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The Einstellung effect, mental rigidity and decision-making in startup accelerators

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Abstract

Purpose – This paper aims to investigate the decision-making on new ventures of eight directors or managers of Brazilian accelerators, aiming to understand if the Einstellung effect – mental rigidity – operates during the judgment of new ventures to accelerate.

Design/methodology/approach – Through a quasi-experiment design, the study was conducted with directors or managers of Brazilian accelerators, who were separately interviewed and responded to a psychological test, previously consented, as well as to a simulated decision-making questionnaire.

Findings – The selection process, with the criteria for decision-making, functions as a "template" for the recognition of potentially successful companies and is, indeed, subject to various cognitive biases, among which, the Einstellung effect, characteristic of mental rigidity.

Research limitations/implications – The main contribution of the present study is to identify the cognitive mechanisms, which can negatively affect the evaluation of innovative projects and propose ways that can counteract or mitigate them.

Originality/value – The psychological approach to decision-making, usually studied in chess game context or problem-solving, was applied to a relatively unexplored field that is startups to accelerate. Its originality remains at the interdisciplinary approach, combining knowledge from psychology, decision-making and entrepreneurship.

Keywords Decision-making, Cognitive biases, Startups, Innovative projects, *Einstellung* effect, Mental rigidity

Paper type Research paper

1. Introduction

Experience may blind us from recognizing obvious solutions to problems (Greenberg, Reiner, & Meiran, 2012)

For many years, decision-making was considered a rational process, since it was more comfortable to exclude subjective factors from the analysis.

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> Early economic theorists, like Marshall, were very psychologically minded, but from 1870 on there was a tendency for economists to assume an increasingly simple rational psychology of motivation, partly because they felt safer that way and partly because psychologists were not providing them with any concrete data to work with McClelland (1961, p. 393).

Many years later, important scholars such as Tversky and Kahneman (1974), Ariely (2010), Kahneman (2011), Thaler et al. (1997) and Thaler, Sunstein, & Balz (2013), three of them Nobel laureates, investigated the influence of psychological elements in decision-making and the role of cognitive biases, which defy rational ways of thought. These studies provided the foundations of a new discipline, named Economic Psychology or Behavioral Economics.

During an interview, Thaler (2017) said that this new science "helped us to understand how people make choices in the real world," aiming at psychological realism, that is, a more realistic description of human behavior, beyond models based on rationality and which has prevailed since then.

Based on the knowledge developed by this new discipline, we can state that decision-making processes, especially those regarding the assessment of new ventures, consider if something – an object or situation – meets specific criteria, infer about its potential for success and, eventually, provide grants or financial resources.

Surprisingly, studies on this phenomenon applied to innovative projects are rare. The objective of this paper was to investigate if cognitive biases, especially one that is less known – the *Einstellung* effect – influence the analysis of innovative projects, particularly new ventures that answer to calls for funding from Brazilian accelerators.

Combining knowledge developed by both social psychology and cognitive science – separated from the Gestalt theory – with creativity and innovation management, our research tried to understand the possible negative impact that the *Einstellung* effect, as a mental rigidity, could have on decisions about innovative new ventures, in Brazilian accelerators and venture capital environments. In other words, the study questions if the process of selecting startups for acceleration is subject to mental rigidity, expressed by continuing to use the same criteria, even when inappropriate, as a basis for decision-making.

2. Theoretical framework

> Sometimes an idea can be your worst enemy, especially if it blocks your thinking of alternates (Lupton, 2011, p. 61).

Decision-making requires mental flexibility and, consequently, avoiding the *Einstellung* effect trap (as explained below). When decisions refer specifically to accelerating new ventures, the set of criteria usually works as a template, thus, leading to the mentioned trap.

Moreover, when assessing new ventures, the degree of novelty (Kaufmann, 2004) is usually analyzed as a Gestalt, like Rubin's Goblet, the well-known picture of the vase and faces, with the figures being the innovative project and the ground, the context and potential market.

The Gestalt theory considers perception as the fundamental mental structure and studies and research developed along the 20th century shed light on its operation. According to one of its principles, "people [. . .] focus on specific perceptions and make sense based on [. . .] ¨figural¨ perceptions, which are understood against a dim background" (Liotas, 2014, p. 172).

In an attempt to understand this complex phenomenon through an interdisciplinary lens, some cognitive psychological constructs such as mental models and executive functions, as well as the *Einstellung* effect, comprise the theoretical framework. This kind of approach is unusual – even rare – in entrepreneurship and innovative startups' field of study and, as

such, represents a challenge. At the same time, it can lead to a deeper comprehension of the phenomenon, by integrating psychology and management knowledge.

To understand better the cognitive processes involved in decision-making on new ventures' acceleration, this section presents the most relevant topics of social and cognitive psychology: mental models, cognitive biases, the *Einstellung* effect, degree of novelty and executive functions.

2.1 A Brief review on mental models

During the 19th century, it was common to state: "The laws of thought are nothing else but the laws of logic" (Johnson-Laird, 1983, p. 24), but this reasoning could not explain neither where mental logic came from, nor how we acquired it. Piaget (as cited in Johnson-Laird, 1983, p. 25) was the first to argue, "Children construct logic by internalizing their own actions and by reflecting upon them" [. . .] "The mastery of propositional thinking ultimately grows from the mental operations engendered by this reflective process."

Kenneth Craik (1943) was probably the first psychologist to refer to mental models as an internal representation of the external world, made by individuals as a way of ordering and making sense of it. Followed by many others, as Gardner (2008), this construct became a dynamic representation of the world, the specific manner through which an individual realizes codifies and accesses information from the external world.

According to Johnson-Laird (1983), "human beings construct mental models of the world, [. . .] by using tacit mental processes." Mental models differ from logic and do not believe humanity to be rational: "Perhaps, there is no logic in the mind and, perhaps, humanity is intrinsically irrational" (Johnson-Laird, 1983, p. XI), anticipating, somehow, what Ariely (2010) observed many years later.

Johnson-Laird highlights inference as one of the crucial elements of reasoning, by saying:

> In any science, it is useful to have a number of test cases – phenomena that must be explained by a proposed theory, if it is to count as having any explanatory value.

For cognitive science, inference comprises most of the major theoretical goals of the discipline and the specific topic of mental models.

> Inference can be defined as a process of thought that leads from one set of propositions to another. Typically, it proceeds from several premises to a single conclusion, though sometimes it may be an immediate step from a single premise to a conclusion (Johnson-Laird, 1983, *p* 23).

We commonly apply mental models and especially inference, to decision-making processes, as they involve assumptions expressed, for example, by each criterion of a call for funding. This leads to conclusions such as accepting or investing in a specific start-up for acceleration.

As computer programs, which rely on internal consistency rather than reflecting reality (Johnson-Laird, 1983; Besnard, Greathead, & Baxter, 2004) discuss the accuracy of the mental model¨*s* theory, pointing out that:

> When two consecutive events happen as expected by an operator, such a situation [typically] reinforces the confidence in one's mental model. However, consecutive events can happen as a random co-occurrence, for reasons that actually differ from the ones believed by the operator. Nonetheless, because of the consistency between the environmental data and the operator's expectations, one event can be taken to be the cause of the other. When this false belief happens, the mental model is erroneously assumed to be valid (Besnard et al., 2004, p. 117).

The problems raised by these scholars lead to the core theme of our study, mental rigidity.

> Although there is a positive advantage [from an individual's point of view] in using mental models rather than a mental logic to make inferences,[. . .] a logic will either sanction an inference or not [. . .]. A system of mental models more accurately reflects the uncertainty of inferences that depend on proportions: a conclusion of debatable status is forthcoming since the search for refutations can be guided by general knowledge (Johnson-Laird, 1983, p. 138).

Mental models, thus, refer to the tacit mental processes that allow internal representations of the world. Operating through images and symbols, they help individuals to achieve the feeling of internal consistency (Johnson-Laird, 1983, p. XII). The problem with them begins when they search for this consistency surpasses reality itself.

Ariely (2008, 2010), an important scholar of Behavioral Economy, highlights that human beings are not only irrational but predictably irrational and it is possible to observe this phenomenon in daily decision-making, as well as in decision processes involving billions of dollars. The experiments led by Ariely and also by Tversky and Kahneman (1974), defied the classical economic theory and confirmed that rationality is not the prevalent attribute for decision-making.

Other studies (Carr and Steele, 2009) introduce stress as a relevant factor for cognitive and behavioral rigidity, affecting decision-making under ambiguous and uncertain scenarios, which was one of the elements investigated in the history of research on the *Einstellung* effect.

2.2 A historical perspective on the Einstellung effect research

Any innovative project is, by definition, surrounded by three main elements: uncertainty, ambiguity and risk, which are characteristics of new ventures or innovative entrepreneurship (Shyti and Paraschiv, 2014).

For many years, the risk was considered the critical factor, faced by both entrepreneurs and decision-makers in assessing new ventures. These authors disagree, observing that they are confronted more often with uncertainty and ambiguity (unknown probabilities) than with risk. Through an experiment with entrepreneurs and non-entrepreneurs, exposed to different degrees of ambiguity, uncertainty and risk, the authors investigated these influences on decision-making processes:

> In business contexts, entrepreneurs are seldom in situations where they are able to estimate an objective probability of success (risk) or in situations of the total absence of information (complete ignorance or radical uncertainty). Hence, many entrepreneurial decisions are generally subject to ambiguity or imprecise information about probabilities of success (Shyti and Paraschiv, 2014, p. 23).

Nevertheless, the authors state: "if ambiguity is about imprecise information, the degree of imprecision may bear some relevance in the way it affects behavior" and, for them, "past experience or expertise in a given context may mitigate the effects of ambiguity, reassuring decision-makers about what to expect" (Shyti and Paraschiv, 2014, p. 24).

This statement partially contradicts the studies on the *Einstellung* effect, as there is no consensus about the relationship between experience – expertise – and cognitive biases; that is, expertise may not be sufficient to mitigate the effect of ambiguity, but, on the contrary, can facilitate it. We further discuss the influence of experience and the impact of expertise on decision-making and explain the *Einstellung* effect, for a better understanding of the phenomenon.

Gestalt psychologists of the late 19th century were pioneers in researching rigidity such as Abraham S. Luchins (1914–2005), who is well known for his research on the role of a mental set (*Einstellung* effect) for solving the water-jar problem. His first idea was to find out

to what extent the successful use of a problem-solving strategy has a negative effect when that strategy cannot solve a new task.

The test developed by Luchins (1942) consists essentially of a series of simple arithmetic problems expressed in terms of three water jars, each with a known maximum capacity. Individuals are required to manipulate the jars to achieve a given amount in one of them (Levitt and Zuckerman, 1959).

Following Luchins, these authors understood the water-jar *Einstellung* test as a measure of rigidity, defined by them as "the inability to change one's set when the objective conditions demand it." The test scores were applied, for instance, to measure political attitude and influenced the scales further developed. Up to now, the water-jar test is considered a valid and reliable instrument for evaluating the presence of the *Einstellung* effect[1].

The *Einstellung* effect describes rigid thought patterns consolidated by experience, which prevent identifying more adaptive approaches and solutions. In this task, participants are required to use three hypothetical jars to attain a specific amount of water. Initial problems are solvable by the same complex formula, but for later "critical" problems, a much simpler formula is also appropriate. In these attempts, the experience is a "trap" that may result in overlooking the simple formula. A rigidity score is compiled, reflecting the degree of persistent use of the complex formula (Greenberg et al., 2012, p. 2). Luchins treated the water-jar task as an experiment and, to prove his hypothesis, took a control group that received only the last problem, easily solved. He observed that difficulties and mistakes in the experimental group were due to the similarity of the last problem to the previous ones, thus concluding that former experience may induce thought inflexibility. As Greenberg et al. (2012) state: "Experience may blind us from recognizing obvious solutions to problems."

Karl Duncker (as cited in Grammenos, 2014, p. 58) confirms the importance of previous knowledge and adds the concept of "functional fixedness," as a mental bias that limits a person to using a known object in new ways.

Additionally, an interesting finding in decision-making research is the "less-is-more effect" (Norton, Frost, & Ariely, 2007). Under specific conditions, individuals with less knowledge make more accurate inferences than those with more knowledge. However, for a better understanding of the *Einstellung* effect as a cognitive mechanism, it is important to follow Kaufmann's (2004) analysis about the degree of novelty, both the one regarding the problem and that related to the solution.

2.3 Degree of novelty

Kaufmann (2004, p. 154) proposes a "clear-cut distinction between novelty on the stimulus and novelty on the response side" and adds: "This distinction is used as a platform for the development of a new taxonomy of different kinds of creativity and intelligent behavior."

The taxonomy includes four categories, shown in Table 1. The first quadrant – familiar task combined with a known solution – regards most typical routine problems such as "using a known formula to solve a familiar equation in mathematics." The second type – familiar task and new solution – refers to turning a familiar situation into an unfamiliar one, that is: "a paradox between theory and practice" (Kaufmann, 2004, p. 160). The psychological theory of problem-solving traditionally has been and still is, dominated by a paradigm of reactive responding and, in this second type, it simply involves an improvement over the status quo, the proactive creativity. He exemplifies with the present TV technology with its fixed-sized monitor, compared, for instance, with a potential flexible-sized one.

Regarding the third type, when a new task demands a known solution, Kaufmann classifies it as intelligent adaptation. "Intelligence refers to the activity of using previous experience in new task situations" (Kaufmann, 2004, p. 159). Tasks of rule induction and rule deduction are the most representative of the intelligence function.

The fourth type regards a new task and a new solution, through innovative creativity, which is the most important for the study of the *Einstellung* effect (Luchins, 1942). Under controlled laboratory situations, individuals first solve a series of problems according to a specific formula. Next, they receive a slightly deviating task that can be solved according to the old formula but is more easily solved through a new one. A large number of participants in these experiments continue to use the old complicated formula, rather than the new and more convenient one. In the following stage of the process, a new problem is presented, that cannot be solved according to the standard formula, but is easily done through a new and simple one. Results show that a surprisingly large number of people are not able to solve this simple problem because of the mental changes required for reaching the solution.

This kind of scenario strongly resembles what is called the "success trap" in organizational learning and problem-solving, when organizations over-rely on their experience and are, thus, unable to adjust to new demands and challenges. As an example, we can imagine a manager who had great success in a company and then moved to a radically new, virtual organizational style. The old form of leadership would have to be significantly reshaped for this new environment (Kaufmann, 2004, p. 160).

Kaufmann¨*s* taxonomy is helpful to understand the *Einstellung* effect in innovation environments because new task-solution scenarios are the most common and "experience may blind [one] from recognizing obvious solutions to problems" (Greenberg et al., 2012, p. 1). According to these authors, research shows that physicians and health-care professionals are likely to overlook the correct diagnosis in cases that do not match their experience. Similar findings were reported concerning difficulties in reframing clinical situations experienced by health-care professionals and difficulties of managers and decision-makers to replace existing procedures with new, improved and simpler ones. This "blinding" to new solutions is a form of cognitive rigidity, which has often been defined as a resistance to change beliefs, attitudes or personal habits or the tendency to develop and insist on using mental or behavioral sets.

Before finishing the theoretical framework, it is important to highlight contemporary studies (Baggetta and Alexander, 2016; Blair, 2016; Friedman and Miyake, 2017; Mallorquí-Bagué et al., 2018), which understand mental flexibility – the opposite of mental rigidity, revealed by the Einstellung effect – as crucial for decision-making and one of the executive functions.

2.4 Executive functions

Executive function is defined as the ability to plan and coordinate a deliberate action among alternates, monitor and update the action as necessary and suppress distracting material by

Familiar task	Familiar task
Known solution	New solution
Routine	Proactive creativity
New task	New task
Familiar solution	New solution
Intelligence	Innovative creativity

Source: Kaufmann (2004)

Table 1.
The degree of novelty

focusing attention on the task at hand (Seabra et al., 2014). Scholars usually include flexibility, inhibitory control and operational memory as components of those functions and acknowledge them as crucial for decision-making. Blair (2016) understands it as:

> [. . .] the ability to hold information in working memory, to inhibit fast and unthinking responses to stimulation and to flexibly shift the focus of one's mental frame; it is more or less the foundation for the intentional, volitional self-directed control of behavior.

To suppress distracting materials is equivalent to resist the first idea that comes to mind or being capable to inhibit it; therefore, it is similar to the *Einstellung* effect. Operational memory is necessary to keep the focused information in mind throughout the process of solving a problem or making a decision. In turn, mental flexibility is the ability to change the focus of attention or the perspective or even the priorities or rules, therefore being able to adapt to external and changing demands.

A fluid intelligence, in contrast with a crystalized one, will be more satisfactory to evaluate innovative projects, due to volatility, uncertainty, complexity and ambiguity[2], which are inherent to contemporary business environments.

Cognitive flexibility involves the ability to change the direction of cognitive processing, through thoughts or behaviors, according to environmental demands. However, for changing behavior it is necessary to inhibit the previous one and store the new one in the operational memory. This process is the opposite of what happens when the *Einstellung* effect is present.

In short, executive functions refer to an individual's ability to engage in self-oriented behaviors toward objectives, to volunteer for and perform independent actions directed to specific goals, as in the case of a decision-making process (Seabra et al., 2014).

The complex kind of behavior known as "executive functions" includes attention, concentration, the selectivity of incentives, abstraction, planning, flexibility, mental control, self-control and operational memory, etc.

The Wisconsin Card Sorting Test – WCST – is one of the alternates for investigating executive functions and was our choice for the research. It allows assessing flexibility of thought when an individual faces changing conditions of stimulation.

2.5 Summarizing the theoretical framework: mental rigidity and cognitive biases in innovation environments

The *Einstellung* effect and other cognitive biases have been studied in different contexts such as chess games, political attitudes and others. However, we did not find any studies in innovation environments that associated those phenomena with decision-making regarding innovative ideas or new ventures.

In a previous investigation about rejected ideas (Barlach and Plonski, 2018), data on innovation history showed that important ideas and products such as aspirin or post-it (Van Gijs, 2016) were initially rejected as unnecessary, unfeasible or undesirable, but afterward achieved great success and acceptance.

One of the main assumptions of our study is that cognitive biases and the *Einstellung* effect, as mental rigidity, may lead to two kinds of evaluation errors, as mentioned above.

"Individuals may be rigidly 'blind' to adaptive solutions or alternate courses of action due to previous experience" (Greenberg et al., 2012, p. 6). The *Einstellung* water-jar task tells us about missing obvious adaptive solutions that lie right "under the nose" because people are caught up in learned and repetitive thought patterns (p. 2). In assessing startups for acceleration, one mistake is to reject a potentially successful one – type 1 error -, while

accepting another startup, by believing in its potential success and being blind to factors that may lead it to failure – type 2 error.

Regarding the well-known vase and faces picture, Rubin's Goblet[3], the author says:

> We cannot see the two (the faces and the vase) at the same time; we have to make a decision. This provides information about how people make sense, always based on something they perceive and something that they are not aware of (the concept of figure and ground) (Liotas, 2014, p. 172).

This concept is fully applied to the evaluation of innovative projects, as well as new ventures and is probably associated with the two types of errors mentioned before.

Another assumption is that innovative ventures stand on creative, unorthodox ideas, therefore being more subject to wrong judgments. However, unorthodox ideas are, sometimes, the focus of the evaluation, especially within innovative environments.

Back in 1959, Levitt and Zuckerman showed that "rigidity is a function of the situation, rather than of personality" (p. 362) and tested the *Einstellung* effect under stress conditions. "When the [subject] is placed in stress, the frequency of dominant responses [. . .] increases" (p. 363). For him, this test¨*s* singular attribute is that one of the two competing responses is dominant, but the weaker response is the "correct one" (p. 363).

As stress and time pressure are more and more present in business environments, this issue brings empirical evidence about its impact on decision-making (Jeffrey, Lévesque, & Maxwell, 2016; Miletić and van Maanen, 2019).

3. Method: sample, data collection and analysis

We conducted a quasi-experiment to measure the impact of mental rigidity on decision-making, especially expressed by the *Einstellung* effect. This technique differs from a classical experiment in two aspects:

(1) lack of control; and

(2) non-randomization of the sample.

Experimental and quasi-experimental research designs examine whether there is a causal relationship between independent and dependent variables. In other words, the independent variable should cause some variation in the dependent variable. "The main feature that distinguishes non-experiments from true experiments is the lack of random assignment" (Rogers and Révész, 2020). Our studý*s* design approached the topic through three steps, described below.

Although the water-jar test developed by Luchins is the main instrument to measure mental rigidity, there are other tests for collecting data on cognitive flexibility versus rigidity. We can measure behavioral and cognitive rigidity by the Wisconsin Card Sorting Task, which we chose for its large popularity, applying it to executive functions. In this study, we addressed top management individuals, together with images of the *Ebbinghaus* illusion and the cognitive reflection test (CRT). We describe and comment on each step in detail.

Step 1: Individuals answered questions regarding their roles as decision-makers and on decision-making processes in each specific accelerator. After that, we used CRT and the *Ebbinghaus* illusion[4] as warming up activities, before they responded to the main instrument – Wisconsin Card Sorting Task.

In the *Ebbinghaus* illusion test, two circles of identical size are placed near each other; one is surrounded by large circles, while the other is surrounded by small circles. Because of the circles' overlap, the central circle surrounded by large circles appears smaller than the one surrounded by small circles. Regardless of the relative sizes, if the surrounding circles

are closer to the central circle, the central circle appears larger and if the surrounding circles are far away, the central circle appears smaller.

For Grammenos (2014), this is an example of the *Einstellung* effect, which shows that after solving several problems with the same solution, individuals would mechanically adopt it, even for problems that had a simpler solution or a different one.

The cognitive reflection test (CRT), in turn, measures a person's tendency to override an incorrect instinctive response and engage in further reflection to find a correct answer (Toplak, West, & Stanovich, 2011). Thus, it was a warming-up exercise for the quasi-experiment. The original test by Frederick (2005) is a predictor of performance in heuristics and biases tasks and contains the three following questions:

Q1. bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost? _____ cents

Q2. If it takes five machines 5 min to make five widgets, how long would it take 100 machines to make 100 widgets? _____ minutes

Q3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? _____ days.

Step 2: Following CRT, we asked individuals to take up the Wisconsin Card Sorting Task (WCST), which checks the ability to show flexibility in face of changing conditions or situations. All of them agreed verbally to take the test. We presented a number of stimulus cards to the participants. They should match the cards, but were not told how to match them; however, they were told if a particular match was right or wrong. We used an electronic version of WCST, which took around 12–20 min to carry out; it automatically generates the categories achieved such as attempts, errors and persistent mistakes. An example of the test display is available on the Psytoolkit webpage[5].

In short, in the WCST, people have to classify cards according to four different criteria and the only feedback is whether the classification is correct or not. One can classify cards according to the color of their symbols, their shape or the number of shapes on each card. The classification rule changes every 10 cards (which participants don¨*t* know) and this implies that once the individual has figured out the rule, he/she will start making one or more mistakes as the rule changes. The task measures how well people can adapt to changing rules, which is another way of describing mental flexibility, one of the most important executive functions (Nyhus and Barcelo, 2009).

Step 3: After WCST, the final task was simulated decision-making, where individuals had to assume the role of an entrepreneur who submits a project for acceleration. The questions were similar to those of Shyti and Paraschiv (2014), with 14 hypothetical scenarios including elements of ambiguity, risk and uncertainty. In each scenario, participants faced a situation where they had to choose between a future entrepreneurial project – expected to yield a profit of US$500,000 in case of success or zero, otherwise - and an annual salary, in thousands of US$, as a paid employee, for which they would give up the entrepreneurial project. From one question to another, the chances of success of the entrepreneurial project changed but keeping constant the expected outcome of US$500,000.

3.1 Sample and data collection

Before the study, we conducted a pilot interview with two directors of major Brazilian accelerators, located in the city of São Paulo. We made one open question to both, regarding the major mistake they had done in deciding on startup acceleration. Data collected in these

interviews disclosed many important aspects of decision-making in that context and contributed to the final research design.

In the study, participants were eight directors or managers, of Brazilian accelerators or venture capital companies, located in São Paulo, which is the country's main economic, financial and cultural center. In 2016, Brazil had approximately 62 accelerators, 26 of them located in the state of São Paulo (Flor et al., 2018). Among these, 10 were located in the city of São Paulo[6]. We could only contact eight of them; therefore, the prevailing criterion was accessibility.

This relatively new player in the innovation environment was chosen due to its recent growth, both globally speaking and, locally, in Brazil and due to the financial impact of decision-making, especially those resultant of type 1 error (approving a new venture to be accelerated and regretting having done it), pointed up in pilot interviews as the most frequent one.

We collected data between February 6 and April 15, 2019. They were face-to-face interviews, as the Wisconsin Test was installed on the researcher's laptop. The analysis consisted of interpretative phenomenological analysis (IPA), with an idiographic focus, aiming to offer insights into how accelerators¨ managers and directors, in their decision-making context, make sense of that phenomenon. It combined psychological, interpretative and idiographic components (Breakwell et al., 2006). After interpretation, we established the categories described in the next chapter.

4. Findings[7]

Seven out of eight individuals were female. Ages varied from 27 to 68 and 33% have participated in decision-making regarding new ventures for more than five years.

Most of them had no personal entrepreneurial experience[8]. Only one had opened up a startup but did not succeed, according to his own words.

Error type 1 (approving a new venture for acceleration and later regretting it) was often mentioned as the most common. Individuals related that after a company starts the acceleration process, disputes among partners were frequent and the team was not fully integrated; this was the cause of their subsequent failure, difficult to anticipate.

Table 2 shows the results of the Wisconsin Card Sort Test. The individuals' performance, regarding error count, varied between 6 and 18, with persistent error count ranging from 3 to 12 and non-persistent from 1 to 6.

Persistent error, that is, continuing to use the same rule even when it cannot solve the problem, was also frequent, especially in individuals 4, 5 and 6.

Table 3 shows the experience in decision-making, in a number of years and a number of persistent errors.

Individual	Error count	Persistent error count	Non- persistent error count
1	8	3	5
2	6	3	3
3	6	5	1
4	18	12	6
5	16	11	5
6	14	10	4
7	10	5	5
8	9	7	2

Table 2.
Answers to WCTS

After answering the Wisconsin test, participants passed through simulated decision-making. As in Shyti & Paraschiv's study (2014), respondents faced a situation where they had to choose between a future entrepreneurial project and an annual salary, as a paid employee, for which they would give up the entrepreneurial project. This setup allowed estimating risk and ambiguity attitudes and had the advantage of providing all respondents with the same decision parameters. Table 4 shows the results (in U$1,000).

We excluded the answers from participants 3 and 4, as they were non-numerical, expressing that they "would not give the project up if they were, indeed, entrepreneurs" or making other considerations. Saying that "they would never give up the entrepreneurial path", for any money, sounded unreal, thus, inappropriate from a director (or manager) in charge of selecting innovative projects for acceleration.

Considering the 14 hypothetical scenarios, we observe a general tendency to use mathematical formula, multiplying or dividing the percentage of risk by the expected outcome of US$500.000. In general, their attitudes toward risk, ambiguity and uncertainty were almost the same, varying with the percentage of each factor in the equation. It is important to notice that applying the same formula to different problems reveals, with no doubt, the *Einstellung* effect operating as a mental rigidity bias during a decision-making process.

5. Discussion and implications

Although limited to a small number of participants, all of them in a single city (São Paulo), we can say that mental rigidity is present during selection processes of startup acceleration, as indicated by the number of persistent mistakes. It is also important to mention the limitations related to the quasi-experimental methodology, with a non-randomized sample.

Table 3.
Comparison between the number of years making decisions on innovative projects and persistent errors at WCST

Individual	Experience in decision-making on innovative projects (no. of years)	Persistent errors	
		Total	(%)
1	4	3	4
2	2	3	4
3	5	5	8
4	1.5	12	20
5	5	11	18
6	9	10	17
7	30	5	8
8	16	7	12

Table 4.
Simulated decision-making (original results of the study) (US$1,000)

Participant	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	250	25	100	250	400	500	50	100	75	250	250	400	400	500
2	1.000	500	700	800	900	1.000	500	700	700	800	800	1.000	1.000	1.000
3 **	**	**	**	**	**	**	**	**	**	**	**	**	**	**
4 ***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
5	300	100	180	300	400	450	120	180	150	200	250	350	350	400
6	600	200	300	400	500	600	200	300	300	400	400	500	350	400
7	250	100	150	250	400	400	100	200	200	250	250	400	400	400
8	200	120	120	200	400	500	120	120	120	250	230	400	450	500

We discuss four main topics and their implications. Why type 1 error was the most common; lack of entrepreneurship experience among decision-makers; monetary values that they would be accepted in exchange for giving up the entrepreneurial project and if mental rigidity, measured by the Wisconsin Test, could be possibly present during the assessment of new ventures for acceleration.

As mentioned before, most of the participants chose type 1 error (approving a new venture for acceleration and regretting it later) as the most frequent. They approved companies with frequent disputes among partners, pointing up that this was the cause of their subsequent failure. One of them observed that to avoid this mistake, the company had hired the services of a psychologist, to work with team integration.

Another important issue for discussion is that most of them had no experience or just a little, as entrepreneurs. Thus, "taking the other¨*s* place," that is, putting himself/herself in the place of an entrepreneur whose project is being assessed and deciding for what annual salary to give it up, was, indeed, a difficult exercise to do. They face this same difficulty in their everyday life.

When in Shyti & Paraschiv¨*s* study (2014), which was the basis for the present research, the authors compared entrepreneurs (business owner = yes) and non-entrepreneurs (business owner = no), they considered different wage values and concluded that entrepreneurs would ask for more money to abandon a business prospect. Surprisingly, in Brazil, none of the participants had any entrepreneurship experience, which calls attention to one of the principles of empathy or to the exercise of alterity, which regards experiencing the other¨*s* situation to evaluate it.

The simulated decision-making exercise aimed to analyze attitudes toward risk, ambiguity and uncertainty, but we noticed no important differences among the three kinds of situations. Thus, we assumed that individuals considered them, cognitively, as equivalent and decided based on a formula applied to all situations.

However, in business contexts, entrepreneurs seldom find themselves in a situation where they can estimate an objective probability of success (risk) or in situations of the total absence of information (complete ignorance or radical uncertainty). Hence, many entrepreneurial decisions are generally subject to ambiguity or imprecise information about success probabilities (Shyti and Paraschiv, 2014, p. 23). Decision-makers face these same conditions, that is, they are evaluating projects surrounded by uncertainty, ambiguity and risk. Thus, cognitive biases, as the *Einstellung* effect, identified in the present study should sound as an alert for decision-makers in the innovation context.

The amount of persistent error, during the Wisconsin Card Sort Test, indicates that mental rigidity is present, but it does not seem to be related to previous experience in decision-making. As shown in Table 3, individuals with less experience and some more experienced, had similar results.

Participants 3 and 4, who gave non-numerical answers to the decision-making simulation, are more likely to present mental rigidity because their answers show no flexibility in adapting to hypothetical scenarios, sustaining a fixed point-of-view, which can have a great impact on real decisions.

To balance the *Einstellung* effect, it is important to find examples that contradict onés judgment. Super-experts, who have evaluated many projects over the years, are more likely to find them, but beginners need the courage to overcome the first idea that comes to their mind, regarding decision-making. Like in CRT and Ebbinghaus illusion test, one would have to override an incorrect instinctive response and engage in further reflection to find a correct answer. This also could explain why type 1 error is more frequent.

The search for counter-examples can help to avoid availability heuristics, in the words of Tversky and Kahneman (1974, p. 1127):

> One may evaluate the probability that a given business venture will fail by imagining various difficulties it could encounter. However, [this given business venture may be] affected by factors other than frequency and probability.

As another possibility to offset or mitigate the effects of cognitive biases on decision-making, we could try to contradict theory; that is, instead of trying to find which features of each new business venture match the idea of a successful company, we would look into the characteristics that could lead to a non-successful outcome.

Finally, in contemporary scenarios, biases are, indeed, more frequent, due to time pressure on decision-making. The number of projects submitted to calls for funding is drastically increasing, but the deadlines for each decision-making process are not. More and more, new ventures search for support to get safely into the market and both accelerators and venture capitalists, trying to provide proper environments for startups to grow, have to evaluate more projects in a given time. The result is time pressure on decision-making, which can lead to biases and errors and increase mental rigidity.

6. Conclusions and recommendations for future studies

Although the question addressed in the paper – if the process of selecting startups for acceleration is subject to persistent errors – cannot be answered with a simple "yes-no" form, the present study shed light on this sensitive aspect of decision-making and the potential consequences of mental rigidity in it. Even subject to the limitations mentioned above, data collected allow to state that mental rigidity is present during the process of decision-making regarding startup acceleration.

As mentioned at the beginning, there is a lack of studies on cognitive biases and the *Einstellung* effect, a symbol of mental rigidity, which innovative projects. Thus, expanding the research to other environments, where decisions on new business ventures and innovative projects take place, will lead to a further understanding of the potential negative impact that the *Einstellung* effect, as a mental rigidity, could have in innovative environments, not only in Brazil.

Moreover, when decision-making regards innovative projects or new ventures, the Gestalt theory is helpful to provide information on how people make sense of something, based on what they perceive as relevant and what they are not aware of, as in the concept of figure and ground. We recommend a creative and experimental attitude toward the emerging process, as an antidote to cognitive biases; this is achieved through constant training of "a second thought" about any object, subject or situation. The Gestalt approach to human psychology discusses awareness as not only thinking, over-analyzing, reflecting or self-monitoring. "A person who is aware knows what he or she does, how he or she does and that he/she has alternates" (Liotas, 2014, p. 172).

As in Johnson-Laird¨*s* words "An inference is valid IF AND ONLY IF, there is no interpretation of the premise that falsifies the conclusion" (1983, p. 130). "But human reasoners often fail to be rational. They lack the guidelines for systematic searches for counter-examples; they lack secure principles for deriving conclusions; they lack a logic" (p. 133).

For future studies, it would be interesting to carry out an experiment simulating decision-making, in a way that would reveal more clearly persistent errors, in a context closer to a "real" one, so that it could demonstrate mental rigidity in operation and the impact of this psychological mechanism, leading to error number 1 or number 2.

It would also be stimulating to compare decision-making in two groups, one composed by directors with previous entrepreneurial experience and the other with no experience at all, to elucidate the influence of this factor on mental rigidity, expressed by the *Einstellung* effect.

Notes

1. *Einstellung* is the development of a mechanized state of mind. Illustration of a computer display on a critical attempt (English version) is available at Greenberg, Reiner, & Meiran (2012). Following instructions to apply the shortest and simplest solution, participants score the desired number of jugs of each type in the dialog box at the bottom and switch between the "add" and "subtract" options to reach the target amount specified on the right of each displayed figure.
2. VUCA: volatile, uncertain, complex and ambiguous. Based on the leadership theory, by Warren Bennis and Burt Nanus.
3. See Liotas (2014, p. 173). Image available at https://en.wikipedia.org/wiki/Rubin_vase
4. Based on Gestalt theory, the *Ebbinghaus* illusion deals with optical illusion of relative size perception (for example, www.sciencedirect.com/science/article/abs/pii/S0001691817304626).
5. www.psytoolkit.org/experiment-library/wcst.html
6. According to the Brazilian Association of Startups, this is the number of accelerators located in the city. Note that the State and the city have the same name, but the State has 645 cities and São Paulo city is the capital and financial center.
7. We did not consider the answers to CRT and Ebbinghaus illusion test as results, as they were warming-up exercises, but they are consistent with the main findings of the study. That is, in CRT, individuals had difficulties in overriding an incorrect instinctive response and the same happened with Ebbinghaus illusion, confirming, in a way, the WCST results.
8. The importance of this dice is that the simulated decision-making (step 3 of the research) proposed a change of roles between the decision-maker and the entrepreneur and its assumption is the ability of "putting himself on another onés shoes" or to exercise alterity. WE presume that otherness is important for deciding about accelerating – or not – other¨s new venture.

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