeness of the sample of *Essay 3*, I refer to chapter 3.4 where I have motivated the use of student samples, following Hsu et al., 2017. Then, ecological validity, the degree to which an experiment’s procedures, materials, and tasks represent a real world situation, matters to generalize findings based on a specific context. Both studies in *Essay 3* have been pre-tested in the form of discussions during several seminars and conferences with relevant practitioners and field experts in order to ensure their practical sense (Perdue & Summers, 1986).

Additionally, to show the relevance of the study, descriptive results such as means and a discussion about the magnitude of the observed relationships have been reported, following guidelines provided by Grégoire and colleagues (2019).

Lastly, *construct validity*, the ability to “(make) inferences from the sampling particulars of a study to the higher-order constructs they represent” (Shadish et al., 2002, p. 65), can be established by measuring the extent to which the manipulations align with theory and with participants in a theory-consistent manner. Both studies have followed post hoc manipulation checks, for the important condition that participants in both studies were not aware of the precise goal of the study and manipulation, as this would have potentially biased the results. Chapter 3.5 and *Essay 2* provide further details about these analyses. Additionally, the pilot study has been followed up with post-experiment interviews in order to (1) examine whether the answers given during the interview correlate with the answers given during the experiment, (2) whether the experiment in the eyes’ of the participants represented realism, and (3) whether the manipulation has a long lasting effect on the participants to exclude priming from training.

*Essay 3* deals with a different set of criteria to evaluate the quality of the research. Specifically, internal validity, generalizability, and objectivity are quality criteria that are in contrast with qualitative research because they do not intend to test a hypothesis. Lincoln and Guba (1984) offer a set of criteria that ensure the quality of qualitative works. Firstly, *credibility*, the equivalent of internal validity in quantitative research, requires the researcher to describe plausible information in the findings based on the original data. Credibility can be reached, as shown in *Essay 3*, with the help of triangulation, the use of different data sources, in order to ensure correct interpretations from the participants. *Transferability*, the quantitative equivalent of external validity, is a second important condition to ensure the quality of *Essay 3*, because it is concerned with the extent to which the results of the study apply in other contexts. Particularly, the contextualization of *Essay 3* represents two distinct phases (intention and action) under different degrees of uncertainty, highlighting a processual approach through different stages of the venture creation process. Then, *dependability*, the equivalent of quantitative reliability, the researcher needs to preserve consistency. For example, in *Essay 3*, each step of the research process has been documented, such as the data collection and analysis process, and is accessible on request. *Confirmability* assesses the degree to which the results of the study can be supported by data and confirmed by others. Details about this process can be found in the methodology section of *Essay 3*.

## Essay 1

### **Ignorance and international entrepreneurship.**

#### **Two sides of a blade in the decision to enter a foreign market**

##### **Abstract**

The aim of this chapter is to further explore and understand the role of a topic seldom discussed so far in the decision to enter a foreign market for entrepreneurs, namely ignorance. Rather than providing an extensive literature review of the topic, we will explore why entrepreneurship scholars so far neglected the topic how entrepreneurs, and their firms, ‘don’t know.’ Specifically, this chapter will be focused on the entrepreneur as an individual when making the decision to enter a foreign market. Throughout this chapter, we shall analyse ignorance from different perspectives when foreign entry decisions on an individual level have to be made. We will discuss that widespread international knowledge may not naturally advance International Entrepreneurship opportunities, point out the idea that individual decisions are cognitively influenced by ignorance, and point to the relevance of knowing what you don’t know in IE. Finally, the chapter calls for an integration of ignorance within the decision making framework in IE.

Key words: Entrepreneurship cognition, Decision making, Cognitive biases, International entrepreneurship, Foreign market entry

##### **Introduction**

*“Perhaps all this talk about knowledge is a way of creating an appealing image of an economy going places in order to avoid discussing the darker prospects that haunt de-industrializing countries around the world” (Alvesson & Spicer 2016, p. 30).*

Entering a foreign market is among the key decisions in a firm’s management. In taking these decisions entrepreneurs are confronted with two apparently conflicting issues: on one side they want to pursue an opportunity for the growth of their firm, on the other side they fear the “liability of foreignness” (Zaheer & Mosakowski, 1997), which primarily consists of lack of “familiarity” with the foreign context. The literature in international business has been

developed on the construct of the liability of foreignness and thus portrays internationalization as a process, in which firms need to acquire knowledge, either gradually via foreign operations, starting from less “unfamiliar” markets and from low commitment entry modes, as the original Uppsala model postulates (Johanson & Vahlne, 1977) or leveraging on foreign partnerships, as the revised Uppsala model suggests (Johanson & Vahlne, 2009). The latter substitutes the liability of foreignness with the liability of outsidership from networks. However, the “liability” read of the internationalization process persists. At the same time, the last thirty years have witnessed the surge of International Entrepreneurship studies, which have brought a new discourse about the international expansion of the firm. From the observation of cases of early and fast internationalization, the so-called international new ventures (Oviatt & McDougall, 2005a) and born global firms (Knight & Cavusgil, 2004), this new field of enquiry shifted the attention from the liabilities perspective to the pursuit of “cross border opportunities” (Oviatt & McDougall, 2005b). However, international entrepreneurship scholars have often explained the precocious and fast global growth through the role of business networks, thus somehow converging towards the later Uppsala model, or through the previous experience of the founders and their social capital.

Thus, both the liability and the opportunity interpretations seem to find a common ground on the key role of knowledge, either acquired via experience or through networks. But the empirical evidence about these processes of knowledge acquisition to explain international growth is elusive (Zucchella, 2021). Some firms start operations in foreign countries without any market-specific knowledge and –when young and with founders lacking previous experience in business - also with limited general knowledge (Nummela et al., 2020). Thus, knowledge and the decision to enter a foreign market reveal a possible gap in research.

Moreover, there is still little research in the field about entrepreneurial cognition in approaching international markets. The micro-foundations in international business represent an underexplored area of inquiry (Zucchella, 2021), which calls for studies about the individual decision makers, their cognition and their biases when facing decisions about foreign market entry. Research revealed that these decisions can be affected by cognitive shortcuts, but this is still an understudied area. Some of these biases do not necessarily imply a lack of general or market-specific knowledge about something, but rather a lack of cognitive awareness. “That is, firms can be overconfident at the beginning of the process because they do not understand what they do not know”, which leads individuals to be partly ignorant in their decision making

process (Niittymies & Pajunen, 2019, p. 6). This implies that core decisions like entry into a foreign market are often affected by lack of knowledge, cognitive biases, or both.

Alvesson and Spicer (2012, p. 2) call for a more nuanced significance of knowledge because “researchers take it for granted that the foundation of industrial economies has shifted from natural resources to intellectual assets”. Thus, firms that internationalize without relying on these sources of knowledge remain scarcely investigated.

Internationalization studies have confirmed that the cognitive perspective remains scarcely investigated (Aharoni et al., 2011; Maitland & Sammartino, 2015). This is a problematic issue since firms are recognized to follow heterogeneous paths, which can arguably be best understood by considering an individual’s cognition as antecedent of the decisions of the firm (Zahoor et al., 2020). The increased interest in understanding the role of the individual actor and her<sup>7</sup> cognitive strategy has -as mentioned above- lately been acknowledged to contribute to current micro foundations research gaps in IB and entrepreneurship (Buckley & Casson, 2020; Foss & Pedersen, 2019; Niittymies & Pajunen, 2019).

In this chapter, we provide arguments to answer these gaps and calls for studies, by pushing the field towards a better understanding of how cognitive aspects influence entrepreneurs in international settings (Dana, 2017). More specifically, we highlight the role of ignorance, which we define as *an inevitable widespread phenomenon that concerns a lack of information, knowledge, or awareness* (Shepherd et al., 2007; Roberts & Armitage, 2008). Ignorance as a topic is, despite its relevance, usually considered to be perpendicular to knowledge. While knowledge construction and knowledge formation processes are inevitably interwoven with entrepreneurship theories (e.g. entrepreneurs use knowledge structures when making judgments and decisions; internationalizing ventures aim at leveraging on their knowledge or their partners’ knowledge), ignorance as a topic remains to be largely ignored (Ungar, 2008).

We argue that firms often find themselves with a lack of knowledge and information when facing internationalization decisions. These forms of ignorance impact the role of the bounded rational individual in her perception of the environment, and in her cognitive available tools to arrive at satisficing decisions (March & Simon, 1958). This chapter takes an

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<sup>7</sup> Note that we use female pronouns when referring to the individual entrepreneur for readability reasons. Our theory is gender neutral.

unconventional perspective on entrepreneurship, namely, the existence of ignorance as a generic phenomenon. We elucidate this viewpoint by integrating the recently increased interest in understanding entrepreneurship cognition with internationalization studies. In doing so, shall we analyse the individual role in internationalization choices (Dabić et al., 2020) and discuss ignorance, heuristics and cognitive biases as affecting foreign market entry.

### **The concept of ignorance**

In this chapter, we define ignorance as *an inevitable widespread phenomenon that concerns a lack of information, knowledge, or (and) awareness* (Roberts & Armitage, 2008; Shepherd et al., 2007). The first assumption within our notion is that ignorance is *inevitable* because individuals in most cases do not have full knowledge or information about anything. Indeed, any sense of certainty produced by new knowledge automatically creates uncertainties about other matters. Choose one topic that had your interest in the last years and you will find yourself realizing that the more you read and learn, the more you became aware of how much you do did not know yet. An elegant example of this paradox is provided by Alvesson and Spicer (2012, p. 4), who use the example that “scientific inquiry into climate change has produced a sense of certainty about some issues (such as the long run increase in planetary heat in the last century), but also revealed new areas of ignorance (such as the precise causes of it) (Ungar, 2008).” This implies that new knowledge and information acquired by discoveries do not diminish ignorance. Thus, the basic idea is that ignorance is unavoidable and generic. Ignorance cannot be seen as the contrary of knowledge and is socially constructed. That is because “it is virtually impossible to speak intelligibly about ignorance without referring at least implicitly to a social standard of truth and falsehood, or irrelevance. Ignorance is made possible by the very nature of social interaction and language; and it is embedded in a variety of social norms, occasions, settings, roles, scripts, and identities” (Smithson, 1985, p. 168).

Although ignorance relates to everyone and clearly is a social issue, it is largely ignored by scholars. Among many explanations, we suggest that it may also depend on ignorance being most of the time unnoticed and is thus unproblematic (Ungar, 2008).

An example of an unproblematic but noteworthy case is Swatch. The Nicolas Hayek Swiss-founded firm entered a market in the early 80’s, when the Swiss industry was in turmoil, which resulted in decreases in exports and bankruptcies. It was the time when digital watches were expected to take over, and dominated by Japanese cheap mass production. The

conventional approach for Swiss-based watchmakers was to focus on the luxury market. When Hayek recommended a merger in an attempt to save the two largest watch manufactures in Switzerland, he decided to radically move away from the traditional approach, ignoring the voices of many stakeholders. Some outraged suppliers refused to sell the necessary parts when hearing the plans. An investment bank replied: “This is not what consumers think of when they think of Switzerland. What the hell are you going to do with this piece of plastic against Japan and Hong Kong?” Hayek decided to proceed anyway. His solution? An inexpensive, plastic watch, using the Japanese dominated quartz technology, a Swiss brand with every possible color of the rainbow, to be changed daily based on the mood and the clothing. The fact that in the years after Hayek’s launch, Swatch sold close to 100 million watches worldwide, a successful born global case, illustrates the idea that acquiring knowledge from existing sources does not guarantee success (Taylor, 1993).

The example shows that there may be highly successful international entrepreneurs that make decisions based on what is, till then, unknown to thrive. Investors, customers, and suppliers might even be completely ignored for the better good. The case of Swatch elegantly illustrates that when individuals solely rely on existing knowledge, they may ignore contradictions, fail to reflect, overlook opportunities or pursue opportunities that many others are pursuing. In fact, “a fetishistic interest in knowledge and intelligence can in some cases drive ignorance and poor judgment” (Alvesson & Spicer 2016, p. 40).

### **Being aware when deciding**

The second assumption in our definition of ignorance is that it concerns a lack of information, knowledge, *or (and)* awareness. Knowledge involves information, facts, and skills acquired through education or experience (Roberts & Armitage, 2008). It refers to the cognitive structures that organize the perception of what people believe to be true, and the degree of confidence in that belief (Fischhoff et al., 1977; Fiske & Taylor, 1984). International entrepreneurs, however, often miss knowledge and experience because every foreign entry decision by definition has its own unique features with related context due to differences in terms of economic, political, and social-cultural conditions. It is often from the initial unknown features of a potential foreign market that firms eventually decrease their unfamiliarity over time. Later on, “they start to understand what they do not know and perceive their lack of knowledge. In the final stage of the process, they understand what they know and what there is

to know about the foreign markets” (Niittymies & Pajunen, 2019). Through the process of obtaining experience, post hoc, someone may conclude to have made a reasonable successful decision under conditions of uncertainty (Langlois, 2007). A priori, however, judgments that should lead to sound decisions rely on many unknown factors within the mental model of the entrepreneur. Thus, to make rational decisions to enter a foreign market, it is important that ignorance such as a lack of information or knowledge is consciously acknowledged. This is an important issue for entrepreneurs because better decisions “follow from the increase of the level of awareness of one’s mental processes and from the acquisition of more adequate knowledge about such processes” (Colombo et al. 2010, p. 446). Maintaining this constant level of awareness when decisions are made is however, a difficult task. For example, research has shown that individuals often lack awareness of their sub-optimal decision making processes, make faulty judgments and as a consequence, remain to be ignorant about what is not known to them (Dunning, 2011).

### **Degrees of ignorance**

*As we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know*

Donald Rumsfeld, former US Secretary of Defense

Rumsfeld, not notably well-known for his epistemological interests, once underscored a fundamental issue in the fields of entrepreneurship (Foss & Klein, 2012). Namely, the differences in decision-making between known and unknown issues, and the essential importance to consciously acknowledge and know the differences. Entrepreneurs act on a daily basis within such a complex international environment while relying on incomplete, non-objectively optimal decision making processes under uncertain circumstances (e.g. Caputo & Pellegrini, 2019; Forbes, 2005; Packard et al., 2017; Townsend et al., 2018).

The awareness of these limitations in order to enter a foreign market is essential in identifying firstly the ‘known knowns’ - information that entrepreneurs have and *know that they have* – and secondly the ‘known unknowns’ – information that entrepreneurs do not have and *know that they lack* (Gross, 2007; Proctor, 2008). There are also some elements that imply ignorance that is rather invisible to people. Those we call ‘unknown unknowns’ – information that is relevant to decisions but that entrepreneurs *do not know they lack* (Dunning, 2011). This

is information that is not questioned because it lies outside a decision-maker's scope. Founders for instance may be unaware of data because they lack the skills to make sense to them, or because they are not brought to their attention (Hayward et al., 2006). 'Unknown unknowns' may frequently refer to essential information such as potential problems, risks, actions, strategies, and lead to fatalities. Often, entrepreneurs and their firms do not know what to do with scenarios that represent unknown outcomes with the presence of forms of ignorance such as misinformation, complexity, volatility, uncertainty, and ambiguity (Suarez & Montes, 2020). The Boeing 787 production issues (resulting in \$10 billion additional costs) and the Fukushima crisis in Japan (forcing 100,000 to evacuate and \$38 billion compensation costs) were novel, unknown, and thus unanticipated events that had massive consequences for the international economic environment (Kaplan et al., 2020). We follow Faulker et al. (2017) in their distinctions that something 'known' implies knowledge and 'unknown' lack of knowledge, and that 'known unknowns' suggest awareness while 'unknown unknowns' suggest an absence of awareness. Unknown unknowns may go unrecognized until people got informed. Fischhoff and colleagues (1977) argued for example that people cannot critically evaluate and distinguish inferred knowledge when they are unaware of the nature of their perception.

This implies that a lack of awareness may need an external reference point to serve individuals becoming aware of their limitations. As a result, it is essential for entrepreneurs to reduce fatal 'unknown unknowns' toward 'known unknowns' and eventually 'known knowns', by consciously searching and considering what might not be known yet. Ignorance is both socially constructed and socially de-constructed (Smithson, 1985). For example, Roberts (2015) suggested that unknown unknowns may be discovered a priori during moments of interaction with customers, competitors, and suppliers, or as a result of recruiting staff, because this would add new knowledge for the firm. We will briefly get back to ways to handle unknowns later on in this chapter.

### **The role of ignorance in International Entrepreneurship**

When firms are involved with internationalization decisions, such as the foreign market entry, they balance on a daily basis between their known, unknown, and unknowable knowledge (Chow & Sarin, 2002). That is because, taking any point in time, there are always some known matters and some unknown matters, to any individual (Faulker et al., 2017). In economic theories, ignorance can represent a necessary part of the market process since it is described to

be responsible for the creation of profitable opportunities (Kirzner, 1979). This disequilibrium is a consequence of market ignorance. “Thus, an understanding of ignorance, or limitation of knowledge, is crucial in Austrian thought” (Elias et al. 2020, p. 323).

In international business theories, internationalization is usually described as a process developed from knowledge and through which knowledge is further gradually acquired. However, this assumption overlooks alternative internationalization processes that rely on anything but knowledge. When international firms are in the process of discovering new markets, entrepreneurs often don't know what it is that they don't know. In some cases, they might not even deliberately be scanning or consciously searching (McMullen & Shepherd, 2006). The previous example of Swatch demonstrated that it is the process of discovering the unknown for entrepreneurs that often leads to success. It is not the awareness of what people know, but what people don't know, that leads to new insights and discoveries.

Additionally, internationalization studies have recently shown that foreign country entries do not necessarily elaborate on a slow and progressive process of acquiring knowledge, while more traditional entry forms like the Joint Venture point to the complementary role of knowledge (Buckley & Casson, 2009; Hennart, 1982; Hymer, 1960; Rugman & Verbeke, 2003). Instead, some firms that decided to enter a foreign market have been using an opposite approach. For instance, successful foreign entry strategies have been explained with the so-called in and out decisions, in which firms do not seem to build on knowledge (e. g. Nummela et al. 2020; Melén & Nordman, 2009). Galkina and Chetty (2015) and Nummela and colleagues (2020) illustrated this by documenting a serendipitous process in which the sequence of foreign country entries is basically random because it is the result of unsolicited orders and fortuitous contacts. These findings appear to confirm that it is the process of discovering the unknown for entrepreneurs that often leads to success.

After all, if the knowledge behind the decision was known to someone else, it would have been done before (Taleb, 2007). New knowledge however always leads to new perspectives of what is unknown. Entrepreneurs and their firms thus, may never reach complete knowledge as long as new knowledge is discovered. In reality, “the unknown is not diminished by new discoveries. Quite the contrary: the realm of the unknown is magnified” (Gross & McGoey, 2015, p. 1). Nevertheless, entrepreneurship theories tend to be rather knowledge obsessed, but our theories about the knowledge intensive economy and knowledge-based organizations might not tell the complete story (Alvesson & Spicer, 2012).

The idea that some firms, with founders lacking previous experience, operate in foreign markets without any market-specific knowledge can imply that knowledge and experience may not unconditionally lead to the identification of new foreign markets or opportunities. In fact, the acquisition of new knowledge may in different situations lead to less positive results. That is because these information and knowledge processes have been suggested to create mental loops and contradictions. For example, Zahra et al. (2005) debated that widespread international experience may lead to overvaluing existing knowledge while ignoring or overlooking new information. That is because this kind of knowledge may result in an unhealthy, excessive degree of focus because “this experience may promote a rigid focus on familiar clues, causing new information to be ignored” (ibid, p. 139). This overestimation of solely previous knowledge may moreover move firms toward wrong decisions, because it causes entrepreneurs to ignore sense making and instead search for confirmation. Thus, entrepreneurs can fall prey to cognitive biases such as sunk-cost-fallacy (Arkes & Blumer, 1985; Weick, 1995), and become overly committed to the original choice when making a decision, “and then subsequently make decisions biased by psychological commitment” (McCarthy et al., 1993, p. 9).

### **Ignorance in judgment and decision making**

So far, we have mostly analysed ignorance as a lack of knowledge or information. Within the framework of international decision-making, however, we must not only consider decisions based on *limited knowledge or information*, but also based on *limited awareness*. Indeed, research has shown that we tend to underestimate the value of what we don't know while overvaluing what we do know, and as a result, ignore evidence that contradicts our preconceived ideas (Kahneman, 2011; Taleb, 2007). This leads us to propose that knowing what you don't know is a powerful tool to go ahead in today's society (Grant, 2021). Indeed, in every decision makers best interest when entering a foreign market, it is probably optimal to confess her or his degree of ignorance. This, however, is a complicated skill to obtain and maintain. Research has shown that individuals often make inaccurate judgments and decisions while missing the insight of recognizing their shortcomings. The explanation for this statement can be found in the fact that the same knowledge that underlies the ability *to produce* correct judgment is also the knowledge that underlies the ability *to recognize* correct judgment (Kruger and Dunning 1999, p. 1121). Both circumstances highlight the fact that people's insight into their deficits is imperfect and incomplete since they have been argued to be cognitively

camouflaged in various ways (Dunning, 2011). We argue that, as one's environment becomes more complex and complicated, combined with an incomplete and uninformed mind due to novel, unknown circumstances, one's strategy to recognize ignorance becomes an essential part of a major decision such as entering a foreign market.

Decision making is the “entire process of choosing a course of action” (Hastie 2001, p. 657), usually preceded by an identification process which we know as judgment. Decisions such as foreign market entry rely on a dual-process mechanism when processing information. System 1 is known as the fast system of thought that works automatically. System 2 on the other hand involves effortful, slow, rational processing of information. Most of what individuals think and do happens in System 1. System 2 comes usually into play when System 1 runs into difficulty (Kahneman 2011; Stanovich & West, 2000). Given the complexity and uncertainty of the entrepreneurial environment coupled with non-optimal information processing of the human mind, heuristics and biases may occasionally come into play (Caputo & Pellegrini, 2019; Grégoire et al., 2011; Packard et al., 2017). In fact, ignorance is believed to influence cognitive biases and heuristics in significant ways (Roy & Zeckhauser, 2015).

### **Heuristics and cognitive biases**

Heuristics come into play when rather quick judgmental shortcuts must be made by entrepreneurs. They refer to simplifying fast and frugal mental shortcuts or principles that entrepreneurs use for information processing and problem-solving (Baron, 2007; Kahneman & Tversky, 1982). Heuristics additionally enable entrepreneurs to make sense of uncertain and complex situations more quickly (Mitchell, 2007). They represent “actionable simple rules that synthesize the entrepreneur's subjective knowledge, expectations, and vision, and for which optimal outcomes cannot be determined by mathematical methods” (Gilbert-Saad et al., 2018, p. 76). An example is Sarasvathy's research (2008) on effectuation that has been shown to support entrepreneurs in international settings and implies the existence of heuristics (Sarasvathy et al., 2014).

The field of IE has demonstrated that entrepreneurs are affected by these cognitive shortcuts in their decisions to enter a foreign market. For example, Zahra and colleagues (2005) showed that entrepreneurs' cognition as a result may lead to more risky foreign activities, since it may lead to inaccurate opportunity evaluation. That is because System 1 thinking leads

individuals to arrive at the first plausible-appearing explanations. Some scholars have suggested that heuristics interact in considerable means with ignorance because it “adds a dimension of the unknown beyond uncertainty. Thus, decision makers confronting it also suffer more from biases and heuristics than when faced merely with uncertainty” (Roy & Zeckhauser 2017, p. 235). That is because some of the cognitive tools that often work out well tend to lean strongly towards what is known from previous experiences, or prior knowledge, when predicting the future, such as the availability heuristic (Tversky & Kahneman, 1973). For example, research has shown that availability leads economic forecasters to ignore crucial known information by solely judging *a moment*, and as a result overlooking well-known practices (Alvesson & Spicer, 2016; Lee et al., 2008).

The future, however, is mostly unknown. The cognitive ease that individuals apply to rely on their known past has little to say about judging a future world that is unpredictable and uncertain. A similar case occurs with the recognition heuristic. When individuals are presented two equal alternatives but only one of them is mentally recognized, it will automatically be valued higher. That is because people have a preference to bet on known probabilities (Ellsberg, 1961). Once individuals are confronted with an unknown situation, they tend to follow familiar clues and ignore unfamiliar contextual information. These heuristics imply that people overestimate what they know, and do little effort to find out what they might still be ignorant about. When decisions such as entering a foreign market are made, “crucial information is ignored, and the wrong lessons are drawn from experience,” because people are not consciously aware of these heuristics (Alvesson & Spicer 2016, p. 61).

Because heuristics simplify or ignore part of the information processing, they are associated with cognitive biases, systematic deviation from rationality or norms in judgment and decision making (Gilovich et al., 2002; Kahneman & Tversky, 1982). Research on cognitive bias - systematic errors in decision making (Kahneman, 2011) - has become an important area of study because it provides practical and empirical perspectives in entrepreneurial decision making (e.g. Krueger, 2003; Zacharakis & Shepherd, 2001; Zahra et al., 2005). Most cognitive biases are undergone unconsciously, at least *a priori*.

Cognitive biases are known to make IE activities risky (Zahra et al., 2005), and ignorance plays a fundamental role. Some examples are overestimation, which leads entrepreneurs overvaluing previous market knowledge while ignoring novel information (Zahra et al., 2005), illusion of control, in which individuals overestimate their ability to control events

while ignoring the base-rates, fundamental attribution error, where individuals tend to ignore contextual factors when entering a foreign market, halo effect, that may lead entrepreneurs to have a falsely positive image of a particular market without any previous experience, and confirmation bias, that inclines people to ignore solutions, such as leaving an unprofitable market, that contradict their primary judgment and as a result demonstrate cognitive dissonance. Similarly, when foreign entry decisions are made within a team of co-founders, the group think bias may cause entrepreneurs to “go with the crowd” and thus ignore arguments, contradictions, critique, doubts, and the consequences that follow from the decisions made.

While the above examples illustrate the unconscious character of biases with ignorance, that is not always the case. Some other biases may be perceived and operated consciously because a decision maker believes the outcome will be favorable. For example, in the case of overconfidence (Busenitz, 1999; Gudmundsson & Lechner, 2013), entrepreneurs may be aware of the risks of entering unfamiliar foreign markets but simultaneously believe that they can beat the odds of breakdown, therefore ignoring the information and ‘taking the risk for granted’ (Hayward et al., 2006). Another example may be the sunk cost fallacy, where firms persist to invest in entering foreign markets that are clearly underperforming, hoping for a positive change and ignoring the less costly decision to abandon (Holland & Shepherd, 2013).

During the process of entering a market, additional cognitive biases may evolve, even when they are recognized. The status-quo bias is one’s tendency to hold on to pre-existing choices and is often triggered by loss aversion. That is because decision makers are more affected by losses than by benefits. Research has demonstrated that firms keep investing in decisions that have been shown to not work, in order to win back their losses (Staw, 1981). Additionally, even when firms recognize their ignorance, they may fall prey to status-quo bias because their awareness has not yet been overcome. For example, potential self-blame may affect decision makers in “doing nothing or maintaining one’s current or previous decision” (Samuelson & Zeckhauser, 1988, p. 7). This additionally shows the complex direction of cognitive biases, since, like with ignorance, one may lead to another. Ignorance may cause the emergence of biases, and these biases may additionally lead to new ignorance. A similar example is the indecision bias, which refers to inaction because of one’s tendency to delay or play the game safe as a result of acknowledged ignorance, resulting decision makers being paralyzed (e.g. Goldman, 1986; McMullen & Shepherd, 2006). Roy and Zeckhauser (2017, p. 237) note that indecisions facilitate individuals to “fail to recognize that choosing the unknown

probability often offers valuable learning opportunities, opportunities that would otherwise be missed.” Thus, cognitive biases that go well with ignorance do not only differ in degree of consciousness, but may additionally emerge when acknowledged but not yet conquered.

### **Towards an Integration of Ignorance**

So how do we move from here? Ignorance is a cognitive condition that affects all of us. That is not necessarily bad, as long as its presence is acknowledged. Rather than neutralizing ignorance, we propose that ignorance should be embraced by increasing one’s awareness. In doing so, we see two directions to cope with ignorance.

Firstly, when analysing the interaction of ignorance with heuristics and cognitive biases, entrepreneurs should tailor their decision-making processes through their dual-process theory (Kahneman, 2011; Stanovich & West, 2000). The type of ignorance that interacts with these processes is, as we have shown, often not beneficial for entrepreneurs when entering a foreign market. Thus, ignorance needs a neutralizing approach. Behavioural decision theorists have shown that situations where actors use counterfactual thinking (Baron, 2000) and search for feedback (Fischhoff, 1982) limit the functioning of cognitive biases, while Alvensson and Spicer (2012) pointed out that an inability or unwillingness to mobilize one’s cognitive capacities is caused by a lack of critical thinking and reflexivity. The above cases illustrate that obtaining an awareness of considering an alternative point of view in the decision makers’ thinking, either triggered by the self or by someone else, supports well-grounded decision making. This could be done for instance by actively training metacognition, which refers to a conscious reflective process and helps individuals to organize their knowledge when making decisions (Flavell, 1979). Recognizing that a firm may cope with unknown unknowns and using scenario planning or foresight studies may help to transform them into known unknowns. Previous research has found these techniques beneficial to create several consistent scenarios to anticipate on future possibilities (Loveridge, 2009). These processes may, as a result, help individuals in their decision making process, because acknowledged ignorance by definition is less hurtful. *Table 7<sup>8</sup>* below displays our adapted version of how different varieties of ignorance may be unmade best (Smithson, 2015). We separate the individual decision maker from an outsider, suggesting

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<sup>8</sup> We would like to acknowledge the role of the anonymous reviewer in our submission process, who generously provided us this table in order to better understand ways to unmake ignorance.

that unknowns are better understood and comprehended when an outsider, such as with the help of feedback, exposes what is unknown.

**Table 7: Unmaking ignorance**

		Situational point of view	
		From the individual	From an outsider
<b>State of actors' or awareness of something</b>	Conscious (Aware)	<i>Known knowns:</i> active relevant knowledge or competences at hand  <b>Tool:</b> Leverage and develop further knowns by gaining knowledge and experience	<i>Known unknowns:</i> Perceived information and development needs  <b>Tool:</b> Expose the unknown
	Unaware	<i>Unknown knowns:</i> Possessed, unknown or unutilized competence or knowledge  <b>Tool:</b> Move to knowns with serendipitous processes	<i>Unknown unknowns:</i> Not perceived potential risks or failure factors  <b>Tool:</b> Raise consciousness about the unknown

Secondly, ignorance may also be beneficial. The Swatch example demonstrated that purposefully ignoring customers and investors may lead to new opportunities. Ignorance thus is not always unwanted and can even be used intentionally. Learning and discovering, for example, has been linked with consciously acknowledged and constructed ignorance. Similarly, tolerance of ignorance facilitates a creative entrepreneurial climate, and ‘not knowing’ has benefits for knowledge creation and innovation in fast-changing markets (Roberts & Armitage, 2008). Having no complete access to full knowledge, or purposefully ignoring part of the information, surely may create benefits to firms. On many occasions, firms balance between known, unknown, and unknowable knowledge, applying in and out decision strategies, serendipity, or improvisation that rely on a lack or complete absence of knowledge. This may happen because the required knowledge is unavailable within the firm, or inaccessible because of the economic environment. Limited knowledge may eventually lead to action where full knowledge about a decision may lead a firm to be indecisive. The above cases illustrate that ignorance does not need a neutralizing approach as long as there are degrees of awareness about one’s ignorance. Rather than eliminating one’s ignorance, it may result in unexpected results that may be beneficial when entering a foreign market. Here, ignorance should be embraced as an advantage.

Finally, one of the main issues of studying ignorance is that it is hard to measure (Ungar, 2008). However, to understand ignorance better as a research topic, it has to be studied empirically eventually. An interesting approach to identify ignorance has been suggested by North and Kares (2005) who suggest ten disablers-enablers criteria of ignorance. The smaller the gap, the lower one's awareness of ignorance. A larger gap on the other hand increases the chance that someone is unaware of one's lack of knowledge or information in the decision making process. We adapt this scale toward an entrepreneurial context in *Figure 7*. The main goal of the scale is to lay out a gap analysis and can be filled in by entrepreneurs and their team members following a set of questions.

## **Conclusion**

The aim of this chapter was to demonstrate the role of ignorance in International Entrepreneurship. We debated that scholars might have overemphasized the role of knowledge, while ignorance has been ignored. We have argued that firms who internationalize do not exclusively follow pre-defined knowledge strategies in order to find their most suitable foreign market. We have also demonstrated that following knowledge patterns, even if they exist, may not give satisfying results to firms, since it may result in overlooking opportunities and ignoring new important information.

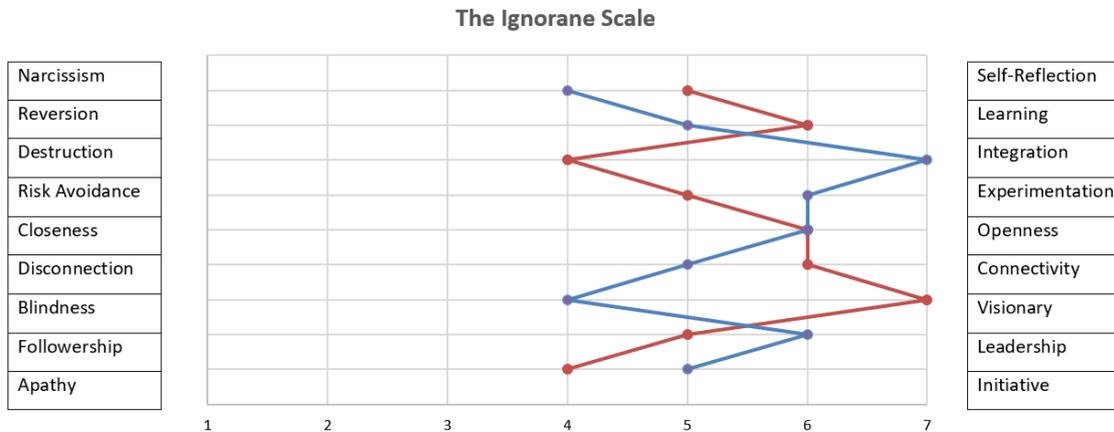
Ignorance also plays an important role in entrepreneurial cognition and may cause, or be caused by, serious cognitive errors. The field of entrepreneurship, International Entrepreneurship not excluded, has seen many fruitful contributions in the past two decades that highlighted the role of heuristics and biases in the decision making process. Ignorance so far is a neglected topic in entrepreneurship. While uncertainty is “the favored child of behavioural decision, ignorance, in contrast, suffers neglect” (Roy and Zeckhauser, 2017, p. 232). We call for the inclusion of ignorance, because knowledge is power and knowing what you don't know is bliss (Grant, 2021). This chapter does not allow us for a full overview of ignorance, but we see promising future research contributions coming from scholars that focus on re-thinking and unlearning patterns, allowing us to analyse decision makers not solely from a knowledge point of view. We also see potential contributions coming from studies aimed at reducing ignorance in entrepreneurial decision making, perhaps by designing awareness training programs for entrepreneurs. Future research contributions may also come from

theoretical reviews, which would allow us to get a complete picture of the role of ignorance in the fields of entrepreneurship.

Lastly, we see potential contributions coming from studies focused not only on the individual level but on the organizational level. For example, future studies might investigate how ignorance within organizations is created, strengthened, and promoted (Alvesson & Spicer, 2016). Additionally, promising works could investigate how ignorance may be used strategically within organizations between employees or toward customers (Smithson, 1989). Finally, cognitive biases that relate to the organizational level of analysis, such as groupthink and halo effect, may become particularly interesting here. Recent calls have emphasized to “move one step further and show that ignorance needs to be understood and theorized as a regular feature of decision-making” (Gross & McGoey 2015, p. 4). We make an effort to answer that request in this chapter. It is our hope that this contribution encourages our research community to embrace the topic as an existing, relevant concept.

## Appendix Essay 1

**Figure 7:** *The Ignorance Scale, adapted version from North and Kares (2005)*



The questionnaire consists of 9 items that could be answered on a 7-point Likert Scale (1 = very low, 7 = very high) following the statement: *How would you rate entrepreneur's A capability to ...*

*... assess his/her willingness to recognize weaknesses, strengths and mistakes? (1)*

*... create awareness of the importance of knowing by learning and innovating? (2)*

*... stimulate a strong sense of the value of people by integration, networking, and communication? (3)*

*... be open for change, try new solutions, and permit errors? (4)*

*... see and integrate ideas, trends, and form open relationships and networking? (5)*

*... build and assess the value creation of networks and communities? (6)*

*... see and develop shared mental images of the future? (7)*

*... make transparent decisions toward a shared goal? (8)*

*... stimulate initiatives to mobilize and take actions? (9)*

## Essay 2

### **To Be Aware or Not To Be?**

#### **The Impact of Metacognition on Entrepreneurial Decisions**

##### **Abstract**

Recent, radically uncertain events in the economic landscape have impacted entrepreneurs and their decision-making process. As a result of these fluctuations, individuals may feel not be in control anymore, to behave risk-averse and as a result, stick with the same decisions disproportionately, a cognitive bias known as the status-quo bias. This study explores how the status-quo bias can be overcome. Specifically, we propose that metacognitive processes overcome the choice of a known, not necessarily best, option by bouncing to new alternatives beyond the familiar. In a randomized post-only experiment, we test a metacognitive treatment on several decision-making scenarios. The results highlight mixed results. Participants who were trained to use their metacognition choose the status-quo option less frequently in some, but not all scenarios, emphasizing the importance of ways how entrepreneurs contextualize their decision environment. The study results contribute to new insights about how metacognition can be advantageous in debiasing research, and simultaneously, highlights the challenges.

Key words: Entrepreneurial decision-making, Status-quo bias, Metacognition, Debiasing

##### **Introduction**

The ability to produce, recognize and distinguish accurate and reliable from imprecise judgment plays a fundamental role for entrepreneurial decision making (Shepherd, 2014). That is, among other things, because entrepreneurial decisions are affected by certain types of cognitive biases, such as egocentric bias, status-quo bias, representativeness bias, and overconfidence (Burmeister & Schade, 2007; Forbes, 2005; McCarthy et al., 1993). The consequences of biases are generally seen as costly decisions, but evidence in entrepreneurship research is two-faced. Sometimes, cognitive biases help entrepreneurs (Busenitz & Lau, 1996; Gudmundsson & Lechner, 2013; Hayward et al., 2010; Parker, 2006; Koellinger et al., 2007), while at other times, they lead to rather negative consequences (Camerer & Lovallo, 1999; Hayward et al., 2006; Hmieleski & Baron, 2009; Lowe & Ziedonis, 2006; Wu & Knott, 2006).

These preceding perspectives have resulted in many valuable contributions on the identification of particular biases in specific entrepreneurial settings, demonstrating how entrepreneurial judgment is bounded with varied outcomes.

Rather than eliminating biases in judgment, decision-makers would be better off by recognizing and neutralizing biases in decision making using “exercises aimed at making entrepreneurs more aware of the potential dangers of their heuristics and cognitive biases” (Cossette, 2014, p. 492; Kahneman et al., 2011). The operation to conquer this process is problematic, there is still little knowledge on the process how individuals overcome their biases to behave optimally” (Milkman, et al., 2009). However, individuals are generally limited in their awareness regarding the decisions they make, and do not consider alternative options (Colombo et al., 2010; Dunning, 2011), which makes these diversions from rational behaviour are hard to eliminate (Fischhoff, 1982; Milkman et al., 2009). Just some de-biasing tools may help to alter a cognitive distortion by changing experiences, settings or accessibility of content (Sanna & Schwarz, 2003). In their review of cognitive bias in entrepreneurship literature, Zhang and Cueto (2017) nevertheless detected de-biasing research to be remarkably absent in entrepreneurship research. This is a problematic matter because current cognitive bias research shows just one side of the cognitive coin, the identification process, or as Fischhoff (1982, p. 423) argued, “the study of biases clarifies the sources and limits of apparent wisdom, just as the study of de-biasing clarifies the sources and limits of apparent folly. *Both* are essential to the study of judgment.”

The psychological literature offers a tool that optimizes decision-making, namely, metacognition (Batha & Carroll, 2007; Rosi et al., 2019). Metacognition, or cognition about cognition, represents an individual’s awareness of outcomes while reflecting on them (e.g., Efklides, 2008; Flavell, 1979). Metacognition has several benefits for decision making because of its self-regulating nature to detect possible flaws in reasoning (Croskerry, 2002). That is because metacognition self-regulates understanding what individuals know and don’t know in order to perform tasks (Efklides, 2008). It serves as a ‘second opinion’ from one’s conscious mind and provides individuals advantages, such as seeking out alternative explanations and exploring the consequences of these alternatives (Graber et al., 2012). For example, Schraw and Dennison (1994) demonstrated with an experiment that adaptable decision-making is positively related with metacognitive awareness. Haynie and colleagues (2010, p. 226), debated that “metacognition may help individuals compensate for limitations to decision making

brought on by heuristics” because it “serves as a psychological mechanism that bridges the divide between the biases embedded in individuals' cognitive mechanisms”, and showed that metacognition contributes to effective feedback adaptation (Haynie et al., 2012), while Baron (2014) proposed that metacognition may help entrepreneurs to avoid biases such as the sunk cost fallacy. In light of this, this work proposes that metacognition has explanatory power in helping individuals recognizing and reducing biases in their decision-making process. Many decisions nowadays are confronted with an increasingly amount of complexity (Soll et al., 2015). Thus, we propose that the time has come to move beyond identifying the existence of cognitive biases in decision-making, and “desire empirically tested strategies for reaching better decisions in those situations” (Milkman et al., 2009: p. 382). While metacognition is a well-established topic in entrepreneurship literature, its de-biasing nature received little attention. Our work proposes to go beyond the so far successful identification process of cognitive biases, and shift towards the process of neutralizing biases and optimizing decision-making process.

Following Shepherd (2015, p. 22) who called for research where “research may explore the means by which individuals can (or should) reduce biases”, we propose that metacognition may help individuals to overcome cognitive bias and counteract their lack of awareness in their decision-making process (Colombo et al., 2010). Specifically, we distinguish this work by setting up a series of experiments where we operationalize a metacognitive treatment and test this on a specific cognitive bias that represent a real life environment for entrepreneurs in their decision-making process. This design is appropriate because it allows us to accurately identify why metacognition operates as an effective experimental manipulation to optimize decisions, excluding alternative potential explanations of the results.

This contribution empirically advances our existing knowledge of entrepreneurship cognition and in particular, metacognition. Our findings have theoretical and practical relevance. From a theoretical point of view, we complement current assumptions of metacognition, known as an important concept within the fields of entrepreneurial cognition (Haynie et al. 2010), demonstrating that it may improve one’s decision-making by activating an analytic thought process in which different alternatives are evaluated. Additionally, we bring novelty to the field of entrepreneurship cognition, moving beyond the effects of biases on decisions and offer a better understanding within the optimization process that entrepreneurs use to make judgments and decisions (Batha & Carroll, 2007; Rosi et al., 2019). Specifically, we contribute by highlighting that the status-quo bias particularly can be overcome when

individuals use their metacognition. This is because metacognitive processes overcome the choice of a known, not necessary best, option by bouncing to new alternatives beyond the familiar. This study also contributes from a practical perspective. Metacognition may be taught in entrepreneurship courses and incubator programs, using the specific framework that we provide, since it can be enhanced and developed through training (Mevarech, 1999; Nietfeld & Schraw, 2002; Schmidt & Ford, 2003).

The remainder of the present study is structured as follows. The next section draws a theoretical framework, followed by the research approach in which we explain into detail our two experimental studies. Then, a discussion follows where we explain our findings. The final section of the study suggests theoretical and practical implications, limitations, and interesting new directions for future de-bias research in metacognitive studies in entrepreneurship.

## **Theoretical Framework**

### *Cognitive biases in entrepreneurship*

The last two decades have shown that contributions about cognitive bias research - systematic errors in decision making (Kahneman, 2011) – have been an important area of study because it provides practical and empirical perspectives in entrepreneurial decision making (e.g., Krueger, 2005; Zacharakis & Shepherd, 2001). The topic is nowadays considered to be a widespread phenomenon in the field, at least 11 cognitive biases have been studied so far in entrepreneurship (Zhang & Cueto, 2017). There is no general agreement among scholars whether these systematic deviations rather aid or obstruct entrepreneurs (Gigerenzer & Gaissmaier, 2011; Kahneman, 2011). Some studies have suggested that biases within a complex and uncertain environment positively provoke decision making (Busenitz & Barney, 1997), because it would stimulate the recognition of new opportunities, innovation, and faster learning (Alvarez & Busenitz, 2001; Holcomb et al., 2009). This is because intuitive thinking is an effective guide for entrepreneurs to apply fast strategies and simplify information (Gigerenzer & Gaissmaier, 2011). However, at other times, these biases affect critical founding decisions resulting in severe consequences, such as business failures (Camerer and Lovo, 1999; Hayward et al., 2006). Generally, the importance of coping with cognitive biases lies in the process of become aware of the decision-making process.

### *Status-quo bias*

Similarly, having the awareness to consider all available information in the decision-making process is a crucial component to avoid the negative consequences of the status-quo bias. This bias describes *a behavioural tendency to decide for a status-quo option disproportionately often* (Samuelson & Zeckhauser, 1988). Individuals are status-quo biased when they prefer things to stay the same by doing nothing, or by sticking to a decision previously made (Burmeister & Schade, 2007). The status-quo bias occurs because individuals tend to dislike risky options and generally prefer to be in control, causing people to intuitively rely on a familiar, previous decision that represents the desirable, current state. As a result, individuals become attached to what they already know and do not even consider other opportunities that might improve a situation (Martin, 2016). While the latter describes a tendency to ineffective decision-making, there is also a rational status-quo maintenance (Eidelman & Crandall, 2012). For example, entrepreneurs may decide to retain the current situation because switching would imply transaction costs. Thus, the status-quo bias happens to be irrational when individuals ignore alternatives, refuse to give thought to these considerations, and are generally unaware of this process (Debarliev et al., 2020).

### *Emerge of biases*

Cognitive biases mostly occur because they are associated with System 1 thinking. When making judgments, people rely on a dual process mechanisms while processing information. System 1 is known as the fast, intuitive, implicit and emotional system of thought that works automatic. System 2 on the other hand involves effortful, slow, rational and logical processing of information. Most of what individuals think and do happens in System 1. This is because “the busier people are, the more they have on their minds, and the more time constraints they face, the more likely they will be to rely on System 1 thinking” (Milkman et al., 2009, p. 380). However, cognitive biases appear more frequently in the intuitive system, because people narrowly focus “on focal features of the issue and fail to consider a wider range of information” (Schwarz et al., 2007, p. 132). The more controlled System 2 comes into play when System 1 needs correction, replacement or acceptance (Kahneman, 2011; Stanovich & West, 2000).

### *De-biasing*

The formation and testing of research on improvement decision strategies, alias *de-biasing*, is relatively unknown in entrepreneurship research (Zhang & Cueto, 2017). That is because cognitive shortcuts are generally assumed to be difficult to be removed from an

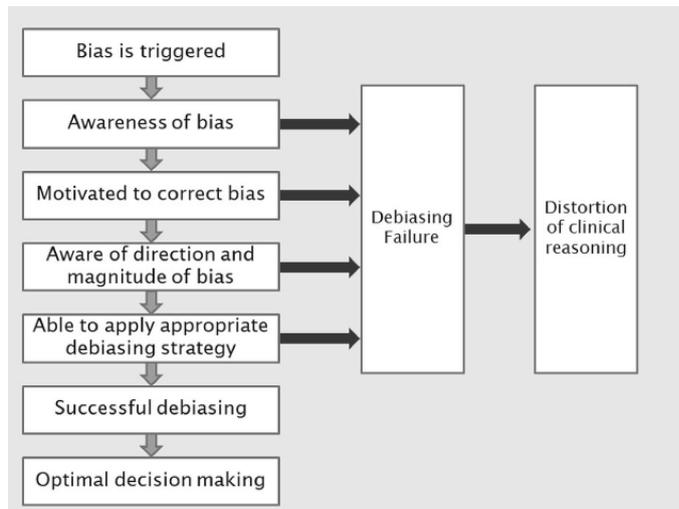
individual's decision-making process (Soll, et al., 2015). Scholars in different fields have, because of that, adapted techniques that change, optimize, or train individuals and their context. These works point to the possibilities of cognitive interventions to reduce errors (e.g., Alter et al., 2007; Croskerry, 2002; Graber et al., 2012; Larrick, 2004). Common suggested methods to de-bias individuals that are proven to be effective are (1) changing incentives, (2) optimizing choice architecture and (3) training (Martin, 2016; Morewedge et al., 2015). One popular example is nudging, in which the setting, rather than the person itself, undergoes adaptation (Thaler & Sunstein, 2008).

However, all of these techniques have pros and cons. Backfire effects from diminishing motivation and underestimation of information may cause the opposite, or even worsen, the desired effect if not carefully implemented (Downs et al., 2009; Gneezy et al., 2011; Lerner & Tetlock, 1999). For example, incentives that are poorly framed could lead to demotivate behaviour and result in a costly and non-optimal solution for cognitive biases reduction (Morewedge et al., 2015). Likewise, some training intervention results have demonstrated to be ambiguous, especially when tasks are too abstract (Lilienfeld et al., 2009; Phillips et al., 2004).

With regards to training, Bazerman and Moore (2008) concluded that “even intensive, personalized feedback produced only moderate improvements in decision making” (Milkman et al., 2009, p. 380). Strategies such as ‘offering warnings about the existence of a cognitive bias’, ‘describing the bias direction’, and ‘feedback’ “yielded minimal success” (ibid). As a matter of fact, awareness training in considering an alternative point of view in the decision makers' thinking, might not be sufficient to support well-grounded decision making. This is because individuals might be able to comprehend knowledge about a cognitive bias, but simultaneously find themselves unable to recognize the decision problem, and incapable to apply the right strategy to counteract the difficulty consequently (Willingham, 2008).

Nevertheless, de-biasing training interventions hold much potential for improving judgments and decisions (Morewedge et al., 2015). Recent experiments have shown that training interventions may be adequate to overcome cognitive biases (Yoon et al., 2021). In fact, the effects of biases such as sunk cost fallacy, bias blind spot, confirmation bias, overconfidence and anchoring were all mitigated by training effects (e.g. Chang et al., 2016; Fong, et al., 1986; Morewedge et al., 2015; Sellier et al., 2019). The above exemplifies that de-bias training needs to be designed around a process of variables such as awareness, motivation, and strategies. *Figure 8* illustrates this process.

**Figure 8:** De-biasing process, extracted from Wilson and Brekke (1994)



### *Metacognition*

One approach that may be effective for cognitive de-bias training is metacognition (Croskerry, 2002). Metacognition, a representation of cognition, refers to a higher-order cognitive process that reflects upon one's learning, and increases awareness over knowledge structures necessary for the decision-making process (Flavell, 1979; Haynie et al., 2010). It has several benefits in decision-making, metacognition increases the adaptation of cognitive feedback and stimulates consistency in decision-making processes (Haynie et al., 2012; Mitchell et al., 2011). It also helps individuals to reduce uncertainty in their decision-making process by seeking out alternative explanations and exploring the consequences of alternatives (Graber et al., 2012).

Metacognition, because of its self-regulatory nature, may particularly help individuals without extensive experience, because entrepreneurs new to the field, (1) are often much on their own, (2) frequently carry out tasks that are new to them, (3) and are inclined to rapidly act while analytic, reflexive thinking might have been more appropriate (Baron, 2014). Specifically, metacognition creates more adequate knowledge of one's mental processes *and* goes beyond cognitive process to complete a task (Colombo et al., 2010). This is because metacognition is needed to understand *how* a task will be performed (Akturk & Sahin, 2011; Schraw, 2001).

Additionally, individuals with higher degrees of metacognition find themselves employing analytic strategies in order to develop a set of alternatives. This is because

metacognition may “serve as an alarm” that “assesses and sometimes corrects the output” of forms of reasoning that appeared to be insufficient, aiding individuals awareness of what was previously unknown to them (Alter et al., 2007, p. 569). In fact, metacognition has been proposed to activate System 2, suggesting that slow, conscious forms of reasoning supports de-biasing processes and accordingly decouples from intuitive judgments (Croskerry et al., 2013). Since heuristics and cognitive biases are a result of the fast and intuitive System 1, entrepreneurs may overcome these tendencies by shifting to System 2 (Milkman et al., 2009). Importantly, metacognition can be learned and improved by training (Schmidt & Ford, 2003), there is evidence that decision-making skills improve and cognitive biases diminish with a metacognitive training (Chew et al., 2016; Rosi, et al., 2019).

Cognitive biases, such as the status-quo bias, share the identical characteristic that individuals are in general unaware of the scope to which they are biased (Kahneman, 2011). Specifically, the status-quo bias “largely arise from cognitive mechanisms” (Zhang & Cueto, 2017, p. 429) which fits with a training that encompasses metacognitive rules in which participants consider alternative points of view (Willingham, 2007). Since metacognition stimulates higher-order cognitive processes that do not only process cognitive tasks, but additionally create awareness about the decision-making process in that it creates knowledge about how a task should be performed (Colombo et al., 2010; Schraw, 2001), we expect that a metacognitive treatment may help individuals to become aware of the status-quo bias, and choose more economically attractive alternatives in their decision-making process. As a result, we hypothesize that:

**Hypothesis 1.** *Participants using metacognition choose the status-quo option less often.*

The potential role of metacognition parallels recent de-bias suggestions in which individuals “should go beyond telling people that bias exists or creating uncomfortable experiences that are more likely to prompt defensiveness than learning. Rather, the most effective training is anti-bias training that is designed to increase awareness of bias and its lasting impact, plant seeds that inspire sustained learning, and teach skills that enable attendees to manage their biases and change their behavior” (Carter et al., 2020, p. 58).

## Research approach<sup>9</sup>

The study reported here has used an experimental design to investigate the effect of metacognition on the status-quo bias. Entrepreneurship represents a socially-constructed field, and causal relationships “can enhance the argument that one’s research is novel” in the meaning-making of the community of entrepreneurship researchers since “entrepreneurship is a complex phenomenon that evokes unique challenges for use of experimental methods” (Williams et al., 2019, p. 216). Experimental designs have the advantage that, with the help of randomization, it can control for possibly confounding causes and exclude alternative explanations (Shadish et al., 2002). Specifically, the experimental study has used a randomized control design, since it permits researchers to reduce noise factors by isolating the variables under interest.

The use and publication of *more* experiments has been explicitly called to be the new gold standard (Williams et al., 2019) to contribute to the field of entrepreneurship research (Hsu et al., 2017). Moreover, an experiment suits our research question best because it has been demonstrated to be an inexpensive method “to uncover new biases, develop new theories, and test new interventions” (Morewedge et al., 2015, p. 137). In our study, we use a between-subject experiment with an active participation design (the main study). The context of the study has been role-playing, following Lévesque and Schade (2005), in which our respondents were given several business decisions, imagining to be an entrepreneur.

## Main study

### *Participants and procedure*

The appropriateness of the use of student samples have been debated in entrepreneurship experimental research and may be more appropriate under certain conditions. Hsu and colleagues (2017) discussed student samples to be suitable when: (1) “students are or resemble the population of interest,” (2) “when the manipulation is likely to be confounded by the

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<sup>9</sup> For this study, two experimental studies were conducted; a pilot study, and the main study reported here. The pilot study served as a crucial enabler for the main study because it (1) highlighted the need to study one bias at the time, (2) emphasized the need to design a tailor-made training, rather than priming, following that “people do not apply their training to unfamiliar and dissimilar domains because they lack the necessary metacognitive strategies to recognize underlying problem structure” (Morewedge et al., 2015, p. 131), (3) underlined that our manipulation (reading instructions) was not strong enough, (4) pre-tested our dependent variable, and (5) helped to improve our manipulation check variables. Because of its importance, details about the pilot study can be found in the appendix.

professional experience of the participants,” and (3) “when the relationships under investigation are grounded in a broad theory” (p. 385). Indeed, university students show characteristics of nascent entrepreneurs who may be unaware of their decision-making process due to their lack of experience and knowledge. Following Haynie and colleagues (2012) who noted that no experience in a metacognitive study is an essential part of the study “because such prior knowledge would likely confound the true nature of the theoretical construct” (p. 239), we met the criteria of Hsu and colleagues (2017).

The sample of the main study included 41 students and took place during multiple group settings in an university class setting, two for the experimental group and two for the control group. Before each class, the study was briefly introduced as a study on entrepreneurial decision-making. The students that decided to participate gained a potential bonus point on their final grade, and were informed that participation in each class was mandatory in order to be eligible for the bonus point. Participants were free to abandon the study at any point if they would not feel like continuing. Additionally, participants were told that the results of the experiment were anonymous and would not impact their final grade. The data of this study has been collected during different phases (A, B, and C), which is summarized in in *Table 8*.

**Table 8:** *Details about main study set-up*

<b>Phase A</b>	Entrepreneurship course A1 (control group, $N = 24$ ) <i>Duration:</i> 45 minutes training, September ‘21
	Entrepreneurship course <b>A2</b> (experimental group, $N = 17$ ) <i>Duration:</i> 45 minutes, September ‘21
<b>Phase B</b>	Online survey sent out after Phase A
<b>Phase C</b>	Entrepreneurship course C1 (control group, $N = 22$ ) <i>Duration:</i> 60 minutes training, October, ‘21
	Entrepreneurship course <b>C2</b> (experimental group, $N = 17$ ) <i>Duration:</i> 60 minutes training, October, ‘21

Prior to phase A, participants were randomly assigned to either the experimental or control condition. The experimental group participated in course A2 and C2 (in **bold**), the control condition participated in group A1 and C1. Differently from the pilot study, the two conditions were not in the same classroom during any phase of the study. Additionally, different from the pilot study, our dependent variable is the status-quo bias, since we expected that the use of more biases would increase the chance of interaction effects between the dependent variables, a possibility that we exclude in this study. In phase A, participants were trained for 45 minutes. While participants in the pilot study participated passively, the main study actively impacted participants to both conditions. Here, participants were told that the aim of the class was to learn about entrepreneurial decision-making. During the training, participants were presented decision-making examples and were stimulated to actively engage with the trainer, both individually and in groups. While the experimental group worked on cognitive biases and metacognition, the control group worked on entrepreneurial decision-making in an international context with the help of product-market combinations, thus ensuring the same cognitive load for both conditions.

Then, in phase B, control and moderator variables were collected with the help of an online survey that was sent to every participant by mail. Participants were told that they had 5 days to fill in the survey, which they all did. Before the experimental task, that took place in phase C, instructions were sent out to all students to bring a laptop. Then, both conditions received a re-cap of the discussed materials in an active participation format. The time between phase A and phase C has been chosen intentionally, in that we can argue that we were not just priming, but also training, assuming a long lasting effect. Indeed, both training sessions (in phase A and phase C) had an interactive character with the aim to train, instead of passively stimulate participants to reason while reading.

Next, during both sessions (C1 & C2), participants were told to fill out the survey (*M* time to complete = 18.3 min) without any interaction or discussion between participants. The survey with the experimental tasks and manipulation checks was then sent to the students by mail, in which each participants received the experimental tasks in a randomized order. The answers for each task were randomized as well. Since two participants did not participate in the last lecture, they had to be filtered out of our data set, leaving a final sample of 39 participants. *Table 9* represents details about the main study sample, in which 13% were female.

**Table 9:** *Participants details of main study*

<b>Variable</b>	<b>M</b>	<b>SD</b>
Gender	1.13 <sup>10</sup>	0.34
Age	24.49	2.01
Education	1.10	0.38
Experience A (N attended business classes)	1.23	1.48
Experience B (ever started a business)	0.15	0.37
Experience C (currently a founder)	0.08	0.27

### *Treatment*

For this study, each participant was randomly assigned to one of the two conditions. As *Table 13* illustrates, both the control group and experimental group took separately part in two training sessions that lasted in 105 minutes in total. The framework of the training was developed by combining the learner-oriented approach developed by Bottiroli and colleagues (2013) and the metacognitive strategy decision-making training developed by Rosi and colleagues (2019, p. 206), that noted that “all activities carried out in the training aimed to promote judgment and decision-making skills through the use of specific metacognitive principles and analytical strategies.” During phase A, participants were introduced to the goals of the training and the content that they would be presented, namely, (1) decision-making and cognitive biases, (2) the status-quo bias, and (3) metacognition. The main goal of this phase was to get participants comfortable with the topics. Firstly, the difference between intuitive and analytic decision-making in entrepreneurship was explained with several examples, and how this may lead to cognitive biases (Kahneman, 2011).

Then, the status-quo bias was explained with a definition, its antecedents, examples, and consequences for entrepreneurs. Lastly, metacognition was presented as a cognitive tool to reflect on thinking and overcome cognitive biases, emphasizing the value of the adapted PWES matrix: Problem, Wrong, Evidence, Strategy (Chew et al., 2016). Explicit instructions about the importance to recognize the status-quo bias were discussed, and several examples

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<sup>10</sup> Note. M and SD represent mean and standard deviation. Gender (1=male, 2 = female), Education (1 = bachelor, 2 = graduate), Exp A (0 = none, 4 = four or more), Exp B & C (0 = No, 1 = Yes).

emphasized the need for participants to practice and repeat this matrix. The experimental group finalized their first training with a wrap-up of the discussed topics, and a short discussion about what confused them most about the training so far, since the identification of one's lack of understanding stimulates a metacognitive process in which learning about self-awareness is encouraged (Efklides, 2008).

Importantly, the classroom training has been a crucial improvement of the experimental design in order to *train* metacognition, since classroom settings with vocal instructions have been suggested to facilitate deeper learning and reflexivity that stimulate thinking about thinking processes (Balbio & Andal, 2018). Similarly, Carter et al. (2020; p. 58) have argued that “anti-bias training needs to go beyond simply creating awareness of a cognitive bias and instead *combine* awareness of bias and its lasting impact, plant seeds that inspire sustained learning, and teach skills that enable attendees to manage their biases.” Our intervention followed this in that, during both sessions, participants were trained to not only generalize metacognition, but also apply this in their decision-making, emphasizing to “think about decision-making situations in their day-to-day life and to reflect on how to implement the metacognitive-strategic questions in that situation” (Rosi et al., 2019, p. 207).

Then, during phase C, the training started with a re-cap of the materials discussed during the previous training. The main goal of phase C was to practice different decision scenarios that contained the status-quo bias with the help of metacognitive strategies. By asking participants what they still remembered of the previous training, we additionally stimulated metacognitive processes since the recognition of cognitive growth helps students to stimulate higher-order thinking skills. We strengthened this process with an interactive discussion in which participants had to reason how their thinking about the subjects had changed since the start of the training. Next, several examples of the status-quo bias were given, and this recognition process was explained with the help of the PWES matrix.

Following Rosi et al. (2019), for each decision scenario, participants were asked to analyse and base their answers on the metacognitive-strategic questions. Participants then worked in teams to recognize the status-quo bias in a daily life decision, in which participants imagined themselves to be entrepreneurs and have been asked to make several business decisions (Lévesque & Schade, 2005). Subsequently, participants were sent the experimental tasks and manipulation checks by mail. After the survey, a de-briefing session followed in

which participants were explained into more detail about the purpose of the study, what they have been working on, and a final discussion in which any doubts or questions were debated.

### *Experimental task*

In our study, we use six decision scenarios relevant for an entrepreneurial context. While four of these scenarios are measurements that have been confirmed to be reliable (Burmeister & Schade, 2007; Samuelson & Zeckhauser, 1988), we additionally develop two scenarios, inspired by these established works, to strengthen the entrepreneurial context of the study, and add methodological richness. Examples of the scenarios can be found in the appendix. These decision tasks were designed to lead participants fall prey into the status-quo bias. We expected that participants in the experimental condition would have activated their metacognition to perform better on these tasks, and avoid choosing the status-quo option.

### *Manipulation check*

We used a modified version of the Generalized Measure of Adaptive Cognition developed by Haynie and Shepherd (2009) as a manipulation check in this study, after pre-testing the full 36-item scale in our pilot study (appendix). This scale is a “measure of cognitive adaptability grounded in metacognitive theory that is appropriate for use in an entrepreneurial decision context” (Haynie & Shepherd, 2009, p. 696). Firstly, we reduced the number of items for our adapted scale dimensions (Haynie et al., 2012), since we presume that the cognitive load in terms of time of the original 36 items in our pilot study might have had an effect on effort and motivation of our participants. Specifically, we eliminated Goal Orientation since it had the lowest validity score in our pre-test in the pilot study. More importantly, these items were general traits while we were interested in specific statements about our dependent variable. We also slightly modified the wording of some statements, avoiding the use of ‘strategy’, since this could have caused issues with our training that emphasized the use of strategy in both groups, either as a metacognitive or as a product-market strategy. For example, ‘I thought of several strategies to solve the problem and chose the best strategy’ became ‘I thought of several ways to solve the problem and chose the best way to answer the questions.’ The participants answered these items on a 11-point scale from ‘strongly disagree’ to ‘strongly agree’ as suggested by Haynie and colleagues (2012).

Additionally, we add a bias knowledge scale (1 = knowledge of bias, 0 = no knowledge of bias) as suggested by Morewedge<sup>11</sup> et al. (2015), in which we indicate greater ability to identify and discriminate between the dependent variable. Participants were presented instances of the status-quo bias and tested the degree in which participants were able to identify the bias in a multiple-choice format. With these additional manipulation checks, we can more precisely explain if the metacognitive treatment had an effect because of metacognition, or knowledge of the status-quo bias, or both.

### *Control variables*

Several control variables have been collected between the two training sessions that may influence the effect of metacognition on cognitive bias. Specifically, we included gender, age, and educational background (Rosi et al., 2019). We collected data on business class experience, founder experience, and additionally added experience as a current founder, as this may influence metacognition (Haynie et al, 2012) and decision-making (Ashby and Maddox, 1992; Forbes, 2005; Judge and Miller, 1991). Then, we collected further variables that might influence the status-quo bias specifically. Firstly, risk may have an influence on the status-quo bias, since individuals weigh potential losses from switching from the status-quo option as larger than potential gains (Samuelson & Zeckhauser, 1988). We measured risk propensity following Keh and colleagues (2002) who used this scale in an entrepreneurial context (Palich & Bagby, 1995). Then, we measured control using Levenson's (1981) 8 items that measured self-evaluations on a 6-point scale from 'strongly disagree' to 'strongly agree', since the need to feel in control has been proposed to be a significant source of the cognitive bias (Hogarth, 1981; Langer, 1975) and status-quo bias (Samuelson & Zeckhauser, 1988). We also measured thinking style using the 7-item cognitive reflection test (Toplak et al., 2014), that separates intuitive and analytic thinking. We were aware of the influence of regret avoidance in relationship with the status-quo bias, however, our experiment did not have the setting to control for this since the specific tasks did not match with general regret scales without disturbing the main relationship of the experiment. Finally, we asked participant in an open question to answer in detail what they remembered about the first training session.

### *Results main study*

We found acceptable reliability and validity for our metacognitive manipulation

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<sup>11</sup> We are grateful for the supplementary materials provided by the authors.

checks, with items varying between .63 and .73, and a total score of .88, taking all items together. We also report reasonable Cronbach alpha scores for our intuitive-analytic measure (.62), risk (.57), and control (.61) scales. We follow Kline (1999) who debated that scores below 0.7 can be expected especially when working with psychological constructs. Then, we calculated for each item the mean score, and compared this between the experimental and control group with the help of a t-test. The t-tests showed us that, although only one item showed a significant effect, it was particularly metacognitive knowledge that highlighted differences between the two conditions. Most of the items on our metacognitive knowledge scale showed a higher mean score for the experimental group in comparison with the control condition. This result is in line with previous research that demonstrated *only* metacognitive knowledge to be positively related to effective and persistence decision-making, and not, for example, metacognitive experience (Haynie et al., 2010; Mattingly et al., 2016).

Then, we performed t-test for our additional manipulation check, namely bias knowledge. We find significant values for all our scales, with M differences *experimental x control* (.33,  $p < .02$ ), (.58,  $p < .00$ ), and (.45,  $p < .00$ ).

**Table 10:** ANOVA's for dependent variables

DV	Source	F	P
<i>Scenario 1</i>	Samuelson & Zeckhauser, 1988	6.94	<b>0.0123</b>
<i>Scenario 2</i>	Self-developed	0.00	0.9870
<i>Scenario 3</i>	Self-developed	5.58	<b>0.0236</b>
<i>Scenario 4</i>	Samuelson & Zeckhauser, 1988	1.67	0.2048
<i>Scenario 5</i>	Burmeister & Schade, 2007	0.31	0.5803
<i>Scenario 6</i>	Burmeister & Schade, 2007	0.76	0.3897

Next, analysis of variance, or ANOVA, has been conducted (*Table 10*) over the six dependent variables since it helps researchers to test the fit of a linear model with group means (Field, 2018). The aim of this analyses was to test whether we could find a significant difference on our decision-making scenarios between the experimental and control group. Concretely, we expected that the experimental group would score significantly lower, choosing the status-quo

option less frequently than the control group. We report mixed findings here. Firstly, we found that *scenario 3* ( $p < .02$ ) and *scenario 4* ( $p < .20$ ) show a positive effect. The experimental group scored significantly better in the case of *scenario 3* ( $M$  score experimental group .11 x control group .45), and nearly significant in the case of *scenario 4* ( $M$  score experimental group .29 x control group .5), which can reasonably be expected to become significant with a larger sample size. We also found no significant differences in the case of *scenario 2* ( $p > .98$ ,  $M$  score experimental group .41 x control group .41), *scenario 5* ( $p > .58$ ,  $M$  score experimental group .24 x control group .32), and *scenario 6* ( $p > .39$ ,  $M$  score experimental group .12 x control group .23). For *scenario 2*, over 40% of both the experimental and control condition have chosen for the status-quo option. For *scenario 5*, we report that almost 2/3<sup>rd</sup> of both conditions have chosen in favor of a non-status-quo option. Since these scenarios were self-developed, we expect that one option might have been presented too favorable in comparison with the other options. Surprisingly, we also found a significant relationship in *scenario 1* in favor of the control group ( $p < .01$ ,  $M$  score experimental group .35 x control group .05). Additionally, for *scenario 6*, we found that both conditions did not choose the status-quo option frequently, but were not consistent in the alternative options that they chose. While the control group mainly chose option 2, the experimental group generally went for answer option 3. Thus, we find partly support for hypothesis 2, that will be further discussed in the following section.

## Discussion

In the main study, we find promising results for *scenario 3* and *scenario 4*, but also report non-findings for scenarios 2, 5, and 6. In both *scenario 5* and *scenario 6*, the frequency of occurrence of the status-quo bias is consistent with previous findings by Burmeister and Schade (2007), who noted that the status-quo bias appears stronger in consumer than business scenarios. For our study, we have specifically focused on business scenarios to increase the ecological validity, representing real world scenarios to generalize our results based on a specific context (Hsu et al., 2017). Shepherd et al., (2003, p. 383) noted that experience in decision-making reinforces the status-quo bias since “experienced individuals’ thoughts may tend to become increasingly channeled by their past experience.” Participants in our pilot study had some more experience in business classes than participants in our main study, suggesting that experienced individuals may be more susceptible to the status-quo bias on consumer choices (Burmeister & Schade, 2007). Additionally, for *scenario 2* and *scenario 5*, we observed

the common issues that one option by both groups has been chosen disproportionately often. We suspect that the differences between the alternative answers were framed excessively unequal relative to the most frequently chosen option. Previous findings have shown that the way how information is framed, “even when care is taking to make the language and presentation of instructions as neutral as possible” may have strong effects on experimental findings (Cookson, 2000, p. 55), and this may explain our non-significant findings with these scenarios. Additionally, Arkes (1991) pointed out that decision-makers may still be biased even when applying strategies deliberately and analytically, because the initial selection of the strategy, rather than the thinking style, may have contained the problem. This may have caused under – and overconfidence in the decision-making process of our scenarios (Croskerry et al., 2013). This may suggest that entrepreneurs, when using their metacognition, rather balance between an intuitive and analytic approach (Groves et al., 2011), rather than relying mostly on the latter in their decision-making process.

Remarkably, we find an opposite significant effect for *scenario 1*, in which our treatment appears to have had a reverse effect on the experimental group. One explanation for this may be verbal overshadowing, that occurs when “verbalization negatively affects performance on a task related to the verbalized materials” (Chin & Schooler, 2009, p. 396). Specifically, task performance may be reduced when cognitive tasks are verbalized and may particularly interfere with metacognitive experiences (Norman, 2020; Schooler et al., 1993). Indeed, our manipulation checks demonstrated that only 3 out of 8 items on metacognitive experience were scored higher by the experimental group. Clare and Lewandowsky (2004) additionally suggested that verbalization causes a move towards more *conservative* choosing. It may be possible that some of our participants perceived none of the alternatives to be correct, thus going for the more conservative, status-quo option as it was given.

Lastly, is the status-quo bias always as cognitive bias a an outcome of irrational behaviour? Burmeister and Schade (2007) noted that this depends on the context of the decision. When the environment presents changes in innovations, technology, competition, or demand, entrepreneurs are better off by detaching from the status-quo. However, when the economic consequences do not differ much between alternatives, a status-quo option may be justified. Similarly, when switching costs are involved, sticking to the status-quo may be the result of a rational choice because the costs of the transition would be greater than the potential gains. The status-quo option may additionally be perceived as a rational choice in relationship with cognitive load. This occurs when the status-quo bias offers an alternative that needs less mental

effort to maintain (Debarliev et al., 2020). Following this line of reasoning, participants in the experimental group may have perceived the status-quo option in *scenario 1* as the most rational option since they had knowledge about the bias, and this decreased the cognitive load of their decision, while the control group did not have this ‘advantage’.

Besides, biases are not necessarily a result of cognitive shortcuts, and neither should they be consequently be ‘fixed’. A different school of thought than the normative Kahneman and Tversky perspective provide convincing evidence that heuristics are adaptive tools that operate through an efficient cognitive conscious and unconscious process (Gigerenzer and Gaissmaier, 2011; Hertwig and Gigerenzer, 1999). From this line of reasoning, some of our non-findings may be explained by the fact that participants judged an alternative option as more important for overall business success. Indeed, “this might be questionable from a normative perspective but still be a valid heuristic in an entrepreneurial process where probabilities are often unknown” (Barbosa et al., 2019, p. 553). From this perspective, breaking the status-quo in order to exceed the chances of success were perhaps logical choices in *scenario 5* and *scenario 6* for all participants, while remaining the status-quo was most reasonable for *scenario 2*. While also other scholars point to the sometimes beneficial side of biases (Busenitz & Lau, 1996; Gudmundsson & Lechner, 2013; Hayward et al., 2010; Koellinger et al., 2007), we point out that above all, an *aware* individual is more likely to make a justified decision than an *unaware* person, and metacognition may help individuals with this process.

### *Theoretical implications*

To understand cognitive biases, the ability to recognize accurate from imprecise judgment plays an important part for entrepreneurs and their decision-making (Busenitz & Barney, 1997; Forbes, 2005; Koellinger et al., 2007; McCarthy et al., 1993). Our research offers theoretical insights on not just why cognitive biases impact entrepreneurs, but also on how this can be overcome. Specifically, we progress knowledge on metacognition, an established cognitive phenomenon in entrepreneurship (De Winnaar & Scholtz, 2019; Haynie et al., 2010), and highlight the importance of the underdeveloped topic of de-biasing within this framework (Zhang & Cueto, 2017). While previous research has studied the role of metacognition on feedback in opportunity task performance (Haynie et al., 2012) and decision consistency (Mitchell et al., 2011), this is the first to compare these processes on cognitive biases.

With our contribution, we also advance entrepreneurial decision-making, moving from the identification process towards the neutralization process of cognitive bias. Specifically, we offer new understandings on how the status-quo bias can be recognized and neutralized. Since status-quo biased individuals are attached to what is most familiar to them, they do not consider the existence of alternative opportunities (Roy & Zeckhauser, 2017). Metacognition operates as an analytic tool in this process because this higher-order process stimulates individuals to study all available options, moving beyond a known, most familiar alternative.

In our study, we find that participants who use their metacognition are in *some* scenarios better able to recognize the status-quo bias than participants in the control group. Altogether, we assume that it was the *combined* effect of awareness of the bias and its impact, and the trained metacognitive skills that taught the skills to manage the status-quo bias. This is in line with recent de-bias research (Carter et al., 2020), where combined strategies such as training programs with coaching have had more success than separate interventions, such as to offer warnings about bias, or describe its consequences (Milkman et al., 2009).

These insights are valuable because they support the idea that metacognition has explanatory power in helping individuals to know what they do not know. That is because people are generally aware of only a fraction of the extent to which they are biased, are unwilling to acknowledge it, and as a result have difficulty to un-do, i.e. de-bias, their decision-making (Scopelliti et al., 2015; Wilson & Brekke, 1994). While one's misinformed mind frequently *prevents* recognition (Dunning, 2011), metacognition provides an improved understanding of how entrepreneurs may overcome this process in their decision-making process. Although the status-quo bias may be overcome by changing the way how information is framed through choice architecture (Martin, 2016), we provide additional understanding of de-biasing the status-quo with the help of training. This is an important implication of our study because it highlights the possibility that the status-quo bias is not necessarily bounded to one specific de-bias mechanism.

### *Practical implications*

Our findings have important implications for entrepreneurs and practitioners. First, the findings highlight the importance of stimulating metacognitive processes and knowledge about a bias in order to recognize the status-quo bias. This awareness of the potential negative consequences of biases and heuristics is relevant for any individual involved in a decision-

making process. Additionally, we highlight the importance of context in this process, as decisions in different scenarios may vary in the degree in which they are status-quo biased. Our findings also have implications for entrepreneurship practitioners in that we offer a novel approach to de-bias training. Entrepreneurs and practitioners may adapt metacognitive training, for example, prior to meetings where decisions are taken, to recognize a potential status-quo bias. Additionally, incubators may implement this training as an active part of their program. Methodologically, metacognitive training could be extended by designing different interventions aimed to optimize different biases in the decision-making process.

#### *Limitations and future research suggestions*

Our study is not without limitations. Firstly, replication studies are needed to see the effects of our intervention in the long term. Then, the degree to which our scenarios represented a real world situation (ecological validity) might raise concerns since entrepreneurial decisions can usually not be limited up to some options that represent either a good or bad answer. However, previous studies have shown such scenarios to be relevant for entrepreneurs in experimental settings, explaining *why* entrepreneurs are more or less biased (e.g. Burmeister & Schade, 2007). Our study complements this previous line of research. Future studies may test different heuristics and biases with the help of metacognitive training, to enrich our understanding under which circumstances this may help entrepreneurs' decision-making, and when it does not. We argue that metacognition could specifically be important to the awareness creation process of other cognitive biases, such as hindsight bias (Cassar & Craig, 2009), illusion of control (Langer, 1975), availability (Barbosa & Fayolle, 2010) and similarity (Ebbers & Wijnberg, 2012), since they share a “sketchy-attribute” type of bias, sharing the similar characteristic of “attending to one attribute when other attributes are more relevant” (Baron, 2007; Zhang & Cueto, 2017, p. 429).

Additionally, these studies may use different de-bias mechanisms relevant for entrepreneurs, using the rich toolbox that behavioural science and psychology has to offer, such as the recent work of Zhang and colleagues (2021) on effectuation, and extend our scenarios with other promising domains, such as emotional or moral decision-making. For example, these interventions may be extended to different promising de-bias methods, such as changing incentives and optimizing choice architecture like nudges (Morewedge et al., 2015; Thaler & Sunstein, 2008).

An important last point that has so far been untouched is the following interesting question: Does our successful intervention lead individuals to behave differently? Our answer is, probably not. Although our results highlight that a metacognitive training results individuals to be less biased in their decisions, do we not intent to demonstrate that we actually changed behaviour. Changing behaviour is probably one of the most challenging, and perhaps impracticable objectives in experimental research. Specifically, we see our intervention as a first step for entrepreneurship scholars to cognitive influence people in their decision-making process in order to make better decisions.

## **Conclusion**

The results of our study provide evidence that metacognition may serve decision-makers to compensate the status-quo bias. Our research is one of the first attempts to go beyond the identification of decision biases, by demonstrating how the status-quo bias may be neutralized and acknowledged by entrepreneurs. Importantly, metacognition has been shown to be an important cognitive concept in this process, a novel and important theoretical finding of our study. The degree in which metacognition improves status-quod decisions however, depends on the context in which entrepreneurial decisions are made.

## Appendix Essay 2

### Pilot study details:

In the pilot study, we are testing two processes in particular. Firstly, we expect that a metacognitive training has a positive effect on decreasing overconfidence and the status-quo bias *simultaneously*, since both biases share the common characteristic to lack general awareness of the decision-making process. Specifically, we follow (Chew et al., 2016) who demonstrated that a metacognitive treatment decreases different cognitive biases on different scenarios at the same time. Thus, we hypothesize in Study 1 that: *Participants using metacognition choose, simultaneously, the status-quo option less often and show less overconfidence.*

### Participants

The sample of the pilot study included 38 students and took place in a group setting during an entrepreneurship class. The study served as a pilot test and used a simple design that is explained into more detail in the remaining section. Since one participant did not finish the survey, it has to be filtered out of our data set, leaving a final sample of 37 participants. *Table 11* illustrates details about our sample, in which 68% were female.

**Table 11:** *Participant details of pilot study*

Variable	M	SD
<b>Gender</b>	1.68 <sup>12</sup>	0.53
<b>Age</b>	25.54	4.59
<b>Education</b>	1.11	0.39
<b>Experience A (N attended business classes)</b>	2.92	1.57
<b>Experience B (currently a founder)</b>	1.86	0.35

### Treatment

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<sup>12</sup> Note. M and SD represent mean and standard deviation. Gender (1=male, 2 = female), Education (1 = bachelor, 2 = graduate), Exp A (0 = none, 4 = four or more), Exp B (0 = No, 1 = Yes).

For the pilot study, each participant was randomly assigned to either the experimental or control condition. In the experimental condition, each participant started the survey by reading general instructions about the experiment, and specific instructions about two matrices, one about biases and the other matrix about metacognition, that would follow on the next pages. In the specific instructions, participants became familiar with the notion of a cognitive bias, an example and its possible impact. Explicit instructions were given about the importance of recognizing these biases. On the same page, metacognition was explained as an instrument that helps creating awareness in the decision-making process. Participants were also instructed that this process needed repetition, thus emphasizing the need for participants to carefully examine and practice these metacognitive instructions on the next page. For each of the two matrices, the main goal was given in order to make the participants understand what they were supposed to learn. Additionally, participants were explicitly instructed to read every page carefully, and to only continue if they would feel comfortable enough.

Then, participants read the definition, examples, and negative consequences of overconfidence (De Bruin et al, 2007) and status-quo bias (Burmeister & Schade, 2007), both known to influence entrepreneurs (e.g., Zhang & Cueto, 2017) in a matrix format. Once again, participants were explicitly instructed that the goal of the matrix was to create awareness about the existence of bias and its potential impact on decision-making. Additionally, participants were asked to write down, in an open question format, an example of the overconfidence bias. This has two particular reasons, firstly, as an attention check, and secondly, to ensure that participants have understood the effect of overconfidence on decision-making.

Next, a metacognitive matrix was visualized, that has been introduced as the PWES Matrix: Problem, Wrong, Evidence, Strategy. The PWES Matrix is an adopted version of the TWED matrix designed by Chew et al. (2016), who demonstrated that teaching metacognition with the help of a metacognitive matrix helped individuals to avoid several cognitive biases in their decision-making. The authors demonstrated that it was the *combined* effect of an educational intervention on cognitive biases *and* de-biasing strategies that resulted participants to be less biased in their decision making.

Importantly, previous metacognitive studies have shown that summary matrices significantly contribute to improve learning (Jonassen et al., 1993). Participants were explicitly instructed that the goal of the matrix was to make these self-questions habitual before making a decision (the dependent variable). Participants were also instructed how to

use the PWES Matrix strategically. Specifically, each letter of the abbreviation was narratively explained to be used in a self-questioning format *before* a decision had to be made. Once the experimental group clicked toward the next page, two attention check questions screened if participants weren't careless while conducting the experiment (Maniaci & Rogge, 2014). The instructions and the TWED matrix for the treatment group can be found in the appendix.

Simultaneously, in the control condition, each participant started the survey by reading general instructions about the experiment, and specific instructions about two matrices, one about description of business growth strategies with entrepreneurial examples, and the other matrix visualized the possible impact of each strategy, and different options based on the Ansoff Matrix. Participants also become accustomed with contextual and risk factors that may impact these strategies. Then, on the next page, subjects were presented different business growth strategies. Next, subjects were presented the Ansoff Matrix (Ansoff, 1957) and learned how to use it strategically. Following the experimental design group, participants in the control group were asked to fill in attention check questions as well. We attempted to design the experimental and control instructions, with its matrices, as similar as possible in order to guarantee resemblance in terms of cognitive effort ( $M$  time to complete survey = 25.5 min).

### *Experimental task*

After all participants had read the instructions described above, the treatment and control group jointly performed several decision tasks that are measurement tools confirmed to be reliable from psychological and entrepreneurial literature (Burmeister & Schade, 2007; De Bruin et al, 2007). These decision tasks are designed to lead participants fall prey into several cognitive biases when not analysed well. Particularly, when these decision tasks are performed while relying too much on intuition, participations will be likely to show more overconfidence and sensitivity to the status-quo. We expected that the treatment group, that activated their metacognition, to perform better on these tasks, thus showing less biased decisions. That is because metacognition serves “as an alarm that activates analytic forms of reasoning that asses and sometimes correct the output of more intuitive forms of reasoning” (Alter et al., 2007; p. 569).

The decision tasks that participants had to carry out are well described and tested methods about two cognitive biases previously studied in entrepreneurship, namely

overconfidence and the status quo-bias (Zhang & Cueto, 2017). The overconfidence task consists of a set of true/false questions about various aspects of life. We randomly chose 10 statements from the total list of 30 items, because the full list would be a time-consuming task for our participants, possibly leading to decreased motivation because of information overload (Brundin & Gustafsson, 2013). Participants would firstly have to state if they believed a statement to be true or false. Then, for each question, participants would have to state the degree of confidence they have in their final answer, ranging from 50% (just guessing) to 100% (absolutely sure).

#### *Dependent variable*

To measure the status-quo bias, we followed a verified research design by Burmeister and Schade (2007) who developed several decision scenario's for entrepreneurs. For this study, we chose one out of their six scenario's for the same possible overload reasons as stated above. The selected scenario (Digital camera) was chosen because it has been verified with the best relative frequencies and asymptotic significance levels of the Chi-squared statistics, with p-levels are significant (Burmeister & Schade, 2007). Participants were additionally asked to answer an open question in which they had to reason why they had chosen their preferred option. An example of the decision scenario can be found in the appendix.

#### *Manipulation check*

For the pilot study, we pre-tested the Generalized Measure of Adaptive Cognition developed by Haynie and Shepherd (2009). Since the original items of the Generalized Measure of Adaptive Cognition are presented as statements such as 'I think of several ways to solve a problem and choose the best one', we contextualized these questions in the past tense since participants were asked to answer to the extent they agreed *on the previous task*, resulting in 'I thought of several strategies to solve the problem and chose the best strategy.' The participants answered these items on a 11-point scale from 'strongly disagree' to 'strongly agree' as suggested by the authors. the main goal of this procedure was to confirm that it was actually the metacognitive intervention that made the experimental group activate their metacognition. Additionally, it allowed us to understand specifically which items of the Generalized Measure of Adaptive Cognition were scoring better than others, having the possibility of a replication study in mind. This helped us to reduce the amount of items from the checklist for the main study in order to minimize cognitive and informative overload. Similar with Haynie et al. (2009), we found a good reliability and validity for our adapted scale dimensions, with

Cronbach alpha scores .76 for Goal Orientation, .86 for Metacognitive Knowledge, .80 for Metacognitive Experience, .87 for Metacognitive Choice, and .81 for Monitoring. Thus, we succeeded with our aim to confirm that our adapted scales were reliable.

### *Control variables*

Several control variables have been collected that may influence the effect of metacognition on cognitive bias. Specifically, we included gender, age, and educational background (Rosi et al., 2019). Age influences overconfidence (Forbes, 2005) and functions as a proxy of acquired experiences (Mitchell et al., 2000). We also collected data on business class experience and founder experience, as this may influence metacognition (Haynie et al, 2012) and decision-making (Ashby and Maddox, 1992; Forbes, 2005; Judge and Miller, 1991).

### *Procedures*

The experiment took place in a class room setting during an university course. Before the experiment started, participants were instructed to bring their laptop to the class. Next, instructions were given to read the text and tables carefully, and to take time to examine all the information until there would be comfortable with the explanation. Participants were also told that participation would be entirely anonymous and voluntary, that it would not affect their final grade, and that they would have the freedom to abort the study if at any point if they would not feel like continuing. Additionally, instructions were given to fill out the survey individually and without discussion with others. Then, each student was given a link that automatically randomized the survey into either the control or experimental group. Firstly, a question appeared to consent for age (18+), and to participate on a voluntary basis. Respondents then filled out the survey. With regard to context, the manipulation of the pilot study has been role-playing, in which participants imagined themselves to be entrepreneurs (Lévesque & Schade, 2005). We also implemented a timer of 20 seconds for every page before participants would be able to move forward. The timer helped us to control for participant's attention and effort. It forced participants to stay on the same page until the 'next' button appears, thus, ensured that participants took enough time to read the instructions and tables. While pre-testing the pilot study, we found that 20 seconds was sufficient to not let participants delay moving on to the next task. After every participant had finished filling in the survey, a de-briefing session

followed in which participants were explained about the purpose of the study, what they had done specifically, and any doubts were discussed.

### *Results pilot study*

To test if our manipulation was successful, we applied an ANOVA test for each of the five dimensions. We report no significant relationships, *Table 12* contains details of this analysis. These findings mean that, although results may differ by increasing the sample size, we have to adapt our study design for a second study.

**Table 12:** ANOVA of the manipulation of the pilot study

<b>Goal Orientation</b>					
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
<i>Condition</i>	1	0.03	0.0263	0.014	0.906
<i>Residuals</i>	36	67.44	1.8735		
<b>Metacognitive Knowledge</b>					
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
<i>Condition</i>	1	3.85	3.847	1.458	0.235
<i>Residuals</i>	36	94.99	2.639		
<b>Metacognitive Experience</b>					
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
<i>Condition</i>	1	0.18	0.1813	0.092	0.763
<i>Residuals</i>	36	70.90	1.9696		
<b>Metacognitive Choice</b>					
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
<i>Condition</i>	1	1.86	1.857	0.373	0.545
<i>Residuals</i>	36	179.03	4.973		
<b>Monitoring</b>					
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
<i>Condition</i>	1	6.03	6.034	2.006	0.165
<i>Residuals</i>	36	108.28	3.008		

Additionally, we report non-findings for both experimental tasks (the status-quo and overconfidence tasks). Although more than half of the participants in the control condition have chosen the status-quo bias, the same observation can be made within the experimental group. *Table 13* illustrates that although the scenario (Burmeister and Schade, 2007) indeed triggered most participants to be status-quo biased, this effect was not lowered in the experimental group. *Table 14* exemplifies this by showing that the status-quo option has been chosen more frequently in both groups than the non-status-quo option.

**Table 13:** *Frequency table 1 Status-quo task*

	Experimental Group	Control Group
Option 1 (Status-quo)	12	10
<b>Option 2</b>	6	5
<b>Option 3</b>	1	4

**Table 14:** *Frequency table 2 Status-quo task*

	Experimental Group	Control Group
Status-quo option	12	10
<b>Non-status-quo option</b>	7	9

Similarly, we find no significant difference with the overconfidence bias ( $> .82$ ). Thus, we reject hypothesis 1, our manipulation did not have an effect on the status-quo bias and overconfidence bias jointly.

**Table 15:** *Results overconfidence bias*

	M <sup>13</sup>	Std. Err.
Control Group	0.85	0.02
Experimental Group	0.90	0.02

After analysing the results, we also suspect that additional metacognition might have been activated for the control group. Firstly, because we asked participants *why* they had chosen their status-quo scenario, stimulating a thinking about thinking process. Similarly, reflecting on the overconfidence tasks, we suspect that metacognition might have been activated here likewise, since participants were asked to think about a percentage confidence level, thus priming thoughts about *why* they had previously chosen an answer. We also

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<sup>13</sup> 1 indicates the highest possible score, 0 indicates the lowest possible score

conclude that our non-results could have been caused by our manipulation. Specifically, the manipulation might not have been strong enough, the pilot study encouraged participants to reason but this effect was probably not strong enough. Additionally, interacting effects between the two biases may have caused mixed results. For example, Zhang et al. (2017) argued that different cognitive biases may either reinforce or compete with each other. Lastly, before the study, subjects were told they would probably need about 15 minutes to complete the test. The first participant finished after 14 minutes and the last one after 37 minutes. On average, the test took 26 minutes to be finished, which was more than we expected. We realize that this might have biased our participants. Our results point us to some important directions that would help us to improve the current experimental design. All the above considerations served to conduct an improved experiment, where we simplified the experimental design in terms of instructions and language, are more accurate about the estimated time to conduct the experiment, added more control variables, modified the treatment into a training, altered the experimental tasks significantly, and added additional manipulation check questions.

#### **Pilot study procedure:** *instructions for participants in the experimental group*

Please read the following text and tables carefully, as it contains important information on how to participate in this study successfully. Please take your time to examine both tables until you are comfortable with their explanations. The "Next" button will appear shortly to ensure you have enough time to read this information and these instructions.

On the next pages, we will present you with two tables. Firstly, a table will show some cognitive biases that are very common in entrepreneurship. A cognitive bias is a systematic error in our thinking when we process information, and affects our judgments and decisions. Everyone encounters biases now and then, they are part of our thinking. A common cognitive bias is, for example, when one pays attention to news stories that confirm (rather than disconfirms) one's opinion.

Recognizing these thinking errors is important to make better decisions, but requires more cognitive effort. The table shows you two examples of common cognitive biases to 'grasp' what a bias is. Being aware of these biases will help you understand the possible impact it may have. The main goal of the table is to make you aware of the existence of cognitive biases, and to make you understand how it unconsciously may impact your daily decisions.

Then, a next table will show a matrix that is called **PWES**: **P**roblem, **W**rong, **E**vidence, **S**trategy. Often, cognitive biases go unrecognized because they come to mind unconsciously. The PWES matrix is a tool that will help you to avoid falling into the negative consequences of biases, and to recognize certain cognitive biases. It will allow you to do a 'reality check' by asking yourself why you might be **W**rong. It helps you to consider alternatives, and consider the possibility that you might have missed some important information. Typical self-reflective questions are: Do I see any **P**roblems before making this decision? How could my assumptions be challenged? Did I collect all

the Evidence?

The PWES matrix usually needs repetition in order to be mastered. In order to optimize your daily judgments and decisions, please have a careful look at this Table. The main goal of the second table is to make you familiar with self-questioning Strategies by delaying your initial answer and consider all of the possible alternatives before making a choice.

**Pilot study procedure:** *Table about the two cognitive biases for the experimental group*

<b>Overconfidence Bias</b>	<p>Most of us are overconfident in the precision of our beliefs. While confidence in your abilities is necessary for achievement in life, overconfidence can be a barrier to effective decision making.</p> <p>Imagine the situation where you have developed a marketing plan for a new product. You are so confident in your plan that you have not thought about early market failure. When the first stage of your plan stumbles, will you advance changes in the marketing strategy, or will your overconfidence blind you to its flaws?</p> <p>Too often we 'know' that we are right, while these processes tend to occur automatically, without conscious awareness. For example, overconfident individuals have been found to ignore feedback and overlook different perspectives.</p>
<b>Status-Quo Bias</b>	<p>Often, we think too much about decisions. At other times however, people think too little, especially when long-term decisions are involved. This is when the status-quo bias is activated.</p> <p>Most of us have the tendency to repeat a previous choice overly often, or to stick to decisions the way they are. Change is often perceived as a loss, because we are attached to products and are great procrastinators. Research however has shown that even in situations where changing a decision would have great financial benefits (such as changing an investment or start a retirement fund), people are reluctant and stick to their old decisions.</p>

**Pilot study procedure:** *further treatment instructions*

Below you find the PWES Matrix, which provides a visual summary of self-questioning strategies. The main goal of this Table is **to make you habitual with these self-questions before making a choice**, because it helps you to delay your initial answer and consider all of the possible alternatives.

The four steps in the PWES Matrix help you to analyse choices analytically, and to consider alternatives by studying all the available evidence in order to make a deliberate choice. The steps help you to identify all available alternatives that otherwise might have stayed to you unconsciously.

Before making a choice, firstly, delay your initial intuitive answer and analyse the decision problem. Have you resisted the temptation to instantly face the decision Problem, and instead analysed your options? Have you reflected on what you just read? Then, consider the possibility that

there might be alternatives to solve the decision problem. Could it be that you are **Wrong**? Do you need to make any changes? Thirdly, link these alternative considerations with the information that you have. Have you used all the **Evidence** that was available to you? Could you consider evidence from an opposite scenario? Explore your options by self-questioning each outcome. Does it make sense to you? Then, choose and apply the decision **Strategy** that now feels best.

Please carefully study and memorize each cell of the table.

**Table 16:** *PWES Matrix*

<p style="text-align: center;"><b>P = problem?</b></p> <p>Did I understand the decision problem I have to face? What are the possible choices for this decision problem?</p> <p>Rationale: Here you cross check if you have clearly understood and thought about what you have just read.</p>	<p style="text-align: center;"><b>W = wrong?</b></p> <p>What if I am wrong? What else could it be?</p> <p>Rationale: Here you cross check if you have considered the possibility that there might be alternative solutions.</p>
<p style="text-align: center;"><b>E = evidence?</b></p> <p>What is the main information of the decision problem? Do I have all the information necessary to make a decision?</p> <p>Rationale: Here you cross check if you have used all the information that was available.</p>	<p style="text-align: center;"><b>S = strategy?</b></p> <p>Which strategies can I apply in order to decide? What is my final decision?</p> <p>Rationale: Here you consider different strategies, how to use them, and ask yourself why.</p>

**Pilot study:** *status-quo task (SQ in bold)*

Imagine yourself sitting in a street café in Florence thinking of all the great things you have been lucky enough to experience today. That same second you experience one of the possible dark sides of a holiday trip when you catch a glimpse of a thief vanishing with your camera. You have already planned an evening with your friends when you return home, and you do not want to miss showing the photos you were going to take on tomorrow's sightseeing tour. Therefore, you decide to immediately buy a new camera on the Piazza. **Your last photos were taken with digital camera A.** What camera are you going to buy?

- Digital camera A: 512 MB memory, 5 mega pixel, price: 499 EUR
- Digital camera B: 256 MB memory, 3 mega pixel, price: 299 EUR
- Digital camera C: 256 MB memory, 2 mega pixel, price: 199 EUR

**Main study:** *two examples of the status-quo tasks (SQ in bold)*

*Scenario 1*

As the founder of a tech start-up, you are assessing how to allocate your investment budgets for next year. Investment A will help you to improve your sales. Investment B will help you to improve your technology. **Currently, you allocate approximately 70% of your available investment budget to Investment A and 30% to Investment B.** Since there is a ceiling on the total spending, your options are:

- Allocate 70% to investment A and 30% to investment B
- Allocate 30% to investment A and 70% to investment B
- Allocate 60% to investment A and 40% to investment B
- Allocate 50% to investment A and 50% to investment B

*Scenario 4*

As the founder of a tech start-up, you are ready to move your company out of your home to an office building. There you will need a good, reliable internet connection to ensure that you and your two employees can work well. At home, you have always been very satisfied with your current internet connection by **provider Green**. Since there is a ceiling on the total spending of your business this year, your options for your business are:

- Provider Green: Upload: 45 Mb/s, Download 900 Mb/s, Price € 75 / month
- Provider Blue: Upload 60 Mb/s, Download 1200 Mb/s, Price € 100 / month
- Provider Pink: Upload 40 Mb/s, Download 800 Mb/s, Price € 60 / month
- Provider Orange: Upload 55 Mb/s, Download 1100 Mb/s, Price € 80 / month

## Essay 3

### **Entrepreneurial metacognition: A study on nascent entrepreneurs**

#### **Abstract**

This paper contributes to uncovering the role of metacognition in the decision-making process of entrepreneurs. Specifically, we analyse nascent entrepreneurs in their process of start-up development while relying on metacognitive processes. The experiences of a sample of new venture initiatives are explored in two distinct phases, a start-up competition and the subsequent launch of their venture. Following the Gioia protocol, the study contextualizes the process in which social capital reinforces metacognitive processes. This process stimulates nascent entrepreneurs to consider alternatives, such as extending expertise outside the start-up. Moreover, we find that these processes support entrepreneurs and their teams in improving their decision-making processes. The findings support that nascent entrepreneurs rely heavily on the input of others in their start-up creation process, and contribute to new empirical insights about entrepreneurial metacognition. A dynamic model in which these relationships emerge is developed. The study's results contribute to a better understanding of the antecedents and consequences of metacognitive processes in nascent entrepreneurship.

Key words: Metacognition, Social Capital, Decision-making, Entrepreneurship

#### **Introduction**

In their decision-making process, entrepreneurs depend on incomplete, sub-optimal circumstances with varying levels of uncertainty, ambiguity, time pressure, and emotional stress (Forbes, 2005; Packard et al., 2017). To piece together previously unconnected information, entrepreneurs use their mental models to keep moving between intuitive and reflective cognitive processes (Mitchell et al., 2002; Zollo et al., 2017). These models, even when incomplete, help entrepreneurs identify opportunities and start ventures under conditions of uncertainty. Fast and frugal intuitions, however, can lead to cognitive traps in decision-making (Abatecola et al., 2018; Busenitz & Barney, 1997; Simon, 2000). Given that it is in an entrepreneurs' best interest to make deliberate decisions, it is fundamental to develop accurate self-perceptions about one's decisions through a rational system of thought (Sadler-Smith, 2016). Following this line of reasoning, entrepreneurs may benefit from metacognitive

processes, because they increase self-awareness, promote accurate judgment, and help to identify when one might be erroneous in their decision-making (Kruger & Dunning, 1999).

The process of an individual's understanding and knowledge of their own cognition, is known as metacognition (Flavell, 1979). Metacognition refers to 'thinking about thinking' and represents one's conscious reflection about one's thinking (Schraw & Dennison, 1994). To think 'metacognitively' describes activities such as "to be self-aware, to think aloud, to reflect, to be strategic, to plan, to have a plan in mind, to know what to know, to self-monitor" (Guterman, 2002, p. 285). Whereas cognition is required to complete a task, metacognition is needed to understand how a task will be performed (Akturk & Sahin, 2011; Schraw, 2001). Individuals that effectively apply metacognition have been shown to create self-benefits such as accurately estimating and updating their knowledge, and monitoring and evaluating on-going learning, because metacognition triggers analytic reasoning to evaluate and refine intuitive reasoning (Alter et al., 2007; Everson & Tobias, 1998).

Metacognition has received attention by entrepreneurship scholars only recently. For example, Haynie et al. (2010) suggested foundations of the entrepreneurial mindset to be metacognitive by nature because metacognitive processes are contextual responses to novel and dynamic contexts. However, our current understanding of metacognition is incomplete. Specifically, more research is needed in exploring "metacognitive aspects on entrepreneurial decision-making" (Shepherd, 2014, p. 24). Contextual factors that influence entrepreneurs and their metacognitive processes are scarce and need further exploration in the entrepreneurial decision-making process (Haynie et al., 2012). For example, metacognitive processes do not only require awareness of the self, but also of others' thinking with the help of observations and interactions (King, 1998).

Moreover, when individuals reason, metacognitive processes promote 'a second opinion' that activates more analytic, slow, and logical reasoning in the decision-making processes (Graber et al., 2012). These preceding factors are important to understand because entrepreneurs have been shown to rely heavily on their social environment, and ability to make well-informed decisions in their start-up process (Shepherd et al., 2014). However, little entrepreneurial research has addressed these research gaps. Specifically, explorative research in metacognitive studies has mostly been neglected so far.

To address these gaps, this paper explores how entrepreneurs use the understanding of their cognition to develop their start-ups. In addressing this question, this study adopts an explorative lens and analyses how a sample of nascent entrepreneurs cognitively handles their decision-making process while coping with different contexts of uncertainty. Moreover, although previous studies have given fruitful results using quantitative methods, this study explores contextual factors that emerge during the start-up process, providing methodological novelty by applying a qualitative approach to better understand metacognition as a “multifaceted phenomenon” (Efklides, 2008, p. 277; Mitchell et al., 2014). Following the Gioia protocol, this study emphasizes the practical utility of the heterogeneous ways entrepreneurs employ their metacognition when they undertake start-up activities (Corley & Gioia, 2011).

The results of this study highlight a central role for entrepreneurs’ metacognitive processes while capitalizing on their social capital. Specifically, the study provides an alternative perspective on the role of social capital for nascent entrepreneurs, emphasizing that metacognitive processes are stimulated by others. Metacognitive processes lead nascent entrepreneurs to go beyond their social networks, structures, and memberships to search for expertise and engage with outsiders. These interactions stimulate entrepreneurs to cognitively adopt feedback, either from the extent to which they leverage human relationships inside and outside their venture, or from the extent in which they benefit from comparison within their social structures. Additionally, we find these metacognitive processes to advance entrepreneurs and their teams in improving their decision-making processes. Metacognitive processes appear to have a significant effect particularly on team composition, because differentiated teams increasingly stimulate these metacognitive processes during the start-up creation process. The findings highlight the need for entrepreneurs new to the start-up process to develop metacognitive processes because it supports the mobilization of resources in order to engage in further thinking about thinking processes to achieve business growth. At the same time, we report dropout cases from the start-up process when metacognitive processes are not enough developed.

This study contributes to theory, providing a processual model in which is shown how and which social capital elements play a central role in the development of metacognitive processes for individuals and teams new to the entrepreneurial start-up process. The model further explains how metacognitive processes stimulate nascent entrepreneurs to move beyond their status-quo by expanding their local ecosystems and utilizing expertise in order to add cognitive resources to the start-up. These advantages support entrepreneurs and their decision-making processes.

Additionally, the findings of this study highlight relevance for practitioners and policymakers in educational settings and incubator programs, since metacognition can be strengthened by experience and training (Nelson, 1996; Nietfeld & Schraw, 2002).

The remainder of the present study is structured as follows. The next section briefly draws a theoretical framework of metacognition, followed by the research method and the empirical section. The final section of the study suggests theoretical and practical implications, limitations, and interesting new directions for future metacognition research in entrepreneurship.

## **Theoretical framework**

Metacognition in start-up creation processes is a crucial cognitive enabler to predictor entrepreneurial intentions and leads to superior performance (Botha & Bignotti, 2017; Dew et al., 2015; Urban, 2012). In their decision-making process, metacognition is particularly important to be developed in the early stages for entrepreneurs because it helps to monitor and cope with uncertainty (Qiu et al., 2018). Metacognition, which refers to an individuals' understanding and knowledge of their own cognition, has been defined as the ability to reflect upon, understand, and control cognitive processes relating to a concrete goal or objective (Flavell, 1976; Schraw & Dennison, 1994). These benefits help entrepreneurs who make better use of their metacognition to use cognitive feedback more effectively (Haynie et al., 2012). On the contrary, those that are restricted in their metacognitive abilities are less likely to show cognitive flexibility within a changing environment (Earley & Ang, 2003).

Metacognitive processes facilitate entrepreneurial expertise because of its self-regulating nature. This is because metacognition consists of knowledge about cognition and self-regulatory mechanisms that help entrepreneurs in their learning process to plan, monitor, and reflect (Fust et al., 2018; Mitchell et al., 2007). “To successfully self-regulate, people need to be aware of their goals and monitor and control their cognition”, and metacognition is “instrumental in this process” (Efklides, 2008, p. 282). Consequently, these processes stimulate individuals to obtain entrepreneurial expertise more quickly (Mitchell et al., 2006). For example, when entrepreneurs gain expertise, they are able to use their metacognition in a variety of ways and translate this into different types of opportunities. As a result, this helps entrepreneurs to identify and adapt to the cognitive nature of opportunities (Gustafsson, 2004).

Metacognition also helps individuals recognize certain elements about tasks and situations that enable effective and adaptable cognitive functioning when confronted with input from dynamic, or complex, environments (Brown & Eisenhardt, 1997; Flavell, 1979), actions typical of the venture creation process (McMullen & Dimov, 2013). This is important to understand because entrepreneurial success is influenced by the willingness to show adaptability towards a changing environment (Ireland et al., 2003; Shepherd et al., 2007). For example, metacognition helps entrepreneurs self-generate different frameworks, and combine them with a set of goals to make use of a changing environment (Haynie and Shepherd, 2009). Similarly, higher degrees of metacognition contribute to higher degrees of responsiveness to uncertainty (Mattingly et al., 2016). This explains why some entrepreneurs change their cognitive response to act and mobilize to a changing environment while others do not (Haynie et al., 2010).

More recently, new perspectives in metacognitive research reconsider the original facets of metacognition (Flavell, 1976) and highlight the relationship between metacognition and novel topics such as affect, social interaction, and decision improvement (Croskerry et al., 2013; Efklides, 2008; Koriat, 2007). For example, metacognition exists within social interactions that require awareness of not only the self but also of others’ thinking (Efklides, 2008; King, 1998). This is because metacognition can be seen as a multifaceted process that is continuously updated with the help of one’s awareness, monitoring of cognition, observation of the behaviour of others, and interaction with different individuals (Efklides, 2008).

These social dimensions of metacognition are particularly interesting for entrepreneurs in their start-up process, because aside from moments of isolated, independent thinking, the majority of their work involves direct, or indirect, interactions with other people (Foss & Grandori, 2020).

Moreover, metacognition operates as an analytic tool for cognitive de-biasing in order to improve decision-making processes. For example, metacognition may “serve as an alarm that activates analytic forms of reasoning that assess and sometimes correct the output of more intuitive thinking” (Alter et al., 2007, p. 569). This correction may be of particular interest for entrepreneurs and their susceptibility to cognitive biases resulting from intuitive reasoning, such as availability, a tendency to use information that comes to the mind most quickly, and confirmation bias, a tendency to favor information that confirms existing hypotheses (Barbosa & Fayolle, 2010; Bergen & Bressler, 2018). For example, metacognitive training helps individuals to overcome availability and confirmation bias because it stimulates a cognitive process in which to analytically perceive every decision scenario from multiple perspectives (Chew et al., 2016). Based on dual-process literature (Stanovich & West, 2000) in which individuals reason between two systems, either intuitive and automatic (labelled as system 1), or slow and analytic (labelled as system 2), metacognition is likely to play a role in the activation of slower, effortful, analytical processes (system 2) and as a result improve cognitive performance by reducing the impact of heuristics and defaults in judgment (Croskerry, 2000; Schwarz, 2015). This is because decisions are often made intuitively and unconsciously, and metacognition counteracts “the pernicious tendencies that drive people’s behavior” (Colombo et al., 2010, p. 446). For example, the extent to which managers make erratic strategic decisions is partially decreased by metacognition, because it enables individuals to reflect consistently in their decision-making process (Mitchell et al., 2011).

The preceding discussion emphasizes that metacognition is a multifaceted concept in which social interactions with different individuals need to be considered during entrepreneurial decision-making processes. Additionally, these perspectives underline an exploration of emerging concepts in the contextualization of metacognition. As a result, the following RQ has been developed for this study: How do entrepreneurs use the understanding of their cognition to develop their start-ups?

## **Method and procedures**

We adopt a theoretically grounded research approach as the method of this study, namely, grounded theory (Glaser & Strauss, 1967). To explore how entrepreneurs use the understanding of their cognition to develop their start-ups, the Gioia protocol has been chosen (Gioia et al., 2013). The Gioia protocol allows one to analyse social and psychological processes, through understanding the essence of individual experiences, and the processes by which it unfolds through emerging concepts (Gioia et al., 2013; Langley, 1999). The steps of the Gioia protocol start with the 1<sup>st</sup>-order analysis in which categories emerge from the interviews. Then, similarities and differences among these categories progress that is then labelled. Next, 2<sup>nd</sup>-order themes emerge from concepts and tentative relationships in which particular attention is focused on novelties and concepts that ‘leap out’. Finally, these themes are then further developed into 2<sup>nd</sup>-order aggregate dimensions that form together the basis of a data structure (Gioia et al., 2013, p. 20).

The Gioia protocol with semi-structured, in-depth interviews is suitable for the context of this study because it allows the researcher to (1) take advantage of emergent unpredictable issues, and (2) create an opportunity to dynamically respond, and elaborate upon, participants’ answers while generating new conceptual insights (Anderson et al., 2009; Cannatelli et al., 2019). Specifically, grounded theory is an appropriate method to use for this study since it supports uncovering relatively unexplored phenomena by means of emerging constructs, propositions, and process models (Glaser & Strauss, 1967). Although most studies of metacognition employ quantitative methods (e.g. Haynie et al., 2012; Mitchell et al., 2006; Mitchell et al., 2011), qualitative approaches, such as the use of semi-structured interviews, fit this study because “much can be understood about cognition and its metacognitive regulation through qualitative analysis” (Pressley, 2000, p. 261).

In this study, patterns have been found that represent interrelationships with, and between, metacognition. Additionally, this study analysed an emerging process by assuming that behaviour proceeds and constantly changes from complex interactions between the environment and the mind (Bruner, 1990; Fiske & Taylor, 2017). This has been untangled by moving between a continuous comparison of categories that arise from the interviews, and with the help of memo writing (Birks et al., 2008; Gioia et al., 2013; Glaser & Strauss, 1967).

The transformative process of constant comparison has been crucial to study metacognition because “cognitive research places a noted emphasis on how, when, and why interactions between mind and environment play a role in the development, transformation, and use of mental representations and other cognitive constructs, and on how, when, and why these elements come to influence (and be influenced by) human action” (Grégoire et al., 2011, p. 1146-1147). The data structure that follows from this process, as portrayed by Corley and Gioia (2011), can be found in the finding section, while an empirical model is discussed in the discussion section, following Gioia et al., (2013).

### **Sampling procedure and empirical context**

This research adopts a longitudinal approach to study nascent entrepreneurs, throughout the process of launching a business. The context of this study can be divided into two distinct phases. The first phase refers to a start-up competition (SUC), in which nascent entrepreneurs present their intentions to start a business. The second phase represents the period after the SUC, in which entrepreneurs launched and expanded their businesses. The nascent entrepreneurs that were approached survived two preliminary rounds of a start-up competition with three jury experts as external evaluators, and were selected as the most promising candidates to participate and succeed in the competition. This study argues the choice for purposeful sampling as a suitable technique because the context belongs to a process of discovery on the individual level in entrepreneurship “information rich” studies (Birkner, 2020; Patton, 1990, p. 169). In total, 99 individuals applied to the SUC. Fifteen entrepreneurs were contacted and eleven of them agreed to be interviewed to become part of phase one of the study.

Start-up competitions are becoming an increasingly common context to investigate entrepreneurship because they produce new venture ideas, they have become increasingly well organized, and generate the birth of new firms (Schwartz et al., 2012; Watson et al., 2018). SUCs also facilitate entrepreneurial learning settings close to “very real business situations”, because participants develop a range of individual qualities and attributes that involve reflecting, an important goal of this study (Taylor & Thorpe, 2004; Wen & Chen, 2007, p. 361). The SUC used for this study has been structured by an organization consisting of experts and business angels, which has produced several classes of entrepreneurs over the years (some of which have launched successful businesses).

The goal of the competition for this study was to form a team, write a business plan, engage with investors, and eventually compete for an investment and a position in an incubator. In this phase, the nascent entrepreneurs of this study have intended to found their start-up, and this is where preliminary observations took place during several recruitment and pitch events (see *Table 17*). At the end of the SUC, a final pitch round took place where some of the interviewed participants received funding. Details about the entrepreneurs and their start-ups can be found in the appendix where they have been grouped from C1 to C11. Since the purpose of a SUC serves to understand start-up intentions, as a next step, this study was particularly interested in determining if these entrepreneurs effectively developed their start-up after the SUC. In this second stage of our study, seven nascent entrepreneurs that were previously interviewed agreed to be interviewed again, while four dropouts were noted. Taking together stage one and stage two, 18 interviews were conducted for this study.

Sample size in qualitative works has been debated widely without a clear consensus (Guest et al., 2006). This study follows Kuzel (1992, p. 41) who recommends working with a sample size between twelve to twenty “when looking for disconfirming evidence or trying to achieve maximum variation”. For example, Rashid and Ratten (2020) recently conducted 12 interviews using the Gioia protocol to contribute to new insights about an entrepreneurial phenomenon. During both interview phases, the order, and format of questions were flexible to maximize variation between respondents. The analysis and discussion sections of this study additionally focus on explaining the effects of individual differences on experience, on the explanation of dropout cases for those who abandoned business (and were not reachable for a second interview) during the process, and on contextual differences between the first and second phase. A structure with the main interview questions can be found in the appendix.

## **Participants**

All entrepreneurs in this sample were considered to be nascent, because they all confirmed during interviews that (1) the concept of moving their idea toward a profitable business was relatively new to them and, (2) the potential investment was a crucial condition for moving forward after the SUC (Davidsson, 2005; Johnson et al., 2008). Nascent entrepreneurs are known to devote a significant amount of time and resources to the process of founding a firm.

While latent, potential, and intentional entrepreneurs are mostly thinking about starting a business, nascent entrepreneurs are mainly concerned with the valorization of the opportunity by preparing a business plan and searching for investments, and therefore more advanced in the process (Passaro et al., 2017; Reynolds & White, 1997). The interviewed entrepreneurs of this study represent a key idea behind nascent entrepreneurship research, that is, the process of generating a sample of ongoing start-up efforts. The entrepreneurs were located in a dynamic entrepreneurial region with one of the highest GDP per capita ratios in Europe (Eurostat, 2020). In addition, the respondents varied according to age (21-41), sector (e.g. sustainable energy, food & beverages, biotech), and previous experience.

### **Data collection**

The data was primarily drawn from two main sources, namely (1) observations, and (2) semi-structured interviews. Additionally, to have a more comprehensive understanding of the data, this study integrated different sources such as application data, pitch videos, presentations, email updates, and field notes that supported the process of data collection. These sources are also supported by archival data. Following Rindova et al. (2011), *Table 17* presents details about the source, type, and use of the data collection process. During the interviews, the questions of this study emphasized the relationship with metacognition as the literature suggests, which was when subjects responded with statements such as: “I was thinking”, “I was noticing”, “I was wondering”, “I was feeling”, “I knew what I had to know”, “I thought about that again”, or “Reflecting on that” (Guterman, 2002, p. 285). To obtain deeper insights, these answers were often followed up with questions such as: ‘can you give me an example to make me understand that better?’ or ‘could you tell me a bit more about that?’ In order not to constrain participants, they were not exposed to preconceived definitions or explanations of metacognition. In particular, the second step in the interviewing process allowed for a comparison between the entrepreneurs to observe the emergence of metacognition under different states of uncertainty. Every interview has been followed up with the production of a transcript within the timeframe that literature suggests (Corley & Gioia, 2011; Gioia et al. 2013).

**Table 17: Details on data collection**

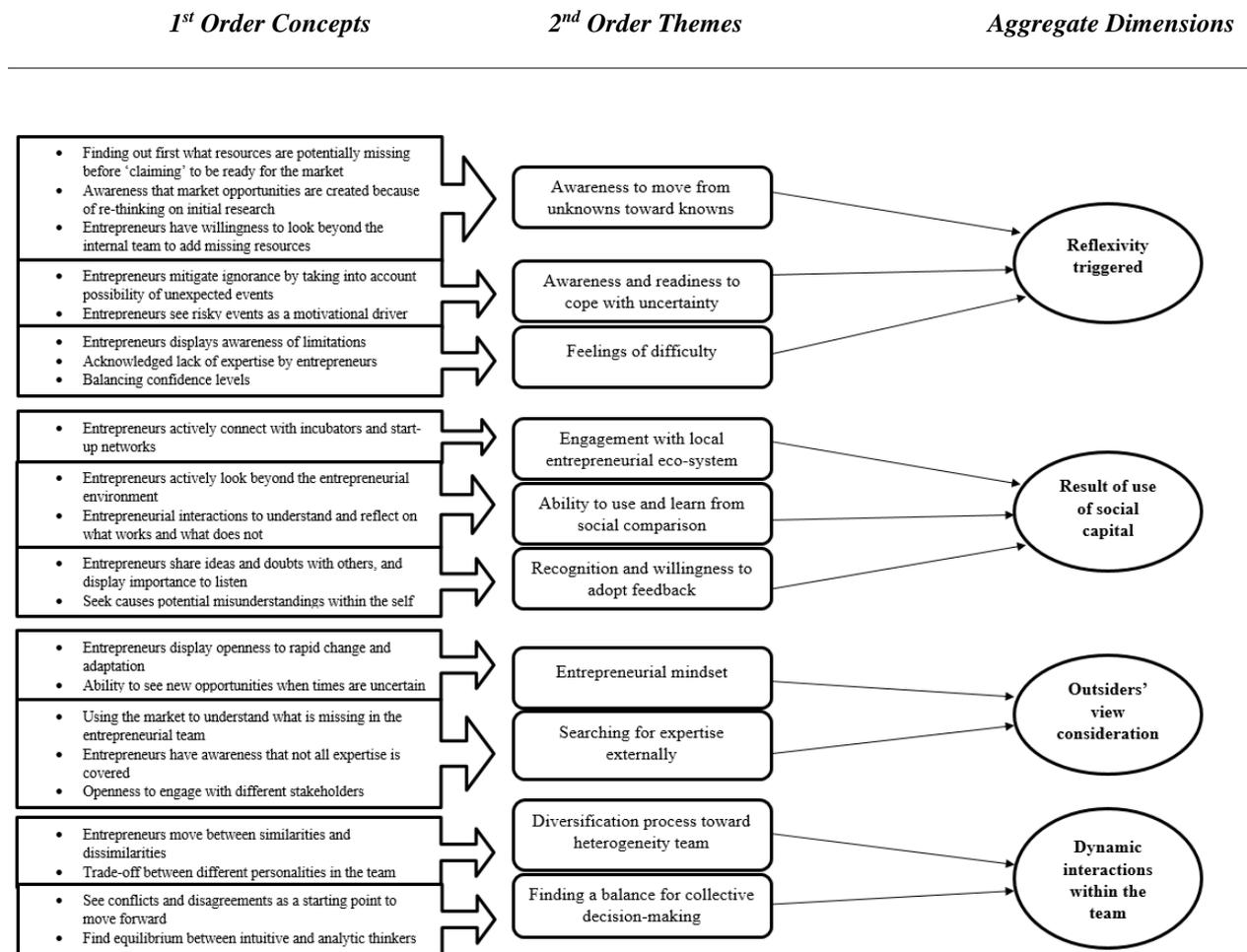
Source of data	Type of data	Use in the analysis
Observations	<p><u>Start-up competition fair</u></p> <p>An all-day ‘recruitment’ event that took place on 21 October 2019 at a Technology Center. Each start-up that was invited for the competition presented the product/service at a desk with promotion materials.</p> <p>In the following days, the start-ups formed a team to write a business plan.</p> <p><u>Smart Building Expo</u></p> <p>A start-up event that took place on 15 November 2019. One of the most promising start-ups was here to find new potential customers.</p> <p><u>Start-up competition final</u></p> <p>The final presentations with the most promising findings have been presented by each start-up during an event that took place on 16 December 2019. An investment of €20,000 has been awarded to the winner.</p>	<p>We observed entrepreneurs, compared the process, and focused specifically on the preparation, presentation, and the way how the entrepreneurs interacted. Triangulated the data with field notes.</p>
Interviews	<p><u>First round</u></p> <p>Took place between September and December 2019.</p> <p>11 interviews have been conducted with the founder(s) of start-ups [C1] – [C11].</p> <p>Interviews were accompanied by field notes and had an average duration of 53 minutes.</p> <p>The data has been recorded and transcribed resulting in a total of 63 pages.</p> <p><u>Second round</u></p> <p>Took place between March and May 2020.</p> <p>7 interviews have been conducted with the founder(s) of start-ups [C1], [C2], [C3], [C5], [C9], [C10], and [C11].</p> <p>Interviews were accompanied by field notes and had an average duration of 76 minutes.</p> <p>The data has been recorded and transcribed resulting in a total of 64 pages.</p>	<p>We collected data regarding the interpretation of decision making processes, motivation, experience, team perception, uncertainty, and re-thinking processes.</p> <p>We compared the COVID-19 context as circumstances under high uncertainty, refined our theoretical assumptions and contextualized cognitive patterns.</p>

<p>Archival data</p>	<p><u>Application data of the start-up competition</u></p> <p>Data was collected in September 2019 at the initiation of the start-up event. A total of 99 start-ups expressed their interest to take part in the program.</p> <ul style="list-style-type: none"> <li>(1) We collected names of the entrepreneurs and their start-ups, age, industry, nationality, emails, LinkedIn profiles, areas of expertise, key competence, patent, and website.</li> <li>(2) Additionally, applicants had to fill in open questions such as ‘describe your idea’, ‘what is your main result so far’, and ‘why is your idea relevant’.</li> </ul> <p><u>Updates via emails</u></p> <p>Regular email traffic has been maintained between the researchers and the entrepreneurs.</p> <p><u>Pitch videos</u></p> <p>10 videos (1 entrepreneur could not make it) have been produced where the interviewed start-uppers briefly introduced their start-up.</p> <p><u>Presentations</u></p> <p>Pitch and final video presentations were analysed.</p>	<p>We triangulated observations and facts. Particularly, we paid attention to the process of each entrepreneur while participating in a semester start-up event, compared this process with the second round of interviews where entrepreneurs did not have specific incentives from a start-up competition investment.</p>
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## Findings

In this section, the study reports the outcomes of the research question: How do entrepreneurs use the understanding of their cognition to develop their start-ups? Following the Gioia protocol, informants’ quotes have been coded and collapsed into first order concepts, providing a first representation of their interviews outcomes. From first order concepts, second order themes have been developed, followed by aggregate dimensions, which represent the highest level of abstraction. Overall the three level of outcomes are portrayed in what Corley and Gioia, (2011) denominate the ‘data structure’, represented in *Figure 9*.

**Figure 9: Data Structure**



The four aggregate dimensions emerging from the empirical study refer to the role of the following issues in metacognitive processes of nascent entrepreneurs: triggers of the reflexivity of actors, use of social capital, consideration of outsiders' view and interactions within the entrepreneurial team.

***Reflexivity triggered***

The findings in Figure 9 show that reflexivity of actors is triggered by (a) an awareness to move toward the 'knowns', (b) an awareness and readiness to cope with uncertainty, and (c) feelings of difficulty. These are individual processes of reflexivity that emerge from metacognition. Specifically, metacognition is conflated with reflexivity, in which aware individuals "test alternative solutions and reflect on differing outcomes" (Haynie et al., 2010, p. 220). Nascent entrepreneurs operate in an environment where a lack of expertise leads them to be ignorant of future outcomes, the so-called unknowns (Niittymies & Pajunen, 2019).

These unknowns, such as selecting the right customer segmentation strategy, can become knowable with moments of reflection over time (Grant, 2021). By reflecting and analyzing upon their thinking, it may be possible for nascent entrepreneurs to discover what is already known to them, and what is not yet known. For example in the case of [C5]<sup>14</sup>: *I think, everybody has its own conception. Some people are more cautious, other people move more on intuition, and they are immediately enthusiastic. By nature we, scientists, tend to be cautious for we make the next step. I should be really, really confident and convinced that my product is the best.*

An intuitive thinking style often leads to satisfying outcomes, but may occasionally lead to thoughtless choices (Kahneman, 2011). When more time is needed to make a decision, such as in the product development process of [C5], thinking about thinking processes may help entrepreneurs to become aware of unknowns and analyse the problem properly: *So this is all very new, we are all moving on a ground that is unknown for us. We have to understand things properly before proposing. In some cases, by intuition, we thought that a component would work. However, that was not exactly how it went, we realized it could be done in another way. When we realized that, we all agreed, and then went back to reprogram. 'Now, let's do things in another way'.*

That is because metacognitive processes, such as the feeling of difficulty, emerge when entrepreneurs move from intuition toward an analytic approach (Efklides, 2008). In this case [C5], it is recognized by an analytic approach that is preferred over an intuitive approach. The outcome of this process is the decision to reprogram the technology because moments of difficulty were experienced that made [C5] take a step back with the team. Moments of reflection help entrepreneurs anticipate future outcomes because it stimulates become aware of a set of alternative possible uncertain outcomes (Graber et al., 2012). This is the case when [C9] states that: *From a general point of view, I mean, it's (COVID-19) a big mess. But at the same time, there are several opportunities that I think can somehow help this moment. So we are now thinking about how to adapt our sparkling sake to that concept. So, let's say it is an 'excuse' to innovate. Me and a group of business partners, exploit the situation to launch a new product. So, in a couple of weeks, we are going to be out on Kickstarter, with this really innovative and*

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<sup>14</sup> We refer the reader to the appendix for details about the cases

*new thing. I am really lucky that I have a group of people around me, we continuously think about our ideas.*

Extreme peaks of uncertainty, such as the COVID-19 pandemic, have been challenging for entrepreneurs. The results show that perceived feelings of difficulty were followed by reflective processes for those who were used to this practice. This habit of reflexivity leads to the discovery and creation of new business opportunities. Additionally, feelings of difficulty are important to embrace, says [C1]: *Maybe, if you want something so hard, you cannot see the difficulty.* Having, at the minimum, an awareness of these difficulties indicates self-reflection (Alvesson & Spicer, 2012). Those who practice self-reflection appear to be more prepared to cope with uncertain moments and difficulties. This is confirmed by the following case [C10]: *Before [N] joined the team, I kind of had a black hole answering business-related questions, in my mind, I could see the structure far away, but I could not focus on that. (With [N] on board) we told each other: 'if we don't act now, we will lose the idea'.* [C10] shows that reflection appears to be a powerful tool in moments where entrepreneurs may experience too much difficulty. It reveals that uncertainty about the business may be compensated by the extent to which entrepreneurs utilize thinking about thinking processes. However, coping with uncertainty is not axiomatic for nascent entrepreneurs, causing cognitive dissonance in the start-up creation process. This is confirmed by dropout case [C7]: *Something I don't like, is that every day something is changing. So before we said, 'let's work on it in this way.' The day after, we are changing it in a completely different way. Sometimes it is good because you can find a lot of new opportunities, but other times it is really annoying. You are working but you need to hold on all the time.*

### ***The use of social capital***

Social capital emerges as an aggregate dimension capable of stimulating the metacognitive processes of entrepreneurs. Anderson and colleagues discuss the different conceptualization of social capital and conclude that social capital is “a social relational artefact, produced in interactions but that it resides within a network” (Anderson et al., 2007, p. 249). The metacognitive processes emerging from the use of social capital have the capacity to (a) stimulate the ability to learn from others, (b) stimulate the recognition of feedback, and (c) engage entrepreneurs with local ecosystems. Social capital, the ability of individuals to exploit benefits from their social networks, structures, memberships, emerges as a crucial antecedent of metacognitive processes for nascent entrepreneurs.

In the context of this study, entrepreneurs have opportunities to pitch ideas during several events, while others are part of a scientific team or an incubator. These networks and structures emerge as an antecedent to stimulate metacognitive processes. For example, [C11] states that this was valuable to him in the development stage of the start-up because he did not consider before that feedback generates re-thinking processes in favor of the development of his start-up: *What I need is someone that is able to put you in the right way, someone that gives you feedback during the project. I didn't think about that before.*

Another entrepreneur [C1] states that interactions help select the most valuable feedback. *The main challenge is the trade-off to listen to the feedback and consider their ideas without being narrow-minded. It is then up to us to make a good balance between that.* Social capital emerges as a reflective mechanism for entrepreneurs to think, re-think, select, and consequently adopt received feedback to improve start-up activities. Specifically, feedback emerges as a major driver of motivation and business improvement, because it is the input of others that stimulates new thinking patterns.

However, to receive feedback, entrepreneurs depend on the input of others. To overcome this dependency on verbal input, entrepreneurs emphasize the role of learning by observing and comparing. Social comparison is the drive of individuals to evaluate themselves by observing others (Festinger, 1954). These social comparison processes emerge from metacognitive processes because it is the environment itself that works as an antecedent to think about thinking. For example, when entrepreneurs are pitching [C10]: *So I have seen other ideas that were not just great but were also very good at selling it at the competition, they were very good at communicating. So yeah we lost but we've learned a lot, we understood what we miss, and what we really have to work on a lot.* Another social comparison example can be seen in the case of [C2]: *After the start-up fair, we understood that we had to do much more work on the presentation, and how to behave in front of people you are presenting to.*

In both cases, the respondents understood that they had to improve their abilities because an emerging process took place where social comparison activated a process of re-thinking about their current abilities. This process of becoming aware as a result of the use of social capital is not evidently a straightforward process for everyone. Nascent entrepreneurs must adopt a willingness to implement these re-thinking processes, as [C8] states: *Another limitation that I have as founder, it is difficult, if you think about an elevator pitch, to convince people. I*

*cannot do that, and I probably don't want to do that.* The findings show a pattern in which engaging with others stimulates metacognitive processes, because the input of others, either by social comparison or feedback, causes a process of re-thinking about initial thoughts. These comparisons may be particularly present when nascent entrepreneurs make use of their social capital because it stimulates metacognitive processes in which individuals become aware of the skills in which they are inexperienced, as is shown in the start-up creation process of [C5]: *We are actually scientists, we are free from thinking of the economic reward. I am totally honest so I follow someone with more experience, with more initiative.* Importantly, this process of social comparison develops further in the steps start-ups take after the SUC. Here, a process takes place in which intentions to consider social ties utilizing observation convert into actionable decisions, such as concretely building a network around the start-up. For example, in the case of [C5]: *So it is great to take the awareness, from a point where the product is not ready yet, closer to the market, with the help of others. And we took the decision, I have to admit, thanks to the company we are currently working with. In fact, I have big news for you, I don't know if you know the innovation site, where there is a research institute. So it is an innovation hub, with other companies. So here, they suggested to us a collaboration, and they agreed on the first testing sessions. If everything goes well, and it is promising enough for them, they would like to take about 15 orders from us.*

Additionally, adoption of feedback and social comparison processes emerge as a motivational trigger for entrepreneurs to engage further in local entrepreneurial ecosystems. The results show that, once respondents are aware of the added value of receiving feedback and learning from others, the willingness to search for additional networks, structures, and memberships significantly increases. An example of this emerging process can be exemplified with the case of [C1]: *Another person in our incubator, who is 50 years old, suggested us an exercise where we tell each other one good thing and one bad thing to each other. When you do this in a quiet situation, it feels better than when you discover it later in a complex environment. It really helped us to become a better team, to become aware of the things by others we are not so good at [...]. The incubator in that sense is a very nice way to stay connected to the entrepreneurial environment. I feel that everyone can learn something from someone else, regardless age or expertise.*

During the second interview, [C1] evidently shows how valuable input received from feedback and social comparison contributes to the development of a local entrepreneurial ecosystem: *I think that the main decision we took was when we had the awareness about the 'second solution', our technical solution, because this was a result of an engineering project during the lockdown period, a society helped us. It was very good from a technical point of view, but it wasn't still ready to market from an economical point of view. So I think that we were right, we took the right decision not to focus only, not to just stay on our engineering point of view, but to try to move forwards and collaborate.*

What emerges here is a process loop where entrepreneurs who recognize the usefulness of observing and listening to others, progressively enlarge their local entrepreneurial eco-system. This process is stimulated because the input of others operate as a metacognitive process for entrepreneurs, it encourages thinking about one's thinking.

### ***Outsiders' view consideration***

A third aggregate dimension refers to the capacity of nascent entrepreneurs to consider an outsiders' perspective. An outsiders' perspective is the process in which entrepreneurs learn to think like an outsider when thinking about their own business, a crucial condition for innovation, growth, and success (Ensign & Robinson, 2016). This is because the consideration of an outsiders' perspective generates more alternatives during the decision-making processes. [C1] for example states: *There is the risk to close your eyes if you only focus on what's good for you, you have to ask yourself what's good for your client. There is a risk when you focus only on the technical part of the start-up.* Metacognitive processes emerge here into beneficial outcomes for entrepreneurs because thinking about thinking processes promote the exploration of alternative explanations and open the possibility for various possibilities in problem-solving and decision-making (Graber et al., 2012). For example, during the process after the launch of the business, [C1] declares that he now sees his ability to consider the perspective of his potential clients as a passion: *I now found [after the SUC] networking with other people as a passion for me, the power to be an and think like an open-minded person, I like to make the links. To keep a possible customer focusing on our solution. For example, if you send an email to someone, and you never send a reminder, they will never tell you anything. So if you give a reason to call them, or to talk with them about something else, and then you get back to our product, you can facilitate the marketing part.*

The findings show that metacognitive processes have additional benefits for nascent entrepreneurs because they stimulate the growth of an entrepreneurial mindset. For example, [C8] states that: *When you pitch that idea to someone from a different environment, with a different mindset, you actually get a real clue of how valuable that idea is.* While [C10] confirms that using their network to add another co-founder with business expertise led to new ways of thinking about entrepreneurship after the launch of their start-up: *After we took [N] on board, we grew a lot as business persons. Before we just met to discuss the technical stuff, now we are looking more business-wise, we were not thinking about how a company worked before.* Here we see that, previously, [C10] did not think about his thinking to take the next step toward a business approach. It was the use of social capital that added the consideration of an outsiders' perspective to the firm. Metacognitive processes take place here because it stimulates nascent entrepreneurs to become aware of what expertise is missing so that this can be sought elsewhere.

However, this process is particularly challenging for nascent entrepreneurs. For example, in the case of dropout [C6], we observe difficulties in the process of considering the view of outsiders: *I am generally unconscious of what I am doing, I was [during the start-up fair] really focussed on the project, on the main idea, and so I was pretty sure that my idea was better than other ideas. You know, my world is different, in the university world, you have time to talk about things. So the main problem was that people when we exchanged the idea, a lot of time they didn't get it, they didn't get what was the deal of my idea.* Here, indications from outsiders are not cognitively processed into re-thinking processes, resulting in an entrepreneur being unable to engage with others. What can be observed here is a lack of metacognitive processes, because the entrepreneur does not consider the possibility to re-think or re-consider his own conscious mind. Rather, the problem is profiled on others. As a result, these lack of metacognitive processes were responsible for an absence of considerations of alternative reasons why potential customers and partners didn't engage with the entrepreneur.

### ***Dynamic interactions within the team***

The different aggregate dimensions are deeply intertwined, as the previous quotes seem to confirm: an outsiders' perspective affects the decision-making process of the entrepreneurial team as well. This happens because metacognitive processes stimulate nascent entrepreneurs to recognize the value of a diverse team, and this improves the balance in their collective decision-making processes.

The social ties that were built up during the development of the start-up were further engaged in the exploitation steps after the SUC, [C11] declares: *I now realize that the social aspects were really nice. I started to say 'our' project, you know, the small things. 'We' have to decide that, all these things, and they immediately felt part of the project, immediately. So one of them is working on one of my projects now. Right now she cannot do something [due to COVID-19], but it is my plan that at the moment that we can produce, to involve her, because I think that she is really good, she wants to learn a lot, we have a really good relationship.*

When individuals think about their thinking, they identify their unknowns, and this process consequently leads to the realization which abilities one has and of which are still missing. The findings show that different levels of self-confidence in a team are helpful to serve as a process of rationalization because the differences in thinking patterns within the team allow a process of identifying knowns and unknowns. This is an important finding since high levels of confidence are associated with processes in “which people do not know what they do not know” (Forbes, 2005, p. 624). For example, in the case of [C3]: *You know, having all the same idea...hmm, not a good idea. Usually, it is good to have some disagreements, to have better products, and to produce better thinking.* And [C1]: *In our case, there are the more optimistic and the more pessimistic ones. I am more in the middle, the main reason why I am like this is that I don't want to be too opportunistic about the outcomes, for our project, before we really build it, it is my character.*

These findings emerge into outcomes that impact collective decision-making because metacognitive processes within the team are causing discussions in which different opinions are considered. For example, when [C5] states: *Clearly it is useful to communicate all together, if you are only focused on the solution without an idea, without considering other comments that can arise from discussions, you have no idea and will never find the real trade-off. So the trade-off gives every member a nice panoramic view of the project.* Different characters and experts within the team cause thinking about thinking processes that advance the decision-making process of the team. This occurs by differences in opinions, disagreement, optimism, or, as in the following example, expertise. Moreover, it implies that a diverse entrepreneurial team stimulates metacognitive processes, and the awareness of these differences are increasingly valued over time, such as in the case of [C10]: *For example, when [N] says something about strategy, of course for me that is like 'okay, she saw this maybe 100 times and if her experience taught her so, I will take it as a valid feedback, validated by experience to*

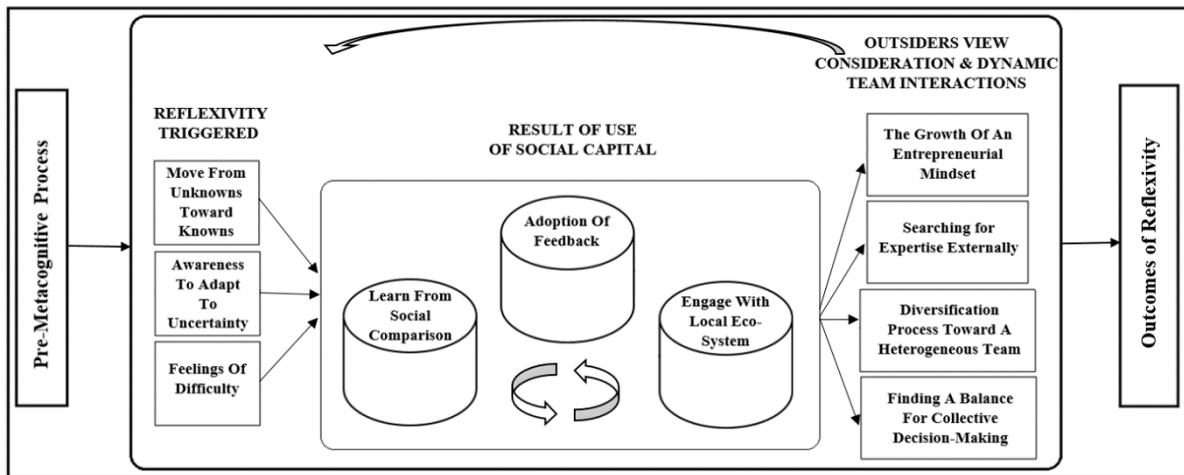
*interpret the information.' So the difficulty is to understand and to give up some ideas you have sometimes. You might think it's the right way, but when you interact with others and you get their feedback, you will understand that there are other ways. Maybe better, maybe worse, but there are other ways.*

However, a heterogeneous team needs to find an equilibrium in order to benefit from metacognitive processes. For example, in the case of dropout case [C4], who recently had changes in his team, states: *Basically I was looking for people that like brainstorming, with a creative mindset. [...] The thing is, I don't think that they are all so business-oriented. It's nice to work with them but I don't think that they are that motivated. People are not really work-oriented, this is what I observe and experience.* In the case of [C4], no trade-off has been found between different characteristics in the team to create a heterogeneous team. Too many same-minded individuals were part of the team, creativity was dominant, which made the stimulation of metacognitive processes problematic. On the other hand, in the case of [C10] above, the original team of founders was composed by similar abilities without an entrepreneurial background. The decision to recruit a member with entrepreneurial experience improved the collective team decision-making progress. It initiated a process in which the other members of the team started to re-think and question their original assumptions. As a consequence, these metacognitive processes created alternative ways of how the individual team members understood solutions in their decision-making process.

## **Discussion**

In order to advance theoretical insights, we follow Gioia et al. (2013) by developing, from our data structure in *Figure 9*, an empirical model to be discussed in this section (*Figure 10*). The model considers that nascent entrepreneurs start from a condition of pre-metacognition, in which they are not aware of what they do not know. Under these circumstances, their decision-making can be severely flawed by unknown unknowns. The topic has been overlooked by academic research, and this research aims at addressing a call for studies in this area: “We suggest that making more room unknown unknowns in strategy may further our understanding of the consequences of heterogeneity (Ehrig & Foss, 2021, p. 4).

**Figure 10:** *Empirical model*



The results show that reflective practices facilitate a process of change. Indeed, reflection as a driver of change is successfully promoted by metacognitive processes because it stimulates the awareness of one’s beliefs (Muis, 2007). The results indicate that these reflective processes serve as antecedents to creating awareness among nascent entrepreneurs for the purpose of understanding what they do not know (Petersen et al., 2008). These processes are particularly important for nascent entrepreneurs because they often lack the expertise to identify what they do not know. Later on in the process, entrepreneurs “start to understand what they do not know” and “what they need to know” to overcome their lack of expertise (Niittymies & Pajunen, 2019, p. 6).

On the one hand, reflection is triggered by an individual process, which leads to the creation of personal awareness in order to prepare nascent entrepreneurs for uncertain, unknown difficulties. The experience of feeling difficulty during the start-up process is important for the self-regulation function of metacognition. This is because feelings of difficulty have been found to alert individuals to make an effort in their decision-making process (Efklides, 2008). These cognitive cues are particularly important in the findings of this study because thinking about one’s difficulty provides entrepreneurs the awareness to prepare for unknowable, uncertain moments.

On the other hand, particular elements of social capital are crucial as input to revitalize metacognitive processes, because the input of others stimulates entrepreneurs to think about their thinking, such as when respondents received feedback. This complements previous

findings on social capital since it has a positive effect on start-up progress for nascent entrepreneurs (Davidsson & Honig, 2003).

The outcomes thus highlight a reflective process with a central role for the use of social capital, an important condition to form start-up growth aspirations (Liao & Welsch, 2003). This research adds to the rich literature existing about social capital in entrepreneurship (Anderson et al., 2007) because it provides an alternative perspective, as represented by its role in metacognitive processes, in which entrepreneurs think about their thinking. These processes lead to new thinking processes that support nascent entrepreneurs' awareness about difficulties they have not thought about before (Efklides, 2008). Additionally, these cognitive processes emerge into fruitful entrepreneurial outcomes, such as the growth of an entrepreneurial mindset and the necessity for nascent entrepreneurs to search for expertise externally to complement their often inexperienced entrepreneurial team.

An entrepreneurial mindset has been described as an “ability to rapidly sense, act, and mobilize, even under highly uncertain conditions” (Ireland et al., 2003, p. 967) and conceptualized into a situated metacognitive model in which entrepreneurial thinking is explained by individual differences in motivational and environmental interpretations (Haynie et al., 2010). This study extends these conceptualizations by empirically modeling a dynamic process in which social capital reinforces the entrepreneurial mindset, and specifies environmental conditions that lead to specific entrepreneurial outcomes when nascent entrepreneurs are in the process of launching their start-ups. This transitional process eventually leads to a diversification of the entrepreneurial team and a balance in the collective decision-making processes, highlighting the important contribution that metacognition is not purely an individual thinking process.

This study shows specific elements of social capital that are in a constant loop, in which nascent entrepreneurs reflect and learn from others with the help of comparisons and feedback. Consequently, the results show that this leads to further engagement with local entrepreneurial ecosystems, such as an incubation process in which nascent entrepreneurs actively engage with other entrepreneurs, mentors, accelerators, and business consultants. These relationships are crucial to establishing because they have a positive influence on firm survival (Mian, 1994).

The role of specific components of social capital in the metacognitive processes of entrepreneurs is another significant contribution of this study. Recent psychological perspectives on metacognition have emphasized that metacognitive processes are continuously updated “through observation of one’s and other’s behavior/actions and their outcomes” and “through communication and interaction with others” (Efklides, 2008, p. 279). The results of this study point to the specific role of feedback and social comparison because these serve to reinforce additional metacognitive processes and further engagement with others. The central role of social capital in the empirical model is justified by the lack of expertise of nascent entrepreneurs in the entrepreneurial process, which can be compensated and complemented by expanding involvement with external stakeholders, incubators, and other experts. Metacognitive processes stimulate extending expertise because thinking about thinking processes gives rise to the consideration of alternative options that create different types of opportunities (Gustafsson, 2004). The results of this study highlight the utilization of expertise as a result of metacognitive processes, extending previous findings through a model that highlights extending expertise as an additional advantage for thinking about thinking processes that is stimulated by engaging with others.

Haynie et al. (2012) have previously shown that individuals with higher degrees of metacognition use cognitive feedback more effectively. This paper finds that feedback is likely to come from interaction to the extent to which entrepreneurs leverage on human relationships inside and outside their venture (Markman, 2007), or from the extent to which individuals benefit from comparison within their social structures (Baron 2007). Thus, we extend these previous findings in which this study shows empirical evidence of how nascent entrepreneurs, by using their metacognition, extend their social capital and go beyond their social networks, structures, and memberships to search for expertise externally. Hence, these emerging concepts lead to the growth of an entrepreneurial mindset, a crucial condition for nascent entrepreneurs to develop because the business success or failure highly depends on business skills such as communication, negotiation, perseverance, and the coordination of social ties (Lamine et al., 2014).

Individual differences between the respondents of this study showed that while some nascent entrepreneurs relied on previous business experience, others relied solely on their academic experience when launching a university spin-off.

These differences are important to consider. For example, academic entrepreneurs have been found to lack the willingness to grow and do not seek profit maximization (Hesse & Sternberg, 2017). Additionally, the process of mobilizing resources can take years for academic entrepreneurs because these requirements are usually extensive (Druilhe & Garnsey, 2004; Garnsey, 1998). These discrepancies highlight the need for academically orientated entrepreneurs to develop a mindset that supports the mobilization of resources to further business growth. Metacognition has been found to stimulate this process because it is a cognitive resource that leads to the development of an outsiders' perspective which helps nascent entrepreneurs re-think current strategies (Ehrig & Foss, 2021), and understand which expertise may benefit their start-up activities (Haynie et al., 2010).

Furthermore, this study proposes that metacognitive processes help in a better understanding of specificities in the dropout cases of this study. This assumption is grounded on the important conceptualization of Haynie et al. (2010) in which the authors reason that metacognition represents a heterogeneous learning process that explains why some individuals adapt to their context, while others do not. Since the empirical study has been conducted in two rounds (during the startup competition and after some time), the researchers had the opportunity to identify dropouts from the original entrepreneurial project. The results of this study show that the dropout cases showed little adaptability to feedback, and little effort to engage with their social capital during the process. Those who abandoned business after the SUC were occasionally composed by a rather homogenous team that generally perform better on routine tasks (Schjoedt & Kraus, 2009).

Our findings highlight the importance for individuals with different backgrounds who are inexperienced in the entrepreneurial process to develop and stimulate thinking about thinking processes to learn to think like an outsider, an important condition for business growth and success (Ensign & Robinson, 2016). The empirical model of this study emphasizes an important transition toward a diversification of the entrepreneurial team and a better balance in the collective decision-making processes.

Unlike frameworks that have described entrepreneurship as an individual activity (Shane & Venkataraman, 2000), recent studies place entrepreneurial teams at the core of entrepreneurship, and as the responsible driver for most start-up activities (Harper, 2008).

The results of this study show that metacognitive processes stimulate nascent entrepreneurs to search for expertise externally. This awareness can lead, as a consequence, to a diversification of the entrepreneurial team, as well as to a search for external advisors. Since heterogeneous teams perform better when operating in a novel context (Schjoedt & Kraus, 2009), the transformation toward a heterogeneous composition is particularly important in the decision-making process of nascent entrepreneurs. Indeed, effective decisions are more likely to come from heterogeneous teams because they consider more options when making decisions (Eisenhart & Schoonhoven, 1990). This study proposes that the team composition has a significant effect on metacognitive processes because teams that are composed by differentiated members increasingly stimulate thinking about thinking processes.

Finally, the model shows that, when entrepreneurs think about their thinking, they become aware of their unknowns. Consequently, this process leads to the identification of missing resources that would complement the entrepreneurial team. It also leads to a more balanced collective decision-making process (West, 2007). For example, when entrepreneurs make decisions, they have been found to display higher levels of cognitive bias than managers (Busenitz & Barney, 1997). Cognitive biases arise because individuals rely mostly on their intuition when making decisions. A more rational, slow processing of information decreases biases in decision-making, but requires more cognitive effort, and is impracticable to be used most of the time (Kahneman, 2011). When decisions are collectively made, metacognitive processes improve decision-making processes. That is because metacognition engages with analytic reasoning and decouples itself from intuitive judgments (Croskerry et al., 2013). For example, self-awareness associated with improved metacognition diminishes cognitive biases in decision-making (Sadler-Smith & Shefy, 2007).

The findings of this study suggest that, when nascent entrepreneurs make decisions collectively, they avoid relying solely on their own, limited expertise. This is because metacognitive processes provide decision-making advantages such as seeking out alternative explanations and exploring the consequences of these alternatives (Graber et al., 2012). Consequently, this outsiders' view consideration has a crucial impact on the process of improved decision-making, because collective reasoning between individuals leads to interactions that facilitate disagreements and different perspectives on the decision-making process (Schraw & Moshman, 1995).

As *Figure 10* shows, metacognitive processes lead to outcomes, in terms of effective start-up from the original business idea and subsequent survival and growth. Our empirical study has a longitudinal nature, covering the period from the SUC to the effective startup of the venture, and thus permits to understand the role of metacognition in dropouts versus effective launches. This role seems particularly relevant, thus contributing to the entrepreneurship literature in this field, by adding the scarcely explored metacognition perspective.

### **Theoretical implications**

This study aims to contribute to entrepreneurship literature by uncovering the understudied role of metacognition in discussing how nascent entrepreneurs can deploy metacognitive processes in their start-up process. The research has found an important role of social capital when entrepreneurs think about their thinking. The comparison between two specific research contexts (the start-up competition and the following launch of the venture) offers a unique insight into how differences in the use of social capital lead to different metacognitive responses, that consequently impact nascent entrepreneurs and their teams in the decision-making process. These findings extend previous studies on metacognition by providing specific environmental elements that give rise to specific entrepreneurial outcomes (Haynie et al., 2010). Additionally, we offer new insights between metacognitive processes and decision-making, highlighting the role of metacognition in activating slower, deliberate, effortful thinking (Croskerry et al., 2013).

Moreover, this study is one of the first to use a qualitative approach to explore metacognition. Thus, we offer new opportunities for new explorative works to further investigate the antecedents and consequences of metacognition in the entrepreneurial process. Finally, the results expand our understanding of metacognition encompassing the role of collective cognition (West, 2007). This is because metacognition is not only related to the self, but also to others (Efklides, 2008), thus suggesting metacognition to be part of a collectively constructed process that has important advantages for the decision-making process.

## **Managerial implications**

The findings also contribute to pedagogic and educational practices. For example, metacognition can be trained and learned in classroom settings (Nelson, 1996; Nietfeld & Schraw, 2002). Thus, metacognition may be used as a practical tool that can be taught and learned, with the potential to have educational value to entrepreneurs and managers. Entrepreneurship education might benefit from this, given the fact that in-class training may lead to more self-reflective and self-regulatory results in an entrepreneurial context. Thus, metacognitive training may be implemented in entrepreneurship courses, accelerator programs, and incubators.

These exercises may consequently lead to the execution of randomized experiments. For example, metacognitive training instructions may be applied as an intervention in decision-making practices. Since metacognition has been suggested to lead to cognitive improvement (Croskerry, 2002) and analytic forms of reasoning (Alter et al., 2007), experimental methods may test the use of a metacognitive checklist or exercise where managers or entrepreneurs may engage in reflexive and awareness exercises. Fruitful new insights may derive from the idea that training by definition is an applicable treat in such a session. Consequently, workshops could use these insights to design tools in which managers would be trained to use thinking about thinking strategies a priori a decision is made, in order to not fall prey to well-known managerial decision-making biases such as confirmation bias and anchoring (Bazerman, 1994).

## **Limitations and future research suggestions**

This paper is not without limitations. Firstly, the study uses a limited number of cases, thus preventing fully generalizable conclusions. To overcome this limitation, future studies might include different samples in their analysis, such as studying start-ups that are competing in different countries within different competitions over time in order to broaden the results of this study. This work allows for additional future research. For example, previous works have suggested that applying cognitive adaptable decision-making tools, such as metacognition, allow individuals to be both self-reflective and self-regulatory (Haynie et al., 2012; Hitt, 2000). This function of metacognition may help decision-makers to mitigate certain cognitive biases.

Future research therefore might focus on the mitigating role of metacognition on cognitive biases. Knowing that entrepreneurs might be unreasonably confident, metacognition may help to avoid costly errors and could have benefits on new-venture performance (Mitchell et al., 2014). Also, work on metacognition has mostly focused on cognitive aspects, while just very recently other facets of metacognition have been highlighted, such as affect (Ustav & Venesaar, 2018). Future research could explore the role of meta-affection in entrepreneurship and explore its role with metacognition. Finally, although this work acknowledges that metacognition is beneficial for nascent entrepreneurs, simultaneously, too much thinking may lead to doubt, delayed decisions, or no decisions (Roy & Zeckhauser, 2015). Future research might thus investigate under which circumstances thinking about thinking may support entrepreneurs in their decision-making process, and when it may not. For example, perhaps that too much thinking about thinking may lead an entrepreneur to stay stuck in the intention-action gap. These future directions have great potential for entrepreneurship researchers.

## **Conclusion**

There is a recognized gap in studies in understanding how unknown unknowns affect firm capacity to adapt to change (Ehrig & Foss, 2021). This research focuses on nascent entrepreneurs, who may be even more affected by unknown unknowns in their start-up process, and how self-regulative mechanisms, such as metacognition, can support them. We thus contribute to understanding better which processes contribute to “enhancing the quality of new firms”, which has been recognized as a key issue for practitioners and policymakers, who share the objective to reducing the high failure rates of new ventures (Brixy et al., 2013, p. 157).

In this study, a sample of new venture initiatives was analysed over time, in two distinct phases of their life: a start-up competition and the subsequent launch of their venture. The findings contribute to new empirical insights about entrepreneurial metacognition, uncovering a reflective process with a crucial role for the utilization of social capital. Consequently, these metacognitive processes generate important outcomes for nascent entrepreneurs to move beyond the status-quo, such as expanding local entrepreneurial ecosystems and growing an entrepreneurial mindset. As a result, these processes emerge toward dynamic team interactions that stimulate diversification, and improve collective decision-making processes. We also find that, when metacognitive processes are not enough developed, dropout from the original entrepreneurial project occurs.

### Appendix Essay 3

**Table 18:** Information about interviewees

Case	Type <sup>15</sup>	Sector	Market	Description	SUC result	Co-founders	Type of experience founder(s)	Dropout
C1	Start-up	Sustainable Energy	B2B	A device capable of obtaining energy from vehicular traffic.	3 <sup>rd</sup> place	3	Academic & Business Experience	No
C2	Academic spin-off	Food & Beverage	B2B & B2C	Sensors for naked-eye monitoring of meat spoilage.	2 <sup>nd</sup> place	4	Academic Experience	No
C3	Academic spin-off	Life Science	B2C	A system for large-scale kinetic analysis.	5 <sup>th</sup> place	0	Academic Experience	No
C4	Start-up	Consumer Goods	B2C	A compact dishwasher that washes dishes with 4 liters of water in 1.2 min.	No award	1	Business Experience	Yes
C5	Academic spin-off	Automation & ICT	B2B	Optimized machine learning algorithms with quantum speedups.	No award	1	Academic Experience	No
C6	Academic spin-off	Biotech	B2B	A cryptographic technique based on protein folding.	No award	1	Academic Experience.	Yes
C7	Start-up	Digital Media	B2C	A platform whose purpose to find caregivers and services.	No award	0	Academic Experience	Yes
C8	Start-up	Eco-Solutions	B2B	A recycling process for sustainable development.	No award	0	Business Experience	Yes
C9	Start-up	Food & Beverage	B2B	Sustainable sake in Europe.	1 <sup>st</sup> place	2	Academic & Business Experience	No
C10	Start-up	Food & Beverage	B2B	An IoT platform for digitalized monitoring of beer drafting.	No award	2	Academic & Business Experience	No
C11	Start-up	Web & Digital	B2C	An e-commerce with unusual products	No award	0	Academic & Business Experience	No

<sup>15</sup> Academic Spin-off has been labeled when the individual created the idea as part of his/her research at an university

**Table 19: Interview scheme**

Topics	Purpose & Focus	Questions	Literature
Entrepreneurial Process	<p>Understand background entrepreneur and process: <i>When, where and why did the entrepreneur come up with the idea, what is the motivation, how was the decision-making process, previous experience in launching a start-up.</i></p>	<p>How did you come up with the idea, when did you start it, and why? What were your reasons and motivations to start this business? Do you have experience with the start-up world as a person?</p> <p>Can you give me an introduction of your start-up, how did you start? Where are you now, what are the differences between the start and now? Which decision did you make during the process? What are your objectives during this period?</p>	<p>McMullen, Dimov, 2013, Hindle, 2011, Shane, 2003.</p>
Teams & Team formation	<p>Differences in the founder team: <i>how and why was the team formed, did they start together, did they face difficulties, conflicts and how was it solved, how do they evaluate each other, which decisions and judgments were made?</i></p>	<p>Can you tell me something about your team? How do you evaluate each other, do you use certain tools? Were there any conflicts in your team so far, and how did you solve them?</p>	<p>West, 2007, Mol et al., 2015.</p>
Metacognition	<p>Understand how founders control and reflect upon their learning: <i>what they recognize about themselves, tasks, situations and their environment, understand the perception of own knowledge and competency and which ways or tools (de-biasing) they have to evaluate themselves?</i></p> <p>COVID-19 context: compare SUC cases with the current context, and learn from start-ups that coped with uncertainty during the pandemic and how they approach this.</p>	<p>Can you name me a specific task you are responsible for? Can you reflect on your role? How did your environment react on your input so far? Have you considered their perception? How do you reflect on these processes? How do you evaluate yourself?</p> <p>What was your initial forecast/expectation to achieve this year? Looking back at the competition, would you have done something different? How do you reflect on this process? What decisions have you made or/and not made because of COVID-19?</p>	<p>Flavell, 1979, Haynie et al., 2009, 2010, Mitchell 2014, Shepherd 2018.</p>

*Social  
Comparison &  
Team Cognition*

The pursuit of new value through entrepreneurship is motivated by social comparison: One way to learn is by observing the behavior of other people (de-biasing).

Is it important for you to talk with your shareholders? How do you observe your competitors? How did you observe the students at the fair of ideas to recruit them? What are you hoping to get from your team? What do you know about the other student teams?

*Mitchell 2007,  
Festinger 1954.*

## 4.0 *Conclusions and Implications*

In the last section of this dissertation, the conclusions of the essays above will be summarized. The aim of this study has been to study how entrepreneurs move from what is unknown towards what can be known in their venture creation process. Throughout the essays, my dissertation has employed an individual level of analysis to provide further insights from a cognitive perspective. This has generated three different essays that provide rich and diverse theoretical, empirical, and methodological contributions. Naturally, the process of answering particular issues gives rise to novel questions, which will be addressed in the implications for future research. At the end of this chapter, the limitations of the essays will be discussed.

### 4.1 *General conclusions*

According to Corley and Gioia (2011), a *theoretical* contribution “rests largely on the ability to provide original insight into a phenomenon by advancing knowledge in a way that is deemed to have utility or usefulness for some purpose” (p. 15). These insights should generally change, challenge, or advance knowledge of a phenomenon (Bansal & Corley, 2011). This dissertation contributes to several theoretical contributions. Firstly, *Essay I* has explored the role of ignorance in the decision to enter a foreign market for entrepreneurs, which I argue to be a generic phenomenon in entrepreneurship, but identified as seldom discussed (Ungar, 2008). However, the absence of a topic does not necessarily imply a contribution, “the route to good theory leads not through gaps in the literature but through an engagement with problems in the world” (Kilduff, 2006, p. 252). As a result, I have combined examples from firms such as Swatch and Patagonia with theoretical arguments, showing that entrepreneurs and their firms often ‘don’t know’ when entering a foreign market. This is because any sense of certainty produced by new knowledge automatically creates unknown matters. As such, I have intended to suggest an alternative view to entrepreneurship cognition literature.

Specifically, *Essay I* problematizes the role of knowledge and argues that widespread knowledge may not naturally advance International Entrepreneurship opportunities. When entrepreneurs internationalize, they do not exclusively follow pre-defined knowledge strategies. Following these knowledge patterns may not necessarily give satisfying results, since it may result in overlooking opportunities and ignoring new important information. Besides, core decisions like foreign market entry are often affected by lack of knowledge, cognitive biases,

or both. This is because individual decisions are cognitively influenced by ignorance, and do not necessarily imply a lack of general or market-specific knowledge about something, but rather a lack of awareness, a crucial condition in entrepreneurial decision-making.

Then, *Essay 2* investigated entrepreneurial decision-making and the ability to produce, recognize and distinguish accurate and reliable from imprecise judgment (Shepherd, 2014). Specifically, *Essay 2* responds to the call of Zhang and Cueto (2017) who detected de-biasing research to be remarkably absent in entrepreneurship research, while many cognitive biases have been confirmed to exist and impact entrepreneurs (e.g. Burmeister & Schade, 2007; Forbes, 2005; Koellinger et al., 2007; Moore & Cain, 2007). This is identified as a problematic issue, since present research solely focused on the identification of cognitive biases, thus neglecting to analyse the sources and limitations in overcoming this in the decision-making process. As a result, *Essay 2* answers the call to “explore the means by which individuals can (or should) reduce biases” (Shepherd, 2015, p. 22), and proposes metacognition, an important higher-order concept in entrepreneurship cognition, as a solution. Metacognition offers a significant theoretical and novel contribution, by highlighting its cognitive role to compensate limited decision-making (Haynie et al., 2010), and its effect to stimulate individuals to seek out and explore alternative explanations and their consequences (Graber et al., 2012).

Specifically, arguments are provided that one’s decision-making process may benefit from metacognitive processes, since it stimulates recognition to overcome the status-quo bias. The status-quo bias is considered to be robust and important in economic decision-making (Kahneman et al., 1991), due to its role in behaviours that lead to loss aversion (Tversky & Kahneman, 1991). *Essay 2* provides theoretical arguments why metacognition overcomes the desire to choose a known, not necessarily best option. Additionally, these theoretical insights bring novelty to the field of entrepreneurship cognition. On the one side, the study moves beyond the identification of biases, and offers theoretical insights into the causes of biases that entrepreneurs may overcome when deciding (Batha & Carroll, 2007; Rosi et al., 2019). On the other hand, while metacognition has mainly been theorized to be part of the entrepreneurial mindset (Haynie et al., 2010), this study is the first to test these higher-order processes on cognitive biases.

*Essay 3* has explored the role of metacognition in the venture creation process, responding to calls that more research is needed in exploring “metacognitive aspects on entrepreneurial decision-making” (Shepherd, 2014, p. 24). This has been done by exploring literature streams different from entrepreneurship. For example, psychological literature emphasizes that metacognitive processes do not only require awareness of the self, but also of others’ thinking with the help of observations and interactions (King, 1998), and that metacognition promotes ‘a second opinion’ that activates more analytic, slow, and logical reasoning in the decision-making processes (Graber et al., 2012). Although entrepreneurs heavily depend on their social capital (Davidsson & Honig, 2003) and decision-making (Shepherd, 2014), these issues have not yet been explored in the context of metacognition. Particularly, the study theoretically contributes to the understudied role of metacognition in explaining how entrepreneurs in their venture creation process deploy metacognitive processes.

The results of *Essay 3* highlight a central role for entrepreneurs’ metacognitive processes while capitalizing on their social capital. The role of social capital is a significant theoretical contribution because it highlights that metacognitive processes are stimulated by others, while previous metacognitive works underline its individual perspective (e.g. Haynie et al., 2012). Additionally, the study results indicate important consequences of metacognitive processes because it stimulates entrepreneurs to overcome their limitations by searching for memberships, social networks and engagement with outsiders to know what they don’t know, therefore, moving beyond their status-quo by expanding their local ecosystems while growing an entrepreneurial mindset. Metacognitive processes stimulate this because thinking about thinking processes gives rise to the consideration of alternative options that create different types of opportunities (Gustafsson, 2004). The results of this study highlight how differences in the use of social capital lead to different metacognitive responses. For example, metacognitive processes utilize expertise, expanding previous findings by emphasizing extending expertise as an additional advantage for thinking about thinking processes that are stimulated by engaging with others. The study also finds that metacognitive processes emerge towards entrepreneurs and their teams in the decision-making process, especially within teams that are differentiated.

*Essay 2* provides *empirical* insights by demonstrating that, although de-biasing has been identified as a topic in which there is still little understanding, rigorous trials that examine what works and what doesn't provide rich new insights in research about decision-making (Milkman et al., 2009). Specifically, the study proposes two hypotheses that offer stimulating empirical understandings about de-biasing in an entrepreneurial context. Firstly, the study shows that the first hypothesis is not supported, and provides arguments why this non-finding occurred, and how it may be overcome. Then, the second hypothesis shows that in some scenarios, a single bias, namely the status-quo bias, may be overcome with the help of a metacognitive treatment. This difference is explained in a difference of context, since the type of scenarios that are presented to participants may influence the degree in which individuals may show biased results (Burmeister and Schade (2007). The difference is additionally explained by suggesting preconditions in which some of the scenarios might be verbally overshadowed, since occasionally, "verbalization negatively affects performance on a task related to the verbalized materials" (Chin & Schooler, 2009, p. 396). Besides, the study also suggests that experience may reinforce the status-quo bias due to a reliance on past experience (Shepherd et al., 2003).

*Essay 3* provides evidence about specific contextual factors that influence entrepreneurs and metacognitive processes in their venture creation process, a significant empirical contribution, since the context in which entrepreneurs use metacognitive processes are scarce and in a need for further exploration in the entrepreneurial decision-making process (Haynie et al., 2012). In particular, the results highlight entrepreneurs' metacognitive processes while capitalizing on their social capital, and this is visualized in a processual model. The empirical model considers that entrepreneurs start from many unknown unknowns in which their decision-making can be severely flawed (Ehrig & Foss, 2021), and contribute to a better understanding of which processes contribute to enhancing the quality of new firms, a key objective to reduce failure rates of new ventures (Brixey et al., 2013). The latter is important, since we report dropout cases from the start-up process when metacognitive processes are not enough developed. Specifically, the empirical model highlights that social comparison, feedback, and engagements within local eco-systems trigger further thinking about thinking processes to mobilize resources and achieve business growth. These empirical insights have been developed with the comparison between two particular research contexts, namely, a start-up competition that constitutes start-up intentions, and subsequently a phase in which entrepreneurs launched and expanded their business.

While metacognitive studies have studied managers (Mitchell et al., 2011) and business students (Haynie & Shepherd, 2009; Haynie et al., 2012) before, *Essay 3* provides an empirical contribution with the comparison between two distinctive contexts. Moreover, these two contexts are additionally divided by the degree of uncertainty. While the first phase of the empirical findings represented regular uncertainty, the expansion phase portrayed radical uncertainty, in which participants did not know what was happening or might happen (Kay & King, 2020). While this phase portrayed unpredictability and unforeseen changes (Ehrig & Foss, 2021), it particularly offers novel insights into how entrepreneurs cope with radical uncertainty, using their cognitive mechanisms.

From a *Methodological* perspective, the main issue with the topic of ignorance is its measurement. The fact that by nature, ignorance assumes a lack of knowledge or awareness, makes the usage of self-assessment measures particularly challenging. To overcome this matter, *Essay 1* provides a methodological contribution by proposing an adapted scale within an entrepreneurial context. The main goal of the scale is to lay out a gap analysis and can be filled in by entrepreneurs and their team members following a set of questions. Although the framework is rather straightforward, it is the first attempt within the domain of entrepreneurial cognition to overcome this liability.

Then, *Essay 2* answers calls that underline the need for more “exercises aimed at making entrepreneurs more aware of the potential dangers of their heuristics and cognitive biases” (Cossette, 2014, p. 492), and the relatively scarce experimental contributions on entrepreneurial cognition research in entrepreneurial settings (Frederiks et al., 2019). In doing so, the essay firstly designed a pilot study in which participants were mainly informed about the existence of a cognitive bias, and then substantially improved this design with the design of a training in an interactive setting. The differences in these two studies contribute significantly to entrepreneurship cognition, it shows that de-bias methods need to be designed around a set of variables, namely increasing awareness, showing its impact, and teaching strategies to overcome biases in a learning setting that aims to engage with participants. From an experimental point of view, *Essay 2* demonstrates specific metacognitive elements that must be integrated within the training design of the treatment. The study additionally offers methodological novelty by proposing a specific framework that serves individuals in their decision-making process.

While experimental methods in entrepreneurship conducted research among metacognition and its role on feedback adaption (Haynie et al., 2012), and decision consistency (Mitchell et al., 2011), this study is the first to test metacognitive processes with the help of an experiment on cognitive biases. Essay 2 lastly brings methodological novelty with the design of self-developed decision-making scenarios that may be used and extended in other research on the status-quo bias.

*Essay 3* offers insights by adapting an explorative approach, providing methodological novelty by applying the Gioia methodology to better understand metacognition (Haynie et al., 2012; Mitchell et al., 2014). Specifically, we follow Pressley (2000) who debated that qualitative approaches, such as the use of semi-structured interviews, fit because “much can be understood about cognition and its metacognitive regulation through qualitative analysis” (p. 261). Although previous metacognitive studies have provided gainful insights using quantitative approaches, *Essay 3* explores the contextual factors that emerge during the start-up process, an important contribution since explorative research in metacognitive studies has mostly been neglected so far.

Additionally, *Essay 3* responds to the call that “future research should focus on the role of cognitive adaptability throughout the many steps and stages associated with the entrepreneurial process such as team formation, customer relations, market identification, and opportunity evaluation” (Haynie et al., 2012, p. 256). As a result, *Essay 3* analysed an emerging process, where subjects were interviewed and observed during different phases of their start-up creation proves. The transformative process of constant comparison from interactions between the mind and environment (Bruner, 1990; Fiske & Taylor, 2017) has been crucial to study metacognition because “cognitive research places a noted emphasis on how, when, and why interactions between mind and environment play a role in the development, transformation, and use of mental representations” (Grégoire et al., 2011, p. 1146 - 1147). Specifically, the processual approach is a significant empirical contribution, given that decision processes play a central role in an entrepreneurial context (Ireland et al., 2003), and metacognitive studies thus far have not employed a similar approach.

## 4.2 *Implications for education, practice, and policymakers*

The conclusions of the three essays of this dissertation have important implications for educators, practitioners and policymakers. Firstly, *Essay 1* calls for embracing the unknown, and particularly of what we are unaware of. In the decision-making process of entrepreneurs, this may be done by tailoring one's decision-making process through their dual-process theory (Stanovich & West, 2000). Specifically, several cognitive mechanisms may help entrepreneurs in a decision-making process by moving from their intuitive reasoning, towards a more conscious, effortful mode of thinking (Milkman et al., 2009). For example, effective strategies that may improve decision-making processes are the search for feedback (Fischhoff, 1982), and the use of counterfactual thinking, which requires individuals to imagine 'what might have been', generating a reflective process on several outcomes that might have happened if circumstances or the act itself were different (Baron, 2000). If decision-makers are encouraged to 'consider the opposite', or if they are held responsible for their decisions, decision biases may be additionally reduced (Larrick, 2004). These mechanisms generally explain what Alvensson and Spicer (2012) diagnosed as the mobilization of one's cognitive resources with the help of critical thinking and reflexivity, a crucial condition for organizations to avoid catastrophic collapses, meltdowns and disasters.

These, and other techniques, may be adapted by entrepreneurs in order to become aware of possible flaws in one's decision-making process. Starting from *Table 7*, entrepreneurs may then strive to unmake their ignorance. Entrepreneurs could, as *Essay 3* suggests, employ their social capital to ask for feedback, or to engage in settings in which individuals provoke 'what if' scenarios while possible decisions are presented. Incubators and entrepreneurship educators may include these techniques in their classes and provide training. These implications do not apply to entrepreneurs only, cognitive biases may occur to any individual, and these implications may have value to any individual involved in a decision-making process. Thus, the above practices could have relevance for managers and policymakers as well, since strategic decisions are systematically associated with cognitive biases (Das & Teng, 2014), and may be reduced similarly (Nagtegaal et al., 2020).

Additionally, managers may use common practices that stimulate reflexive processes, such as ‘what the hell’ sessions in which people bring in questionable practices during meetings, or use a ‘devil’s advocate’, in which one individual is assigned to challenge, question, and pose counter-arguments before decisions are made (Alvesson & Spicer, 2012). Schaefer (2014) noted that ignorance is inescapable and can be undone by viewing it in its context. This may have practical implications for the design of interventions. For example, *Essay 2* highlighted the need to consider the context in which decision biases may appear stronger. Nudges may be designed to steer individuals towards a certain direction by changing the environment (Thaler & Sunstein, 2008). Additionally, large-scale, controlled experimentation has great potential within organizations to generate knowledge and stimulate innovation, if adapted with precision, at a large scale, and throughout the whole organization, with the ultimate goal to make people ‘think experimentally’ (Thomke, 2020). Experiments also complement intuition with evidence-based decision-making, in order to understand and ultimately change behavior in a managerial context (Luca & Bazerman, 2020).

Once ignorance is recognized, entrepreneurs and managers may use its benefits. *Essay 1* highlighted that purposefully ignoring customers and investors may lead to new, better opportunities, innovations, and creativity (Smithson, 1989). These insights have important implications for practitioners. Research has demonstrated that striving for creativity in an ideal way works counterproductive, producing ignorance and an inhibition of reflexive practice (Schaefer, 2014). Rather than stimulating working climates in which knowledge is considered to be the holy grail, practitioners should embrace the unknown, encourage the practice of mistakes and the awareness process in which individuals can be stimulated to promote this as opportunities (Abbott, 2010; Alvesson & Spicer, 2012). One example that could be embraced more frequently is the so-called ‘f-up nights’, in which entrepreneurs essentially engage about their acknowledged ignorance (van Eck et al., 2021).

This also brings us to the need for entrepreneurs to develop metacognitive processes during their venture creation process, because it supports the mobilization of resources in order to engage in further thinking about thinking processes to achieve business growth, an important implication of *Essay 2* and *Essay 3*. Particularly, the contribution that a metacognitive intervention may overcome ignorance about the decision-making process is precious for entrepreneurship educators, incubators, and other practitioners involved in entrepreneurial activities.

For example, metacognition can be trained and learned in classroom settings, and may be used as a practical tool that can be taught and learned, with the potential to have educational value to entrepreneurs and managers. (Nelson, 1996; Nietfeld & Schraw, 2002). Educators may adopt a wide range of available materials to their classes, in order to train self-reflective and self-regulatory practices within an entrepreneurial context (Schraw et al., 2006). Practitioners may use materials on metacognitive learning and promote this in accelerator programs and incubators. The experimental outcomes of *Essay 2* may be used to the execution of new, randomized controlled experiments. Specifically, metacognitive training instructions may be applied as an intervention in decision-making practices, or within managerial exercises to promote reflexive and awareness habits. Workshops may then utilize these insights to design tools in which managers would be trained to use metacognitive strategies a priori a decision is made, in order to not fall prey to well-known managerial decision-making biases (Bazerman, 1994). Lastly, the results of *Study 3* revealed the crucial role for entrepreneurs and their social capital, emphasizing the important role for incubators, networks, ecosystems, and public events. Policymakers may stimulate the availability of these facilities with the promotion of entrepreneurial infrastructure in which a variety of stakeholders are involved.

### 4.3 *Implications for further research*

The results discussed so far can expand and complement research in the field of entrepreneurship cognition. Firstly, *Essay 1* opens the black box to give rise to the topic of ignorance, a neglected topic in entrepreneurship. While uncertainty is “the favored child of behavioral decision, ignorance, in contrast, suffers neglect” (Roy & Zeckhauser 2017, p. 232). Future research in entrepreneurship cognition may include ignorance, since knowing what you don’t know is bliss (Grant, 2021). *Essay 1* has taken the lead to provide a conceptual framework of the topic, but the field lacks consistent theoretical frameworks, the picture is far from complete. More research needs to be conducted to distinguish ignorance and its different facets in entrepreneurship.

A promising first step may be made by scholars that adapt the problematization review, a groundbreaking recently developed a framework that allows researchers to go beyond established concepts and expand knowledge, with the help of challenging assumptions and interpretations (Alvesson & Sandberg, 2020). The topic of ignorance may be specifically appropriate for such review in order to build new theory, since it allows researchers to read

more broadly, reflect, and problematize, all conditions that fit well with a provocative topic as ignorance is. This may help to answer recent calls in which radical uncertainty has been identified to be in a need for new decision-making models (Alvarez & Porac, 2020), moving “one step further and show that ignorance needs to be understood and theorized as a regular feature of decision-making” (Gross & McGoey, 2015, p. 4).

Another promising venue to be explored are decisions that are avoided, postponed, or ignored (Brooks, 2011). This field of non-decision-making is remarkably absent in the entrepreneurship literature. While *Essay 2* provides additional insights about the status-quo bias (Burmeister & Schade, 2007), and some scholars, such as Baron and Ritvo (2004), described the tendency to fail to take action as a preference, little is known about non-decision-making in entrepreneurship. The topic may, for example, have considerable potential in the context of radical uncertainty, such as the current COVID-19 pandemic, to explore the intention-action gap for entrepreneurs and their venture creation process. These processes require more exploration.

Fruitful new insights may additionally arrive from studies that concentrate on the organizational level. While this dissertation has investigated the role of the individual, new cognitive biases may arise when teams or departments are involved. Biases such as groupthink, where groups of people avoid disrupting and confrontation, or the halo effect, where judgments are affected by someone’s appearance, may be two promising directions. Future studies may additionally investigate how ignorance within organizations is created, strengthened, and promoted (Alvesson & Spicer, 2016), and how it may be used strategically (Smithson, 1989).

Next, I see promising future research contributions coming from scholars that focus on re-thinking and unlearning patterns. *Essay 2* pointed out that we have a rich field of identified cognitive biases that may affect entrepreneurs, but do not know much yet about how entrepreneurs may neutralize these. Studies that aim at reducing ignorance in entrepreneurial decision-making with the design of awareness interventions may hold much potential for researchers that desire to understand how entrepreneurs balance cognitive biases. The training instructions, scenarios, and proposed framework (*Table 16*) of *Essay 2* may be replicated with different samples and extended with different dependent and independent variables in future studies.

For example, these scenarios could be extended towards various decision-making domains, such as emotional or moral decisions. Difference dependent variables could be “sketchy-attribute” type of cognitive biases (Baron, 2007), such as hindsight bias (Cassar & Craig, 2009), illusion of control (Langer, 1975), availability (Barbosa & Fayolle, 2010) and similarity (Ebbers & Wijnberg, 2012).

Additionally, different independent variables may be used with the help of the rich toolbox from behavioural science. While Zhang and colleagues (2021) recently found promising results with help of effectuation, more research is needed, perhaps with the help of different de-bias mechanisms such as optimizing choice architecture or changing incentives (Morewedge et al., 2015; Thaler & Sunstein, 2008).

Finally, *Essay 3* explored the role of metacognition in the venture creation process. While the use of an explorative, qualitative approach has been presented as a substantial contribution, more explorative works are needed in metacognitive research. For example, little is yet known about the different antecedents and consequences of metacognition in the entrepreneurial process. Additionally, the results of *Essay 3* may be tested and generalized by researchers adopting quantitative methods.

It is noteworthy that, although many different cognitive aspects of entrepreneurship have been systematically reviewed (e.g. Dew et al., 2015; Mol et al., 2015), a literature review about metacognition in entrepreneurship is notably missing. Future research that would systemize what we know, and what we don't know yet about metacognition, would provide a significant contribution to the field of entrepreneurship cognition. Additionally, while metacognition in entrepreneurship has concreted on cognitive aspects so far, recent evidence suggests the role of affect (Ustav & Venesaar, 2018). This is not surprising. Just very recently, Kuratko and colleagues provided more insights about the mechanisms between cognition, behaviour, and emotions (2021). In metacognitive studies, future contributions may explore the role of meta-affection in entrepreneurship (Ling et al., 2013).

Finally, metacognition thus far has been discussed as a cognitive tool to be constantly favourable to entrepreneurs. However, overthinking may lead to negative consequences in the entrepreneurial process, such as doubt, regret, self-blame, or decision avoidance (Roy & Zeckhauser, 2017). New, interesting insights may derive from research that concentrates on the darker sides of thinking processes.

#### 4.4 *Limitations*

The essays in this dissertation are not without limitations. While *Essay 1* problematizes and perhaps, provokes, it is also missing clear theoretical conceptualizations. Specifically, the topic of ignorance is fragmented and, as one reviewer rightly pointed out last year, a potential minefield. Clear conceptual and empirical rigor is missing in this direction, which may harm the credibility, or perhaps worse, the usefulness of the topic. On the other side could the risk I took in highlighting a topic beyond a ‘research gap’ (a gap implies an opening, I might have addressed a ‘research abyss’) be rewarded in the long run, with many new contributions as a result.

Secondly, throughout this dissertation, cognitive biases have run like a thread through my works. The main assumption that underlined the essays has been that heuristics and biases influence (often negatively) entrepreneurs in their judgments and decisions, following the influential work of mainly Tversky and Kahneman (1974). However, different schools of thought dispute, contrast, or only partially agree with these perspectives (Gigerenzer and Gaissmaier, 2011; Klein et al., 1993). For example, these views dissent the original assumptions of Tversky and Kahneman (1974) to see biases as errors, because they find them based on laboratory settings only, thus neglecting that much of what decision-makers do in more natural settings is intuitively working well. Both criticisms see heuristics in a positive light, emphasizing that these heuristics arise either from learning and lead to advantageous general tools (Gigerenzer et al., 2008), or that heuristics are expressions of experiences that emerge into patterns to make rapid decisions (Klein et al., 2010). From my point of view, these critics are reasonable, and researchers following these theories may rightly find flaws in this dissertation. Nevertheless, only one of these authors has been awarded a Nobel Prize so far, and I have decided to follow this author, although even a “fraction of the Nobel laureates are stupid” (Cipolla, 2011, p. 25).

Thirdly, despite the fact that *Essay 2*, given its number, has not been represented as the last work in this dissertation, it actually was the final project in my research process to write this dissertation. This is because the experiments in *Essay 2* have been organized within the range of possibilities to conduct such studies in a physical environment, which has not been an obvious condition during my research process. Additionally, experiments, due to their causal character, may need a series of repetitions before possible non-results may be understood and redesigned into a setting in which hypotheses hold. Despite the careful design of two separate

experiments, *Essay 2* portrays only partial results as this work on the anvil, which could be considered as a limitation of the study. Additionally, the ecological validity of the dependent variables may give rise to some concerns, as they might not represent a truly real-world situation. Although important, entrepreneurial experiments continually face so-called validity issues in which the trade-off between validity provides best-practice (Grégoire et al., 2019).

Lastly, *Essay 3* used a limited number of cases that may give concerns about the generalizability of the study. Since the Gioia methodology (Corley & Gioia, 2011), as *Essay 3* points out, has different advantages than generalizing and testing hypotheses, this may be seen as a limitation by researchers feeling more comfortable with (post)positivist type of research.

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