

Entrepreneurial opportunity decisions under uncertainty: Conceptualizing the complementing role of personal and cognitive abilities

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Abstract

Entrepreneurship research on decision making under uncertainty has focused largely on the effect of uncertainty on the entrepreneur actions while an attempt at the individual level particularly, from the cognitive framework seeks to explain why actions differ. There are growing attempts to characterize what informs actions and decisions on opportunities under uncertainty. Understanding from the thinking process of the entrepreneur asserts a more heuristic and bias framework of actions towards decisions on the opportunity that encompasses complementing personal and cognitive abilities. In this paper, we offer a review of decisions under uncertainty and develop propositions on the complementing role of entrepreneurial personality traits and cognitive abilities towards opportunity decisions under uncertainty. We provide a conceptual basis for a broader perspective on behaviors that motivate or hinder entrepreneurial actions. While positioning the entrepreneur decisions at the core center of decision theory, we also explore how the entrepreneurial decision process under uncertainty differ from the normative reasoning to decision making and the role information play in this process.

Keywords: *Uncertainty; Entrepreneurial opportunities; Entrepreneurial decisions; Cognitive abilities; Personality traits*

Introduction

Entrepreneurial decisions on opportunities under uncertainty are at the core center of entrepreneurship studies. Opportunities identification and exploration are one of the key concepts that define the boundary and exchange conditions of the entrepreneurship research (Short, Ketchen, Shook, & Ireland, 2010). While these opportunities remain the central theme in entrepreneurship research, there exists little agreement on the exact definition and the decision to exploit it. Different views on opportunities; creation of new product, new ventures or new entry into the market (Gartner, 1985; Lumpkin & Dess, 1996; Schumpeter, 1934) and discovery by optimizing information asymmetries in the means-end relationship of an already establishment (Kirzner, 1979; Shane & Venkataraman, 2000) have been the main contending ideas (Alvarez &

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Barney, 2007). Other researchers view the opportunity as a gradual creative process involving a synthesis of ideas over time (Dimov, 2007). Notwithstanding whichever way opportunities are made, its decision process under uncertainty has always been a concern. The literature conveys different decision styles towards opportunity creation or recognition which most crucially involve the nature of the entrepreneur and his cognition and to a broader spectrum, the biological building block including genetic factors of the entrepreneur (Nicolaou & Shane, 2010).

A recent review of entrepreneurial opportunity construct by Hansen, Monllor, & Shrader (2016) propose a model that integrates a unified account of disparate views on opportunity discovery and creation. The model seems to make it easier for entrepreneurship scholars to identify critical elements that matter for decisions on opportunity outcomes. Regarding the views on decisions under uncertainty, however, the entrepreneurship literature mainly describes the effect of uncertainties as detrimental on the actions and subsequent decisions of the entrepreneur (Garrett & Holland, 2015; McKelvie, Haynie, & Gustavsson, 2011; McMullen & Shepherd, 2006). While this true, on the other hand, a little focus has been paid on how and why certain actions are taken on opportunity decisions in an uncertain environment. In a recent study, McMullen and Shepherd (2006) investigated the entrepreneur action and the role of uncertainty, where they suggested that entrepreneurs perceived uncertainty and willingness to bear uncertainty are the divisive components that separate actions from inactions on opportunities. While these suggestions have been profound, the larger reasons for such actions are what this paper is centered on. Indeed, the decision on opportunities embracing entrepreneurial personal abilities and cognitive bias and their complementing role under uncertain conditions have been narrowly studied. This paper explores how decisions on opportunities under uncertainty differ from rational economic theories and how personal abilities and cognitive biases of the entrepreneur complement each other in making opportunity decision under uncertainty to foster a clearer understanding on why some entrepreneurs take actions on uncertain opportunities and why others do not act.

Understandably, the entrepreneurial uncertain environment is the main setting and compelling reasons that spike different actions through cognitive and behavioral styles towards decisions. The entrepreneurial decision-making environment is characterized by risk and uncertainty (Busenitz & Barney, 1997; Knight, 1921). Information needed to make decisions on opportunities are limited in nature, yet the entrepreneur is expected to take bold actions in the face of uncertainties. Hébert and Link (1988) define such entrepreneur as the one “who engages in exchange for profit; specifically, he or she is someone who exercises business judgment in the face of uncertainty”. Thus, the entrepreneur must be willing to act in uncertainty where the future of an opportunity or a venture is often ambiguous and incomplete. For this reason, he is largely considered as a risk-taker, uncertainty bearer or rugged individual (Begley & Boyd, 1987; Knight, 1921; Schumpeter, 1934) who deviate from normal social behavior (Busenitz & Barney, 1997) or normative way of reasoning. The entrepreneur decisions under uncertainty can be analyzed in different ways. A priori, rational theorist posits that decisions under uncertainty would conform to the normative theories such as the subjective expected utility (Neumann & Morgenstern, 1944; Savage, 1954). Psycho-economics theories have suggested descriptive decisions based on observed human

behavior (Kahneman & Tversky, 1979). However, despite the logically sound and optimal decisions these traditional theories provide, entrepreneurs hardly apply in creation theory (Alvarez & Barney, 2007) and they rarely follow its prescribed procedures (Gustafsson, 2009; Kahneman & Tversky, 1979; H. A. Simon, 1957).

Instead, entrepreneurs use different approaches in their decision making³. Action taking under uncertainty encompasses personal and cognitive abilities as well as some heuristics. Cognitive processes that enable “entrepreneurs use simplifying mental models to piece together previously unconnected information that helps them to identify and invent new products or services, and to assemble the necessary resources to start and grow businesses” have been the center of research on entrepreneurial actions and decisions in recent times. For instance, heuristics and cognitive biases such as overconfidence and representativeness (Busenitz & Barney, 1997; Kahneman & Frederick, 2002), counterfactual thinking, affect infusion, alertness schema and pattern recognition (Baron, 2004; Gaglio & Katz, 2001) and effectuation process (Sarasvathy, 2001) are suggested as simple strategies used to reach acceptable decisions. The research focused on cognitive psychology have considered these decision processes as a naturalistic way of decision making (Gustafsson, 2009) while some scholars have generalized it as the differentiating factor from managers (Busenitz & Barney, 1997) and among successful and no successful entrepreneurs (Baron, 2004). Although the recent stream of entrepreneurship research has emphasized more on these cognitive processes, individual personal dispositions such as feelings and moods (affect) have an influence on cognitive abilities and shape the decision process (Baron, 2004) for which new attention must be given to. Brundin and Gustafsson (2013) found that entrepreneur’s emotion plays a role in decisions to continue or discontinue investment under uncertainty. Personal attribute; self-confidence, hope increases the propensity to invest under high uncertainty whereas frustration and embarrassment decrease the propensity to invest when the uncertainty level is high.

Given the significant roles these cognitive biases and personality traits play in arriving at decisions on opportunities, in this paper, we discuss how they affect the decision to create or recognize the opportunity in an uncertain environment. Particularly, this paper makes theoretical contributions to the literature on entrepreneurial decisions under uncertainty by providing further insights into how theoretically, tacit knowledge, alertness to schema and self-confidence, ambiguity aversion among others motivate or hinder the willingness to take opportunity decisions in the complex and ambiguous environment. To drive home these points, we organize the subsequent pages as follows: in section 2, the concept of entrepreneurial uncertainty is discussed. It explains the nature of the entrepreneurial uncertainty, its difference from risk and how information plays a role in uncertain decisions. Section 3 presents some theories used in psychoeconomics theories for decisions under uncertainty. In section 4 where propositions for this paper are made, we demonstrate how some cognitive abilities and personality traits influence the

³ Decisions on opportunity discovery or creation has been the central concepts of entrepreneurship research (Shane & Venkataraman, 2000). The position taken in this paper concerns only decisions on opportunities under uncertainty rather than a general framework on decision making.

decisions on opportunities. We discuss the significance of the complementing effect of these two behaviors to the entrepreneur decisions and conclude in the future.

Uncertainty concepts in entrepreneurial decisions

Nature of uncertainty

Entrepreneurship scholars examining the relationship between uncertainty and decision making have established uncertainty to be detrimental to entrepreneurial actions and affects decisions on opportunities (Garrett & Holland, 2015; McKelvie et al., 2011; McMullen & Shepherd, 2006). The specific kind of entrepreneur actions, however, depends on the nature of uncertainty. Research shows that entrepreneurs attach different attitude to different uncertainty levels with regards to decision making (Brundin & Gustafsson, 2013). Moreover, the uncertainty type manifested eventually determine the entrepreneur actions and decision policy (McKelvie et al., 2011; Milliken, 1987). The nature of entrepreneur uncertainty is perceived to be the result of incomplete or lack of information (Petraakis & Konstantakopoulou, 2015). Such uncertainty can be perceived as mild, severe or absolute depending on the available information⁴. Mild uncertainties are quite manageable, however, severe uncertainties pose much enterprise threat which generates difficulty in predicting accurately investment plans or discriminating between relevant and irrelevant data for those investments. It is quite important to recognize the correspondence between information and uncertainty here as the former provides the source.

Understanding the type of uncertainties generated present ways to delineate the nature of uncertainty. Thus, given that the environment changes unpredictably with different consequences, the entrepreneur faces a different level of uncertainties at different times. Milliken (1987) classified these uncertainties presented by the state of the environment into the state, effect and response uncertainty. State uncertainty refers to the inability to predict the changing composition of the environment. For instance, a dormant entrepreneur may fail to recognize and predict a recurring arbitrage in the market to exploit. Such ineptitude may be driven by factors such as demographic shifts or socio-cultural trend (Milliken, 1987). On the other hand, Effect uncertainty describes the inability to anticipate how changes in the environment would impact the venture. Changes in technology can impact the venture and requires entrepreneurial knowledge and choice about it. Lastly, Response uncertainty describes the lack of coherent response option to the changes in the environment. In the view of Milliken, in effect, the entrepreneur in his decision towards the ambiguous environment ought to know what is happening out there, how it is going to affect him and what appropriate actions must be taken.

Indeed, these types of uncertainties correspond to the lack of information or information shortage represented by each of them (McKelvie et al., 2011). Profoundly, their identification is useful in clarifying the nature of the expected relationship with the environment and act along with

⁴Makridakis, Hogarth, and Gaba (2010) similarly consider these uncertainties as subway, coconut and black swans uncertainties.

it. Research suggests that experienced entrepreneurs are able to recognize to a large extent the nature of uncertainty and match their decision techniques along⁵. Such recognition facilitates creating filters that reduce uncertainty by classifying them to different degrees and defining an optional strategy for each type of degree (Petrakis & Konstantakopoulou, 2015). Means of handling certain uncertainties using private information, tacit knowledge and cognitive biases are treated as private resources to have a comparative advantage over competitors. In most instances, these entrepreneurs handle uncertainties competently enough, differentiating risky investment from good ones.

Risk and uncertainty; ‘A twin division’

Entrepreneurial decisions under uncertainty come with the decision to bear the risk. Risk bearing is a common phenomenon in decision making both entrepreneurially and non-entrepreneurially while uncertainty is peculiar solely to the former. Generally, researchers in financial economics and behavioral decision science adopt alternative theories formalized on probabilities in analyzing risk and uncertainty. Some of these theories provide normative and prescriptive behaviors for the decision maker. Principal among them is the subjective expected utility (Savage, 1954) and the prospect theory (Kahneman & Tversky, 1979). As a priori, uncertainty is assumed to be reducible to a distribution with known parameters. For instance, the rational choice economic decision analysis suggests reducing uncertain situations too risky ones using ignorance prior (Weber & Johnson, 2009). In other words, each possible uncertain event can be assigned an equal probability and managed as a risky one.

Results of risk and uncertainty analysis from rational theorist are, however, unappealing and counterintuitive in the entrepreneurship setting (Amit, Glosten, & Muller, 1993) since uncertainty which is the main construct under which opportunities are exploited in non-reducible. As shown by many studies in entrepreneurship literature (Baron, 2008; Begley & Boyd, 1987; Busenitz & Barney, 1997; Knight, 1921; McMullen & Shepherd, 2006), because entrepreneurs bear all the risk associated with decisions under uncertainty, their personal behavior and cognition differ towards the two concepts. Aversion or tolerance to uncertainty pertaining to its known measurability or immeasurability. The earliest distinction between risk and uncertainty follows Knight (1921) work on *risk, uncertainty, and profit* which now serve as the *locus classicus* for studies on the two concepts. Knight ‘s view of risk describes a situation or game that can be known with certainty through measurable probability; uncertainty then as having no measurable probability or likelihood of occurrence. Thus, risk depicts some degree of uncertainty that is quantifiable and which can be avoided or the entrepreneur adjusting by reducing his exposure to it. The Knightian uncertainty, ‘the true uncertainty’ describes the actual entrepreneurial setting in which the likelihood of future

⁵ The cognitive framework of experienced entrepreneurs is known to be richer in ‘connecting the dots’ between related and unrelated events. For instance, tacit knowledge, long service experience and pattern recognition (eq. Baron & Ensley, 2006) are some of the qualities that form their prototype on opportunity decisions, something that is lacking in ‘go by the textbook’ novice entrepreneurs.

events or the direction of an investment cannot be determined. According to Knight (1921), the entrepreneurial opportunity creation or recognition is masked in this uncertainty and the entrepreneur bears the sole responsibility for decisions on them (McMullen & Shepherd, 2006). Because entrepreneurs cannot prevent uncertainty either can they insure against it, they are characterized by their aversion or tolerance towards it (Amit et al., 1993) which has gotten information moderating it.

Role of information in uncertain decisions

Access to information affect decision making in many ways. Entrepreneur tolerance for ambiguity, risk-taking propensity, confidence level, and confirmation bias are contingent on the weight of evidence-informed by the information at hand. Recent research on entrepreneurship has suggested that many entrepreneurs would change certain earlier decisions had them additional relevant information. Specifically, new venture owners who took risky action based on very limited information but for overconfidence and illusion control (Koellinger, Minniti, & Schade, 2007; Zacharakis & Shepherd, 2001), additional and relevant information might have saved their short span failed ventures (M. Simon, Houghton, & Aquino, 2000). In few instances where information is available, decisions are often close as normative decision theories would suggest. Moreover, access to information has the tendency of reducing ambiguity aversion towards opportunities in a complex environment (Trautmann, Vieider, & Wakker, 2008).

Quite differently, implicit in the literature devoted to Bayesian decision theory is the assumption of full knowledge of information. These studies (eq. Neumann & Morgenstern, 1944; Savage, 1954) assumes the decision maker has access to all information for which rational choice can be made by maximizing utility. Such assumptions tend to ignore the complexities and ambiguous nature of the decision environment. Uncertainty is characterized by unknown or limited information. With limited information, the entrepreneur is unable to anticipate any changes in the environment (McKelvie et al., 2011; Milliken, 1987) from which opportunities are generated. But as uncertainty is the main construct under which innovation, profit, market equilibrium and allocation of resources are made (Amit et al., 1993; Kirzner, 1979; Knight, 1921), information discovery and processing become an important concept in the creation of opportunities. As noted by Kirzner (1979), information asymmetry is the revolving factor to market disequilibrium and opportunity recognition. Complete knowledge about the environment forms the symmetry to rational theorist decisions and entrepreneurial decisions. As the former is constructive and formalized on probabilities deduced from available information, the latter is heuristically indeterminate. The next section clarifies how these two decisions are made.

Decision making under psych-economic theories

Rational choice theory

The normative reasoning implied by the rational choice theorist follow the idea that all human actions are rational in character motivated by want or goals that give optimal satisfaction.

Individual decisions must be optimal, decisions ought to follow certain mathematical axioms to be rational. Individuals are portrayed as economic agents who are fully ‘rational minimizers’ of subjective utility (Gigerenzer & Selten, 2002). Specifically, rational choice theory attempts to explain decision behavior according to the assumption of utility maximization based on a selfish or altruistic preference (Moscati & Tubaro, 2011; Neumann & Morgenstern, 1944; Scott, 2000). Theorist holds the view that people evaluate risky and uncertain prospects by comparing their expected utility values. One of the popularly used yet well criticized for its non-practical axiomatic in human decisions is the Subjective Expected Utility (SEU) popularized by Savage (1954). Savage’s SEU describes how individuals make decisions under uncertainty in a fascinating way by reducing the whole decision dimension into a common set of primitives; probability, utility, and options (Fischhoff, Goitein, & Shapira, 1981). Under these primitives, the individual has the option to assign a probability of desirable outcomes (utilities) before making decisions. In other words, individuals are considered as identifying an alternative course of actions, anticipating their outcomes and calculating that which is best for them. Rational individuals select the optimum alternative that gives the best satisfaction (Scott, 2000).

However, such rationality is largely incompatible with the kind of information, the computational capabilities of the individual and the environment (Gigerenzer & Selten, 2002; H. A. Simon, 1957). As suggested by many behavioral economists, an individual’s behavior in the context of complex social phenomena and uncertain environment can be rational or irrational. Behaviors are perceived to be random in nature and diverge from rational choice theory more radically (Moscati & Tubaro, 2011). Because of these, the rational choice theory has been fiercely criticized.

Normative theories such as the SEU has been violated by certain decision heuristics (Ellsberg, 1961; Kahneman & Tversky, 1979). For instance, Ellsberg’s famous paradox demonstrates that decision makers and investors faced with uncertainty may not make choices consistent with the SEU but with ambiguity aversion to choices whose likelihood they have confidence in. Moreover, rational choice models are increasingly mathematical. Although they yield optimal decisions through rigorous computations, many decision-makers and entrepreneurs do not implement those models for decision making (Gustafsson, 2009). As we shall see in later sections, the entrepreneur’s decisions, ‘irrational’ as it may be, is more dependent on behaviors formalized on some heuristics and biases.

Bounded rationality: Heuristics and Biases

Because there are naturally no such unlimited human resources such as unlimited cognitive capabilities, unlimited information and of time, human beings barely opt for optimal decisions as expected under SEU, rather they often contend with decisions which are ‘satisfying’ (H. A. Simon, 1957). According to Simon, individual’s cognitive abilities are limited, decision making becomes a search process that would lead to satisfactory result guided by aspirations (Gigerenzer & Selten, 2002; H. A. Simon, 1957). By arriving at such satisfying decisions, the individual is not seen as

irrational but rationally bounded by the conditions in which he finds himself. For example, the environment.

Simon's concept of rationality demonstrates the reality of human behavior as observed in real life. Entrepreneurs do not follow normative theories as their preferences are highly inconsistent even in a situation involving no risk or uncertainty. In making decisions bounded by constraints, the entrepreneur uses heuristics and biases based on his adaptation to experiences, skills, psychological plausibility and the structure of the environment. Known as an adaptive toolbox⁶, such tools consist of cognitive abilities set of rules (search, stop, decide) and specific domain heuristics used in achieving proximal goals. The general framework of these informal and natural decision-making process as considered in entrepreneurship literature is known as heuristics and biases. Although bias has a negative connotation in usage in cognitive psychology literature, the two terms are used interchangeably (Gustafsson, 2009) and jointly.

Heuristics and bias refer to unaided layman decision rules, subjective opinions and cognitive mechanisms used in decision making especially in the complex and uncertain environment. For instance, heuristics types such as availability, representativeness and base-rate fallacy (Kahneman & Frederick, 2002) are commonly used in literature and largely employed by entrepreneurs in decision making. Most times, the use of these heuristics and biases provide adequate and acceptable solutions. Heuristics and biases are very useful most times but much to an entrepreneur in question. Individuals with greater cognitive skills are more probable to construct cogent heuristics towards opportunity decisions. In the pages that follow, we demonstrate how some personal traits and cognitive abilities shape these heuristics and motivate or otherwise dissuade the entrepreneur from uncertain opportunity decisions.

Methodological framework

A research paradigm as (Guba, 1990, p. 17) state is argued to be as a 'set of beliefs that guide action'. Considering that, a paradigm is a collection of correlated assumptions regarding the facts that are shared by those investigating the universe (Deshpande, 1983), scholars work with these research paradigms. Researchers usually rely on their research philosophy by examining their epistemological, ontological, and methodological premises or assumptions, and consequently employing research method consistent with these assumptions (Guba, 1990). According to Denzin & Lincoln (2011), a research paradigm, in general, explores four areas: epistemology, ontology, ethics, and methodology.

Epistemology explores the linkage between the reality and the researcher, or the known and the inquirer (Denzin & Lincoln, 1994). In fact, epistemology determines defines how knowledge can be generated and discussed for (Eriksson & Kovalainen, 2015). Ontology asks the basic inquiries regarding the nature of the human being as well as the nature of reality in the world (Guba, 1990).

⁶ The adaptive toolbox offers a bounded rationality decisions based on a collection of heuristics, psychological plausibility and adaptation to the structure of the environment. See Gigerenzer and Selten (2002), p. 37 – 41 for more insights.

For example, it investigates the existence of relationships between individuals, the community and the world as a whole. Ethics rise question about “How can be a moral individual in the world?” (Denzin & Lincoln, 1994). As Eriksson & Kovalainen (2015) highlight, ethics cover all research dimensions from the start of research to the final report. Corresponding to the ethical issues also increase the credibility of the research (Eriksson & Kovalainen, 2015). Lastly, methodology addresses the best means of obtaining knowledge about the world (Denzin & Lincoln, 1994).

This study adopts the statement of Denzin & Lincoln (1994), in which they declared that the basic beliefs of alternative inquiry paradigms bond along with a continuum, and includes constructivism, positivism, post-positivism, and critical theory. According to Denzin & Lincoln (2011), a research paradigm can be seen as a continuum ranging from evolving less structured directives at one side to precise design principles on the other side. The first paradigm to be discussed is constructivism. Constructivism facts are understandable as multiple, elusive psychological constructions that are socially and experimentally based (Denzin & Lincoln, 2011). Guba & Lincoln (1994) suggest that the objective of constructivism is to comprehend the intricate world of lived experience from the point of view of individuals who live it. Researchers commonly take advantage from constructivism paradigm in qualitative data collection, where the scholar is looking for understanding the social world as perceived by others (Malhotra, Kim, & Patil, 2006). This paradigm was considered to be unsuitable for this research as it suggests that the facts are understandable in the shape of intangible mental intangible structures that are based on the social and experimental foundations (Denzin & Lincoln, 2011).

Positivism, as the next studied paradigm, supposes that a research measures independent realities regarding a specific apprehensible fact is commonly engaged for hypothesis testing of quantitative research (Guba & Lincoln, 1994). In this line, Kvale (1996) reveals that the positivism paradigm is a philosophical reservation that has mostly ignored qualitative analysis as a scientific research method. Positivism-framed research has mostly employed for quantitative methodologies and for this reason, adopting this approach was found deemed unsuitable for investigating the phenomenon of IE determinants in different institutions. To obtain information of the SME internationalization in different places a mixed research methodology was regarded as suitable to assure of the quality of data received from the informants (Jafari Sadeghi & Biancone, 2017b).

This paper is adapted to the post-positivist paradigm, which as a paradigmatic approach, is not only a contrast but a modification of the many central assumptions of positivism (Onwuegbuzie, Johnson, & Collins, 2009). This paradigm is based on the multiple methods as a way of gathering as much as possible of real information with the accentuation on the exploring and verification of theories (Denzin & Lincoln, 2011). By this means, the post-positivist paradigm keeps the idea of objective truth but crosses the borders of relativism (Denzin & Lincoln, 2011). More precisely, it is grounded on the fact that knowledge of individuals is not based on constant foundations but rather speculations that can change by passing time (Denzin & Lincoln, 2011). Post-positivism paradigm followers assume that reality can be independently studied, but in the meantime, they believe that imperfect theories can be modified and developed (Onwuegbuzie et al., 2009). They also state that humans are biased in their cognition of the facts based on their experiences (Denzin

& Lincoln, 2011; Onwuegbuzie et al., 2009). Although post-positivisms mostly employ quantitative methodologies in their research, they also take an advantage of the qualitative approaches to improve the quantitative analysis (Onwuegbuzie et al., 2009).

Critical theory has been opposed the positivisms in the social sciences (Denzin & Lincoln, 2011). The followers of the critical theory stand against the relativist, antifoundational epistemologies, and logical positivist (Denzin & Lincoln, 2011). Critical theorists employ a historical realism that facts as result of cultural, economic, political, social and ethnic drivers which transformed to the structures that are now named ‘real’ (Guba & Lincoln, 1994). Although critical theory benefits the mixed-method approaches, this paradigm is not deemed to be appropriate for current research as its assumptions are dependent on the historical and social understanding and are subjective to the researcher (Guba & Lincoln, 1994).

Personal and cognitive abilities in entrepreneur decisions under uncertainty

The personality of a person embodies the intra-individual constellation of all traits of the person including his/her character. Until recently, the entrepreneurship research has presented the entrepreneurial personality as the key component of new venture formation and the reason for diverse decisions on opportunities (Brandstätter, 1997; McClelland, 1987; Shane & Venkataraman, 2000). Several of these traits such as motivation, multitasking, perseverance, confidence, foresight have been described as characteristics of successful entrepreneurs (Jafari Sadeghi & Biancone, 2017a; McClelland, 1987). However, as the unique set of personality traits and differences in psychological and demographic characteristics to the study became difficult (Mitchell et al., 2002), the entrepreneurship research agenda on decision making shifted towards the epistemological difference, informational access and environmental complexities of the entrepreneur. Most of these studies have particularly focused on the cognitive abilities of the entrepreneur (Baron, 2004; Busenitz & Barney, 1997; Gaglio & Katz, 2001; M. Simon et al., 2000). Similarly, we explore cognitive abilities that present the entrepreneur with simple mental models that can be used to make sense of information and the environment towards decision making. However, rather than follow previous research that focuses on this single concept to entrepreneurial decisions, we provide some argument on the personal attribute germane to decisions under uncertainty. While the selected construct here is not exhaustive of all the cognitive abilities and personality traits they are deemed the few most essential and core for decisions under uncertainty. Figure 1 shows the construct used in this paper.

Please Insert Figure 1 Here

Personality traits towards uncertain decisions

Self-confidence

McClelland (1987) observation on the characteristics of successful entrepreneurs reckons entrepreneur self-confidence as a key component to their achievement. Indeed, self-confidence has been a known ideal of the motivation that characterizes entrepreneurial decisions under uncertainty. Schumpeter (1961) underlines it as the main distinctive feature to the will and actions of the entrepreneur that brings creative destruction to the economic system. For uncertain decisions such as new venture formation, perception formed through confidence act as a mediating factor between the preference and behavior of the entrepreneurs, contributing to their disposition of expected outcome (Kahneman & Tversky, 1979; Koellinger et al., 2007). Highly perceived confidence generates a high sum of perceived potential outcome and drives decision actions. Thus, we propose that,

Proposition 1: *A higher self-confidence of the entrepreneur will drive the willingness to bear uncertainty and make uncertain decisions on opportunities.*

McMullen and Shepherd (2006) emphasize the entrepreneur's evaluation as stage two of his actions that triggers decisions under uncertainty. In this evaluation stage, the entrepreneur matches the potential reward of his actions to some potential cost. The belief formed to exploit the opportunity are marked by doubt to the feasibility of the desired end state envisaged. If the entrepreneur is pushed by his self-confidence to overcome his doubt, then the evaluation will be actualized. Enacting that confidence over doubt in entrepreneurship is much explained in self-efficacy theory. Such self-confidence induces the decision for the creation of opportunities under uncertainty much as incentives inspire entrepreneur's alertness and discovery (Kirzner, 1985). Decisions on opportunity creation are made with little or no information, no historical trends and no predicted view of what the expected outcome might be. Usually, attempt to reduce uncertainty might be costly and ineffective (Busenitz & Barney, 1997). With an invariable acceptance of the uncertainty degree, those who decide to exploit opportunities are the ones willing to bear uncertainty (McMullen & Shepherd, 2006) and with the courage to make decisions (Schumpeter, 1934). People who act entrepreneurially are seen as having greater confidence determined by their optimistic disposition to face uncertainty which according to many entrepreneurship studies differentiate them from non-entrepreneurs. Although self-confidence offsets largely ambiguity aversion and provides a sense of certainty to venture formation and uncertain decisions, beyond a certain margin affect venture decisions.

Proposition 2: *Overconfidence negatively affect decision accuracies.*

Whiles entrepreneurial confidence is desirable, overconfidence, on the other hand, create a bias that affects the accuracy of decisions. The ability to interpret information and study the market

prior to decision actions are very crucial and influences the potential upside or venture investment. Usually, for novice entrepreneurs and new venture founders, overconfidence is pervasive; inaccurate market predictions and perception failures are highly probable. They either show optimistic overconfidence or overestimation of their own knowledge (Busenitz & Barney, 1997; Zacharakis & Shepherd, 2001) and apparently reduce the need for thorough information required for decisions under uncertainty. Overconfidence is associated with lower metacognitive ability and positive illusions that undermines detailed process in decision making resulting in inaccuracies and poor result. Recent studies have linked overconfidence to venture failures shortly after their inception (Koellinger et al., 2007; Zacharakis & Shepherd, 2001).

Ambiguity aversion

Comparative to the different levels of confidence in entrepreneurial decisions, different shades of ambiguity aversion affect the exploitation of opportunities. Entrepreneurs vary in their tolerance for ambiguity. Experimental evidence has shown that they are not uniform in their aversion to ambiguity as some are rather ambiguity seeking (Eichberger, Grant, & Kelsey, 2012). While some entrepreneurs are averse or intolerant to ambiguity/uncertainty, others have appreciable tolerance for it (Begley & Boyd, 1987). Ambiguity attitude⁷ can be an inherent character of the individual which sometimes is invariant with the information required for decision making (Eichberger et al., 2012). According to Knight, the entrepreneur conspicuously demonstrates an unusually low level of uncertainty aversion. In the same way, uncertainty aversion rather than risk aversion is considered the main inhibitor to entrepreneur opportunity creation (Amit et al., 1993; Knight, 1921). Begley and Boyd (1987) found that entrepreneurs who formed new venture manifest higher tolerance for ambiguity than managers and non-founders. Psychologically, old venture owners with accumulated experience tend to be more tolerant. Obviously, only if confidence and optimism also exist would such tolerance prevail higher. Tolerance for ambiguity is motivated by an entrepreneur's self-confidence and the "low weight placed on the social and psychological consequences of failure" (Bhidé, 2000). The ambiguity seeking entrepreneur see ambiguity more as an opportunity than a threat. Such a view of uncertainty represents an exciting stimulus to make decisions which according to Begley and Boyd (1987) indicates a positive relationship with the financial performance of the venture. On the other hand, we can argue that,

Proposition 3: *A high ambiguity aversion towards opportunity in a complex environment will deter entrepreneurial decision on the opportunity.*

⁷ Ellsberg's notion of ambiguity aversion also called uncertainty aversion describes people preference for risk with known probability over risk with unknown probability. The unknown probability emphasizes the lack of information about the outcome of a prospect and describes more the Knightian uncertainty where uncertainty cannot be measured. One can then define ambiguity as "the subjective experience of missing information relevant to a prediction" (Frisch & Baron 1988) whose higher likelihood is avoided (Kahneman & Tversky, 1979).

An unwillingness to act, make decisions in the face of uncertainty can discourage entrepreneurs from certain opportunity discovery and creation (Bhidé, 2000). A degree of belief informs the entrepreneur perception and psychological aspect of judgment. Subjective judgment formed as a response to an ambiguous future following inadequate information or the environment can worsen the entrepreneur tolerance towards ambiguity. Studies (eq. Eichberger et al., 2012; Trautmann et al., 2008) found on ambiguity and decision making suggest that individual's ambiguity is enhanced by fear of the negative outcome. Entrepreneurs having this fear demonstrate it to protect their private investment. They usually adopt a prevention focus signal where decisions are taken on the fewer generated hypothesis to prevent negative outcome (Baron, 2004). Some studies have noted such aversion to being economically prudent (Trautmann et al., 2008). However, it is largely the case that, such aversion will elude the entrepreneur of significant opportunities for creation and enterprise profit.

Cognitive abilities towards uncertain decisions

Alertness to schema

As the business environment becomes increasingly complex, entrepreneurs also developmental schemas with which decisions can be made faster. Recent research on the cognitive process has emphasized the role of schemas to decision making in environmental turbulence (Baron, 2004; Gaglio & Katz, 2001; Garrett & Holland, 2015). A schema is a cognitive structure evolving mental models that guide the individual in reasoning and information processing for any task (Gaglio & Katz, 2001). Such schemas can be role defined or event defined (Abelson, 1981; Garrett & Holland, 2015) and they demonstrate high performance and opportunity recognition by entrepreneurs who adopt them than those who do not (Baron, 2004). Complex schema structures interlinking each other provides the entrepreneur a projected view of environmental changes and quick corrections to deviation from known patterns. They could be mental mode construct on market price differentials for which sensitivity and alertness could generate pure arbitrage opportunity. We, therefore, propose that,

Proposition 4: *Entrepreneurs who are sensitive to key characteristics of their schema will have a higher propensity to opportunity discovery and quicker ways to decisions under uncertainty than those who do not have*

Schema theory assumes individuals are environmentally stimulus matching changes to existing information. They provide outside the box thinking and heuristics that offer quicker decisions in an uncertain environment (Baron, 2004; Garrett & Holland, 2015). Alert entrepreneurs prompted by schema can reassess and react to changes in the environment so easily especially when seemingly unrelated changes in the external environment do not correspond to the current schema. Sensitivity and habitual activation of the schema can lead to the chronic schema (Gaglio & Katz, 2001), a situation which automates individuals to notice without search opportunities and market

disequilibria. Following its central role in opportunity recognition, alertness to schema has been considered as a useful signal for opportunities under uncertainty. The ability to be alert to opportunities marks the first decision point in the entrepreneurial process. The discovery theory conceptualizes decisions on the opportunity as pure arbitrage opportunities of individual alertness that occur as a means-ends framework to imperfect knowledge in the market (Kirzner, 1979; Korsgaard, Berglund, Thrane, & Blenker, 2016; Shane & Venkataraman, 2000). “The ability to notice without search opportunities that have hitherto been overlooked” and the “propensity of man to formulate an image of the future” demonstrates a participatory process in which the entrepreneur’s alertness to schema aid in quicker discovery (Kirzner, 1979, 1985; Sarasvathy, 2001). The present view of opportunity discovery involves uncertainty and alertness as a continuous process of passage of time through which mental schema induces sensitivity to market disequilibrium signals (Dimov, 2007; Gaglio & Katz, 2001).

Tacit knowledge

One of the greatest assets of the entrepreneur is his tacit knowledge formed through past experiences and logical understanding of related patterns of events in the past. Tacit knowledge identifies the entrepreneur with a set of epistemic tools under which coherent decisions can be made. Though the concept of tacit knowledge is difficult to visualize or parametrized given the subjective, personal and idiosyncratic nature, it is known to demystify future circumstances and induce information search regarding the decision to create or recognize the opportunity. Information is essential in unraveling uncertainties. Some scholars regard information as “knowledge reduced to the message” that can be transmitted to decision agents (Partha & David, 1994). Others regard it as the codification of tacit knowledge (Ancori, Bureth, & Cohendet, 2000; Spulber, 2012). When the decision environment is varied in different degree of uncertainties and lack of information, tacit knowledge provides an intuitive judgment on what actions must be taken. Highly significant is its role in entrepreneur innovation building such as knowledge creation and scientific discovery.

From the cognitive point of view, the entrepreneur knowledge forms the basis for most of the biases made in uncertain decisions. Tacit awareness connects to the uncertain external environment and induces a construct for schemata, alertness and meaningful patterns upon which opportunities can be recognized. According to Polanyi (1962), a large part of the human knowledge is tacit and the nature of its acquisition makes it difficult to formalize or communicate. Cognitive research shows that the formation of tacit knowledge over time result from accumulated prior knowledge. Prior knowledge is valuable in making sense of the uncertainty in the environment (Johnson & Bock, 2017). Much interest has risen of its essence in entrepreneurship literature as it forms an intent and first-hand information in interpreting and pursuing opportunities.

Entrepreneurs who employ tacit knowledge are “mentally richer” in identifying and further deciding on opportunities whereas tacit bereft managers and novice entrepreneurs may be denied those opportunities under uncertainty. To this end, we make the following proposition.

Proposition 5: *Entrepreneurs who possess tacit knowledge that codify into information will be 'richer' in recognizing opportunity and deciding on opportunity creation.*

Discussions and conclusion

Persisting research questions in entrepreneurship encompass how decisions on opportunities are made under a complex and changing environment. Specifically, why some people but not others decide to discover and profitably exploit opportunities? why some people and not others succeed in new venture formation and why some entrepreneurs are more successful than others (Baron, 2004; Mitchell et al., 2002; Shane & Venkataraman, 2000)? These questions underscore the differences among individuals in terms of their personality, biological make-up, and cognitive abilities. The general research on the collective understanding of the thinking process of the entrepreneur has gone beyond the single-insight individual paradigm to embrace access to information and cognitive abilities as the probable factors to discovering opportunities and partially answering the above-raised questions (Mitchell et al., 2002; Shane & Venkataraman, 2000). Further, there could more unexplored in literature. Knowing that entrepreneurship research is a growing phenomenon varying with the changing environment, there can be no one single model as a specific 'adaptive toolbox' in which entrepreneurial decisions under uncertainty would conform to. The larger framework for decisions under uncertainty rest on the combined personal behavior, sunk outcomes in committed ventures, the entrepreneur cognitive abilities and the complexity of the environment. Besides, the contextual and social influences at the given time affect the decisions and the shaping of ideas of the entrepreneur (Dimov, 2007).

This paper has made propositions which reiterate the role personal and cognitive abilities play in the uncertain decisions on entrepreneurial opportunities. The importance of cognitive abilities emphasizes the significance of cognition as the divisive component to answering the 'how' questions in entrepreneurship decision process while the personal nature of the entrepreneur and his environment represent an important understanding of 'why' certain decisions are made. It is important to note that these two complement each other in answering 'how' and 'why' questions on opportunities under uncertainty. As noted by the British Novelist Arnold Bennet, "to the cognition of the brain must be added the experience of the soul" (Baron, 2008; Bennett, 1954), the entrepreneur cognition cannot function well without a counterbalance with some personality traits. The significance of these bi-directional complementing effect to the entrepreneurial decisions under uncertainty manifest in two ways:

Personality traits are enhanced by cognitive abilities. There have been studies showing a positive correlation between cognitive abilities and personality traits notably of the five-factor model (Rammstedt, Danner, & Martin, 2016; Tuten, Tracy L.; Bosnjak, 2001) and between personality and entrepreneurial outcomes (McClelland, 1987; Murnieks, Sudek, & Wiltbank, 2015). Such personality is achieved through stimuli which permeate the disposition of the individual positive attitude towards tasks and effective thinking. Theorizing from the given propositions, it is easy to recognize that entrepreneurs who have developed their cognitive abilities

are adequately prepared mentally in their personal pursuit of profit to make decisions in an uncertain environment. Additionally, their perception and opinions are more influenced towards a positive desire to explore an opportunity when cognition is utilized in the decision process. For instance, entrepreneurs rich in tacit knowledge are enhanced with higher confidence to approach opportunities whereas poor thinking and problem-solving skills contribute to negative outcomes.

Previous scholars attribute lower perception of risk and personal decision to start new ventures to cognitive abilities and biases (Busenitz & Barney, 1997; M. Simon et al., 2000). At the broadest level, these cognitive abilities induce a sense of capabilities – a personal enhancement to pursue opportunities. Cognition plays a central role in self-efficacy, self-confidence, and self-motivation. For example, tacit knowledge and entrepreneur alertness can induce an appreciable level of self-confidence needed to embrace decisions under uncertainty. Notwithstanding, there is the need to draw a thin line between known self-confidence and over-confidence as a prudent measure to avoid inaccurate decisions. The latter is classified as bias (Busenitz & Barney, 1997; Koellinger et al., 2007; Zacharakis & Shepherd, 2001) that can affect decisions while former is a perceived personal trait that direct the entrepreneur to pursue investment (Brundin & Gustafsson, 2013). Therefore, it important for research emphasizing the creative and innovative role of the entrepreneur and his decisions on opportunities to consider and identify the cognitive role on specific personal characteristics that improve the decision-making abilities of the entrepreneur.

Personality traits and affect influence cognition towards decisions. Across the breadth of literature on psychology and organizational behavior, personality has been demonstrated to have an influence on several factors germane to prudent decisions (Baron, 2008; Rammstedt et al., 2016). The existence of the ability to construct schema and be alerted to it, combine task and evaluate decisions on opportunities can be understood to be the consequence of a moral firm and knowledgeable entrepreneur. The study of Rammstedt et al. (2016) established education as the correlation between cognitive abilities and one’s openness as well as his emotional stability. It is therefore agreed that personality traits are instrumental in the development of intellectual skills (Ackerman, 1996) and mental structures. The extent to which one develops an alertness schema, for instance, depends on his belief and perception of the world. Entrepreneurs who are highly ambiguity intolerant tend to relent on the effort to construct a schema for uncertain decisions. Such a negative view of uncertainty prevents broader cognition and heuristics to creativity and opportunity search. Furthermore, recent findings suggest that emotions, motivation, affect, self-confidence and fear can potentially override and “tip the balance towards specific decisions” when the environment is uncertain (Baron, 2008; Brundin & Gustafsson, 2013; Dimov, 2007). Therefore, while the personality paradigm, in theory, maybe under-studied in recent works, it’s essential to cognition, the general entrepreneur behavior and decisions in the uncertain environment must be reemphasized in literature.

In conclusion, given that the entrepreneurial opportunities are always marked in the Knightian uncertainty space, effectual reasoning towards opportunity creation or recognition requires a broad understanding of the entrepreneurial adaptive toolbox. One that strikes a balance between complementing role among characters in the toolbox. When a balanced mechanism of these

behaviors exists, the decision to recognize or create opportunity can be effectuated prudentially (Sarasvathy, 2001). The contribution of this paper has been in this regard. It consolidates different findings germane to the entrepreneurial decision theory under uncertainty and presents some unique comprehensive arguments essential to the research on decision theory in the field. While the arguments presented are intuitive, a more empirical research on these prepositions would enrich the entrepreneurship literature on decision making.

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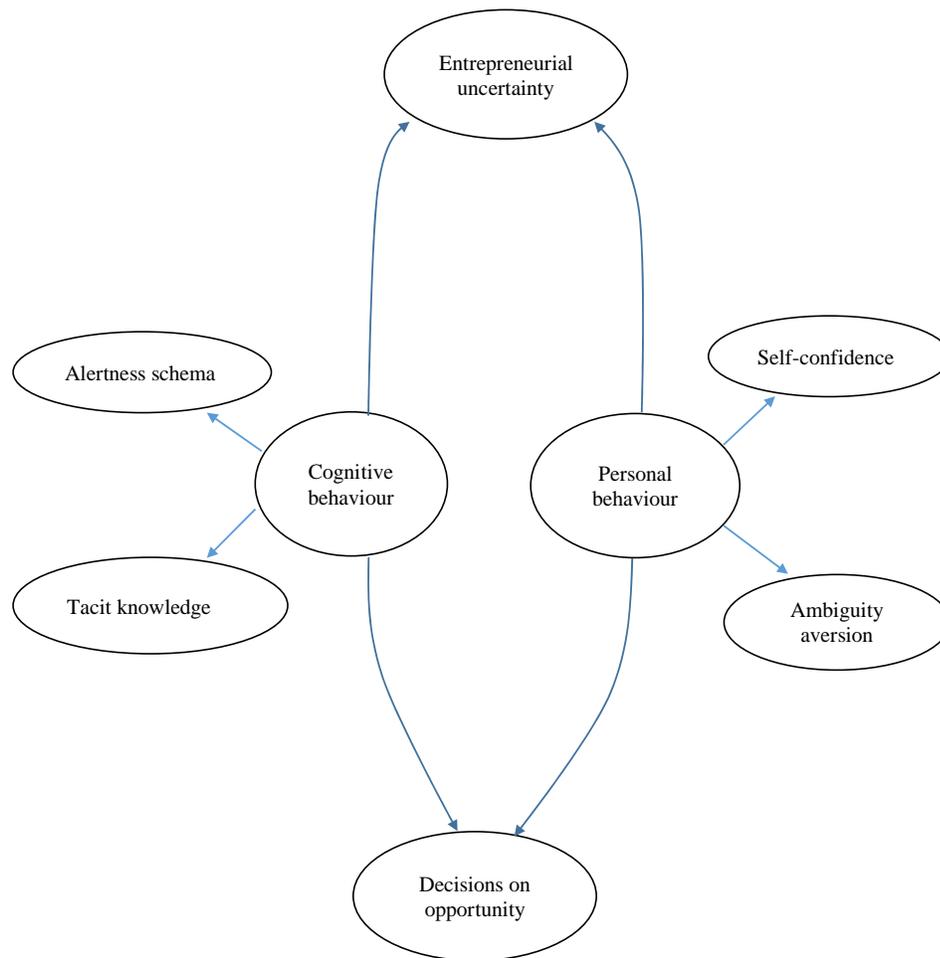


Figure 1. Entrepreneurial decision process under uncertainty

