

## Adoption of key performance indicators in Brazilian startups

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**Abstract:** Our study aims to analyze the adoption of main key performance indicators in Brazilian startups based on the software as a service (SaaS) model. This study is exploratory and descriptive using a survey carried out in 2018 a closed-ended questionnaire with dichotomous answers as a method. As for the use of the model to measure the performance of the startup, the applicability, in general, was mostly positive. Startups have already shown benefits in the application of a structured performance measurement model, but more focused on cash management and less concerned with commercial and marketing expenses. This research contributes to check the applicability of performance indicators in startups in the SaaS model, while implying in impediments to the scalability of the product or service.

**Keywords:** Startups; Software as a Service (SaaS) Model; Performance Indicators.

## Adoção de indicadores de performance em startups brasileiras

**Resumo:** Nosso estudo objetiva analisar a adoção dos principais indicadores de desempenho em *startups* brasileiras baseadas no modelo *software as a service* (SaaS). Este estudo é de natureza exploratória e descritiva, utilizando como método uma *survey* realizada em 2018 por meio de um questionário de estrutura fechada com respostas dicotômicas. Quanto à utilização do modelo para medir a performance da *startup*, percebeu-se que a aplicabilidade, de um modo geral, foi majoritariamente positiva. As startups já evidenciaram benefícios na aplicação de um modelo de medição de desempenho estruturado, porém mais focado na gestão do caixa e menos preocupado com os gastos comerciais e de marketing. Esta pesquisa contribui para verificar a aplicabilidade de indicadores de desempenho em startups do modelo SaaS, implicando em impedimentos para escalabilidade do produto ou serviço.

**Palavras-chave:** Startups; Modelo *software as a Service* (SaaS); Indicadores de Desempenho.

## 1 Introduction

The logic of traditional business, driven towards an internal perspective of the organization and the development through intellectual property, is losing ground to the emergence of new technologies and business models (CHESBROUGH; APPELYARD, 2007). In the evolutionary models of entrepreneurship, entrepreneurs have developed new firms through different business models, strategies and resource combinations (BAUM; SILVERMAN, 2004). Therefore, the entrepreneurs search for methodologies where the process of creating a new business is agile. Startups are created by entrepreneurs who wish to solve

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a problem in an innovative way (RIES, 2011) corroborating with the concept of creative destruction of Schumpeter (2003). However, this perspective advances because a startup is a temporary organization in search of a scalable, repeatable, and profitable business model (BLANK; DORF, 2014).

Startups have a high impact on economic development, contributing to job creation, especially in the high technology sectors (MAIA, 2016; PADRÃO; ANDREASSI, 2013; TORRES; SOUZA, 2016), and changing the economic, social and political environments. With have high mortality rates (BAUM; CALABRESE; SILVERMAN, 2000), mainly due to difficulties in accessing resources, maintaining stable business relationships, and dealing with business unpredictability (BAUM, 1996). Thus, the liability of newness and smallness reinforce the incipience of organizational routines, generating uncertainty about the quality of products and services offered (EISENHARDT; SCHOONHOVEN, 1990; LARSON, 1992). Startups are characterized by a high degree of uncertainty and the need for swift decision-making (AUDRETSCH; THURIK, 2000; BHIDE, 1994), further aggravating this context of high mortality of a firm.

The uncertainty associated with startups is one of the challenges in the financial perspective (HALL; LERNER, 2010) since the positive evaluation of investors leads to obtaining additional resources, thus influencing the subsequent results (SCOTT; SHU; LUBYNSKY, 2015). Thus, the study on the adoption of performance indicators in startups with the software as a service (SaaS) model is important, because these business models are growing exponentially, but also declaring at the same speed. In 2018, the income of software firms with SaaS grew more than 22%, reaching more than US\$ 73 billion (TI INSIDE ONLINE, 2018). However, about 90% of startups in the world (PATEL, 2015) and 75% of startups in Brazil (ROSA, 2018) go bankrupt as quickly as their creation.

Regarding this scenario of uncertainty about startups and the need of indicators to evaluate them, we set the following research question: Which is the level of adoption of key performance indicators in startups based on the SaaS model? Thus, this study aims to analyze the adoption of main key performance indicators in startups based on the software as a service (SaaS) model. Our study aims to contribute to check the applicability of key performance indicators (KPIs) in startups following the SaaS model. Many bankruptcies of startups occur within 18 months after its creation, mainly as a result of the majority of entrepreneurs having a young profile, without fear of risk and often without money (PONTIFÍCIA UNIVERSIDADE CATÓLICA DO RIO GRANDE DO SUL (PUCRS), 2017). In addition, entrepreneurs that fail to attract profitable investment and lack of money are the second leading reason for a startup bankruptcy, accounting for 29% of cases and losing only to the failure of products and services in meeting a market requirement that represents 42% (FORBES, 2017).

## **2 Theoretical Background**

### **2.1 Startups**

Following the digital transformation, startups have increased their relevance in the global economy (STALLKAMP; SCHOTTER, 2019). Startups are firms born into the digital world, designed to grow rapidly (DOVER; LAWRENCE, 2012), which have limited stories about their operations, restricted financial and human resources, and few established practices as they become vulnerable and prone to failure (GITAHY,

2016; SEKLIUCKIENE; VAITKIENE; VAINAUSKIENE, 2018). A startup does not refer to a small firm or a smaller version of a large firm, but rather it can be a large firm that has not yet grown, as long as it survives in an extremely uncertain environment. In these organizations, there is a need for validated learning, that is, they experience each element and exist to learn how to develop a sustainable business. Thus, a startup aims to solve a real-world problem in the best possible way while generating potential to scale and expand or affect many people (RIES, 2011). Therefore, building, measuring, and learning are essential activities in a startup. It must transform an idea into a product, measure the customer reaction and then learn if it is the case to pivot or to accelerate this feedback cycle. Thus, successful startups with technology-related business can evolve and become an exponential organization (ISMAIL; MALONE; GEEST, 2014).

The products that a startup develops are experiments and the learning on how to develop a sustainable firm is the result of these experiments. In product development, the goal is to be able to conduct experiments that will assist the learning on how to develop a sustainable business. In these terms, the main goal of a startup is simply to survive while dealing with decisions and solutions to problems that are unique to them (KAZANJIAN; DRAZIN, 1989; MINSHALL et al., 2008). Startups are based on the formation and validation of a business idea, developing solutions that are faced with specific context and challenges (SEKLIUCKIENE; VAITKIENE; VAINAUSKIENE, 2018). Then, there are three different stages in the development of a startup: problem-solution fit, product-market fit, and scale (MAURYA, 2016).

Startups also have a true destination in mind: to create a prosperous business that can change the world. I call this view of a startup. In order to achieve this view, startups employ a strategy that includes a business model, a product plan, a point of view of the partners and competitors, and the ideas about who the customers will be. The product is the final result of this strategy. (RIES, 2011, p. 24)

Many startups fail because they currently operate in an uncertain environment, and as the world becomes more uncertain, it is increasingly difficult to predict the future (RIES, 2011). This is why they also rely on validated learning, which is a rigorous method to demonstrate the progress of a startup. It is a way to empirically demonstrate when a team comes across with important truths related to the business. It is often faster and more accurate than market forecasts or some business planning. It prevents a plan that may not be successful is executed (RIES, 2011).

### 2.1.1 Startups in the World and Brazil

In emergent countries, startups are born with the same goal of any other country: produce, distribute, and boost innovation (BLANK; DORF, 2012; RIES, 2011; THIEL, 2014), but at a slower pace. While developing countries are characterized by barriers to competition such as low-skilled labor, excessive regulation in the labor market, inequality in income distribution, non-compliance with legal contracts (DAL-SOTO; MONTICELLI, 2017; XAVIER; BANDEIRA-DE-MELLO; MARCON, 2014), developed countries have economic, political and legal stability, high scientific and technological development, as well as access to a more sophisticated financial system that generates lines of financing for emerging businesses. Even so, startups are becoming a relevant part of the entrepreneurship ecosystem in emerging economies (SALAMZADEH, 2018).

The American ecosystem is boosted by the investment and produced more than 100 unicorn firms in recent years. On the other hand, the Brazilian ecosystem is far behind and has legal, political, social, economic and cultural barriers that startups must face (ANDREASSI; SIQUEIRA, 2006; PENG, 2003; PENG et al., 2009; PRASHANTHAM; YIP, 2017; SCOTT, 2008; TEECE, 2014). Although it is new in Brazil (SILVA, 2015), the entrepreneurship levels based on startups have increased, mainly due to creation and development costs reduction, monetization facility and low cost of distribution and maintenance, resulting in large profits expectancy (SCHREIBER et al., 2016).

In the United States, startups are mainly Business-to-Consumer (B2C) and project large scales, in the expectation to become valuable long-term assets. In Brazil, startups often adopt a Business-to-Business (B2B) model, with little time to achieve the targeted revenue (ANDREASSI; SIQUEIRA, 2006; PENG, 2003; PENG et al., 2009; PRASHANTHAM; YIP, 2017; RAMALHO, 2010).

In Brazil, business ideas with particularly innovative features struggle to access funding. Therefore, there is a financing gap, which is essentially due to the existence of market failures. These failures are related to the existence of information asymmetry, which makes it difficult for financiers to measure risk. There are issues of adverse selection and moral hazard, which usually translate into greater difficulty in obtaining and financing and/or paying higher interest rates (HALL; LERNER, 2010).

The *Doing Business 2018* report presents the investigations of regulations that improve or restrict business activities. The report presents 11 quantitative indicators (Box 1) on business regulations and the protection of property rights that can be compared among 190 economies. Brazil shows low competitiveness in this evaluation, as it is in the 125th place in the ranking (WORLD BANK GROUP, 2018).

**Box 1: Indicators of Business Regulatory Areas**

<b>What <i>Doing Business</i> measures – 11 areas of business regulation</b>	
<b>Indicator Set</b>	<b>What is measured</b>
Starting a business	Procedures, time, cost, and paid-in minimum capital to start a limited liability company
Dealing with construction permits	Procedures, time and cost to complete all formalities to build a warehouse and the quality control and safety mechanisms in the construction permitting system
Getting electricity	Procedures, time and cost to get connected to the electrical grid, the reliability of the electricity supply and the transparency of tariffs
Registering property	Procedures, time and cost when transferring property and the quality of the land administration system
Getting credit	Movable collateral laws and credit information systems
Protecting minority investors	Minority shareholders' rights in related-party transactions and corporate governance
Paying taxes	Payments, time and total tax and contribution rate for a firm to comply with all tax regulations as well as post-filing processes
Trading across borders	Time and cost to export the product of comparative advantage and import auto parts
Enforcing contracts	Time and cost to resolve a commercial dispute and the quality of judicial processes
Resolving insolvency	Time, cost, outcome and recovery rate for commercial insolvency and the strength of the legal framework for insolvency
Labor market regulation	Flexibility in employment regulation and aspects of job quality

Source: Adapted from World Bank Group (2018, p. 12).

In Brazil, the hiring of nascent firms by large and well-established firms in the market is expanding. According to a survey made by 100 Open Startups, 135 contracts between startups and great corporations had been signed in Brazil. The country represents more than 55% of the business number of startups in Latin America and it is one of most promising countries for startups in the world (GEN, 2019). Moreover, from the Brazilian Association of Startups counted 4,151 startups to more than 6,000 startups in 2019 and almost 13,000 startups in Brazil (ABSTARTUPS, 2020).

In geographical terms, the state of São Paulo is the leader in the number of affiliated startups with 45%; Minas Gerais is in second place with 13%, and Rio de Janeiro is in third place with 11%. Paraná and Santa Catarina have both 7%, Rio Grande do Sul has 6%, while Pernambuco, Ceará and Distrito Federal have 3% of startups in Brazil (ABSTARTUPS, 2020).

Startups can be divided in four different stages according their development: ideation, traction, operation and scale-up. In Brazil, 41% of startups are in the traction phase, 30% are in the ideation phase, 24% are in the operation stage, and 5% are in the scale-up stage (ABSTARTUPS, 2020). According to Ravikant (LOIZOS, 2017), traction is basically quantitative evidence of the demand of the customers. This stage is key for mobilizing resources for the new organization to deal with uncertainties and difficulties, mainly at the beginning of the project (BAUM; SILVERMAN, 2004) and market-product fitting. The ideation phase (idea validation in a business model) represents 30%; the operating phase (go-to-market stage to seek and approach clients) represents 24%; and the phase of scale-up (annual growth of 20% in terms of revenues or collaborators number) represents 5%.

Startups are temporarily organizations that, generally, are created with few resources and collaborators. It makes sense because startups are characterized to be a high-risk business; hence, at the beginning, it is relevant to validate the idea in a business model that can generate revenues. The startup teams in Brazil have on average 10 collaborators, with 50% of the startups having 9-15 collaborators. During the development, 90% of the startups hire new collaborators for their team, with on average 3 new people per startup (ABSTARTUPS, 2020). At this point, startups often deal with the employees' lack of commitment, lack of knowledge about the environment, and difficulty in the relationships with customers and suppliers (ALDRICH; AUSTER, 1986).

About this startups' difficulties issue, according to InovAtiva Brasil (2017), 29% of the organizations were closed down. Thus, the difficulty of accessing capital represents 40% of the reasons for not going ahead with the businesses. At the same time, 16% of the startups failed by difficulties when entering the market and 12% due to societal problems. These problems are caused by the uncertainty environment of startups, such as laws and regulations changes, partners negotiations and new entrants in the market. In the global market, startups fail due to other difficulties such as team management difficulties, lack of sufficient knowledge about the market and the business, and technology lag (GÓMEZ, 2007). Moreover, startups deal with little operational experience, often from undefined or premature routines that lead to a performance below expectations (ALDRICH; AUSTER, 1986). There seems to be a "valley of death" deriving from the high mortality of startups (HUDSON; KHAZRAGUI, 2013) while the literature has not offered many explanations for this topic (SONG et al., 2008).



In a few years, the startup market will have an important share in the Brazilian Gross Domestic Product (GDP). For the time being, given that this sector is still small when compared to countries where technologies are more developed, it is impossible to assess the share of these activities in the generation of wealth. However, this scenario might change soon, especially in sectors where the country has an important export presence.

## 2.2 SaaS Model and Revenue Generation

Software as a Service (SaaS) is a form of distribution and marketing of software used, mainly, by startups. The software provider is responsible for the structure necessary to make the system available (servers, connectivity, and information security care), and the customer uses the software via the internet by paying for the service offered (MELO et al., 2007).

Two models of revenue generation for a firm that uses the SaaS model can be varied. First, the model in which the services provided are free and the providers generate revenue from ads on the portal. Second, the model in which software providers generate revenue due to the use of the actual service (CLOUD COMPUTING USE CASE DISCUSSION GROUP, 2010; DEETER; JUNG, 2013).

## 2.3 Importance of Measuring Key Performance Indicators (KPIs)

According to Rummler and Branche (1994, p. 167), “[...] an organization can only be bigger than the addition of its parts when it is managed”. Thus, the effective management of the organization will only occur when the organization has a performance measurement system based on indicators associated with the related objectives. Indicators are quantifiable forms of representation of the characteristics of products and processes. They are used by the organization to control the quality and performance of its products and processes over time (TADACHI; FLORES, 2005).

In startups, the higher value for the customer is even more relevant, since the increase of the user base is a more important objective than the generation of revenue. Similarly, it is aimed to measure the number of products created, the product development cycle, and the sales growth (GARCÍA-MUIÑA; NAVA-LOPES, 2007; MENDELSON; PILLAI, 1999). In this sense, models measuring the performance and focusing on the customer’s perspective emerged use indicators to define startups’ strategies, mainly regarding their uncertainty environment. Thus, KPIs are used to measure each process in the startup because it deals with high risks and there is a need to evaluate them.

## 2.4 Startup SaaS Metrics Dashboard

The greatest difficulty faced by startups is to create a solution that is relevant to the customer. Thus, it forces the entrepreneur to define relevant metrics to measure the advances achieved by the attraction of new customers, activation, retention, and revenues created by the startup (RIBEIRO, 2015). In order to help the entrepreneurs, a model in the market called SaaS Metrics Dashboard was developed. This

metrics model provides insight into the customer behavior related to the business in order to better target marketing efforts and the respective product development (JANZ, 2016). The customer acquisition funnel in this model is divided into:

- Visitors and registrations: this stage initiates the identification of the customers as individual users. Thus, it is the first *transaction* as a user (SKOK, 2015). It can also be stated that all the registrations made in the system (SOUZA, 2015).
- Paying customers: is when users start being considered as potential customers. Through the interaction, in this stage, these people are more available to consume the service being offered and to pay for it (SKOK, 2015).
- Monthly Recurring Revenue (MRR): is a metric used by startups that work with the recurring subscription to calculate the monthly gain forecast. By tracking this metric also helps to measure the growth of MRR by measuring the entry, renewal, and cancellation of subscriptions and/or plans (VINDI, 2016). It assists in providing information that makes it possible to analyze growth and the future earnings of the firm. It unifies the financial and strategic management areas while identifying the sectors that need resources to optimize sales (VINDI, 2016).
- Customer Acquisition Cost (CAC): is critical for firms working in segments that need loyal customers, such as SaaS firms. The objective is to allow entrepreneurs to measure the costs of acquiring new customers. In addition to helping to understand the effectiveness of the firm's current marketing campaigns, the customer acquisition cost also maps its financial health (ALMEIDA, 2017).
- Finance: Bendle et al. (2010) define customer cycle value and customer lifetime as the monetary value of the customer relationship based on the present value of the projected cash flows. It measures the revenue potential that a user can generate to the service provider. Thus, the suggested model can be adopted to improve the relationship with customers and consequently increase the number of conversions and sales. The model presented shows the path that the users are following in the customer acquisition funnel. The metrics presented to allow the entrepreneur to get to know the business, the target audience, and to plan with more precision the actions to be developed (TOLEDO, 2016).

The Ratio of CAC and LTV is a sustainability and longevity indicator of a startup. It measures the relationship between the Customer Acquisition Cost (based on the marketing and selling expenses) and Life Time Value (the amount paid by the customer during the relationship with the startup). Cash Burn Rate measures the amount of money for monthly expenses to continue the operations. RunAway measures when the firm will run out of money, projecting that its current revenues and expenses remain constant. The managers of the startups pay special attention to the total revenues and expenses and the Cash Burn Rate, that is, they mainly evaluate the impacts of the business on the cash flow, considering the uncertainty environment of the startups for the decision-making (MIRANDA; SANTOS JUNIOR; DIAS, 2016).

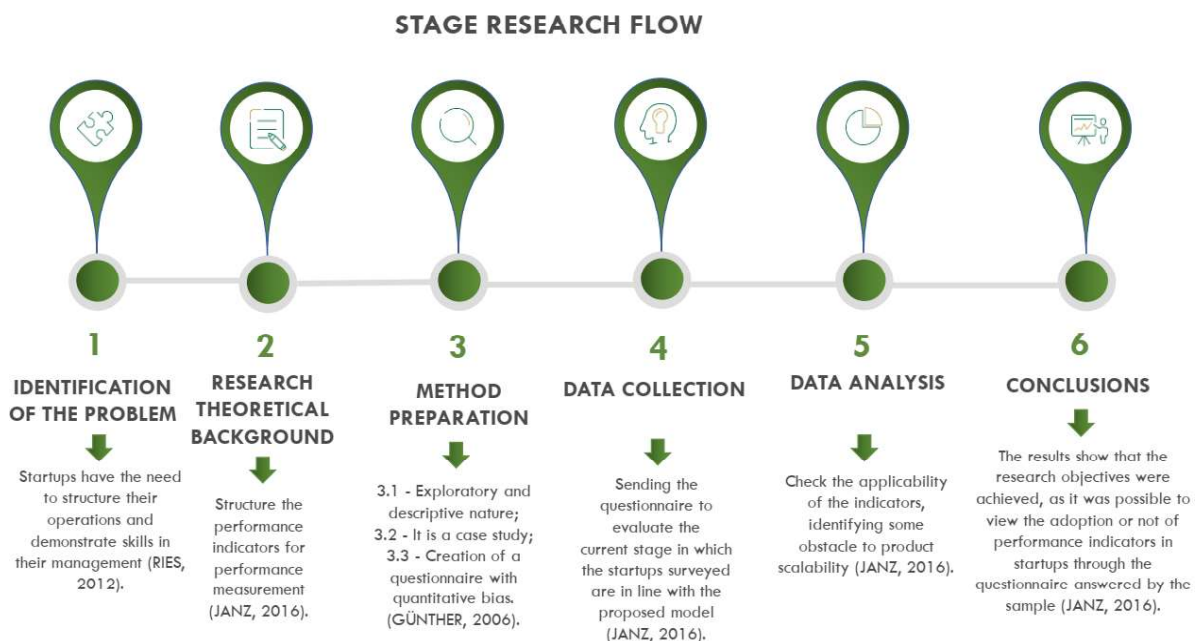
In order to measure the performance of a startup, financial and non-financial indicators should be used to contextualize the uncertainty environment and the product-market fit, as presented below

(CASSAR, 2014; DIAS, 2016; MIRANDA; SANTOS JUNIOR.; READ et al., 2009). It is relevant because startups deal not only with risks but also with unforeseeable uncertainty, that is, the difficulty to recognize all the relevant variables that can influence the performance due to the complexity of the startup business model (SOMMER; LOCH; DONG, 2009).

### 3 Method

This is an exploratory and single cross-sectional study, intending to analyze the adoption of KPIs in startups based on the SaaS model. Figure 1 summarizes the study procedures, from the initial research question throughout the analysis of the results.

Figure 1: Sequence of the study procedures



Source: the authors (2020).

A research instrument was created, due to the premature stage of the research field, including few studies published about KPIs related to startups. The research instrument was validated by three researchers of entrepreneurship, innovation, and startups. They contributed with the use of terms and with adapting the language for a better understanding of the respondents. Moreover, they also assisted in the redefinition of the constructs, mainly in the variables of performance. We chose to use a Likert-type scale that captures the respondents' perceptions about the topics. The measurement with quantitative indicators was defined to achieve greater applicability and comparison of results in different scenarios.

The research instrument has a quantitative bias with a closed structure questionnaire with dichotomous answers. It went through a pre-test with 10 respondents to reduce the possibility of errors when completing the questionnaires (MALHOTRA, 2006). There were no changes in the format of the questionnaire, and



the response time was adequate for the adopted collection method (5 to 10 minutes). The internal reliability of a questionnaire was performed by composite reliability and extracted variance of constructs. Regarding validity, the objective was to evaluate how well the scale measures the construct that intends to measure. This research addressed the content validity (theoretical consistency), face validity (practical to the respondent) and discriminant validity (the relationship between two measures provides evidence that the two sets of measures are discriminated from each other) (NETEMEYER; BEARDEN; SHARMA, 2003).

For the analysis of the adoption of KPIs with the software model (SaaS) in startups, the city of Porto Alegre and its metropolitan region, Curitiba, Florianópolis, and São Paulo were selected, as they are centers of innovation and technology and allowed the researchers to access them. The starting point was based on the search and selection of interviewees within the researchers' networking because the interviewees were responsible for creating a follow-up of indicators for startups with different profiles. A so-called snowball sampling of further contacts was established as a non-probability sampling that starts with someone that meets the criteria for participating, who will further recommend others who meet the criteria and could participate in the sample (EASTERBY-SMITH et al., 2012). The interviewees were selected because they were responsible for creating a follow-up of indicators for startups with different profiles. The data collection was obtained after the application of the questionnaire sent to the participants electronically. The main topics raised were: a) demographic profile of the entrepreneur; b) demographic profile of the startup; c) use of the KPIs.

A survey was carried out between June and August of 2018, in which 94 questionnaires were obtained from the startups. Three of those questionnaires were validated, using as a parameter up to 10% of lost data that were replaced by the mean of the corresponding question (MALHOTRA, 2006). Participant observation in events was compared with the information resulting from the questionnaires applied and the bibliographic material, thus allowing the data triangulation (GÜNTHER, 2006).

The data analysis involves the partition, identification, and measurement of variation in a set of variables, either between each other or between a dependent variable and one or more independent variables. The SPSS (Statistical Package for Social Science) software, version 21.0, was used for the treatment of quantitative data, prioritizing the use of means, frequency, standard deviation, analysis of variance (ANOVA).

Before applying any data analysis technique, the data were previously prepared and checked, as well as missing values, outliers, and tests of multicollinearity, normality, and linearity. The missing values represented less than 5% (KLINE, 2005) of the data and showed a random distribution (HAIR JR. et al, 2009), as a function of which they were replaced by the mean of the variable. We checked the outliers from the Mahalanobis distance and found only two outliers and we decided to keep the respondents in our database. We considered that the relationship among variables over  $|0.85|$  indicates that there is potential multicollinearity (GANZACH, 1998); the data did not show multicollinearity. Skewness and kurtosis values assess the normality index using Kolmogorov-Smirnov. Variables should be  $|10|$  for skewness and  $|3|$  for kurtosis (KLINE, 2005). We examined the scatter plots of the variables and identify nonlinear patterns to verify the linearity (HAIR JR. et al., 2009). The data have a normal distribution.

## 4 Results

This section addresses the results from the collection of primary and secondary data, which were initially analyzed under the scope of previously research design. Thus, we present the quantitative results and analyses divided into subsections.

### 4.1 Demographic Profile

The demographic profile of the entrepreneur consists in analyzing the data regarding the gender, age of the interviewed, education, and occupation of the interviewees. Our data shows that 70% of the participants in our research with C-Level responsibility within the startups are male and 30% are female. It is relevant to clarify that a C-Level includes those collaborators with a management position, that is, with a Chief position, for example, Chief Executive Officer (CEO). At the same time, the most participants aged 20-25 years and 36-40 years. These results are in line the studies of Torres and Souza (2016) and Maia (2016) who identified as age groups 25-54 years-old and 25-42 years-old, respectively, as prevailing among startups' entrepreneurs.

When analyzing the education levels, most entrepreneurs have a bachelor degree (35%), a master's degree (30%), or postgraduate studies (24%). These results are in line with the studies of Torres and Souza (2016) who identified the relevance of entrepreneurs having an academic degree when applying their knowledge in a business model. In this sense, the occupations with the highest incidence are focused on Computing and Information Technology (33.25%) and Management (21.72%), evidencing the need to internalize these activities for the startups to be developed. This result is partially in line with the findings of Silva (2015), who identified most startups managers as young entrepreneurs that do not understand management. In case the startup founders do not consider themselves experienced enough to run the business, they seek support from incubators or accelerators to improve the business model and strategy (BLANK; DORF, 2014).

#### 4.1.2 Demographic Profile of the Startup

The demographic profile of the startup consists of analyzing the data regarding the current position of the interviewee, state, time of activity and whether the startup already has a net profit or not. Our results show that more than 35% of the interviewees occupy C-Level positions. More specifically, 32.40% of them represent the CEO positions, similarly as in the studies of Silva (2015) and Maia (2016). Moreover, the most interviewees from startups are located in the state of Rio Grande do Sul (73%) and São Paulo (19%). This can be a result from the accessibility criterion of the research, which was carried out within the contact network of the researchers in that state.

Our results also evidence that 54% of the startups analyzed have been active for 1 to 12 months since their foundation, being relatively new. In this regard, startups that deal with decision-making in a complex and highly uncertain environment (HALL; LERNER, 2010) often makes it difficult to perpetuate the business model. Moreover, 60% of the startups have already made a net profit. In startups, the

intensive use of technology promotes great expectations regarding the growth of the business. Therefore, the intensive use of technology allows the startups to identify market opportunities and to explore them (SALAMZADEH, 2018). On the other hand, due to the high degree of innovation required for the viability, startups have a high level of uncertainty regarding their business model while experiencing difficulties, until they consistently adjust their offer (BLANK; DORF, 2014). Consequently, many startups can struggle to obtain profits, mainly in the first years of their business.

#### 4.1.3 Use of Key Performance Indicators

Considering the results in this research, we can identify startups wanting to assure the customers to upgrade their memberships, from free trials to new paying customers (69%). Moreover, startups intend to identify the customer acquisition cost (CAC) (63%), which defines how much revenue is necessary to acquire a new customer to the business, and the monthly recurring revenue (58%), which indicates how much a firm generates monthly by selling their products.

Other KPIs are considered less relevant, such as churn (customer evasion rate, that is, the cancellation fee) (53%), cancelled registrations (47%), customer retention rate (to expand the customer loyalty) (45%), and CAC recovery time (39%). These results converge with the short-term existence of startups, the unpredictability of the business environment, and the high mortality rates (BAUM; CALABRESE; SILVERMAN, 2000), as 54% of the startups surveyed have lasted for 1 to 12 months. Customer Acquisition Cost (CAC) is the monetary value to be spent on sales, channels, marketing and related expenses (final average value) to acquire a new customer. It determines the efficiency of the efforts of the startup, although it is more significant when combined with other metrics. The Monthly Recurring Revenue (MRR) measures the income that a startup generates via recurring payments in a given month, especially from subscription models (SaaS). This indicator reveals safety and predictability to the investors. In this study, these indicators were relevant because many of the startups are in the operation phase, but not all of them have made any profits yet.

Our results showed that, on one hand, there is a greater concern of startups with the acquisition of new customers, the registration of paid sources and the average gain from each customer. On the other hand, the customer retention rate and the average acquisition of new customers have not been emphasized. For the startups, the investment relationship is different from traditional firms, since they seek angel investors or venture capital investors from the beginning of their operation, which in turn assess the business expansion capacity and the short-term risk and return ratio (BLANK; DORF, 2014).

In our results about the startups' expenses of startups, two issues are worth mentioning. First, for the startups surveyed, the most important indicators are measuring general costs (87%) and measuring fees and taxes (84%). Second, costs related to marketing and sales (76%) are pushed to the background when compared to the monitoring of general costs, taxes and fees. In these terms, monitoring operational expenses and taxes can be key when calculating the CAC (JANZ, 2016). In addition, selling and marketing expenses have been less considered for the researched startups, once again showing the startups searching for accelerated growth in large markets while using commercial and marketing actions to achieve this

goal. In the current scenario, customer behavior plays an important role when researching and executing a business model (RIES, 2011), especially when dealing with startups.

Our results show that cash burn rate (91%) and total revenues and expenses (89%) are the main KPIs used by startups. Again, regarding the initial stage of many startups, it makes sense because there is a worry with the sustainability of the operations. Many startups researched still not obtaining profits and, in this case, the main need is financial survival using money from partners or loans. Thus, the interviewees had been paid special attention to the total revenues and expenses and the cash burn rate, that is, they mainly evaluate the impacts of the business on the cash flow. It is motivated by the uncertainty environment for the decision-making in which the startups are inserted (MIRANDA; SANTOS JUNIOR; DIAS, 2016).

Finally, we analyzed the main KPIs mentioned in the survey, using ANOVA to compare the use of the CAC with others KPIS (Table 1).

**Table 1:** Analysis of variance comparing the use of CAC as a KPIs by the startups

Indicator	n	Mean	Standard deviation	F	p-value
Visitors and registrations	94	23.15	8.57	2.60	0.054 <sup>ns</sup>
New paying customers	94	64.48	27.97	2.72	0.046 *
Monthly recurring revenue	94	58.5	12.07	0.70	0.551 <sup>ns</sup>
Churn	94	11.9	24.88	0.85	0.771 <sup>ns</sup>

<sup>ns</sup> Non-significant difference.

\* Significant difference at 5%.

According to our results, KPIs focused on new paying customers were significant, unlike other KPIs with no statistical significance difference at 5%. In these terms, there is a greater homogeneity in the adoption of indicators focused on the prospect of customer acquisition and operationalization of the business model, mainly KPIs that are related to startup expansion, as Visitors and Registrations, Monthly Recurring Revenue and Churn. However, there is less uniformity in the adoption of financial indicators, which may imply in the business sustainability. Startups that do not further the adoption of KPIs that evaluate the financial dimension from a more complex perspective will incur more bankruptcy risks, even before reaching the desired product-market fit. Startups are characterized by high-risk investments in an uncertainty environment. On one hand, investors may obtain high profits, mainly when startups reach a fast and large scale (SCOTT; SHU; LUBYNSKY, 2015). On the other hand, startups deal, mainly at the beginning, with the challenge to reach and maintain its financial sustainability (HALL; LERNER, 2010). Therefore, our results showed that the main challenge is not the startups to reach scale or financial sustainability but how these startups will balance between promoting their expansion and profiting from the business and partnerships.

## 5 Final considerations

There is a global interest in encouraging startups because of the expected economic development that they can generate. However, the sustainability of this startup is relevant to develop and maintain

innovation in these high uncertainty environments. Therefore, this study aimed to analyze the adoption of main KPIs in startups based on the SaaS model aiming to consider not just the innovative aspects of the startups but the continuity of these kinds of organizations.

Our theoretical contributions showed KPIs, when built, managed and measured correctly, will create a view of the stage of the firm. This analysis is not limited to KPIs. These are guidelines that assist in keeping the focus and continuously deliver results in pursuit of a sustainable business: scalability, cost-effectiveness, replicability (with recurring revenue) and impact (disruption).

Our managerial contributions showed that the most used KPIs are the stages of Paying Customers, Recurring Monthly Revenue and Customer Acquisition Cost, representing a maturity stage of the researched startups because many of them are in the operational phase and have profits in the business. Moreover, we identified a need to measure Total Revenues and Expenses and Cash Burn Rate, thus indicating a focus on their financial sustainability.

When the perceptions of the interviewees regarding the use of the model to measure the performance of the startup are raised, the applicability, in general, was mostly positive. Thus, it is possible to state that startups have already shown benefits in the application of a structured performance measurement model. However, a difficulty is to balance the fast and large expansion with the financial sustainability because one of the search for the scalability of the product offered, mainly in the SaaS model.

The study presented limitations regarding the size of the sample and the method design because the sample has a determined homogeneity level that hinders the use of other statistical analysis. Moreover, it is subject to the bias of the participants' perception. For future studies, we suggest a survey with greater heterogeneity of startups in order to investigate potential new variations in the steps presented and then create alternative metric models for other types of businesses and cultures.

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