RISK MANAGEMENT IN THE EVALUATION OF INVESTMENT PROJECTS IN STARTUP

Weniston Ricardo Andrade Abreu
weniston@gmail.com
Fluminense Federal University - UFF, Niterói, Rio de Janeiro, Brazil.

Luis Perez Zotes
lpzotes@gmail.com
Fluminense Federal University - UFF, Niterói, Rio de Janeiro, Brazil.

Karolina Matias Ferreira
karolinamatias@gmail.com
Fluminense Federal University - UFF, Niterói, Rio de Janeiro, Brazil.

ABSTRACT

The purpose of this article is to identify if the use of risk management by Brazilian startup entrepreneurs minimizes the level of investor uncertainty in the evaluation of these projects/ventures. In order to meet this objective, the methodology of the study consisted primarily of reviewing the literature on the topics of startup and risk management, in order to obtain a theoretical framework for the study. In addition, field research was applied with two groups: a) representatives of supporting institutions, accelerators and investors; b) startup entrepreneurs. The field survey, with an intentional sample, had the objective of knowing the perception of the interviewees about seven categories of risks inherent to projects of this nature, as well as if the management practices adopted by startup entrepreneurs contributed to the reduction of these uncertainties. The results indicated: a) a low level of knowledge about the topic of risk management; b) a slight similarity between groups in relation to the degree of importance of each category of risk; c) the three risk categories whose management practices indicated a lower incidence of use by entrepreneurs.

Keywords: startup; risk management; business model; innovation.

1. INTRODUCTION

The modern era has forced organizations to increasingly renew themselves, seeking to understand the behavior and needs of consumers of their products and services. Anticipating competitors and innovating is essential in the current business environment, where consumers will gain those organizations that deliver value to their customers in a more agile, intelligent, sustainable, and cost-effective way.

In this context, the so-called startup organizations, generally technologically based microenterprises with great potential for growth and business expansion, gain importance in the economic scenario in several countries because they have the conditions to generate and incorporate innovations that meet the aspirations of modern society.

In Brazil, at the initiative of the Ministry of Science, Technology and Innovation (MCTI - Ministério da Ciência, Tecnologia e Inovação, in Portuguese), startups are being stimulated and supported through public policies, such as the Startup Brazil Program, which aims to leverage technology-based startup acceleration by placing new innovative products and services in the local and international market and connecting these companies with global trends and markets. Through a partnership between government and private initiative, the program aims to contribute to the generation of an ecosystem favorable to technology-based entrepreneurship (Start-Up Brasil, 2018).

Every enterprise or project, whether large, medium or small, carries with it a component of uncertainty. In innovation projects, these uncertainties take on even greater proportions, due to the lack of parameters and history about the performance of the product or service. In this sense, the research problem of this study arises: to what extent does the use of risk management by Brazilian startup entrepreneurs minimize the level of uncertainty of investors and supporters in the evaluation of these projects/ventures?

The Project Management Body of Knowledge (PMBOK) (PMI, 2013) places risk management as one of the main areas of knowledge in project management. It includes six processes: a) risk management planning; b) risk identification; c) quantitative risk analysis; d) qualitative risk analysis; e) risk response planning; f) risk monitoring and control.

This study will address the theoretical framework on startup themes and risk management through a bibliographical research and, based on a field survey with

intentional sample, the perceptions of two distinct but active groups will be collected under the same theme, regarding the use of risk management to reduce uncertainties in startup projects/ventures.

Because it is an intentional sample, the research has limitations regarding its generality, however, without reducing its relevance as an exploratory tool for generating knowledge about the subject under analysis.

This article is divided in five sections, composed by Introduction, Methodology, Theoretical Referential, Field Research Results and Final Considerations.

2. METHODOLOGY

The methodological procedure for the production of the research was carried out in two stages: the first consisted of a literature review on the topics startup and risk management, in order to construct the theoretical reference of the study. The second step consisted in the application of an electronic questionnaire with an intentional sample of two groups, namely: Group A: supporting institutions, investors, and accelerators, preferably those participants of the MCTI Startup Brazil Program; Group B: Startup entrepreneurs participating in Demonstrators status at the DEMO BRASIL 2014 event, Rio de Janeiro, held on June 05 and 06, 2014.

Before the application, the research questionnaires were validated with members of the sample, in order to gather opinions about the understanding of the instrument and contributions for its improvement.

Companies are subject to the most diverse types of risk. For the purposes of this research, seven risk categories were defined as follows:

- Market risk (RME) - uncertainties as to the acceptability of the product/service by the market;

- Regulatory risk (RRE) - uncertainties as to aspects of the legal environment in which the company, its product or service are subject to laws, norms and regulations that may positively or negatively affect the business;

- Economic and financial risk (REF) - uncertainties related to the company's ability to generate revenues to cover its costs and provide a return on investment;

- Human capital risk (RCH) - uncertainties as to the technical and managerial ability of the project/

venture team to supply the necessary skills to conduct the business;

• Technological risk (RTE) - uncertainties as to the degree of innovation, the domain of technology and the secrecy/protection of intellectual capital;

• Environmental risk (RAM) - uncertainties regarding the environmental impact of the product/service;

• Social risk (RSO) - uncertainties in terms of the social impact of the product/service.

The interview questionnaire for Group A was divided into three blocks. The first is intended to collect data on the profile of the interviewee and the organization they represent; the second group sought to identify the level of knowledge of the interviewee on the subjects addressed in the research; and the third objective was to gather data on the interviewee's judgment regarding the importance of the categories of risk presented in a startup, the techniques used in the evaluation of the projects/ventures, the relevance of considering the risk management in the structuring and management of the startup and to what extent the risk management can ease the degree of uncertainty for the interviewees.

The questionnaire for Group B was also divided into blocks. The first aims to identify the profile of the startup and of the interviewees; the second to identify the level of knowledge of the interviewees on the subjects addressed in the research; and the third block sought to collect data on the judgment of respondents as to the importance of the categories of risk presented within a startup, the relevance of considering risk management in the structuring and management of startup and to what extent risk management can soften the degree of uncertainty for supporters and investors. Finally, the last block aimed to collect data on the degree of agreement in the application of a set of 40 management practices, related to the seven risk categories defined in the research. For each management practice, the entrepreneur should classify the adoption of the respective practice on a Likert scale of agreement, in which 1 is for "strongly disagree" and 5 for "fully agree". Data analysis was undertaken to indicate practices with lower levels of adoption and, consequently, their associated risk categories.

The questionnaires have a set of common questions, in order to provide a comparative analysis of responses and perceptions between groups.

The questionnaire was initially applied to Group A from June 16 to 20, 2014. For Group B the questionnaire

was applied between June 20 and 25, 2014. The analysis of the results will be presented in the fourth section of this article.

3. THEORETICAL REFERENCE

3.1 Conceptualization of startup and business model

The literature presents several concepts about startup; however, they all converge to some common elements, which leads to a generic conceptualization from which startup can be defined as a business model aimed at the development or creation of a technology-based product or service. Ries (2011) characterizes startup as a "human institution designed to create a new product or service under conditions of extreme uncertainty".

FINEP (2013) defines a new technology based company [startup], as:

> "[...]a company whose corporate and business strategy is underpinned by innovation and whose technical production base is subject to frequent changes arising from competition focused on continued research and technological development efforts".

Rocha (2008) *apud* Minatogawa (2013) argues that most new innovation-based businesses do not realize their great value-generating potential. In this sense, predicting and reducing uncertainties becomes an imperative to increase the chances of success of these enterprises.

A business model is similar to a representation of an abstract model that reflects the logic of a company's business in earning revenue and its relationships between the elements that make it up (Osterwalder, 2004).

Within the concept created by Kaplan *et* Norton (1992), Osterwalder *et* Pigneur (2003) created a business model that is divided into product innovation, infrastructure management, customer relationship, and financial aspects. As far as product innovation is concerned, the company excels in launching an innovative product at a lower cost than its competitors or with a high level of quality offer. With this, one must seek to meet the needs of a particular public, through a value proposition that serves a segment of customers, also considering the importance of defining the potential and skills that the company must have to meet its objectives.

In the case of infrastructure management, according to Osterwalder *et* Pigneur (2003), it is identified as acti-

vities that can configure value not only those necessary to create and deliver value, but also intermediate activities. The customer relationship function is related to creating an approach with these customers to identify their needs, aiming to provide products and services that meet the demands and generate a certain loyalty, which can be understood as a result of consumer satisfaction and trust. We must also look at the financial aspects that are compounded by the revenue model and cost structure. The costs added to the aggregated value determines the price, which then can turn into revenue.

Timmers (1998), in his definition, proposes what can be understood as an architecture of flows, services, and information. Following this line, but more succinctly, Mahadevan (2000) defines as a business model the aggregation of organizational flows related to value, revenue and logistics. Osterwalder *et* Pigneur (2003) also adopt, in a similar way to Timmers (1998), the idea of architecture, defining business model as the architecture of a company and its network of partners to create, generate market, deliver value and capital related to one or more customer segments in order to generate sustainable profit and revenue.

Chesbrough *et* Rosembloom (2002) *apud* Minatogawa *et* Batocchio (2012) highlight the business model as an important tool in technology transfer. The creation of a technology presents no value without a goal. The technology developed can be of no value without the elaboration of an appropriate business model.

Startups are therefore understood as business models in an "immature" form, seeking to launch themselves on the market with an innovative purpose that has significant value and often stimulating the appreciation of a good based on the usefulness and relative limitation of wealth. It is considered a risk business due to its unpredictability related to market acceptance, the impact generated by its products or services, operational management, among other factors that create uncertainties and instability for investors.

A startup has product development among its core business processes. In a study on risk management in new product development processes, Dewi *et al*. (2015) argue that companies are not very aware of their risks and how to mitigate them. The authors also point out that some of the challenges that companies face are related to uncertainties regarding market demand, short product life cycles and rapid changes in consumer needs.

Success in new product development projects, in many cases, is very low. The failure rate before the project ends can reach 80%. This can be caused by some risks that oc-

cur at different stages of the new product development process. In these circumstances, it is recommended that risk management addresses these issues (Monsef, 2012).

Risk management in new product development processes is generally focused on identifying risks at the design or planning stage of the project, and less on risk mitigation processes (Susterova *et al*., 2012).

3.2 Risk management

Risks can be defined as uncertainties that can create opportunities or threats to the business. The process of developing a new product has two types of risks, so-called internal risks (operational, technological and organizational) and external risks, for example, market risk and logistical risk (Park, 2010)

For Zhang (2011), however, risk is understood in different ways by different researchers and, for this reason, there is still no consensus on its concept.

In the introductory paragraph of ISO 31000: 2009, risk is presented as the consequence of the establishment and pursuit of objectives by the organization in the face of an environment of uncertainties.

Purdy (2010) argues that:

> [...]risks are the uncontrollable internal and external influences and factors that determine uncertainty and this, in turn, can prevent or delay the achievement of objectives by the organization. It is worth remembering that these influences and factors can also contribute to the achievement of the objectives before or even after the deadline.

Purdy (2010) also stresses that risks should not be characterized as positive or negative, but rather the consequences experienced by the organization. According to the author, risks can be created or altered according to the decisions made and, since the decision-making process is routine in organizations, it becomes especially important in times of change or when there is a need to respond to internal or external events.

Wysocki (2009), in turn, approaches risk as a future event that results in positive or negative change. According to this author, most of the time, risk is associated with losses. However, it states that these losses can be evaluated from the combination of two factors, namely: the probability of a certain event occurring and the severity of losses in the case of an event. This assessment

leads the manager to decide what to do to mitigate risk and reduce losses.

Latest corporate risk theories advocate not only the probability of losses, but also the possibility of gains. This view is more common in business, when, for example, certain capital is "put at risk" in order to finance a new venture (Wysocki, 2009). The differences in terms of risk perception between investors and entrepreneurs will be addressed in the following section of this article.

According to the Project Management Institute (2012) *apud* Ferreira *et al*. (2013), risk is "an uncertain event or condition that, if it occurs, will have a positive or negative effect on the project objectives." In more detail, it can be said that these effects can impact the project in terms of scope, cost, quality and/or schedule.

According to Zhang (2011), there is a debate regarding the nature of the risks, whether they are essentially objective or subjective. The author points out that risks can be categorized into two main schools: one that considers risk as an objective fact and another that considers it a subjective construct. Each of these schools makes distinct recommendations on risk management policy, since they have different understandings about them, about their epistemological dimensions, and about analytical methods.

The school that considers risk as an objective fact argues that risks exist objectively and that their analysis consists of objective, technical and impartial activities. Risk analysis is essentially a type of quantitative analysis whose purpose is to verify the probabilistic distribution of risks. In this way, it becomes possible to use an objective criterion to measure and compare different types of risks. Therefore this would result in a rational decision--making process (Zhang, 2011).

On the other hand, the school that considers risk as a subjective construct argues that risk is, in fact, a subjective phenomenon that has multiple epistemological dimensions. These dimensions would depend on the observers, the context chosen and the perspective adopted by them. Thus, it is understood that the epistemology of risk is not limited to probability, and therefore risk analysis cannot be composed of unbiased/objective activities, since aspects such as experiences, society and culture cannot be ignored or depreciated by this analysis. It is important to highlight that, as defended by this school, the rational decision-making process does not play a dominant role in risk management, because even in a probabilistic analysis, people tend to make decisions and define strategies based on their perceptions, values, goals, and agendas (Zhang, 2011).

The literature shows that risk management is a process composed of steps. According to Purdy (2010), this process begins with the contextualization stage, which includes the definition of the organization's objectives and the internal and external factors that can influence the achievement of these objectives. This step is considered fundamental for the identification of risks.

For the PMBOK (2012) *apud* Ferreira *et al*. (2013), the risk management planning process is very important because it contributes to the success of the following five processes: risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning and risk monitoring. This planning process begins early in the design of the project and aims to define how risk management will be performed during the project life cycle.

Finally, it is worth mentioning once again ISO 31000: 2009, which establishes that risk assessment is composed of three stages: identification, analysis, and evaluation of risks. The risk identification stage consists in the application of a systematic process that allows knowing what can happen, how, when, and why. Risk analysis, in turn, seeks to obtain a better understanding of each risk, its consequences and probabilities of occurrence. Finally, risk assessment requires a decision on the level and priority of the risk to the organization. The next step is risk management, which is a process where existing controls are improved or new control mechanisms are created and implemented (Purdy, 2010).

The authors mentioned make clear that in any enterprise where there are uncertainties and the possibility of occurrence of some risk that compromises a goal to be reached, risk management should be considered as a management element.

3.3 Differences in perception of risks between investors and entrepreneurs

Investors and entrepreneurs seek to converge interests that allow them to generate a win-win relationship between them. The former want to invest in projects/ ventures that have good prospects of return. On the other hand, entrepreneurs want partners who contribute not only financially but with knowledge and networking to leverage their startup. It occurs that there is not always a convergence of perceptions between them.

In a study of the different perceptions of investors and entrepreneurs regarding the risks involved in a venture and how much this may influence the process of combining interests to do business, Polzin *et al*. (2018) identified a misalignment in terms of risk perception, the im-

portance attributed to risk, the search channels used to find potential partners, and the risk assessment criteria used in some factors, such as the degree of product innovation and the capacity of the team. The main results found by the authors are convergent to the results of this study and, therefore, are highlighted below:

The misalignment of perceptions between the parties exists at different stages and this may explain the low realization of business between investors and entrepreneurs;

Investors should disclose how they assess and manage risks so that entrepreneurs can provide the right kind of information and thereby increase business chances;

Both entrepreneurs and investors attach importance to the business model, the scalability potential, and the financial criteria for evaluating the enterprise; however, the perceived weight of each criterion differs. Investors want to invest in businesses that they understand. This confirms a hypothesis of the study that high-tech ventures have more difficulty in obtaining investment because of the lack of clarity as to the absorption of the technology by the market;

Investors attach greater importance to innovation potential and technology, while for entrepreneurs the business model and market potential are the most important factors;

Entrepreneurs underestimate the importance of technology and innovation and the financial criteria used in the investor's decision-making process;

Entrepreneurs and investors attribute approximately the same weight to technological risk in initial ventures. The technology or risk of the product has a little more importance in the perception of the investors than of the entrepreneurs;

Political and regulatory risks are of relative importance to both investors and entrepreneurs. Both understand that these risks are unmanageable and cannot be managed, and therefore have a high degree of uncertainty.

Polzin *et al*. (2018) conclude that there is no clear evidence that the divergence of risk perception affects the conduct of business between investors and entrepreneurs. If, on the one hand, doing business can be hampered by the divergence of perceptions about the types of risks involved in the venture and which risk management strategies are most appropriate to mitigate them; on the other hand, this same difference in terms of risk

perception may be the fundamental reason that justifies the conduct of business between the parties. That is, if entrepreneurs have a more accurate estimate of the risk of the technology or product and investors have a more reliable estimate of market risks, this would create an opportunity for them to join forces and share venture risks.

The results of Polzin *et al*. (2018) corroborate previous studies. Wüstenhagen *et* Teppo (2006) and other authors (Criscuolo *et* Menon, 2015; Mazzucato *et* Semieniuk, 2017) have identified the existence of market risks, technological risks, political risks, and financial risks in new ventures.

Financial criteria (current financial situation) and expectations of return (future financial situation) influence both the decision of the entrepreneurs to raise external resources, as well as the evaluation of the venture by the investors (Eckhardt *et al.*, 2006; Petty *et* Gruber, 2011).

Perceptions on the characteristics of the enterprise, such as the business model, technology, innovation, and market potential and its scalability will need to be aligned in order to achieve successful cooperation (Bengtsson *et* Hsu, 2015; Hsu, 2006; Petty *et* Gruber, 2011).

When assuming uncertainties and risks, Investors and entrepreneurs must implement risk management techniques (Parhankangas *et* Hellström, 2007). Depending on the perceived importance of these techniques, investors and entrepreneurs are more or less likely to cooperate (Chassot *et al*., 2014; Wüstenhagen *et* Teppo, 2006).

4. FIELD RESEARCH RESULTS

4.1 Presentation and analysis of the results of the questionnaire applied to investors/supporters (Group A)

The first questionnaire applied was aimed at startup investors who provide financial resources and startup supporters who offer support in the form of training, consulting, and mentoring. The intentional sample consisted of 15 research sources, including representatives from accelerators, business incubators and investors. Responses were obtained from nine research sources for the group investors/supporters.

The resulting profile of the respondents in this group was: occupants of strategic position at the direction or management level, with time in office ranging from nine months to 12 years and graduate training at the postgraduate level *lato sensu* or *strictu sensu*.

As described in the methodology, the research sought to initially assess the level of knowledge of Group A regarding the themes of project management, risk management, startup, company valuation, and investment valuation. The question asked them to value from 0 (totally unknown) to 5 (know deeply) each of the themes. Table 1 shows the valuation scale adopted.

Table 1. Valuation scale used to respond to the interviewees' knowledge about project management, risk management, startup, company valuation and investment assessment (Group A and Group B)

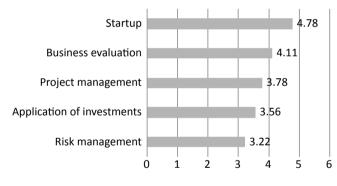| Grade	Knowledge level
1,0 ¬ 1,5	Know nothing
1,5 ¬ 2,0	Know nothing or little
2,0 ¬ 2,5	Know a little
2,5 ¬ 3,0	Know a little to reasonably
3,0 ¬ 3,5	Know Reasonably
3,5 ¬ 4,0	Know reasonably well
4,0 ¬ 4,5	Know well
4,5 ¬ 5,0	Know deeply

Source: The authors themselves.

Figure 1. Level of knowledge about research subjects (Group A).

Source: The authors themselves.

The results of figure 1 indicate that the respondents stated that they were deeply familiar with the Startup theme, which is the theme with the highest average score [4.78 points] among the five mentioned in the question.

The business evaluation theme received the second highest average score [4.11 points], followed by the project management theme [3.78 points], and investment assessment [3.56 points]. The score of the latter indicates that the subjects are reasonably known to well known.

The theme with the lowest average score [3.22 points] was risk management, indicating a reasonable level of knowledge by the respondents of Group A.
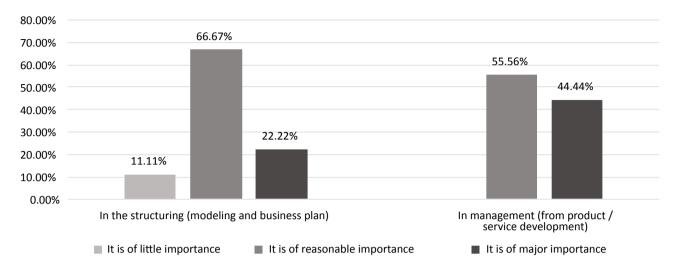
Specifically on the topic of risk management, respondents in Group A assessed that in the structuring of the startup the topic is reasonably important [66.67% of responses] to very important [22.22% of responses]. In the management of startup this level of importance increases, since 55.56% evaluated as reasonably important and 44.44% as very important, as shown in figure 2. This result contradicts what is supported by Susterova *et al.* (2012).
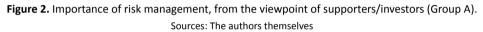
Investors/supporters also had to indicate the weight of some uncertainties related to startup projects. The uncertainties refer to 07 classes of risk: a) regulatory risk, b) market risk, c) economic and financial risk, d) human capital risk, e) technological risk, f) environmental risk, and g) social risk. In this question the interviewees should classify in order of importance, on a scale of 01 to 07, each class of risk to be considered within a startup, being 07 for the most important and 01 for the least important. In this way, the risk class that obtained the highest weighted grade would be the most important and so on.
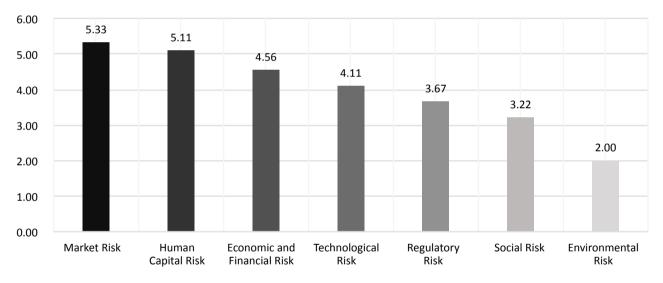
In figure 3 it is verified that the market risk class was evaluated as the most important by the respondents. The following appeared, respectively: human capital risk, economic and financial risk, technological risk, regulatory risk, social risk and, finally, environmental risk. Considering the three risk classes with the highest average score, it is perceived that Group A considers it essential to monitor market risk [uncertainties regarding the acceptability of the product/service by the market], the risk of human capital [uncertainties regarding technical and managerial capacity of the project/business team to provide the necessary skills for conducting the business] and the economic-financial risk [uncertainties related to the company's ability to generate revenues to cover its costs and provide a return on investment].

As for the techniques used in the evaluation of startup projects/ventures, according to the responses of Group A, it was observed that the evaluation of the business model was considered the most important [88.89%], followed by evaluation of the business plan [77.78%], investment return analysis [44.44%], cash flow analysis [33.33%] and break-even analysis [33.33%], analysis of operational performance indicators [11.11%], and accounting analyzes [11,11%]. It should be noted that this issue allowed the marking of more than one option and also contained a text field option where interviewees could cite another technique other than those listed in the question. Only one interviewee cited other techniques: "Business Canvas, Evidence of Validation Based on Learning [Customer Development, Lean Startup]".

Figure 2. Importance of risk management, from the viewpoint of supporters/investors (Group A).

Sources: The authors themselves

Figure 3. Scale of importance of the risk classes, according to the view of the supporters/investors (Group A).

Source: The authors themselves.

When asked if they analyzed the use of risk management by entrepreneurs in the structuring and management of startup, 66.67% reported not using this analysis and 33.33% reported using it in structuring the project. On the other hand, in the management of startup, 44.44% reported using this analysis, although the percentage of those who do not use it is higher [55.66%], as shown in figure 4.
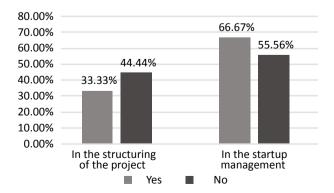

Figure 4. Analysis of the use of risk management in the structuring and management of startup.

Source: The authors themselves.

Investors/supporters were also questioned about risk management and their contribution to ameliorating the degree of uncertainty for startup support/investment: 78% of respondents believe that it slightly softens; 11% think it is indifferent; and another 11% believe that it softens a lot.

4.2 Presentation and analysis of the results of the questionnaire applied to entrepreneurs (Group B)

4.2.1 Startup profile

Most of the companies interviewed are in the initial phase of their life cycle, with a constitution time of less than one year [53.3%]. A significant percentage for this sample [26.7%] reported that the startup is not formally constituted, as shown in table 2.

Table 2. Startup build time

Formation time	Frequency %
Not established (zero)	26,7
From 0 to 06 months	13,3
From 7 to 12 months	40,0
From 12 to 24 months	6,7
More than 24 months	13,3

Source: The authors themselves

The startups researched work with the development of a product or service based on information technology with internet application and/or mobile applications. In 73.4% of the companies interviewed there are one to five employees in the direct employees board; in 53.3% there is also the use of indirect workforce from one to five indirect employees, and in 20% of the companies there are six to ten indirect employees.

Table 3. Startup development stage

Reply Options	Frequency %
Product/service under development, without formally constituted company	0,0
Product/service in market test, without formally constituted company	20,0
Product/service under development, with company formally constituted	0,0
Product/service in market test, with company formally constituted	26,6
Product/service already launched in the market, company with customer base and recurring revenue	26,6
Company at an advanced stage of revenue generation and seeking investors (venture capital) to leverage the business	13,3

Other (specify): "Product already launched in the market without a company formally incorporated"; "Product already launched in the market, but a company in the process of acquiring customers and revenue in progress."	13,3

Source: The authors themselves

It can be seen from the analysis of the data in Table 3 that the majority of the startup surveyed are formally constituted [response D, E, F total 66.6%]. There are 46.6% of companies with the product under market test [B and D] and about 40% with the product already in the market [E and F answers].

4.2.2 Profile of respondents

As in Group A, Group B respondents hold strategic positions in companies. The vast majority [66.7%] answered "Chief Executive Officer - CEO". The other answers were: "Chief Project Office - CPO"; "Founder"; "managing partner", "Technical Director-Partner"; "Marketing and Business".

Regarding the time that the interviewees occupy the position, 64.3% have been for more than a year and 35.7% have been for less than a year. Comparing this information with the opening time of the company, it is suggested that many startups begin informally, most probably counting only on the involvement and work of the founders, who, even if the company is not operating, consider that they have a position.

Table 4. Time in office

Time in office	Frequency %
up to 06 months	14,3%
07 to 12 months	21,4%
13 to 18 months	35,7%
19 to 24 months	28,6%
more than 24 months	0,0%

Source: The authors themselves

The qualitative analysis of the responses related to the training area of the interviewees indicates a balance between training in Management and Economics, Engineering, Mathematics and Computer Science. Formations in Journalism, Marketing and Physical Education also appear, but with less incidence.

Among the interviewees, there is a certain balance regarding the time of professional formation. Although there is a predominance of people with higher education or newly graduated leading the startups, since 20% stated that they have not yet graduated and 33.3% graduated two years ago, there are also, at the other extreme,

people with six to 10 years of training [20%] and others with more than 10 years of training [20%].

Table 5. Time of formation of the interviewee (Group B) since graduation

Graduated time since graduation	Frequency %
Not yet graduated	20,0%
01 to 02 years	33,3%
03 to 05 years	6,7%
06 to 10 years	20,0%
more than 10 years	20,0%

Source: The authors themselves

When questioned about their complementary training, many interviewees opted not to answer the question, which suggests that they do not have a degree, since 53.3% graduated in less than two years or are still studying. Of those who answered the question, 71.43% declare that they have a postgraduate level of *lato sensu* specialization. The others equal the percentages in 14.29% for post-graduation *strictu sensu*, Masters and Doctorate. It should be noted that the answer to this question was not mandatory.

4.2.3 Level of knowledge of research themes and perception of the importance of risk management

The same question applied to Group A was also used in the Group B questionnaire to identify the participants' level of knowledge on the research themes, with the same rating scale [Table 1]. The results indicate that the Startup theme was the one with the highest average score [4.4 points - knows well]. The second theme with the highest average score [3.8 points - from know reasonably to know well] was project management, followed by in-

vestment assessment [3.6 points - from know reasonably to know well] and corporate evaluation [3.5 points - know reasonably]. The lowest scoring theme, similarly to what occurred in Group A, was risk management [3.3 points - know reasonably], as shown in figure 5.
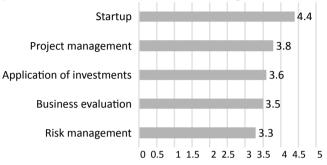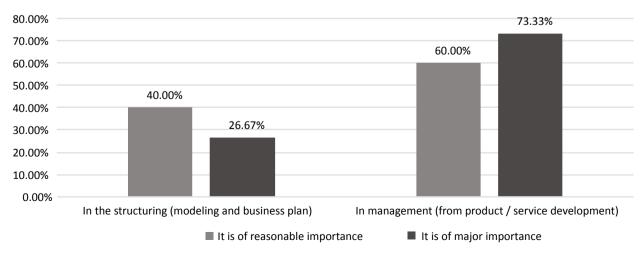

Figure 5. Level of knowledge about research subjects (Group B).

Source: The authors themselves.

The participants of Group B were also asked about the importance of risk management, both in structuring the startup, predominant stage of business modeling, and in the management of the company, phase in which the product is under development, market testing or in commercialization. Respondents consider that risk management is reasonably important [40%] or very important [60%] in the structuring stage. According to the interviewees, the importance becomes greater during the management phase: 73.33% of respondents stated that risk management is very important at this stage. A comparative analysis of the results of this question between Groups A and B will be performed in section 4.3 of this article.

Considering that startups are projects with different stages of maturity and are subject to a lesser or grea-

Figure 6. Importance of risk management, from the perspective of entrepreneurs (Group B).
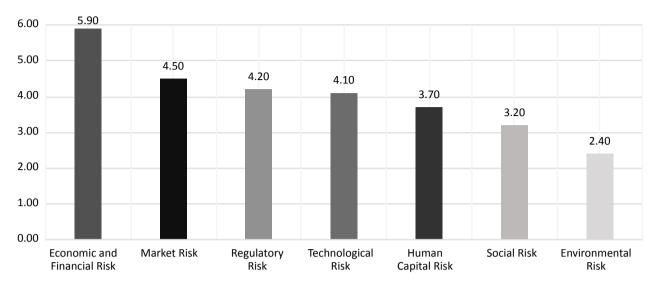
Source: The authors themselves.

Figure 7. Scale of importance of the risk classes, according to the view of the entrepreneurs (Group B).
Source: The authors themselves.

ter degree to the incidence of the seven risk categories defined in this research, entrepreneurs were also questioned about the level of importance of each class, considering the same scale of valuation adopted for Group A. The results with the average scores for each risk class are presented in figure 7, remembering that the highest grades represent the classes with the highest level of importance according to the perception of the entrepreneurs [Group B].

It can be noticed that the three categories with the highest weighted grades and, therefore, those considered most important to be managed are, in order of importance: economic-financial risk [REF], market risk [RME] and regulatory risk [RRE]. This result presents some important differences regarding the results of Group A that will be discussed in section 4.3.

When asked to what extent risk management alleviates the degree of uncertainty for supporters and investors in the startup, the entrepreneurs interviewed said that it slightly softened [71.43%] or greatly softened [28,57%].

4.2.4 Management practices used and their relationship to risk classes

In the last block of the questionnaire for entrepreneurs, 40 statements that characterize management practices, which if adopted by entrepreneurs tend to reduce uncertainties related to the risk categories defined in the research, were presented. For each management practice, the entrepreneur should assess on a scale of agreement on the adoption of the respective practice, being 1 to "fully disagree" and 5 to "fully agree".

In all statements, except in the affirmative, "The staff turnover level is high" [Q9.26], the higher the weighted score, the greater the degree of agreement of adoption of this practice and, consequently, the lower the risk associated with the risk category. This statement was the only one that presented a contrary qualification, that is, the lower the degree of agreement the better the indicator and the lower the associated risk. In order to correct this criterion and avoid discarding this assertion in the analysis, a correction was made, thus reducing in absolute terms the weighted note of this affirmative of the maximum value of the scale. In this way, the judgment and qualification criterion of the statement is reversed, making the higher the weighted grade, the better the index and the lower the risk associated with the category of risk.

According to the weighted notes, the statements were grouped according to the categories in table 6. The presentation corresponds to the affirmative number, the associated risk category and the average grade obtained in the questionnaire response. Thus, item Q9.25 - RCH [4,91] means statement no. 9.25 - human capital risk - average score 4,91 (the statements are presented in the appendix).

Table 6. Categorization of the affirmative of management practices by level of agreement of adoption of the practice.

Strongly disagree	Disagree a little	Agree a little	Fully agree
1 |- 2	2 |- 3	3 |- 4	4 |-| 5
	Q9.36 – RAM (2,91)	Q8.11 – REF (3,90)	Q9.25 – RCH (4,91)
	Q9.30 – RTE (2,82)	Q9.31 – RTE (3,82)	Q8.15 – REF (4,78)
	Q8.17 – REF (2,75)	Q8.13 – REF (3,73)	Q8.20 – RCH (4,70)
	Q9.2 – RME (2,55)	Q8.2 – REE (3,70)	Q9.39 – RSO (4,64)
	Q9.33 – RTE (2,55)	Q8.10 – REF (3,67)	Q9.29 – RTE (4,64)
	Q8.6 – RME (2,33)	Q9.37 – RAM (3,64)	Q8.9 – RME (4,60)
		Q8.4 – RME (3,64)	Q9.40 – RSO (4,55)
		Q9.35 – RAM (3,55)	Q9.28 – RTE (4,55)
		Q9.32 – RTE (3,45)	Q9.38 – RSO (4,45)
		Q8.12 – REF (3,44)	Q8.14 – REF (4,44)
		Q8.3 – REE (3,40)	Q8.21 –RCH (4,27)
		Q9.22 – RCH (3,36)	Q8.1 – RRE (4,27)
		Q8.18 – REF (3,22)	Q8.8 – RME (4,18)
		Q9.26 – RCH (3,18)	Q8.7 – RME (4,10)
		Q8.16 – REF (3,00)	Q9.34 – RTE (4,09)
			Q9.23 – RCH (4,00)
			Q9.24 – RCH (4,00)
			Q9.27 – RCH (4,00)
			Q8.19 – REF (4,00)

Source: The authors themselves.

Subtitles: RRE = Regulatory Risk; RME = Market Risk; REF = Financial Economic Risk; RCH = Human Capital Risk; RTE = Technological Risk; RAM = Environmental Risk; RSO = Social Risk.

For the purposes of this study, of the assertions of management practices with a score lower than 4.0 were considered those that deserve greater attention regarding monitoring for the incidence of risks, totaling 21 statements. For these, a new calculation of weighted scoring was done in order to identify the category of risk with the lowest score and that, therefore, should be prioritized in the management practices of startup companies.

Table 7 shows the number of such practices, the associated risk category and the respective score obtained in the research.

Table 7. Lowest weighted scores by risk category.

Amount of practice	Risk Category	Weighted grade
3	RME - Market Risk	2,84
4	TEN - Technological Risk	3,16
2	RCH - Human Capital Risk	3,27
3	RAM - Environmental Risk	3,37
7	REF - Economic and Financial Risk	3,39
2	RRE - Regulatory Risk	3,55
0	RSO - Social Risk	

Source: The authors themselves.

It can be noticed that the three categories with lower scores were market risk, technological risk and human capital risk.

4.3 Comparative analysis and conclusions of field research

Some of the common questionnaire questions for supporters/investors and entrepreneurs deserve a comparative analysis.

As for the complementary training, it is noticed that both groups of respondents are people with a good level of professional training. In relation to the knowledge of the topics addressed in the research, it is interesting to note that the weighted scores for each group do not present significant differences, with the Startup theme presenting the highest score in both groups, and being classified as "know well". The weighted scores with the largest difference between the groups occurred in the subject of company valuation. The group of supporters/investors presented a higher grade, which is naturally expected. The theme that draws most attention is, precisely, the main object of this research: risk management. This theme presented the lowest index in both groups, being classified in the classification "know reasonably" in both groups.

The importance given to risk management, both in the structuring phase [business modeling] and in the management phase [from product/service development], presents different levels for each group. Interestingly, most supporters/investors [66,67%] consider that risk management is reasonably important at this stage, whereas entrepreneurs, for the most part [60%], consider it very important. Similarly, in startup management, most sup-

porters/investors [55.56%] find it reasonably important, while 73.33% of entrepreneurs consider it very important.

For both groups, the impact of risk management slightly lessens [77.78% of supporters/investors and 71.43% of entrepreneurs] the uncertainty about the development and success of the startup.

As for the risk categories, there were interesting differences regarding the degree of importance attributed by each group. Table 8 shows the order of importance for each group and the respective weighted scores.

Table 8. Comparison of the importance of risk categories under the view of supporters/investors and entrepreneurs.

Order of importance	Supporters/investors		Entrepreneurs	
	Risk Category	Weighted grade	Risk Category	Weighted grade
1	RME	2,00	REF	2,4
2	RCH	3,22	RME	3,2
3	REF	3,67	RRE	3,7
4	RTE	4,11	RTE	4,1
5	RRE	4,56	RCH	4,2
6	RSO	5,11	RSO	4,5
7	RAM	5,33	RAM	5,9

Source: The authors themselves

Subtitles: RRE = Regulatory Risk; RME = Market Risk; REF = Financial Economic Risk; RCH = Human Capital Risk; RTE = Technological Risk; RAM = Environmental Risk; RSO = Social Risk.

It can be seen that, among the three most important risk categories, market risk and financial risk are present in both groups. However, interestingly, economic-financial risk is the third most important for supporters and investors, with market risk as the first level of importance for this group, followed by the risk of human capital. For entrepreneurs, the economic-financial risk is the most important, followed by market risk and regulatory risk. From these results, it is suggested that the general perception of risk to supporters/investors lies in the uncertainties regarding the acceptance of the product/service of the startup by the market and also in the technical and management capacity of the team to conduct the business. On the other hand, for entrepreneurs, the perception of risk is greater in the aspects of financial return of the business and also of the acceptance of the product/service by the market, which, to a certain extent, are directly related. For entrepreneurs, relative importance is also given to regulatory aspects, which may affect the performance of the product/service or even render it unfeasible. These results are convergent with the works of Polzin *et al*. (2018), where it was identified that investors and entrepreneurs have different perceptions regarding the types of risks involved in the business and the importance attributed to each type of risk.

When analyzing the degree of agreement or disagreement regarding the set of management practices, which, in turn, are related to a category of risk, it is noticed that the three risk categories that presented the lowest weighted score, reflecting the lower incidence of these practices were market risk, technological risk, and human capital risk [Table 7]. These three types of risks are also present in the literature as being the ones with the greatest attention on the part of entrepreneurs and investors, as the works of Polzin *et al*. (2018), Mazzucato *et* Semieniuk (2017), Mrkajic *et al*. (2017), Criscuolo *et* Menon (2015), Petty *et* Gruber (2011), Wüstenhagen *et* Teppo (2006), Eckhardt *et al*. (2006).

5. FINAL CONSIDERATIONS

This study aimed to identify the extent to which risk management can reduce the degree of uncertainty for startup supporters/investors. The work started from a bibliographical review on the topics startup and risk management, in order to create the theoretical framework for the study and, later, a field survey of intentional sample was applied, with the objective of knowing the interviewees' perception on seven risk categories defined for projects of this nature, as well as if the management practices adopted by startup entrepreneurs contributed to the reduction of these uncertainties. The results indicated: a) a low level of knowledge about the topic of risk management in both groups; b) the perception of importance in relation to each category of risk differs between the groups surveyed; c) the three risk categories whose management practices indicated a lower incidence of use by entrepreneurs.

From the theoretical point of view, the results of the study reinforce the relevance of the use of risk management in the modeling and management of startup projects/ventures, as defended by Parhankangas *et* Hellström (2007), Chassot *et al*. (2014), Wüstenhagen *et* Teppo (2006), Petty *et* Gruber (2011) e Polzin *et al*. (2018).

From the empirical point of view, it reveals that, although there is an understanding on the part of the entrepreneurs about its importance, its management practices still lack elements that incorporate risk management, especially in the categories of market risk, technological risk and human capital risk. Regarding the supporters/investors, the study revealed that risk management is not regarded as of great importance in the evaluation of projects/ventures. It is suggested that this

low importance to risk management may be associated with a lack of in-depth knowledge on the subject, with the acceptance that a startup is, in essence, a risk business or with the lack of a methodology that can incorporate the risk management in the context of project/ venture evaluation techniques, especially in the business model, which is the main evaluation tool used, according to the results of this research.

As a suggestion for studies and future research it is recommended: a) to expand the sample base of the research in order to have a greater representation of the Brazilian startup ecosystem and to be able to minimize the limitations of the research regarding its generality; b) analyze the possibility of constructing a methodology that incorporates risk management in the business modeling tools used in the scope of startup.

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Appendix - Statements of the questionnaire

Question	Statements
Q8.1	- At the stage of structuring the company elements of the regulatory environment that could impact the success of the enterprise were identified.
Q8.2	- We have suppliers and partners who assist us in monitoring the regulatory aspects of our segment and alert us to actions that must be taken.
Q8.3	- Our company has a team dedicated to monitoring the aspects related to laws, norms and regulations inherent in the business segment.
Q8.4	- In the elaboration of our business model, we have made a careful research on the profile of our target market, current and future competitors, as well as on the acceptance potential of our product/service by the market.
Q8.5	- We have a marketing department with a specialized team responsible for monitoring the market and identifying threats regarding our product/service.
Q8.6	- Market monitoring is done through a contract with a specialized advertising and marketing agency.
Q8.7	- The organization is able to capture enough customers, deliver the products, and provide good services to make the business viable.
Q8.8	- We know our target market well and the types of customers we serve
Q8.9	- The organization can expand the target audience and/or the production process to have a broader sales base.
Q8.10	- We regularly monitor revenue generation, comparing with the goals of our business model/plan.
Q8.11	- We review our strategies and take corrective actions if revenue generation is not as planned.
Q8.12	- We periodically inform our stakeholders, including investors, about the results of our business and management decisions taken for correcting the direction.
Q8.13	- The organization has enough money to cover the costs of this startup phase.
Q8.14	- Entrepreneurs are directly involved in the financial management of the enterprise, controlling costs and expenses.
Q8.15	- We have a lean team appropriate to the projections of costs and revenues.
Q8.16	- There are people who specialize in Startup financial control.
Q8.17	- Every month we have a positive balance in our cash flow.
Q8.18	- Startup is able to operate in a surplus ratio between revenues and expenses.
Q8.19	- Entrepreneurs know exactly the sources of revenue and the source of Startup's costs.
Q8.20	- Startup is structured with a team of additional skills to manage the enterprise.
Q9.21	- The technical team has excellent level of knowledge and experience with technology and business.
Q9.22	- We have policies of attraction and retention of personnel consistent with market practices.
Q9.23	- We adopted practices of sharing and managing the knowledge generated in Startup activities.
Q9.24	- All activities are recorded and everyone on the team is knowledgeable about what is being produced and the results of the business.
Q9.25	- Loyalty and confidentiality of information are values shared among all of the team.

Q9.26	- Staff turnover is high.
Q9.27	- We are guided through mentoring and coaching by experienced professionals in the market in which we operate.
Q9.28	- Our technical team and entrepreneurs have full mastery of the technology needed to develop the product/service.
Q9.29	- Our product/service has scale and replicability.
Q9.30	- There is no technology similar to our product/service in the market in which we intend to operate or that we already operate.
Q9.31	- We believe that our product/service has a high degree of technological innovation.
Q9.32	- We adopt protection strategies to avoid the imitation and/or adoption of our technology by the competitors.
Q9.33	- Our product/service is already patented.
Q9.34	- We have adopted clear and well-defined rules on information security and confidentiality policies.
Q9.35	- Our product/service brings important improvements to our environment.
Q9.36	- We take special precautions to avoid environmental damages in relation to the product/services that we intend to commercialize or that we already market.
Q9.37	- One of our values is to conduct our business with respect and concern for the preservation of the environment.
Q9.38	- Our product/service passes an ethical message and does not contain discriminatory content.
Q9.39	- Our product/service represents or will represent a significant and positive change for society.
Q9.40	- We take care to prevent our activities from resulting in any ethical, moral or social harm to the communities that may be affected by our products/services.