

## **Cognitive-Affective Attributes and Biases in Pivot Decisions**

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### **Abstract**

Founders play an essential role in entrepreneurial decision-making not only because they are sometimes the only human resource that a new venture has, but also because founders often feel personally responsible for the new venture. Consequently, entrepreneurs' cognitive-affective attributes, biases, background, and psychological well-being affect risk perceptions, preferences, decisions, and firm performance. In this study, we aim to investigate which are the cognitive-affective attributes and biases that can affect pivot decisions. Pivots are deemed as one of the most common and crucial decisions that can determine the new ventures' fate. We performed a literature review and assessed this body of research following a two-staged process. First, from the literature review, we identify which cognitive attributes and biases affect entrepreneurial decisions. Second, we analyzed these cognitive elements in the light of two central constructs: the transformative purpose of pivot decisions, and the failure as the triggering factor that leads to such decisions. We found that cognitive adaptability/flexibility, counterfactual thinking, optimism, risk-taking

propensity, self-regulation, exploratory style, self-efficacy, entrepreneurial passion, and openness are the cognitive-affective attributes most related to pivots. Additionally, we found fear of failure, locus of control, overconfidence, over-optimism, psychological ownership, solution/product blind adherence, persistence bias, risk aversion, inertia, confirmation biases, failure-driven biases, and self-serving attribution as the biases most related to pivots. We argue that awareness of these aspects can contribute to improving such a critical decision, by promoting the establishment of more accurate metrics, or by enhancing some cognitive attributes that help entrepreneurs to make complex decisions during the entrepreneurial journey. Furthermore, we discuss how researchers can advance in this literature by proposing research opportunities.

## **1. Introduction**

Founders play an essential role in entrepreneurial decision-making not only because they are sometimes the only human resource that a new venture has, but also because founders often feel personally responsible for the new venture (Dencker et al., 2009; Haynie et al., 2012; Liñán et al., 2016). Consequently, entrepreneurs' cognitive-affective attributes (CAPS), biases, background, and psychological well-being affect risk perceptions, preferences, and firm performance (Mattingly et al., 2016; Zhang & Cueto, 2017). One crucial decision during the venture creation process is the pivot (Batra, 2016; Comberg et al., 2014). Pivots are defined as “strategic decisions made after a failure (or in the face of potential failure) of the current business model and lead to changes in the firm’s course of action, resource reconfiguration and possible modifications of one or more business model elements” (Flechas & de Vasconcelos Gomes, 2021, p. 1).

Recently, scholars have devoted research efforts to explore important aspects of pivots such as the impact of these decisions on stakeholders' networks (Hampel et al., 2020; McDonald & Gao, 2019), and the relationship between pivots and entrepreneurial identity (Domurath et al., 2020; Grimes, 2018). However, a large number of aspects related to this decision have been barely explored. For instance, what triggers have the greatest potential to derive in pivots, which are the mechanisms employed by entrepreneurs to perform this decision, and which are the CAPS and biases that might influence the pivots. The present study aims to address this final aspect, and is driven by the following research question: Which are the cognitive-affective attributes and biases that can affect pivot decisions?

To address this research question, we performed a literature review and assessed this body of research following a two-staged process. First, from the literature review, we identify which CAPS and biases affect entrepreneurial decisions. Second, by focusing on the Flechas and de Vasconcelos Gomes (2021) conceptualization of pivots, we retrieve what are the cognitive-affective attributes and biases more related to pivot decisions. We center this discussion on two fundamental constructs: (1) Pivot decisions have a *transformative purpose*, i.e., a change is expected to occur (Morris, Kuratko, Schindehutte, & Spivack, 2012); and (2) Pivot decisions are triggered by *failures* (or potential failures), i.e., unsatisfactory results (Flechas & de Vasconcelos Gomes, 2021).

Awareness of which CAPS and biases may be involved in pivot decisions can contribute to entrepreneurs to improve such a critical decision. For instance, knowing that biases such as fixation and blind adherence can hinder the ability to objectively measure the performance of the new venture, the entrepreneur may opt to establish more accurate metrics or be more open to second opinions in an attempt to lessen the effect of these biases. Similarly, they can attempt to

strengthen their self-efficacy to diminish the rejection to change and enhance the recovery process from failure (Anglin et al., 2018; Arora et al., 2013; Uygur & Kim, 2016). Furthermore, we discuss how researchers can advance in this literature.

## **2. Within-person Aspects in Entrepreneurial Decisions**

In the entrepreneurship literature, knowledge is employed to guide decisions related to opportunity recognition (Shane, 2000), opportunity evaluation (Mitchell et al., 2007), to act or do not act (Wood et al., 2017), and resources allocation (Uygur & Kim, 2016). In this line, Mitchell et al. (2002) propose the concept of entrepreneurial cognition defined as “the knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth” (p.97). Considering that entrepreneurs primarily depend on their own judgment to decide between alternative courses of action during the construction and evolution of the new venture (McMullen & Shepherd, 2006; Dencker et al., 2009), it is expected that within-person aspects in personality, pre-entry knowledge, and prior experiences, interfere with the pivot decision.

Shoda and Smith (2004) conceptualized personality as a cognitive-affective attribute system (CAPS) wherein the person’s mental representations network activates thoughts, feelings, and behaviors. This system not always responds in the same fashion, even though the relative consistency of the responses, there are some variations commonly related to the situation specificity (Jones et al., 2017). In addition, there are several situations in which founders respond with pre-established ‘mental rules’ (i.e., heuristics, Acciarini et al., 2020) that may further be affected by bounded rationality and lead to biases. Biases are referred to as ‘irrational beliefs’ or misused heuristics that hinder the decision-making process based on factual evidence (Acciarini

et al., 2020; Tversky & Kahneman, 1981). CAPS and biases change over time due to new information and the exposure to determined situations affecting the mental network of representations (Mitchell & Shepherd, 2012; Shoda & Smith, 2004). Together these views argue that some specific traits, biases, and CAPS can in fact affect the entrepreneurs' decisions. This argument is central to this study in which we approach the influence of CAPS and biases on pivot decisions.

### **3. Methods**

The following search query was applied: ((“strategic decision” OR “organizational change” OR “strategic flexibility” OR “strategic choice” OR “business model change” OR “reframing” OR “reorientation” OR “reconfiguration” OR “pivot\*” OR “change direction” OR “change” OR “strategic change”) AND (“startup” OR “start-up” OR “new firm\*” OR “new venture” OR “entrepreneur\*”). Additionally, considering the year in which the term ‘pivot’ was coined (Ries, 2009), we considered articles published between 2008 and 2020. To reduce the noise of the sample, the search was restricted to the “research areas” of Business Economics (BE), Computer Science (CS), and Operations Research Management Science (ORM).

Furthermore, we applied the term filter “article” for document type, as these documents undergo peer review. The search was performed in the Web of Science (WoS) database and in ten of the top entrepreneurship journals (Entrepreneurship Theory and Practice, International Entrepreneurship and Management Journal, International Journal of Entrepreneurial Behavior and Research, International Small Business Journal, Journal of Business Venturing, Journal of Management Studies, Organization Science, Strategic Entrepreneurship Journal, Strategic Management Journal, and Entrepreneurship & Regional Development.). The search on WoS

returned 1824 documents; despite the application of filters, a large number of articles were found to be unrelated to our research; therefore, carefully read the titles and abstracts to decide whether to discard or maintain the article. We assessed two criteria: the document must focus on startups or entrepreneurship, and it must study strategic changes or decisions. After the screening process, 1754 documents were discarded. The direct search on journals and the snow-ball method led to 101 and 4 articles. The final sample included 175 articles published in 48 Journals, from 2008 to 2020.

#### **4. Results**

##### ***Theoretical foundations and main research groups***

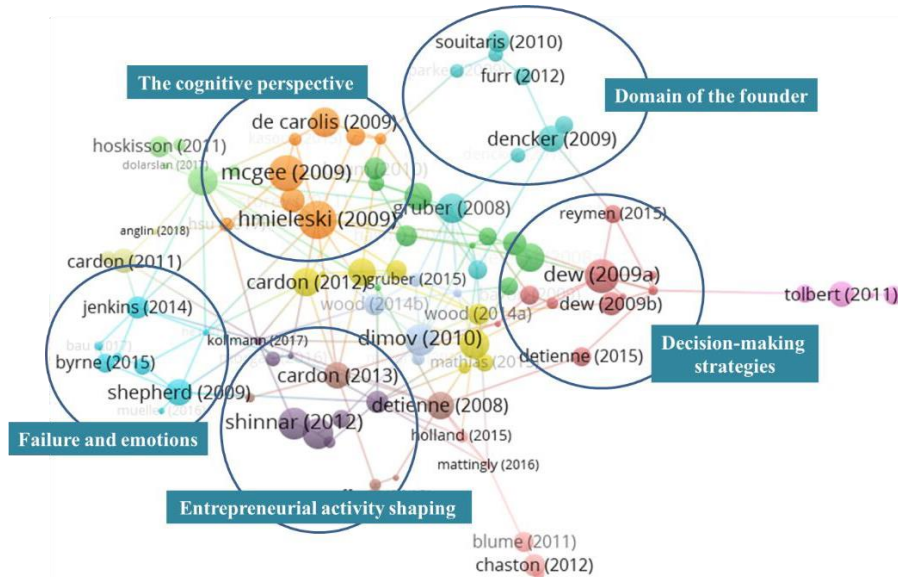
Cited references were used to create the citation analysis identifying the most related items based on the number of times they cited each other (See figure 1). Although no minimum of citations was established, 68 items were eliminated because they were not connected with each other, this led to an analysis of 90 items. This network depicted a relationship between the common topics and interests of the authors. We identified five main groups of items which are described below.

The *decision-making strategies*' group discusses which type of logic, whether effectual or predictive, is the most appropriate for entrepreneurial activities (Baron, 2009; Dew, Read, et al., 2009). In the *failure and emotions*' group, authors suggest that entrepreneurial failure is massively charged by emotions comprising feelings of grief and loss that can lead to biases, but can also serve as important source of learning (Shepherd and Cardon, 2009).

The *cognitive perspective* group addresses how cognitive aspects can enhance or hinder entrepreneurial performance (Hmieleski and Baron, 2009). In the *domain of the founder* group, the

authors suggest that the founder or the founder-leader significantly influences a firm’s strategic decisions (Dencker et al., 2009; Furr et al., 2012). Finally, the *entrepreneurial activity shaping* group discusses the role of individual and environmental aspects during a firm’s formation. (Shinnar et al., 2012; Kollmann et al., 2017).

Figure 1. Citations analysis network.



**Cognitive-affective attributes and biases in the entrepreneurial decisions**

Baron (2004) and other researchers (Haynie et al., 2012; Uygur & Kim, 2016) suggest that there are several CAPS and biases that affect the entrepreneur’s performance. For instance, Grimes (2018) notices that self-concepts, such as self-efficacy or psychological ownership, might regulate the willingness to revise the ideas. Notwithstanding, a second strand of literature argues that the individual cognitive traits are not easily referable to an entrepreneur’s performance in the prior studies, or reveal a weak level of association (Hisrich, Langan-Fox, & Grant, 2007).

A preliminary study conducted by Ürü and colleagues, suggests that the most cited entrepreneurial characteristics, were risk propensity, need for achievement, locus of control, optimism, competitiveness, and innovativeness (Ürü et al., 2011). In a more recent study, Zhang

and Cueto (2017) identified the most common biases (11 in total) present in entrepreneurial literature: overconfidence, over-optimism, self-serving attribution, illusion of control, the law of small numbers, similarity, availability, representativeness, status quo, planning fallacy, and escalation of commitment. In our literature review, we identify 52 CAPS and 27 biases strongly associated with entrepreneurial decisions (see Appendix 1).

## 5. Discussion

### *CAPS and Biases in Pivot Decisions and the Transformative Purpose*

Regarding the conceptualization of pivot decision set by Flechas and de Vasconcelos Gomes (2021), we consider cognitive adaptability/flexibility, counterfactual thinking, self-efficacy, optimism, risk-taking propensity, and self-regulation as the cognitive-affective attributes most related to pivots. When considering the *transformative purpose*—i.e., a change is expected to occur (Morris et al., 2012), of pivot decisions, it is essential that entrepreneurs be willing to change and voluntarily undertake actions to alter firm performance. To this effect, cognitive adaptability and flexibility can certainly facilitate the propensity to adapt strategies and act promptly when required (Haynie et al., 2012). A risk-taking propensity also affects positively the attitude towards change and failure (Jiang et al., 2018). However, too many risky attitudes might lead to overconfidence bias (Zhang & Cueto, 2017). To counteract this effect, entrepreneurs can employ self-regulation mechanisms such as budgetary controls, in order to consider their own limitations and capabilities (Baron, Mueller, & Wolfe, 2016; Van Gelderen, 2012). Likewise, counterfactual thinking, self-efficacy, and optimism can diminish the rejection to change and enhance the recovery process from failure (Anglin et al., 2018; Arora et al., 2013; Uygur & Kim, 2016).



On the other hand, we consider fear of failure, locus of control, overconfidence, over-optimism, psychological ownership, solution/product blind adherence, and persistence bias as the biases most related to pivots. Several scholars point out fear of failure and overconfidence as the two most influential biases during the entrepreneurial decision-making process (Kollmann et al., 2017; Morgan & Sisak, 2016). Fear of failure can increase the natural aversion to change, leading entrepreneurs to persisting in the same past strategies regardless of the negative outcomes (Batra, 2016; Holland & Shepherd, 2013). Conversely, do not consider or underestimate the negative outcomes (that may lead to overconfidence and overoptimism biases), may also jeopardize the firm performance (Zhang & Cueto, 2017). People tend to feel more comfortable following the same patterns and is worst when people are specialist in a determined area and do not have enough knowledge to adopt a different strategy (Furr et al., 2012). This situation can lead to solution/product blind adherence, a very common bias among entrepreneurs that may affect pivot decisions (Ambos & Birkinshaw, 2010; Eggers, 2016; Warnick et al., 2018). Similarly, psychological ownership may reduce the entrepreneurs' willingness to cede control over their originals ideas, and even relinquish or adjust them in response to external feedback (Grimes, 2018). Finally, locus of control may hamper failure recovery, since one of the initial steps in this process is to recognize the causes and assume the responsibility in order to learn and take appropriate actions (Shepherd & Cardon, 2009; Yamakawa et al., 2015).

### ***CAPS and Biases in Pivot Decisions and Failure***

There are several biases associated with failure in the literature: risk aversion, fear of failure, inertia (do not act), confirmation biases, self-serving attribution, and those referred to as 'failure-driven biases' which lead to persisting in a particular path (Kollmann et al., 2017; Zhang & Cueto, 2017). Drawing on Mark Twain's analogy about a cat sitting down on a hot stove lid,

Denrell and March (2001) propose the hot stove effect, a type of anti-failure bias in which a negative effect (e.g., a burn by sitting down on a hot stove lid) will lead to establishing a golden rule (e.g., do not sit down ever again on any stove lid, even on a cold one) and be hesitant to take up new alternatives.

Among ‘failure-driven biases’ is the technological adherence which is associated with the concept of ‘design fixation’ –‘a blind adherence to a set of ideas or concepts limiting the output of conceptual design’ (Crilly, 2018, p. 52), and might be related to the origin of the domain knowledge, and passion. Furr, Cavarretta, and Garg (2012) found that executives with extensive domain experience tend to reduce technological change, whilst executives who bring experience from outside undertake more significant technological change. In this line, Warnick and colleagues (2018) note that ‘product passion’ (i.e. passion for the product and technology) might contribute to blind adherence and diminishes the propensity to change. Furthermore, Eggers (2016) suggests that focusing on markets and customers’ expectations may diminish some implications of failure biases such as blind adherence to a determined product or technology, or risk aversion. Therefore, too much focus on the solution/product might hinder the decision to pivot.

People and organizations also tend to manifest uncertainty-avoidance, fear of failure, loss aversion, and unwillingness to change (Denrell & March, 2001; Morgan & Sisak, 2016). However, this behavior may be an oxymoron when discussing entrepreneurs, because new firms fail, so entrepreneurs should embrace the failure as a part of the entrepreneurial process and propose strategies to learn and recover from failure (Dew et al., 2009; Eggers & Song, 2015; Politis & Gabrielsson, 2009). Another frequent bias from failure is self-serving attribution that occurs when an individual takes credit for success while attributes failures to external and uncontrollable factors such as bad luck (Mcgrath, 1999; Zhang & Cueto, 2017).

Some strategies and cognitive attributes help entrepreneurs to cope with failure and failure's biases. For instance, Muehlfeld et al. (2017) proposed the exploratory style strategy in which entrepreneurs decide to persist with the current strategy while exploring new alternatives following a parallel trial-and-error rather than a sequential approach. Traits such as self-efficacy, openness, entrepreneurial passion, risk-taking propensity (Jiang et al., 2018), and previous experiences of failure (Politis and Gabrielsson, 2009) positively affect the attitude towards failure, diminish the levels of over-optimism, and motivate entrepreneurs to act opportunistically. Finally, learning from failure is facilitated when entrepreneurs use an intuitive cognitive style (Mueller and Shepherd, 2016), avoid blaming fate or external circumstances for the bad outcomes (Yamakawa et al., 2015), and when entrepreneurs create mental images that allow them to anticipate negative outcomes (Bingham & Kahl, 2014). This last consideration can have an important link with pivot decisions since attitudes such as those described could encourage entrepreneurs to recognize the need to change the course of action, formulate alternative options, and ultimately, pivot.

## **6. Conclusions and Final Remarks**

This study identifies which CAPS and biases may affect pivot decisions. From a literature review, were identified the most common CAPS (52) and biases (27) involved in entrepreneurial decisions. Based on the conceptualization of pivots proposed by Flechas and de Vasconcelos Gomes (2021) we analyzed the CAPS and biases identified in the light of two central constructs: the transformative purpose of pivot decisions, and the failure as the triggering factor that lead to such decisions. We determine that cognitive adaptability/flexibility, counterfactual thinking, optimism, risk-taking propensity, self-regulation, exploratory style, self-efficacy, entrepreneurial passion, and openness are the cognitive-affective attributes most related to pivots. Additionally, we found fear of failure, locus of control, overconfidence, over-optimism, psychological

ownership, solution/product blind adherence, persistence bias, risk aversion, inertia, confirmation biases, failure-driven biases, and self-serving attribution as the biases most related to pivots (see Table 1).

Table 1. Cognitive-affective attributes and biases that affect pivot decisions

CAPS* and Biases in Pivot Decisions	
Transformative Purpose	
CAPS	Biases
<ul style="list-style-type: none"> <li>-Cognitive adaptability/flexibility</li> <li>-Counterfactual thinking</li> <li>-Self-efficacy</li> <li>-Optimism</li> <li>-Risk-taking propensity</li> <li>-Self-regulation</li> </ul>	<ul style="list-style-type: none"> <li>-Fear of failure</li> <li>-Locus of control</li> <li>-Overconfidence</li> <li>-Over-optimism</li> <li>-Psychological ownership</li> <li>-Solution/product blind adherence</li> <li>-Persistence bias</li> </ul>
Failure (or potential failure)	
CAPS	Biases
<ul style="list-style-type: none"> <li>-Exploratory style</li> <li>-Self-efficacy</li> <li>-Entrepreneurial passion</li> <li>-Risk-taking propensity</li> <li>-Openness</li> </ul>	<ul style="list-style-type: none"> <li>-Risk aversion</li> <li>-Fear of failure</li> <li>-Inertia</li> <li>-Confirmation biases</li> <li>-Self-serving attribution</li> <li>-Failure-driven biases</li> </ul>

\*Cognitive-affective attributes

The findings of this research have implications for both practice and research. First, awareness of which CAPS and biases may be involved in a pivot decision can contribute to entrepreneurs improving such a critical decision. For instance, knowing that some biases can hinder the ability to objectively measure the performance of the new venture, the entrepreneur may opt to establish more accurate metrics or be more open to receiving advice in an attempt to lessen the negative effect of these biases. Similarly, they can attempt to strengthen their self-efficacy to diminish the rejection to change and enhance the recovery process from failure (Anglin et al., 2018; Arora et al., 2013; Uygur & Kim, 2016). Mentors and entrepreneurship professors can also advise their pupils about how cognitive elements (i.e., CAPS and biases) may positively and

negatively impact their decisions, particularly in situations of failure (or possible failure) in which entrepreneurs do not have much room for maneuver.

Furthermore, this research deepens previous studies on traits and personal characteristics of entrepreneurs that affect decision-making (Baron, 2004; Zhang & Cueto, 2017). We related this body of research with another growing research topic: Pivot decisions. As prior researchers and practitioners have argued (e.g., Hampel et al., 2020), pivots are crucial because they can determine the new venture's fate, therefore, a better understanding of the factors that may influence this decision is critical to entrepreneurship research. Finally, like other research, our study is not exempt from limitations, therefore, we provide some guidelines for future research. First, empirical research as longitudinal cases and QCA studies may provide further evidence on the incidence of the CAPS and biases identified in this research in pivot decisions. Second, in line with Breslin (2017), scholars can develop studies regarding how entrepreneurs can enhance their cognitive attributes (e.g., self-efficacy, openness, self-regulation) to better overcome challenging situations and improve their decision-making processes. Finally, other literature reviews can be conducted with other methods such as systematic revisions and meta-analysis to integrate temporal and clustering factors that can enhance the analysis of the within-personal characteristics that influence entrepreneurial decisions.

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### Appendix 1.

Table 1 – Cognitive-affective attributes involved in entrepreneurial decision-making

Cognitive-affective attributes	Author(s)	Definition / Reference
Cognitive adaptability/flexibility	Haynie et al. (2012); Furr et al. (2012)	"The ability to effectively and appropriately evolve or adapt decision policies (i.e., to learn) given feedback (inputs) from the environmental context in which cognitive processing is embedded" (Haynie et al., 2012, p. 238).
Cognitive closure	Uygur & Kim (2016)	"The tendency to be more likely to form judgments based on a limited information set" (Uygur & Kim, 2016, p. 176).
Cognitive feedback	Haynie et al. (2012)	"Involves information conveyed to the decision maker about the relations in the environment, relations perceived by the

		person, and relations between the environment and the person's perceptions" (Haynie et al., 2012, p. 242).
Cognitive legitimacy	Grégoire et al. (2011)	"Knowledge about the new activity and what is needed to succeed in an industry" (Grégoire et al., 2011, p. 1464).
Cognitive style	Mueller & Shepherd (2016)	"Refers to the consistent approach an individual takes in organizing and processing information during learning" (Mueller & Shepherd, 2016, p. 464)
Competitiveness	Ürü et al. (2011)	The tendency "to be aggressive and proactive thus entrepreneurs behave likely to competitive" (Ürü et al., 2011, p. 542).
Counterfactual thinking	Hisrich et al. (2007); Baron (2004); Arora et al. (2013); Frederiks et al. (2018);	Ability to recreate possible future alternatives (Baron, 2004).
Empathic accuracy	McMullen (2015)	"Ability to accurately infer the specific content of another person's thoughts and feelings (Ickes, 1993, p. 588).
Entrepreneurial capabilities	Hisrich et al. (2007); Abdelgawad et al. (2013)	"The ability to identify new opportunities and develop the resource base needed to start a firm" (Hisrich et al., 2007, p. 584).

Entrepreneurial cognition	Uygur & Kim (2016); Katz & Shepherd (2003); de Mol et al. (2015), Chaston & Sadler-Smith (2012)	"The knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation, venture creation, and growth" (Uygur & Kim, 2016, p. 171).
Entrepreneurial decisiveness	Uygur & Kim (2016)	"Is the tendency of individuals to make decisions quickly in venturing tasks" (Uygur & Kim, 2016, p. 176).
Entrepreneurial intuition	Blume & Colvin (2011)	Judgments affectively charged that arise through rapid, nonconscious, and holistic associations involving in the entrepreneurial process (Blume & Colvin, 2011).
Entrepreneurial passion	Yamakawa et al. (2015); Warnick et al. (2018); Hsu et al. (2017); Crommelinck et al. (2016)	Passion for creating and developing new firms (Warnick et al., 2018).
Entrepreneurial persistence	Mattingly et al. (2016)	"Refers to entrepreneurs choosing to continue with an entrepreneurial opportunity regardless of the counter influences of enticing alternatives that are observed in the environment " (Mattingly et al., 2016, p. 1236).

Entrepreneurial resilience	Corner et al. (2017)	"The capacity or ability to maintain relatively stable, healthy levels of psychological and emotional functioning despite experiencing trauma or serious loss" during the entrepreneurship process (Corner et al., 2017, p. 688).
Entrepreneurial self-efficacy	Uygur & Kim (2016); Kasouf et al. (2015); Wennberg et al. (2013); Blume & Colvin (2011); Yamakawa et al. (2015)	"Refers to a person's confidence about his/her ability to perform the various tasks and roles relevant to entrepreneurship" (Uygur & Kim, 2016, p. 175).
Explanatory style	Kasouf et al. (2015)	"The mechanism of how people attribute the positive and negative experiences in their lives" (Kasouf et al., 2015, p. 8).
Extraversion	de Jong et al. (2013); Shane & Nicolaou (2013)	"Refers to assertiveness and dominance, as well as sociability, gregariousness, and talkativeness (...) extraverted leaders tend to influence the environment by scanning for opportunities, showing initiative, taking action, and persuading people about task-related issues" (de Jong et al., 2013, p. 1830).
Innovativeness	Ürü et al. (2011); Dai et al. (2016)	Refers to the tendency in which entrepreneurs look to getting involved in innovative endeavors (Ürü et al., 2011).

Intuition	Calabretta, Gemser, & Wijnberg (2017); Dane & Pratt (2007)	“a decision-making mechanism that relies on rapid, non-conscious recognition of patterns and associations to derive affectively charged judgments” (Calabretta, Gemser, & Wijnberg, 2017p. 366)
Knowledge relatedness	Wood & Williams (2014)	"Is defined as the degree to which the knowledge required to identify, evaluate, and exploit an opportunity is similar to the knowledge the entrepreneur already possesses" (Wood et al., 2014, p. 257).
Metacognition	Mitchell et al. (2007); Haynie et al. (2012); Baron (2009); Byrne & Shepherd (2015)	"Refers to those experiences that are affective, based on cognitive activity, and serve as a conduit through which previous experiences, memories, intuitions, and emotions may be employed as resources in the process of making sense of a given decision context" (Haynie et al., 2012, p. 239).
Metacognitive experience	Haynie et al. (2012); Mattingly et al. (2016)	"Represents past events that are affective, based on cognitive activity, and serve as a conduit through which memories, intuitions and emotions may be employed as resources

given the process of making sense of a given task " (Haynie et al., 2012, p. 242).

Metacognitive knowledge Haynie et al. (2012); Mattingly et al. (2016); Wood & Williams (2014); de Mol et al. (2015); Baron et al. (2016) "Is defined as the extent to which the individual relies on what is already known about oneself, other people, tasks, and strategy when interpreting, planning, and implementing goals to manage a changing environment" (Haynie et al., 2012, p. 241).

Need for achievement Hisrich et al. (2007); Ürü et al. (2011); Dimov (2007); Shane et al. (2003); Zhang & Bruning (2011) "A desire to influence and control the context in which a person operates because he/she seemed to be ambitious, hard working, competitive, keen to improve their social standing, and he/she places high value on achievements" (Ürü et al., 2011, p. 540).

Openness de Jong et al. (2013); Liñán et al. (2016); Shane & Nicolaou (2013); Zhao & Jung (2017) "Refers to whether people accept new experiences, are interested in unusual thought processes, and possess creative tendencies" (de Jong et al., 2013, p. 1829).

Opportunity prototype Mueller & Shepherd (2016) "Refers to a cognitive representation of the ideal business opportunity, composed of the attributes an individual has found to be most desirable and predictive of success" (Mueller & Shepherd, 2016, p. 463).

Opportunity refinement competency	Hoskisson et al. (2011)	"The discovery or enactment of an opportunity and the ability to further refine and develop the opportunity into a clearly articulated and commercially viable business concept" (Hoskisson et al., 2011, p. 1152).
Optimism	Hmieleski & Baron (2008); Ürü et al. (2011); Ucbasaran et al. (2010)	Refers to the tendency "to hold positive expectancies for the future" (Dölarslan et al., 2017, p. 4).
Passion	Cardon et al. (2015); Cardon et al. (2009); McMullen (2017); Warnick et al. (2018); Cardon et al. (2017)	"Concerns intense positive feelings for activities that are central and meaningful to an individual's self-identity" (Cardon et al., 2015, p. 374).
Pattern recognition	Baron (2004)	"Identification of a complex array of stimuli which, together, allow perceivers to recognize an object or a complex pattern of objects or events" (Baron, 2004, p.227).
Performance persistence	Mattingly et al. (2016)	"Refers to the increased likelihood of succeeding in a subsequent venture for those individuals who had success in a previous venture" (Mattingly et al., 2016, p. 1239).
Perspective taking	Frederiks et al. (2018)	"Is the cognitive capacity to consider the world from another individual's viewpoint" (Frederiks et al., 2018, p. 4).



Prospective thinking	Frederiks et al. (2018)	"The ability to 'pre-experience' the future by simulating it in our minds" (Frederiks et al., 2018, p. 4).
Relatedness	Shepherd & Cardon (2009)	"It refers to feeling connected to, and understood by, others" (Shepherd & Cardon, 2009, p. 929).
Risk-taking propensity	Hisrich et al. (2007); De Carolis et al., (2009); Ürü et al. (2011); Dimov (2007)	Refers to the tendency of individuals frame decisions as 'risk-taking' under conditions of uncertainty (De Carolis et al., 2009).
Self-compassion	Shepherd & Cardon, (2009)	Is the "self-awareness that one is experiencing a sense of loss and intention to respond to the loss by doing something about it" (p. 933). Self-compassion comprises self-kindness, common humanity, and mindfulness. (Shepherd & Cardon, 2009).
Self-confidence	Brundin & Gustafsson (2013)	"Refers to a belief in oneself" (Brundin & Gustafsson, 2013, p. 571).
Self-directed learning	Mattingly et al. (2016)	"Refers to a metacognitive ability to "connect the dots" between what one knows, what one wants to know, and how they can get there" (Mattingly et al., 2016, p. 1238).
Self-efficacy	Arora et al. (2013); Dölarslan et al. (2017); Dimov (2007);	"Belief in one's ability to muster and implement necessary resources, skills, and

	Shane et al. (2003); Warnick et al. (2018)	competencies to attain a certain level of achievement on a given task" (Baron, 2004, p.224 ).
Self-efficacy in opportunity recognition (SOR)	Fernández-Pérez et al. (2016)	"Reflects the perceived ease or difficulty of identifying or defining opportunities to act upon an entrepreneurial idea" (Fernández-Pérez et al., 2016, p. 299).
Self-esteem	Jenkins et al. (2014); Arora et al. (2013)	Good feelings and emotions about oneself (Jenkins et al., 2014).
Self-kindness	Shepherd & Cardon (2009)	"It refers to extending caring and understanding to oneself rather than harsh judgment and self-criticism (after project failure'" (Shepherd & Cardon, 2009, p. 934).
Self-regulation	Hmieleski & Baron (2008); Van Gelderen (2012); Crommelinck et al. (2016)	"The ability to adjust one's learning process in the face of feedback" (Mitchell et al., 2007, p. 14).
Sensation seeking	Nicolaou et al. (2008)	It is a "personality trait that creates a need for novel experiences" (Nicolaou et al., 2008, p. 9).
Sensing capability	Abdelgawad et al. (2013); Jiao et al. (2013); Dai et al. (2018); Bingham & Kahl (2014)	Centers on seeing and scanning information about market, industry and technology changes or opportunities (Abdelgawad et al., 2013).

Social cognition	Mitchell et al. (2007)	"The ways in which we interpret, analyze, remember, and use information about the social world" (Mitchell et al., 2007, p.5).
Start-up motivation	Hopp & Stephan (2012)	"Refers to the entrepreneurs' willingness to exert effort in the venture creation process to make the venture work" (p. 922).
Strategic Flexibility (firm)	Dai et al. (2018); Fernández-Pérez et al. (2016); Fernández-Pérez et al. (2012); Renato & Naguib (2016)	"Is an organisation's capability to identify major changes in its external environment, to commit resources quickly to new courses of action in response to change, and to recognise and act promptly when it is time to halt or reserve the commitment of such resources " (Fernández-Pérez et al., 2016, p. 297).
Successful intelligence	Hisrich et al. (2007); Baum & Bird (2009)	"Consists of practical, analytical, and creative intelligence that (...) enables and motivates successful entrepreneurial behavior" (Baum & Bird, 2009, p. 397).
Tolerance for ambiguity	Shinnar et al. (2012)	"The propensity to view situations without clear outcomes as attractive rather than threatening" (Shane et al., 2003, p. 265).

Tolerance for negative experiences Muehlfeld et al. (2017) In spite of adversity, is "a stronger tendency to continue sampling information about alternatives" (Muehlfeld et al., 2017, p. 541).

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Table 2 – Biases involved in entrepreneurial decision-making

<b>Cognitive Biases</b>	<b>Author(s)</b>	<b>Definition / Reference</b>
Anti-failure bias	Yamakawa et al. (2015)	The tendency to focus on success and to avoid failure at all costs (Yamakawa et al., 2015).
Availability	Zhang & Cueto (2017)	"Use a familiar situation as a cognitive shortcut for making decisions" (Zhang & Cueto, 2017, p. 427).
Confirmation bias	Baron (2004)	"Information that confirms our current beliefs is noticed, processed, and remembered more readily than information that disconfirms our current beliefs" (Baron, 2004, p.226).
Design fixation	Crilly (2018)	"Refer to a blind adherence to a set of ideas or concepts limiting the output of conceptual design" (Crilly, 2018, p. 52).
Escalation of commitment	Zhang & Cueto (2017)	"Persist unduly with unsuccessful initiatives or courses of action" (Zhang & Cueto, 2017, p. 427).

Failure-driven biases	Eggers (2016)	Biases related to fear of failure and persistence in the same strategy despite negative results (Eggers, 2016).
Fear of failure	Kollmann et al. (2017); Wood et al. (2014); Crifo & Sami (2008); Hacklin et al. (2018); Shinnar et al. (2012)	"It is a motive that energizes and directs individuals' behavior away from critical, negative situations in which failure is likely" (Kollmann et al., 2017, p. 283).
Illusion of control	Zhang & Cueto (2017); De Carolis et al. (2009)	"The belief that the skills could increase performance even in situations where chance plays a large role" (Baron, 2004, p. 226).
Inertia	Eggers, 2014; Zuzul & Tripsas, 2020	Refers to resistance to change and limited switching behavior from one state to another (Eggers, 2014).
Law of small numbers	Baron (2004); Zhang & Cueto (2017)	"The tendency to use a small sample of information as a basis for firm conclusions" (Baron, 2004, p.226).
Locus of control	Dölarslan et al. (2017); Dyer et al. (2008); Ürü et al. (2011); Shane et al. (2003); Zhang & Bruning (2011)	"The belief of whether or not one's outcomes depend mainly on one's own actions or on factors not under one's control" (Dölarslan et al., 2017, p. 2)
Need for closure	Schenkel et al. (2009)	"Desire for an answer on some topic, any answer as opposed to confusion and ambiguity" (Schenkel et al., 2009, p. 52).

Neuroticism	de Jong et al. (2013); Bandera & Passerini (2020)	"Refers to a person's tendency to be tense, defensive, thin-skinned, and worrisome" (de Jong et al., 2013, p. 1830).
Overconfidence	Schenkel et al. (2009); Invernizzi et al. (2017); Artinger & Powell (2016); Cain et al. (2015)	"Perceive a subjective certainty higher than the objective accuracy" (Zhang & Cueto, 2017, p. 427).
Over-optimism	Hmieleski & Baron (2008); Parker (2009); Hmieleski & Baron (2009); Wolfe & Shepherd (2015); Ucbasaran et al. (2010)	"Overestimate the likelihood of positive events and underestimate the likelihood of negative events" (Zhang & Cueto, 2017, p. 427).
Over-pessimism	Kirzner (1997)	"Are those [situations] in which superior opportunities have been overlooked" (Kirzner, 1997, p. 83).
Persistence bias	Cardon et al. (2015); Yamakawa et al. (2015); Batra (2016)	"Refers to the tendencies of organizations to stick to their past strategies" (Batra, 2016, p. 311).
Planning fallacy	Hisrich et al. (2007); Zhang & Cueto (2017)	"Refers to the tendency of making predictions about how much time will be needed to complete a future task display an optimism bias and underestimate the time needed " (Baron, 2004, p. 235).

Psychological ownership	Grimes (2018)	“that state in which individuals feel as though the target of ownership (material or immaterial in nature) or a piece of it is ‘theirs’” (Grimes, 2018, p. 1694).
Risk aversion	Ghio et al., 2019	The people’s tendency to prefer outcomes with low uncertainty (Ghio et al., 2019)
Self-serving attribution	Parker (2009); Dai et al. (2018); Hisrich et al. (2007)	"Take credit for success while deny responsibility for failure" (Zhang & Cueto, 2017, p. 427).
Similarity	Zhang & Cueto (2017)	"Tend to evaluate more positively those who are more similar to themselves" (Zhang & Cueto, 2017, p. 427).
Solution/product blind adherence	Eggers (2016)	The tendency to focus on a determined product or technology, neglecting the feedbacks from markets and customers, and diminishing the propensity to change. (Eggers, 2016)
Status quo	Zhang & Cueto (2017); Batra (2016)	"Repeat a previous choice overly often" (Zhang & Cueto, 2017, p. 427).
Sunk costs fallacy	Baron (2004); Crilly (2018)	"The tendency to stick with decisions that generate initial negative outcomes, the tendency to “stay the course” in the face of initial, negative results" (Baron, 2004, p.235).

Uncertainty avoidance	Wennberg et al. (2013)	"Refers to the extent to which individuals in a society feel threatened in ambiguous situations" (Wennberg et al., 2013, p. 761).
Unwarranted optimism	Baron (2004)	"The tendency of persons who choose to become entrepreneurs to underestimate the amount of risk involved in starting a new venture" (Baron, 2004, p. 224).

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