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SECTION: ORIGINAL ARTICLE

Mapping funding sources, success factors, and challenges faced by Brazilian university start-ups: a scoping review

Mapeamento de fontes de financiamento, fatores de sucesso e desafios enfrentados pelas start-ups universitárias brasileiras: uma revisão de escopo

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Abstract: This scoping review aims to investigate the following aspects of start-ups that are part of incubators/accelerators, or technology parks within Brazilian universities: 1) success factors and challenges faced; 2) funding sources; and 3) entrepreneurs' profile. The main success factors found were good planning and management, market knowledge and assessment, R&D for innovative solutions, and robust network. The main challenges faced were lack of financial resources, high bureaucracy, multiple roles performed by entrepreneurs, and lack of time. We also found that government is the main Brazilian start-ups funding source, and that there is a lack of Brazilian research on start-ups entrepreneur profile. We compare and discuss these findings with the success factors and challenges of start-ups in other countries. While there are several similar factors across different countries, we found that bureaucracy and lack of financial resources may be more common in low- and middle-income countries. Further studies directions and practical implications are provided.

Keywords: Academic entrepreneurship; technology parks; incubators; new ventures.

Resumo: Esta revisão de escopo tem como objetivo investigar os seguintes aspectos das start-ups que fazem parte de incubadoras/aceleradoras ou parques tecnológicos de universidades brasileiras: 1) fatores de sucesso e desafios enfrentados; 2) fontes de financiamento; e 3) perfil dos empreendedores. Os principais fatores de sucesso encontrados foram: bom planejamento e gestão, conhecimento e avaliação do mercado, P&D para soluções inovadoras e rede de contatos robusta. Os principais desafios enfrentados foram a falta de recursos financeiros, excesso de burocracia, as múltiplas funções desempenhadas pelos empreendedores e a falta de tempo. Também descobrimos que a principal fonte de financiamento das start-ups brasileiras é o governo, e que existe uma carência de pesquisas brasileiras sobre o perfil do empreendedor de start-ups. Essas descobertas foram comparadas e discutidas com os fatores de sucesso e os desafios das start-ups em outros países. Embora existam vários fatores semelhantes em diferentes países, descobrimos que o excesso de burocracia e a falta de recursos financeiros podem ser mais comuns em países de baixa e média renda. Por fim, são fornecidas orientações para estudos futuros e implicações práticas.

Palavras-chave: Empreendedorismo acadêmico; parques tecnológicos; incubadoras; novos empreendimentos.

1 INTRODUCTION

Entrepreneurship can be conceived from the perception of market opportunities by individuals. These individuals will be responsible for

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organising the creation of companies to exploit these opportunities. A company can be structured in various ways depending on the goal and type of business (Lopes; Almeida; Lima, 2019), one of the riskiest forms of entrepreneurship is start-ups, which can be defined as a type of company that aims to develop or improve products and services, usually linked to technological innovations. It is a temporary and high-risk business model, with the purpose of validating processes and finding a management model in the format of scalability and recurrence (Bertucci Ramos; Pedroso, 2022). According to data from Dom Cabral Foundation (Nogueira; Arruda, 2015), there is a high failure rate of start-ups in Brazil, at least 25% of start--ups do not survive within 12 months, 50% within 4 years, and 75% within 13 years. Nevertheless, successful start-ups can significantly contribute to economic growth and job creation (Freire; Sousa, 2020). Therefore, creating conditions conducive to the development of start-ups is fundamental to ensure their survival and success (Nogueira; Arruda, 2015; Schwartz, 2013).

One way to increase the survival and success chances of start-ups is through incubators/accelerators and technology parks, which are environments that offer resources and opportunities for the growth and consolidation of start-ups in the market (Nogueira; Arruda, 2015; Schwartz, 2013). Incubators provide a set of tools that minimise the costs of implementing a new venture, providing infrastructure for work, mentoring and training services, access to capital sources, and networking - such elements are vital to maximising start-ups success chances (Nogueira; Arruda, 2015; Silva *et al.*, 2012; Silva; Oliveira; Angnes, 2020). Incubators can be located within technology parks or large companies linked or not to a university (Silva; Oliveira; Angnes, 2020).

Regarding university incubators, we note that they are organisations created within higher education institutions to support the development of startups. And in addition to the tools mentioned above, university incubators also enable startups to access knowledge (e.g. research groups and databases) and specialised resources (e.g. technologies – cf. Nogueira; Arruda, 2015; Figlioli; Porto, 2012). Furthermore, it is noteworthy that accelerators are the new generation of the startup incubation model, although they are similar in terms of structures, they have different objectives. While incubators provide a supportive environment for start-ups in their early stages, accelerators focus on more mature start-ups (e.g. already have a minimum viable product or a prototype) and offer services more focused on rapid growth. Both incubators and accelerators are valuable in helping startups grow and succeed (Lange; Johnston, 2020; Pauwels *et al.*, 2016). It is important to note that this development in the Higher Education sector occurred due to a necessity for creating opportunities for financial sustainability as well as more interaction with other key actors, namely business and government, to transform and improve society (Etzkowitz, 1998, 2003). We quote the founder of one of the largest technology parks in Brazil: "The current financing system of research and the University indicates the need for a search for sustainability in these research activities and also of the University itself in new sources of income" (Audy, 2011, p. 265).

Hence, technology parks are ventures designed to house technology and innovation companies, offering infrastructure and services to support the growth of start-ups. Like incubators, technology parks can also be located inside universities or large companies, but even when located outside a university, parks usually maintain some link with local universities. Technology parks are responsible for creating business and employment opportunities, boosting local and regional economic development, and providing technical support, mentoring, and opportunities for start-ups to establish relationships with other companies and investors (Figlioli; Porto, 2012). Although they are distinct environments, technology parks and university incubators/accelerators share the goal of supporting the development of start-ups and accelerating their entry into the market. Some studies have shown that start-ups inside university structures have higher survival and success rates than independent start-ups (Audretsch; Belitski, 2019; Nogueira; Arruda, 2015). While many studies have focused on assessing the economic impact and survival rate of start-ups, few have investigated the success factors and challenges faced by university start-ups (Audretsch; Belitski, 2019). Some studies suggest that even less is known about start-ups developed within Brazilian universities (Nogueira; Arruda, 2015; Santisteban; Mauricio, 2017). In this context, a systematic review found only one Brazilian quantitative paper related to critical success factors of information technology startups, demonstrating the lack of studies in South America, and suggesting that most of the Brazilian literature on this topic may be qualitative (Santisteban; Mauricio, 2017).

Besides the lack of studies, there is some evidence suggesting that the challenges related to the lack of financial resources (Felipe, 2023; Moreira *et al.*, 2019; Torres; Souza, 2015), and intellectual property registration bureaucracy (Baran; Zhumabaeva, 2018; Marques; Pacheco, 2023) are even worse for Brazilian start-ups. Brazilian patents and intellectual property registration process is well-known for being bureaucratic, delays, as well as high costs, which creates legal insecurity that may undermine start-ups' success chance, especially for those outside university parks and incubators, since they have less access to knowledge and networking (Nogueira; Arruda, 2015; Marques; Pacheco, 2023). Furthermore, the international literature suggests that finding funding sources is one of the main challenges faced by start-ups (Bauer; Junge; Reif, 2024; Drover *et al.*, 2017), since they are high-risk ventures with low chances of return, which is not attractive to traditional investors (Silva; Oliveira; Angnes, 2020). Besides that, there are individuals and organisations interested in investing in start-ups (e.g., angel or venture capital investors), and in some countries the local or federal government also offers incentives and access to public capital through notices (Bauer; Junge; Reif, 2024; Drover *et al.*, 2017; Silva; Oliveira; Angnes, 2020). However, sometimes the high returns charged by those investors are demotivating and represent yet another challenge faced by start-ups (Bauer; Junge; Reif, 2024; Saura; Palos-Sanchez; Grilo, 2019). Therefore, it is also common that founders, their friends and/or relatives are the main funding source of start-ups (Bauer; Junge; Reif, 2024; Drover *et al.*, 2017; Silva; Oliveira; Angnes, 2020).

Besides being part of an incubator or technological park (Audretsch; Belitski, 2019; Nogueira; Arruda, 2015), the international literature also suggests some taxing factors to the successful development of start-ups, such as the new idea marketing and commercialisation (Díaz-Santamaría; Bulchand-Gidumal, 2021; Kim; Kim; Jeon, 2018), assessment of market opportunities, goal-orientation (Kim; Kim; Jeon, 2018), founder's previous experience in establishing companies (Prohorovs; Bistrova; Ten, 2019), entrepreneur competence and management skills (Kim; Kim; Jeon, 2018; Prohorovs; Bistrova; Ten, 2019; Saura; Palos-Sanchez; Grilo, 2019). In Brazil, some studies suggest that the success factors observed in start-ups outside university technological parks and incubators are market knowledge and assessment, networking (Nogueira; Arruda, 2015; Moreira *et al.*, 2019), good relationship between founders and investors, founders' knowledge and business planning, good employee selection and founders' full-time dedication to the start-up (Nogueira; Arruda, 2015).

Another topic understudied in Brazil, is the profile of start-ups entrepreneurs. A recent systematic review found no literature regarding the personality traits of Brazilian entrepreneurs. However, the authors used a qualitative assessment criteria (i.e., at least a C-rating in VHB JQ3 or ABS ≥2 or JCR IF ≥1.5) in this systematic review, which may have excluded some lower-quality Brazilian studies (Salmony; Kanbach, 2022). International literature suggests that personality traits can explain up to 20% of entrepreneurial intentions, but not start-ups success (Frank; Lueger; Korunka, 2007). Some authors also suggest that start-ups founders' hubris, exaggerated self-confidence and inflated self-worth positively influence the assessments of startup founders' trustworthiness, which influence backers' investment decisions (Sundermeier; Kummer, 2022). However, a recent systematic review of the literature in the English-speaking world found personality traits differences across types of entrepreneurs (e.g., immigrants, previously unemployed, and business students with entrepreneurial interest). Overall, the review found that entrepreneurs typically score high on extraversion, openness, need for achievement, innovativeness (new entrepreneurs are commonly low in this trait), internal locus of control, self-efficacy, and risk attitudes (i.e., less risk averse). Successful entrepreneurs are commonly low in neuroticism scores (Salmony; Kanbach, 2022). In Brazil, some authors suggest that entrepreneurs with high scores on self-efficacy and self-realization show higher organizational performance (Schmidt; Bohnenberger, 2009), whilst a recent study with 278 Brazilian start-ups founders concludes that some of the most common traits are self-confidence, resilience, initiative, and propensity to innovation (Coda *et al.*, 2022).

Despite the robust international evidence and some Brazilian research, little is known about Brazilian start-ups success factors, challenges faced, and the profile of Brazilian start-ups entrepreneurs seeking university structures. As far as we know, there is no systematic or scope review that has mapped these characteristics in Brazilian university start-ups. Therefore, this study aims to investigate the following aspects of start-ups that are part of incubators, accelerators, or technology parks within Brazilian universities: 1) success factors and challenges faced; 2) funding sources; 3) profile of start-ups entrepreneurs inside university structures. Within this context, considering the scarcity of Brazilian studies on start-ups inside or even outside university incubators and technological parks, we discussed the similarities and differences of factors and challenges faced by Brazilian start-ups reported by international studies. When available, we also discussed some results with data related to Brazilian start-ups outside universities' incubators or technological parks.

2 METHOD

2.1 PROCEDURES AND SEARCH STRATEGY

A scoping review was conducted following the checklist proposed in the PRISMA Extension for Scoping Reviews (PRISMA-ScR; Tricco *et al.*, 2018). The searches for papers were conducted by three independent researchers (NOC, NCR and MOP) in March 2023. The search string was developed by NOC, SP and AAG based on previous highly cited studies in the university start-ups area (e.g., Swamidass, 2013). Furthermore, considering that, as far as we are aware, there is no systematic review that has evaluated the challenges, success factors and the profile of start-ups entrepreneurs inside university structures, we also consult the search strategy used by previous systematic reviews on the business and start-ups area (e.g., Köhn, 2018; Silva *et al.*, 2020). The following keywords string were used in all searched databases: ("university spinoff" OR "university spin off" OR "university spin-off" OR "spin-off" OR "spin off" OR startup OR "start-up" OR "start up" OR "pre-incubator" OR "pre incubator" OR "pre-accelerator" OR "pre accelerator" OR "technological park") AND (Brazil or Brazilian). The searches were performed in eight databases: Virtual Health Library (VHL), PubMed, PsycINFO, Web of Science, Scopus, Scielo, Ebsco and Embase. The filter "document type" (i.e., article or journal article or conference paper) was used in all databases.

2.2 DATA SELECTION AND ELIGIBILITY

The articles located in the databases were imported to the "Rayyan" website where the screening steps were conducted. Rayyan is a free tool that helps researchers perform systematic, or scope reviews through automatic identification of duplicated publications and a "blind mode" (i.e., similar to the peer-review process) which reduces the risk of selection bias (Ouzzani *et al.*, 2016). After the exclusion of duplicated papers, the remaining studies were screened by three independent judges (NOC, NCR, and MOP). Then, after the title and abstracts screening process, the website allows the removal of blind mode, showing the decisions made by each researcher. Then, a new tab named "conflicts" appears showing all articles with different decisions regarding the inclusion/exclusion in this review. Any disagreements between judges were solved by three senior researchers (WLM, SP and AAG).

The inclusion criteria used during articles screening were: I) empirical studies that went through the peer review process; II) present results on startups that are inside or that have gone through (e.g., graduated start-ups or spin-offs) incubators, accelerators or technology parks in Brazilian universities; and III) investigated at least one of the following topics in a start-up: a) success factors, b) challenges, c) funding sources, d) profile of start-ups entrepreneurs in universities. The exclusion criteria were: I) duplicated articles; II) studies that investigated the opinion of non-entrepreneur university students (e.g., regarding entrepreneurship importance or hacktons experience); III) studies consisting mostly of start-ups in incubators/accelerators outside universities (i.e., ≥ 51%); and IV) full text not available online. Furthermore, to cover as much of the university start-ups literature as possible, we established no restrictions concerning sociodemographic characteristics of participants, publication date or language of the studies.

2.3 DATA EXTRACTION

The following data were extracted from the included studies: 1) study identification (i.e., Authors last name, publication date); 2) Study design (e.g., case study, quantitative/qualitative); 3) Business type (e.g., health, engineering) ; 4) Sample size and type (e.g., entrepreneurs, managers, venture capital investors); 5) Sample age (mean or range); 6) sex ratio; and 7) success factors, challenges, profile of entrepreneurs in universities, funding sources. The data extraction was performed by NCR, MOP, JPA and revised by NOC and AAG.

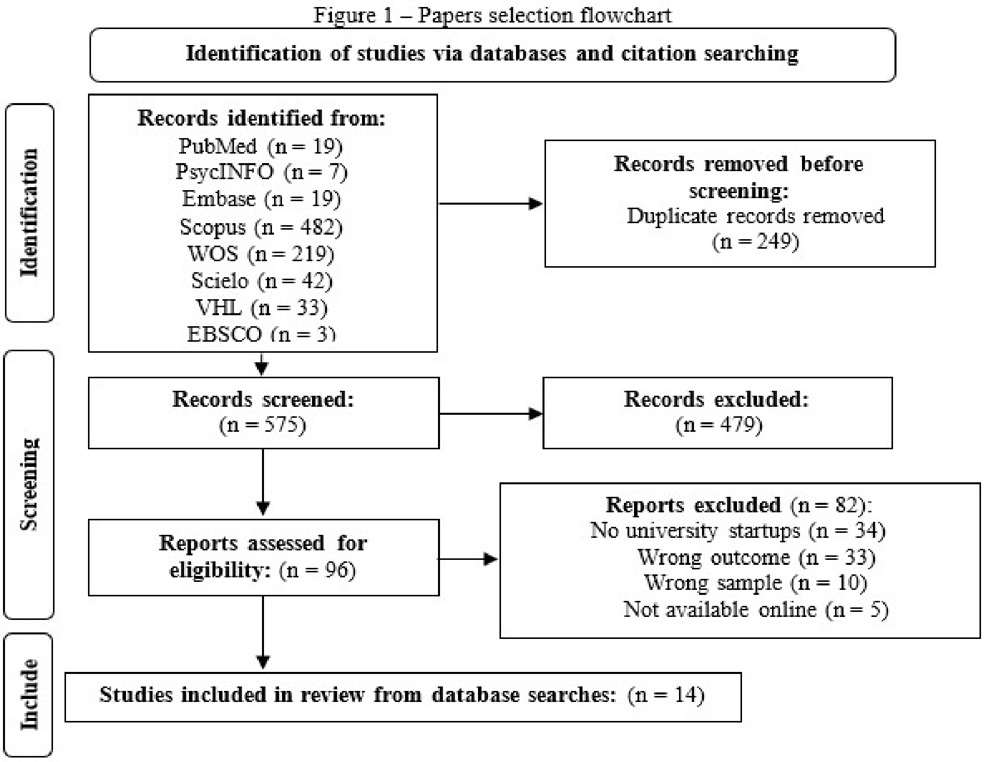
2.4 DATA SYNTHESIS

Lastly, to respond to the aims of this review, the success factors, challenges faced, and funding sources of Brazilian startups were grouped into response categories and subcategories. Those groups were developed inductively according to data extraction and refined through critical analysis. Although all success factors and challenges reported by the 14 included papers were extracted, only the factors mentioned by two or more studies are presented and discussed in this scoping review. Similar subcategories were unified to avoid overlapping during the discussion of the results. For example, the challenges subcategories "Government and universities bureaucracy" mentioned by 4 studies, and "Intellectual property bureaucracy" mentioned by 3 studies were merged into "High bureaucracy". The data synthesis was performed by NOC and revised by WLM, SP and AAG.

3 RESULTS AND DISCUSSION

The initial search identified 824 papers in the eight databases (The file with the information on the 824 records is available as supplementary material). After duplicates were removed the total number of records screened was 575. After the screening stage, based on article inclusion/exclusion criteria, 96 studies were selected for full text review. In this point, the most common reasons for exclusion were papers that evaluate start-ups, but not in university context or did not report any of the outcomes evaluated in our review. After full text reading 14 studies were included in this scoping review. There was disagreement between judges regarding the inclusion of 03 of these studies and the opinion of a third senior researcher (AAG or WLM) was consulted. There was total agreement between all research team regarding the final inclusion of 14 articles. Figure 1 shows the steps of data selection according to the PRISMA-ScR (Tricco *et al.*, 2018).

Figure 1 – Papers selection flowchart



Source: Elaborated by the authors (2025).

3.1 PUBLICATION AND SAMPLE-RELATED INFORMATION

Table 1 shows the main characteristics of the 14 articles and their sample data Each article received a number in ascending order (1, 2, 3...). This numbering is used to mention the studies throughout the results.

TABLE 1 – Studies and sample characteristics

Reference	Method	Analyzed institutions	Sample type (*n*)	Mean Age(SD)
1. Zawislak e Dalmarco (2011)	Documental and mixed on-line survey	57 Start-ups	Managers (NR)	NR
2. Frick e Frick (2013)	Qualitative case study	1 Start-up	Angel investors (NR)	
3. Cruz, Prates e Silva (2013)	Qualitative multiple case study	5 Start-ups	Company directors (NR)	
4. Melan *et al.* (2017)	Documental and qualitative, case study	1 Start-up	Founders of the start-up (*n* = 2)	
5. Sousa *et al.* (2017)	Documental and qualitative, case study	2 Incubators; 1 Technological park	Incubators and technological park managers (*n* = 3)	20-35
		2 Start-ups	Founders of start-ups (*n* = 2)	NR

Reference	Method	Analyzed institutions	Sample type (*n*)	Mean Age(SD)
6. Torres, Lima e Souza (2017)	Qualitative multiple case study	2 Incubators; 1 Accelerator; 1 Technological park	Managers and mentors (*n* =17)	NR
		9 Start-ups	Founders of start-ups (*n* = 9)	29.1 (NR)
7. Pereira, Lopes e Porto (2018)	Quantitative on-line survey	174 Start-ups	Managers (NR)	
8. Tumelero *et al.* (2018)	Quantitative on-line survey	90 Start-ups	Entrepreneurs (*n* = 99)	
9. Del Rey *et al.* (2017)	Documental and qualitative	218 Start-ups	Managers (NR)	
10. Kossmann, Nodari e Figueiro (2020)	Documental and qualitative case study	1 Technological park	Managers and mentors (*n* = 3)	
		7 Start-ups	Entrepreneurs (*n* = 7)	
11. Castro, Antunes e Freire (2021)	Qualitative multiple case study	2 Incubators 47 Start-ups	Managers (*n* = 3) Entrepreneurs (*n* = 8)	
12. Castro, Araujo *et al.* (2021)	Qualitative multiple case study	6 Start-ups	Entrepreneurs (NR)	
13. Nassif *et al.* (2021)	Qualitative case study	1 Incubator	Manager (*n* = 1)	NR
		9 Start-ups	Entrepreneurs (*n* = 7)	30-50
14. Frare *et al.* (2021)	Mixed on-line survey	100 Start-ups	Founders or managers of start-ups (*n* = 100)	NR

Note: NR – Not reported.
Source: Elaborated by the authors (2025).

Most of the studies (*n* = 11) were published between 2017 and 2022, showing a growth of interest in topics related to success factors and challenges faced by start-ups in Brazil. Regarding studies' methods, most used qualitative and/or documental approaches (*n* = 10), only two used quantitative and two mixed methods. As expected, we found qualitative material that was excluded in previous systematic reviews (Salmony; Kanbach, 2022; Santisteban; Mauricio, 2017). Our finding suggests that the university start-ups theme is still understudied in Brazil and most of the publications are qualitative in nature.

Most of the studies (*n* = 9) analysed only start--ups, and five used mixed approach (e.g., start-ups + incubators). The number of analysed institutions (i.e., start-ups, incubators/accelerators, technological parks) per study ranged from 1 to 218, the sum of institutions from all studies is 737, being 7 incubators, 01 accelerators, 03 technological parks, and 726 start-ups. Although it is not possible to estimate how many of these institutions are repeated among the included studies, data from Brazilian government suggest that there are 363 incubators, 57 accelerators, 55 technological parks (Brazil, 2020, 2021). It is noteworthy that this data represents the overall institutions number, both inside and outside universities. Furthermore, although it is hard to estimate the total number of start-ups in Brazil, the government suggests that 1.993 start-ups are inside technological parks (Brazil, 2021).

The sample size of the included studies ranged from 2 to 100 participants. The sum of samples from all studies was 261. Most studies' samples referred to start-ups entrepreneurs, founders, or managers (*n* = 234), followed by incubators, accelerators and technological parks managers or mentors (n = 27). None of the studies report mean age or standard deviation, so it was not possible to estimate an overall mean for all included studies, only three studies report age range. Only one paper (study 14) reported the gender distribution of the sample, which was composed only of women, so we did not add information about sex in the Table 1. Considering the lack of information on age and sex, these data will not be further discussed.

3.2 START-UPS CHARACTERISTICS

Table 2 shows the start-ups characteristics (i.e. business type, success factors, challenges, and financial sources). Although one of the aims of this study was to investigate the profile of start-ups entrepreneurs inside university structures, only two studies (Studies 6 and 14) presented some personal characteristics that can contribute to the success of start-ups inside universities incubators (i.e. persistence, risk-taking and proactiveness). Therefore, we did not add information about entrepreneur's profile in the Table 2. Furthermore, although these personality traits are in line with those found in a previous systematic review (Salmony; Kanbach, 2022) and in a previous Brazilian study (Coda *et al.*, 2022), they should be interpreted with caution, since the persistence and risk-taking traits are based in the opinions of 17 incubators managers and mentors (Study 6). Only the proactiveness trait is based on the opinion of 100 managers or founders of start-ups (Study 14). Overall, this finding suggests that there is a lack of Brazilian studies that address the profile of start-ups' entrepreneurs inside university structures.

Regarding the business type, the most common company type between the studies (n = 10) was Technology-based and/or Software engineering companies, followed by engineering companies (n = 3). Other business types (e.g. health and agriculture) are cited only by one study. Regarding the other start-ups' characteristics, after the careful analysis of the 14 included articles, three categories were elaborated for the presentation and discussion of the results: I) success factors; II) challenges faced; and III) funding sources. The characteristics reported by at least three of the included articles were transformed into subcategories inside categories I, II and III. Most papers reported more than one success factor, challenge, or funding sources; therefore, some studies can be mentioned multiple times in each subcategory.

TABLE 2 – Start-ups characteristics

N°	Business type	Success factors	Challenges	Funding sources
1	Engineering; Agriculture; Health	-	1) Lack of financial resources; 2) High bureaucracy; 3) Multiple roles and lack of time	1) Government
2	TBCs/Software engineering	1) R&D for innovative solutions; 2) Robust network; 3) Good planning and management; 4) Market knowledge and assessment	1) High bureaucracy	1) Government; 2) Angel or venture capital investor; 3) Self-funding
3	TBCs/Software engineering; Manufacture and market products; Engineering	1) R&D for innovative solutions; 2) Robust network; 3) Marketing structure; 4) Market knowledge and assessment; 5) Price setting	1) Multiple roles and lack of time; 2) Conflicts between founders or employees	-
4	Environment	1) R&D for innovative solutions; 2) Marketing structure; 3) Good employee selection and institutional relations; 4) Market knowledge and assessment	1) Lack of financial resources; 2) High bureaucracy; 3) Lack of knowledge or qualified personnel	-

N°	Business type	Success factors	Challenges	Funding sources
5	-	1) Good planning and management; 2) Market knowledge and assessment; 3) Price setting	1) Lack of financial resources; 2) Lack of knowledge or qualified personnel; 3) Conflicts between founders or employees	1) Government; 2) Self-funding
6	TBCs/Software engineering	1) Price setting; 2) Robust network; 3) Good planning and management	1) Lack of financial resources; 2) Lack of knowledge or qualified personnel; 3) Conflicts between founders or employees; 4) Multiple roles and lack of time; 5) High bureaucracy	1) Self-funding
7	TBCs/Software engineering	1) Good planning and management; 2) Good employee selection and institutional relations; 3) Robust network	1) Lack of knowledge or qualified personnel	-
8	TBCs/Software engineering	1) Robust network; 2) Good planning and management	1) Lack of financial resources	1) Government; 2) Angel or venture capital investor
9	NR	1) R&D for innovative solutions; 2) Good planning and management; 3) Market knowledge and assessment	-	-
10	TBCs/Software engineering; Creative industry; Environment and renewable energy	-	1) Lack of financial resources; 2) High bureaucracy	1) Government; 2) Angel or venture capital investor
11	TBCs/Software engineering	1) Robust network	1) Multiple roles and lack of time; 2) High bureaucracy; 3) Lack of financial resources	-
12	TBCs/Software engineering; Social impact	1) R&D for innovative solutions; 2) Good planning and management; 3) Market knowledge and assessment; 4) Good employee selection and institutional relations	1) Multiple roles and lack of time; 2) Conflicts between founders or employees	-
13	TBCs/Software engineering	1) Robust network; 2) R&D for innovative solutions; 3) Good planning and management; 4) Market knowledge and assessment	1) Lack of financial resources; 2) Multiple roles and lack of time; 3) High bureaucracy; 4) Lack of knowledge or qualified personnel	-
14	TBCs/Software engineering; Service sector; Engineering	1) Good planning and management; 2) R&D for innovative solutions	-	-

Note: TBCs – Technology-based companies.
Source: Elaborated by the authors (2025).

3.3 SUCCESS FACTORS

All but two (studies 1 and 10) of the included papers reported at least one factor that contributes to start-ups success. The factors that were reported only by two or three studies were grouped inside some of the subcategories according to thematic proximity. We identified seven factors that can contribute to the success of Brazilian start-ups inside universities.

3.3.1 Good planning and management (n = 9; 64%)

The ability to manage the business through the elaboration and execution of a good business plan was the main success factor reported by Brazilians start-ups founders, managers, and incubators managers or mentors inside universities (studies 2, 5-9, 12-14). This finding corroborates a recent study that suggested that new entrepreneurs attribute a high positive value to the business plan in the early stages of a startup. However, it was evidenced that after six months the business plan was considered internally irrelevant, being useful only for external partnerships (Watson; McGowan, 2019). Furthermore, a study of 116 new ventures found no performance differences between start-ups with or without a business plan before opening the business. Despite this, the authors highlight the need for financial planning and suggest the preparation of a business plan when there is a need to raise external capital from investors (Lange *et al.*, 2007). This conclusion is supported by Brazilian researchers who suggest that at least one of the business founders or managers must be trained to deal with financial and resource management (Aveni, 2019; Braga; Silvestre; Oliveira, 2018).

On the other hand, some authors suggest that developing a product or service without a business model is a factor associated with the failure of start-ups (Akter; Iqbal, 2020). Other studies, which used text mining and sentiment analysis of Twitter data, concluded that the business plan is a neutral factor (i.e., not necessarily associated with the success or failure of start-ups – Saura; Palos-Sanchez; Grilo, 2019). A possible conclusion from all this evidence is that, while the business plan is important, its relationship to the success of start-ups may be mediated by specific situations, such as planning during products or service elaboration (Akter; Iqbal, 2020), and to obtain external capital (Lange *et al.*, 2007); it is to say that writing a business plan without a reason may be a factor that does not directly contribute to the success of a start-up (i.e., neutral factor). Further studies should be conducted to validate this hypothesis, especially in Brazil. Despite that, there seems to be consensus in the literature that good planning and management is one of the main start-ups' success factors.

3.3.2 Market knowledge and assessment (*n* = 7; 50%)

Having a good understanding and access to the market to check the competitors, problems, and possible services/products to solve them was the second most reported success factor reported between the analyzed papers (studies 2-5, 9, 12 and 13). This finding is corroborated by previous studies which suggested that the ability to assess and recognise opportunities in the market (Chandler; Jansen, 1992; Kim; Kim; Jeon, 2018; Ko; An, 2019), competitors' situation and new product need are fundamental for start-ups success (Ko; An, 2019). Similar understanding is also proposed by Brazilian researchers who understand that market knowledge is one of the main success factors in start-ups outside universities (Nogueira; Arruda, 2015; Moreira *et al.*, 2019; Moroni; Arruda; Araújo, 2015), and suggest that start-ups should avoid a comfort zone, especially when they succeed in establishing a product or service in the market. In those cases, anticipating the competition and continuing to create innovative strategies becomes even more important to reduce uncertainty about a startups' future (Moroni; Arruda; Araújo, 2015).

Other success factors associated with market knowledge and assessment were the price setting (studies 3, 5, and 6) and marketing structure (studies 3 and 4). Both factors are also highlighted by previous systematic reviews which suggest that price setting, consumers willing to pay, and marketing/sales strategies (Akter; Iqbal, 2020; Ko; An, 2019) are factors associated with start-ups success (Ko; An, 2019), or failure when those strategies are poor or absent (Akter; Iqbal, 2020). Hence, there seems to be consensus in the literature regarding the role of marketing/sales structures, market knowledge, and assessment in start-ups' success.

3.3.3 R&D for innovative solutions (*n* = 7; 50%)

The ability to develop innovative technologies based on academic research to solve issues identified in the market or in society, was also reported as a success factor by half of the papers analysed (studies 2-4, 9, 12-14). Therefore, this factor is also the second most reported next to market knowledge and assessment. The importance of R&D for innovation was also commonly reported as a start-up success factor in the literature (Santisteban; Mauricio, 2017). However, it is noteworthy that R&D and innovation are not only related to the creation of new products and technologies, the application of innovative marketing and sales strategies can contribute to the success of start-ups (Díaz-Santamaría; Bulchand-Gidumal, 2021; Kim; Kim; Jeon, 2018; Santisteban; Mauricio, 2017).

In Brazil, some researchers also indicate the importance of innovation for start-ups' success and highlight that, although Brazilian start-ups have difficulties implementing innovative strategies, the correct and effective use of design for driving innovation strategies and contribute to the growth and greater interaction between the brand or product and the consumer (Moroni; Arruda; Araújo, 2015). Therefore, there seems to be consensus in the literature that R&D and innovative solutions are one of the main start-ups' success factors. Yet, considering that there are several factors related to innovation (e.g., development of new technology, products, services, and sales strategies), it is recommended that further studies investigate which innovation factors are most important for the success of early-stage start-ups, or whether a combination of these factors is necessary to increase the chances of success.

3.3.4 Robust network (*n* = 7; 50%)

Having a robust network with the market, clients, partners/companies inside and outside incubators, was also reported as a success factor by seven of the analysed papers (studies 2, 3, 6-8, 11, and 13). Hence, this factor is also the second most reported next to R&D for innovative solutions, and market knowledge and assessment. Entrepreneurs' networks are also reported by many studies as an important success factor of start-ups (Passaro *et al.*, 2020; Santisteban; Mauricio, 2017; Sharir; Lerner, 2006; Witt, 2004). One of these studies showed that collaboration with different companies during all stages of the startups' evolution was fundamental to their success, especially through the exchange of knowledge and resources (Passaro *et al.*, 2020; Santisteban; Mauricio, 2017).

Furthermore, Brazilian authors suggest that one of the main advantages of being part of an incubator or university technological park is networking. The quality and extent of networking are usually associated with successful start-ups (Nogueira; Arruda, 2015), which confirms the findings of our review, especially the perception of some incubator managers who suggested that knowledge transfer and access to capital can be improved through the networking of incubators and technology parks inside universities (Study 11). Another universities start-ups' success factor associated with networking was good employee selection and institutional relations (studies 4, 7, 12); and this factor concerns the ability to cultivate and sustain good interpersonal relationships among partners, employees, and company sectors. Some of these studies also indicated the need for a good human resources sector or person to select the new employees, since many of the start-ups' founders perform this and other functions which they are not qualified for (studies 7 and 12). Both factors are also identified in a previous systematic review which suggests that not having the right team is a factor associated with start-ups' failure (Akter; Iqbal, 2020). Therefore, there seems to be consensus in the literature that a strong network of contacts is crucial for start-ups success.

3.3.5 Other success factors reported by previous studies

It is noteworthy that some start-ups' success factors commonly reported in previous literature reviews, are reported by few or none of the studies included in our review. Such as founder's previous experience in establishing companies (Akter; Iqbal, 2020; Santisteban; Mauricio, 2017), academic formation of the founders (Santisteban; Mauricio, 2017), personality traits and start-ups founders' attitudes (Akter; Iqbal, 2020; Ko; An, 2019; Santisteban; Mauricio, 2017). This may indicate that, although most of the success factors are similar among start-ups inside/outside universities and in different countries, some factors may be more common or more studied in certain countries. Further studies should be conducted to validate this hypothesis.

3.4 CHALLENGES FACED

All but two (studies 9 and 14) of the analysed papers reported at least one challenge faced by start-ups. We identified five challenges faced by Brazilian start-ups inside universities, all are reported in four or more papers.

3.4.1 Lack of financial resources (*n* = 8; 57%)

The difficulties of getting financial resources to fund the start-ups was the main challenge faced by Brazilian start-ups inside universities (studies 1, 4-6, 8, 10, 11, 13). This finding corroborates previous systematic reviews, which suggested that run out of cash (Akter; Iqbal, 2020) or find financial sources is one of the main challenges faced by start-ups (Akter; Iqbal, 2020; Bauer; Junge; Reif, 2024; Drover *et al.*, 2017). This conclusion is supported by Brazilian researchers who suggest that due to the lack of financial resources, it is common that start-ups founders, need to apply for government grants, self-funding, family and friends' loans (Felipe, 2023; Moreira *et al.*, 2019; Torres; Souza, 2015), or even seek creative solutions (e.g., crowdfunding - Felipe, 2023). Therefore, there seems to be consensus in the literature that the lack of financial resources is the main challenge faced by start-ups.

3.4.2 High bureaucracy (*n* = 7; 50%)

The number and delay of bureaucratic processes related to opening and maintaining a start-up in Brazil was pointed out as the second main challenge faced (studies 1, 2, 4, 6, 10, 11 and 13). Among the sources of bureaucracy, four articles reported on the onerousness of government, university, and banking processes (studies 6, 10, 11 and 13), and three specifically referred to the high costs and delays in the process of registering trademarks, patents, and intellectual property (studies 1, 2 and 4). This finding corroborates a recent study that investigated data from the bureaucratic structures of 22 countries and concluded that the higher the level of bureaucracy the less likely one is to open a start-up. This relationship is stronger in low-income countries (Patel; Wolfe, 2022). This finding may shed some light on the results of a previous study conducted in the U.S., which found that only 6% of entrepreneurs perceive the government as a barrier and only 1% as a reason for going out of business (Kwapisz, 2019); it is to say that start-ups related bureaucracy may be higher in low- and middle-income countries.

Furthermore, issues related to intellectual property management were also previously reported by some authors who divided the frequent problems into three categories: underestimate intellectual property importance, lack of management strategies, and financial challenges (Baran; Zhumabaeva, 2018). Although the last two issues were reported by the studies included in our review, the Brazilian start-ups founders or managers do not seem to underestimate the importance of intellectual property (studies 1, 2 and 4). In fact, the Brazilian literature commonly highlights the delays and high costs of Brazilian intellectual property registration process (Nogueira; Arruda, 2015; Marques; Pacheco, 2023). Therefore, there seems to be consensus in the literature that high bureaucracy is one of the main challenges faced by start-ups. Yet, further studies should address the hypothesis that start-ups related bureaucracy is higher in low- and middle-income countries.

3.4.3 Multiple roles and lack of time (*n* = 6; 43%)

The need to work in other paid activity and the lack of time generated by those multiple roles were pointed out as the third main challenge faced by entrepreneurs, since startups are not profitable in the short term (Studies 1, 3, 6, 11-13). Between those papers, some incubators managers and mentors also reported lack of time to dedicate to start-ups entrepreneurs, because they are usually professors at the universities, accumulating multiple roles and heavy workloads (Studies 6 and 11). These findings are corroborated by previous authors who suggest that time dedicated to the start-up is associated with higher revenue and a greater probability of obtaining financing (Diaz-Santamaria; Bulchand-Gidumal, 2021). Furthermore, there is evidence that both full-time dedication to the start-up and being willing to work for a long period of time without any financial payment are associated with start--ups' success (Sharir; Lerner, 2006).

Although the founder's time commitment is important to the success of a start-up, a Brazilian study suggests that the greater the number of founders working full-time in the start-up, the greater the chance of start-up failure. Explanations provided for this failure are related to conflicts between founders' and lower capacity to adapt to the market needs and changes (Nogueira; Arruda, 2015). Therefore, there seems to be consensus in the literature that multiple roles and lack of time is one of the main challenges faced by start-ups. However, further studies are needed to investigate the relationship between the number of founders who dedicate full time to the start-up in their early stages and start-up success.

3.4.4 Lack of knowledge or qualified personnel (*n* = 5; 36%)

The lack of founders' knowledge regarding entrepreneurial processes and the lack of employees' knowledge regarding specific job tasks was another challenge faced by Brazilian start-ups inside universities (studies 4-7 and 13). Between those papers, some entrepreneurs reported not knowing how to elaborate a business plan, manage the business, or not having an employee to assist in management tasks (studies 5, 6 and 13). This finding corroborates previous systematic reviews which suggested that founders' lack of experience/knowledge in the field, and not having a qualified team are factors that influence start-ups' failure (Akter; Iqbal, 2020; Santisteban; Mauricio, 2017). Furthermore, one of these reviews also suggests that academic formation of founders may be related to start-up success (Santisteban; Mauricio, 2017).

In Brazil, some authors suggest that founders' knowledge of business management can contribute to the success of start-ups (Nogueira; Arruda, 2015). Furthermore, it is noteworthy that those findings are also related to multiple roles and lack of time since it is common that start-up founders need to perform multiple tasks that they are not qualified for (studies 7 and 12; Akter; Iqbal, 2020), which in turn is also related to the lack of financial resources for hire qualified employees and delegate some start-ups tasks (Akter; Iqbal, 2020; Santisteban; Mauricio, 2017). Therefore, there seems to be consensus in the literature that founders' knowledge about business management (regardless of business plan), and employee's competence can contribute to the success of start-ups.

3.4.5 Conflicts between founders or employees (*n* = 4; 29%)

Interpersonal conflicts between founders, employees, or start-up departments were reported as another challenge that may contribute to start-ups' failure (studies 3, 5, 6, and 12). A previous systematic review supports this result by showing that five studies conducted in multiple countries, found that conflicts between founders or team members lead to start-up failure (Akter; Iqbal, 2020). Furthermore, another systematic review suggests that problems with the team are the main cause of startups' failure (Brattström, 2019). These conclusions were also found by some Brazilian researchers who suggest that disagreement between founders or between founders and investors, are between the main reasons for Brazilian start-ups discontinuation (Nogueira; Arruda, 2015). Therefore, there seems to be consensus in the literature that conflicts between founders, investors and employees/team is one of the main challenges faced by start-ups.

3.4.6 Other challenges reported by previous studies

Some start-up challenges commonly reported in previous literature reviews are reported by few or none of the studies included in our review. Such as lack of market demand, becoming outcompeted, strong competition, user-unfriendly products (Akter; Iqbal, 2020), personality traits, and start-up founders' attitudes (Akter; Iqbal, 2020; Ko; An, 2019). Furthermore, some Brazilian authors suggest that the lack of identification of the founders with the business or product are commonly associated with the failure of start-ups outside university structures (Nogueira; Arruda, 2015). Therefore, most of the challenges faced by start-ups inside/outside universities are similar across different countries.

3.5 FUNDING SOURCES

Most analyzed papers (*n* = 8) did not mention university start-up funding sources. Despite that, we identified three funding sources reported by three or more papers.

3.5.1 Government (*n* = 5)

Obtaining financial resources through government grants was the main source of funding of Brazilian start-ups inside universities (studies 1, 2, 5, 8 and 10). This finding corroborates a recent systematic review on funding start-ups sources, which suggested that governmental venture capital is between the main funding sources. But usually, government grants are provided only for start-ups in late development stages (Bauer; Junge; Reif, 2024). On the other hand, data from the Brazilian Start-ups Association (ABSTARTUPS, 2022) indicate that public funding is the third main source of financing in Brazil. The ABSTARTUPS is one of the largest databases of startups in Brazil, with information on 1753 startups. Only 13% of these received government funding in 2022. Possible explanations for the low rate of funding of startups by the Brazilian government may be associated with the scarcity of resources, calls for proposals or grants that require start-ups in late development stages and/or within university incubators or technology parks (which may explain why government funding was the most reported in our review). Further studies should be conducted to validate those hypotheses.

3.5.2 Angel or venture capital investors (*n* = 3)

Financing through angel or venture investors was the second most reported source of funding (Studies 2, 8, and 10). Previous systematic reviews suggest angel or venture capital investors as one of the main start-ups' funding sources (Bauer; Junge; Reif, 2024; Drover *et al.*, 2017). Unlike government funding, both angel and venture capital investors usually make investments in all start-ups development stages (Bauer; Junge; Reif, 2024). In Brazil, data from ABSTARTUPS (2022) indicate that 39% of start-ups are financed by angel investors. On the other hand, only 3.3% of the funding comes from venture capital investors. Therefore, angel investors are the main source of start-up financing in Brazil. However, the ABSTARTUPS data does not inform how many of these start-ups are part of incubators or technology parks inside or outside universities. Therefore, further empirical studies are recommended to verify the prevalence of these sources of funding within Brazilian incubators and technological parks.

3.5.3 Self-funding (*n* = 3)

Investments made by the start-up's founders, their relatives or friends, were also reported as a funding source by three papers (Studies 2, 5, and 6). Hence, this source is also the second most reported next to angel or venture capital investors. This finding corroborates a recent systematic review, which suggested that friends and family are between the main funding sources, mainly during the early and mid-start-up development stages (Bauer; Junge; Reif, 2024). According to ABSTARTUPS (2022) 17.6% of the start-ups are financed through seed. However, it is unclear how much of this capital is provided by friends, family, or the founders themselves. Therefore, further Brazilian empirical studies that clarify these data are recommended, both with start-ups inside and outside university structures.

3.5.4 Other funding sources reported by previous studies

Some other funding sources commonly reported in the literature were not identified in the results of our review. Such as funding by incubators/accelerators, private companies, banks, university-based funds, and crowdfunding (Drover *et al.*, 2017; Block *et al.*, 2018; Bauer; Junge; Reif, 2024). Data from ABSTARTUPS (2022) indicates that incubators fund approximately 11% of Brazilian startups, and funding from private companies and crowdfunding together represents ≤ 10%. However, it is unclear how many of those start-ups are inside university structures. These data reflect the statements of Brazilian university incubator managers, who report a lack of resources on the part of universities to maintain and offer services to entrepreneurs (Studies 6 and 11). In one of the studies analysed, the managers emphasised that the technology park has as a rule not to financially provide for any of the start-ups, we quote the statement of one of the managers of the technology park (Study 11): "We make [...] clear to the entrepreneur, that our contribution is knowledge transfer, networking, relationship generation that in turn will provide other things like access to capital" (our translation). Therefore, although the main sources of funding inside/outside universities are similar across different countries, in Brazil, the funding of start-ups by universities, incubators/accelerators are apparently uncommon. Further empirical studies in Brazil are recommended to confirm this hypothesis.

4 LIMITATIONS

The current review is valuable because it maps the literature on the success factors, challenges faced, and funding sources of Brazilian start-ups inside universities incubators/accelerators or technological parks. Despite that, this review has some limitations, the first is that most included papers are qualitative in nature and four are conference papers (studies 4, 6, 7 and 9). Therefore, although the total number of start-ups analysed among the studies (i.e., 726) may be considered as representative of the Brazilian start-ups within university structures, caution is recommended when generalising the data, since many of the success factors or challenges may be based on case studies. The second limitation is related to the possibility of some start-up cases overlapping between the analysed studies. Especially among studies with different methodologies (i.e., qualitative vs. quantitative).

Lastly, although, our aims are related to start-ups inside university structures, some of the analysed studies used the ABSTARTUPS or similar databases (e.g., National Association of Innovative Enterprise Promoting Entities - ANTROPEC) databases for recruitment of their samples. These databases list start-ups in incubators/accelerators/technological parks inside and outside universities. This bias was reduced by excluding studies with samples consisting of ≥ 51% of start-ups outside university structures, but studies 7-9 and 14 still used mixed samples. Nevertheless, it is noteworthy that this may be a minor limitation, since according to our findings most of the success factors and challenges faced by start-ups are equal inside and outside university structures.

5 CONCLUSIONS

This review analysed 14 studies that investigated the main success factors, challenges faced and founding sources of Brazilian start-ups inside universities incubators/accelerators or technological parks. This scoping review is valuable to the scientific literature by demonstrating the existence of seven success factors, five challenges faced, and three founding sources commonly reported by Brazilian start-ups founders or incubators/accelerators managers. We also discuss whether the factors located in this review are unique to start-ups within university structures.

Our findings suggest that good business plan and business management, market knowledge and assessment, R&D for innovative solutions, and a robust network are the main factors related to Brazilian start-ups' success. The lack of financial resources, high bureaucracy, multiple roles, and lack of time are the main challenges faced by Brazilian start-ups. The main Brazilian start-ups' funding sources are the government, angel or venture capital investors, and self-funding. It is noteworthy that some of the reported factors tend to be related to each other (e.g., lack of qualified personnel and lack of financial resources). Furthermore, all factors located in our review are similar to factors reported by empirical studies (both international and Brazilian). We also conclude that most of the success factors and challenges faced by start-ups are equal inside and outside university structures. Therefore, the main advantages of being part of the university incubators/accelerators or technological parks seem to be the access to their, physical structure and tools (which reduces the costs of start-ups implementation), mentoring and training (what empowers beginning entrepreneurs), and network (which increase access to funding sources). Those advantages contribute to the success and higher survival rate of startups.

It is noteworthy that the data extracted from the studies analysed in this review are not predictive. Therefore, the fact that some factors have been less reported does not necessarily mean that they are less important than those reported by several studies. Thus, further studies that use predictive analyses to investigate and rank the influence of all success factors and challenges reported in this review are recommended. Especially considering that the fourteen analysed papers asked participants to report the success factors or challenges faced by Brazilian start-ups, none of them requested participants to rank success factors and challenges by relevance/prevalence.

Furthermore, although one of our goals was to investigate the profile of start-up entrepreneurs inside university structures, this objective was only partially answered due to the lack of Brazilian research on this topic. We found that persistence, risk-taking, and proactiveness are the main characteristics reported by incubators managers, mentors, and founders or managers of start-ups. Thus, our findings suggest that there is a lack of Brazilian studies that address the profile of start-up entrepreneurs inside university structures. Further studies should address this topic and seek to corroborate the personality traits reported in the international literature (e.g., big five, self-confidence).

Lastly, we believe that the list of success factors, challenges faced, and founding sources provided in this review, may provide valuable information for start-up entrepreneurs that wish to participate in incubators/accelerators, or university technology parks, as well as for investors interested in these institutions, and as basis for the development of Brazilian public policies that seek to contribute to the emergence of new start-ups and increase their survival rate. We hope that the knowledge shared through this review contributes to new research on start-ups' success factors and challenges.

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