

Main elements involved in the startup scalability process: a study on Brazilian agtechs

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Abstract

Abstract –

Purpose – The study aims to analyze the main elements associated with the evolution of Brazilian agtechs from the initial conception of the business model to becoming companies in the scale-up stage.

Design/methodology/approach – The exploratory research was conducted based on data collected through in-depth interviews. The answers were analyzed quantitatively using descending hierarchical classification (DHC) and correspondence factor analysis (CFA) and qualitatively using content analysis.

Findings – Five main elements were identified as responsible for the evolution of the companies up to their entering the scale-up phase: (1) governance, (2) decisions inherent to resource allocation, (3) monitoring of strategic, tactical and operational activities, (4) fostering human capital development and (5) business model validation. Each element presents a set of performance indicators that show the scalability of these companies.

Practical implications – The model developed can help companies that have not yet advanced from the conception of the business model to the scalability of different sectors, in addition to agribusiness.

Social implications – Proposal of a model that presents the main elements that impact on scalability and respective indicators that contributed to the scalability process of Brazilian agtechs.

Originality/value – This study contributed to advancing the knowledge on the organizational life cycle (OLC) of agricultural startups, particularly regarding the factors responsible for their scalability.

Keywords Business model innovation, Entrepreneurship, Scalability, Startups, Agribusiness

Paper type Research paper

1. Introduction

Regardless of their areas of activity, organizations undergo a series of development phases during their trajectory, which are called the organizational life cycle (OLC) or development cycle (Silva, Jesus, & Melo, 2010).

For a startup company, the importance of understanding the phases of this cycle, as well as the metrics that start or finish each stage, is derived from the need to gain operational efficiency (Hoffman & Yeh, 2018). In these companies, the first phase of the OLC is marked by an ideation process, where the entrepreneurs seek to generate innovative ideas to resolve potential clients' problems (Vianna, Adler, Lucena, & Russo, 2012), and the last phase is characterized by the generation of recurrent revenues and maturation of the company (Croll & Yoskovitz, 2013). The steps involved between ideation and the company's maturation vary



from author to author. [Croll and Yoskovitz \(2013\)](#), for example, report the intermediate stages of “stickiness,” “virality,” and “revenue.” [Blank and Dorf \(2012\)](#) consider the stages of “customer validation” and “customer creation.” For [Hoffman and Yeh \(2018\)](#), the intermediate stage is called “tribe.” However, there is a consensus between the authors that the transformation of a startup into a mature company is marked by the scalability of its business.

Organizations that are undergoing scalability are known as “scale-up” companies ([Blank & Dorf, 2012](#); [Hoffman & Yeh, 2018](#)). Their determinant characteristics are 20% annual growth, for at least three consecutive years, and at least ten employees ([OECD, 2017](#)).

The scalability process occurs in startups from all areas of knowledge, including those in agribusiness, which are called agtechs. Their value proposal is to resolve rural producers’ problems, ranging from crop implantation to the interface with the final consumer ([Bertucci Ramos & Pedroso, 2021](#)).

Recent studies indicate a global market for agtechs worth US\$ 6.8 bn in 2018 ([Agriculture Founder \[AgFunder\], 2019](#)). As for investments, in 2018, US\$ 80 m were invested in Brazilian agtechs in all stages of development ([Vasconcelos, 2019](#)).

Although agtechs can contribute to increasing technification and the adoption of information technology strategies in agribusiness, very few studies have been developed with a focus on this new type of agricultural business ([Dutia, 2014](#)). Moreover, there are few studies on the elements that directly impact the OLC of these companies and contribute to them reaching the scale-up (scalability) phase ([Monteiro, 2019](#); [Brown & Mawson, 2013](#); [Love, 2016](#)). In light of this, this article aimed to analyze how Brazilian agtechs have evolved from the initial conception of the business model to becoming scale-up companies.

2. Theoretical framework

2.1 Concepts of startups

Startups can be referred to as a group of organizations conceived to develop new products or services in the face of situations of uncertainty ([Ries, 2011](#)). Considering the organizational approach, [Blank and Dorf \(2012\)](#) conceive a startup as a temporary organization, engaged in finding a business model that has scalability and recurrence.

For [Kon, Cukier, Melo, Hazza and Yuklea \(2014\)](#), a startup is a cluster of people that enables the conception, implementation and development of innovative or disruptive ideas in a quicker and more agile way, compared to traditional companies.

According to [Bacher and Guild \(1996\)](#), startups seek to sell technologies, which are generally disruptive, with a view to achieving competitive advantage. [Roure and Keely \(1990\)](#), in turn, consider a startup to be a company that presents technological advantages as a cornerstone of its initial strategies. [Nardes and Miranda \(2014\)](#) define a startup as a new venture, with a business model that is still to be fully validated and that is positioned in a market with many hidden variables.

Regarding a company’s life cycle, the startup phase is the initial one. If the company encounters favorable internal and external conditions, it can advance to the scalability phase (scale-up) ([Zajko, 2017](#)). That phase is the moment in which startup companies create and refine the conception of the idea up to the first sale ([Paternoster, Giardino, Unterkalmsteiner, Gorschek, & Abrahamsson, 2014](#)).

According to [Kohler \(2016\)](#), startups are currently inexhaustible sources of innovation as they use emerging technologies to create products and reinvent traditional businesses. Their capacity for innovation, speed and flexibility mean that these companies are excellent partners in the corporate environment ([Moschner, Fink, Kurpjuwet, Wagner & Herstatt, 2019](#)).

2.2 A company's life cycle and the scale-up phase

According to [Croll and Yoskovitz \(2013\)](#), a startup's development cycle traverses five phases: the first, called "empathy," aims to identify the client's problem; the second, called "stickiness," seeks to build a prototype solution for the problem; the third, "virality," aims to validate the prototype created; the fourth, "revenue," seeks to monetize the solution and conquer the initial clients; and the fifth, "scale," aims for growth in the market and the acquisition of new consumers.

According to [Blank and Dorf \(2012\)](#), startups experience four moments: discovering the client, characterized by the identification of market opportunities; validating the client, which seeks to identify the essential component of a business model; obtaining clients, which aims to establish the firm and validate its value proposal; and developing the company, which represents the phase after successfully launching the product or service.

[Hoffman and Yeh \(2018\)](#), in turn, indicate that a startup company traverses five milestones. In the "family" stage, the entrepreneurs must endeavor to devise the product. In the "tribe" phase, they must think of creating and launching the product. In the "village" phase, sales need to be scaled up with the creation of a growth plan. In the "city" phase, it is necessary to gain efficiency, maintaining speed. Finally, in the "nation" stage, the creation of global strategies must be sought with local alignment.

Although with various denominations, the scale-up phase is characterized as the phase in which the entrepreneur needs to add significant resources and leverage processes and partnerships to expand the business within the structure of the validated business concept and a sustainable business model ([Picken, 2017](#)).

We can view a company in the scale-up phase as seeking to develop sales and marketing processes at scale, as well as building an organization based on managing various groups of people. The aim of a firm in the scale-up phase is rapid growth, seeking to acquire a competitive scale and establish sustainable market leadership ([Zajko, 2017](#)).

In monetary terms, an organization in the scale-up phase has recurrent financial revenues, which range from 50 to 100 thousand euros for companies with a business-to-business (B2B) focus or from 500 thousand to one million unique monthly visitors for online business-to-customer (B2C) companies ([Hoffman & Yeh, 2018](#)).

Considering the number of employees, a firm in the scale-up stage has at least ten employees ([OECD, 2017](#)); this number must increase quickly to match the growing number of sales. According to [Endeavor \(2015\)](#), a scale-up company absorbs around 31.3 new employees per year. As for annual growth, scale-up companies present 20% growth for at least three consecutive years ([OECD, 2017](#)).

Using resources, both financial and human, it can be concluded that scale-up organizations aim to increase their market share, revenues and number of employees and, thus, to add value, as well as identifying and exploiting opportunities for collaboration with established companies ([Thiel, 2014](#)).

2.3 Elements involved in the startup scalability process

Advancing in the organizational cycle is a task with high uncertainty for startups. Few studies explore the elements associated with the evolution of startups, ranging from the initial conception of the business model to the scale-up phase. However, some hypotheses can be raised based on papers already published.

According to [Monteiro \(2019\)](#) and [Brown and Mawson \(2013\)](#), startups in the scalability phase of their development cycle have received the support of incubator, accelerator and mentoring programs. These have actively participated in the entrepreneurial ecosystem, sharing information and training. Specifically studying the entrepreneurial environment linked to agtechs in the region of California, [Mikhailov, Oliveira, Padula and Reichert \(2021\)](#)

highlight that the entrepreneurial environment helps to promote the creation, sale and large scale spread of new sets of solutions and technologies, which are very important for the third agricultural revolution. According to [Ferasso, Takahashi and Gimenez \(2018\)](#), integrating an environment that fosters innovation brings advantages, such as obtaining access to complementary resources and capacities, which are necessary elements for scalable growth. These characteristics lead us to the first hypothesis:

H1. Startups in the scale-up phase are participants in the entrepreneurial environment and benefit from it.

For [Cavallo, Ghezzi, Dell'Era and Pellizzoni \(2019\)](#), proving constantly rising demand or greater interest in the value proposal by clients is commonly perceived by organizers of entrepreneurial environments and investors as a sign of traction and, more importantly, as a sign of validation of their business model. According to [Monteiro \(2019\)](#) and [Love \(2016\)](#), this validated business model characterizes scale-up startups, as this validation enables an expansion of the client base ([Reuber, Tippmann, & Monaghan, 2021](#)), generating recurrent revenues and the search for financial equilibrium ([Sullivan, 2016](#)). A validated business model also gives these startups the competitiveness needed for sustainable development ([Piaskowska, Tippmann, & Monaghan, 2021](#)). Their market gain and scale strategies are different from other companies' as the focus is mainly on increasing capacity to explore the business model that has been proven viable ([Zhao, von Delft, Morgan-Thomas, & Buck, 2020](#)). These points led to the second hypothesis:

H2. Startups in the scale-up phase present a specific validated business model for traction and market gain.

A validated business model and participation in the entrepreneurial environment improve the establishment of structured governance and formal procedures, which are elements that are not generally found in startups at initial stages ([Cavallo et al., 2019](#)). According to [Pollman \(2019\)](#) and the Brazilian Institute of Corporate Governance (IBGC) ([IBGC, 2019a, b](#)), startups that tend to achieve success in scalability processes adopt a formal decision-making structure; they have clear stages in the decision-making process; they enjoy the help of people experienced in such decision-making and they hold constant meetings with the aim of aligning their strategic, tactical and operational objectives. These characteristics, resulting from the governance structure, are representations of the core activities of (1) rules and agreements, (2) selectivity of actions, (3) joint problem-solving and (4) socialization of decision-making ([Jingyao, Gang, & Ling, 2021](#)). The need to adopt these practices led to the development of the third hypothesis:

H3. Startups in the scale-up phase have a corporate governance structure.

The presence of formal decision-making structures and the increase in the capacity to require a progressively greater commitment to group resources in formalized activities are characteristics of the scalability strategies of startups in the scale-up phase ([Piaskowska et al., 2021](#)). For [Demir, Wennberg and McKelvie \(2017\)](#) and [Lee \(2014\)](#), startup companies that present a structure for the process of allocating strategic, financial, operational and human resources have ease of scalability as they have organizational structures that support accelerated development and business model readjustments. These companies adjust their resources to enable an increase in the speed of gaining scale, through the adoption of standards in the grouping and distribution of activities. As they seek scale gains, the companies group their resources in a deliberate and no longer experimental way ([Piaskowska et al., 2021](#)). These characteristics led to the definition of the fourth hypothesis:

H4. Startups in the scale-up phase manage the allocation of their resources in a nonexperimental way.

Scale-up companies present a structure of performance indicators for monitoring activities. According to [IBGC \(2019b\)](#), [Lee \(2014\)](#) and [Barbero, Casillas and Feldman \(2011\)](#), scale-up companies have internal and external processes for monitoring the progress of activities, which feature formalization, whether through the creation of metrics or through the elaboration of codes of conduct to carry out the activity. Besides these points, the authors discuss the importance of adopting intellectual property practices during the scalability phase. [Engelhardt and Möller \(2021\)](#) indicate that monitoring indicators that primarily seek to increase scale need to be continuously and rigorously managed. According to these authors, this monitoring starts with the building and adoption of simple indicators. The need to use indicators in scalable startup companies gave rise to the following hypothesis:

H5. Startups in the scale-up phase have a set of internal and external indicators related to the business.

The acquisition and development of human resources are essential for the development of companies in the scalability phase ([Piaskowska et al., 2021](#)). According to [Hinton and Hamilton \(2013\)](#) and [Barringer, Jones and Neubaum \(2005\)](#), human capital is responsible for implementing, validating and, sometimes, modifying the business model of startups. Characteristics such as the technical training of collaborators, the founders' experience and the presence of a training policy drive startup companies and enable them to more quickly achieve the scale objective. Given these characteristics, the sixth hypothesis evaluated was as follows:

H6. Startups in the scale-up phase value human capital and the management of that capital.

2.4 Agtechs

A startup company focused on agriculture is called an agtech, agritech or agrotech. For [Marvin \(2018\)](#), these companies linked to agribusiness are conceived to leverage the use of technology in agriculture. Their success largely depends on the speed with which the producers absorb these technologies.

According to [Dutia \(2014\)](#) and [Pham and Stack \(2018\)](#), the main objective of agtechs is to modify the agricultural sector through increased productivity in line with reductions in socioenvironmental costs.

Among the specific objectives of agtechs, we can mention the following objectives: minimizing food waste; reducing CO₂ omissions; optimizing the quantity of chemical waste produced; managing the quantity of water used in agricultural production; mitigating the scarcity of qualified workforce; optimizing agricultural distribution and logistics; and increasing food security and traceability ([Blanco, 2019](#)).

3. Research method

Considering the theoretical framework presented, six hypotheses were raised to answer the research question: "How have Brazilian agtechs evolved from the initial conception of the business model to becoming scale-up companies?"

To address this issue, exploratory field research was conducted with Brazilian agtechs in the scale-up phase. The sample used was nonprobabilistic and of the snowball type, employing the ABStartups database. The filters used in identifying the companies were as follows: (1) segment: agribusiness and (2) phase: scale-up. Subsequently, data derived from Endeavor's Scale-Up Agrotech program (2019 and 2020) was added.

The companies were categorized according to the model proposed by [Bertucci Ramos and Pedroso \(2021\)](#). That categorization aimed to identify to which link in the productive chain Brazilian agtechs in the scale-up stage belonged.

After choosing these startups, 12 in-depth interviews were conducted with the founders of the companies in the period from July to September, 2020 (Table 1). The interviews were based on a semi-structured script and conducted with the help of Google Meet®.

To ensure that all the companies were in the scalability phase, the parameter characterizing scale-up companies was used, regarding annual revenue growth and number of people, as proposed by the OCDE (2017). The questions asked in the interviews were elaborated based on the six hypotheses described in the theoretical framework.

The interviews were transcribed using the Sonix® software. The resulting transcripts (156 pages, Arial 12) were analyzed qualitatively based on the content analysis technique proposed by Bardin (2011) and quantitatively using the protocols described by Reinert (1990), for the descending hierarchical classification (DHC) analysis and correspondence factor analysis (CFA). The IRAMUTEQ® software was used in the quantitative analyses. Based on the analysis of the interviews, a model that presents the main elements involved in the scalability process of Brazilian agtechs was proposed.

4. Results and discussion

4.1 Categorization and classification of agtechs in the scale-up phase

It is important to recognize to which link in the agribusiness chain an agtech belongs, as this enables adequate triangulation of the information obtained in the in-depth interviews with the factors that impact on scalability.

The model adopted for this classification was proposed by Bertucci Ramos and Pedroso (2021). According to that model, five agtechs (A5, A6, A7, A10 and A11) propose to offer support services for agricultural activities to make the producers' use of operational and financial resources more efficient. According to Saiz-Rubio and Rovira-Más (2020), the advances in the management of information, from both within the agricultural property and outside it, are becoming a key element in modern agriculture as they help agricultural producers in critical decision-making.

Two agtechs (A1 and A12) impact on the production link of the agribusiness chain as they seek to create technological solutions for agricultural or livestock activity, ranging from the installation of vegetable or animal production to harvesting or slaughter. According to Miranda, Ponce, Molina and Wright (2019), the development of products or services for agriculture 4.0 provide contributions to the economy, social relationships and the environment.

Other two agtechs (A2 and A3) help producers with an emphasis on vegetable production to more easily find their final consumers, creating solutions for the consumption link of the agribusiness chain. According to Nedumaran *et al.* (2020), market integration platforms guarantee the producer–consumer connection, increase price transparency and reduce the role of the intermediary and the handling of products at different points.

Other two agtechs (A4 and A9) have the mission of helping the rural producer in integrating the activities of preinstallation of vegetable production (tools for implanting crops). These companies are relevant since the greater the care taken with the crop installation, the greater the chances of the rural producer maximizing their gains (Fastellini & Schillaci, 2020).

Finally, the value proposal of one agtech (A8) is developed for the first link in the agribusiness chain (inputs and equipment): the offer of services or products that improve the efficiency of input purchasing or that allow for better use of equipment during the implementation of the harvest, enabling the reduction of costs per hectare and, consequently, an increase in the return on investment for the producer.

4.2 Quantitative analyses: descending hierarchical classification (DHC) and correspondence factor analysis (CFA)

The DHC and CFA are important, as they organize the distribution of the vocabulary in a understandable and visual way, simplifying the organization process and the deduction of

Interviewees						Agtechs			
ID	Age	Gender	Training	Role in the company	ID	Beginning of operations	State	Interview time	Date of the interview
E1	37	M	Agronomics graduate	CEO and Co-founder	A1	2016	TO	30 min	09/09/2020
E2	38	M	Administration graduate; Master in Administration	CEO and Co-founder	A2	2016	MG	35 min	07/23/2020
E3	32	M	Administration graduate	CEO and Co-founder	A3	2018	SP	45 min	09/10/2020
E4	29	M	Mechatronics engineering graduate	Executive Director and Co-founder	A4	2015	MG	30 min	08/14/2020
E5	40	M	Control engineering graduate; Master in Administration	CEO and Co-founder	A5	2018	SP	37 min	09/15/2020
E6	30	M	Agronomics graduate; agribusiness specialist	CEO and Co-founder	A6	2016	MG	38 min	09/14/2020
E7	28	M	Aeronautical engineering graduate	CBO and Co-founder	A7	2017	SP	32 min	08/21/2020
E8	45	M	Agronomics graduate; Master in Economics	Executive Director and Co-founder	A8	2015	MG	32 min	09/22/2020
E9	35	M	Biology graduate; specialist in business management	CEO and Co-founder	A9	2013	SP	34 min	09/01/2020
E10	32	M	Environmental engineering graduate; specialist in business management	CEO and Co-founder	A10	2016	MG	55 min	09/16/2020
E11	32	M	Computing science graduate; Master in Computing Science	CEO and Co-founder	A11	2014	RS	30 min	09/18/2020

Table 1. Profile of the interviewees and agtechs and duration of the interview

(continued)

Interviewees					Agtechs				Date of the interview
ID	Age	Gender	Training	Role in the company	ID	Beginning of operations	State	Interview time	
E12	38	M	Computing science graduate; Master in Computing Science	CEO and Co-founder	A12	2015	ES	43 min	08/07/2020

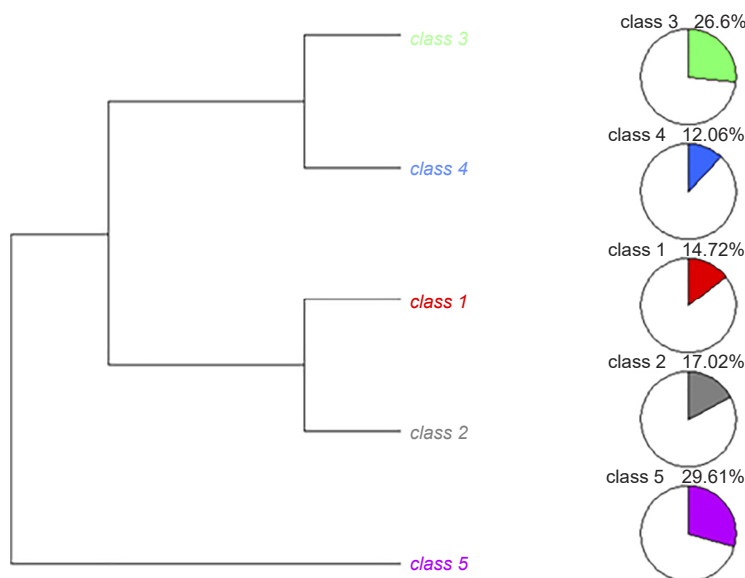
Source(s): The authors

Table 1.

the importance of each segment found in the *corpus* analyzed (Camargo & Justo, 2013; Chaves, dos Santos, dos Santos, & Larocca, 2017).

The components present in the *corpus* studied were classified into five classes (Figure 1), containing 654 segments that explain the importance of each set of words for the content, application context and core objective of the study.

Class 1 is composed of words that refer to generic aspects of the interview, the main ones being “example,” “initiative” and “application.” Class 2 is formed by words that validate aspects related to human capital and scalability, mostly represented by the words “technical,” “training,” “crop,” “agro” and “teach.” Class 3, on its turn, is composed of words involved in the context of business models and validation of those models, made up of the words “clients,” “validate,” “model” and “basis.” Class 4 groups the words that indicate the importance of the environment for the scalability process, in particular “acceleration,” “investment,” “participate,” “program” and “support.” Class 5 is formed by words that show the



Source(s): The authors

Figure 1.
Dendrogram of the
interview classification
segments based on
field research data

importance of decision-making processes and the use of governance aspects for scalable growth, represented by the words “decision,” “meeting,” “council,” “strategic,” “monitoring” and “KPIs.”

Considering the DHC, it is possible to observe through the dendrogram (Figure 1) that Classes 1 and 2 are interlinked. This can be verified since the interviewees, when questioned about the importance of human capital for scalability, presented examples, initiatives and applications on what the process of developing collaborators is like. The link between Class 3 and 4, on its turn, originates from the cause and effect relationship, since there were mentions of the importance of the entrepreneurial environment, both for validating the business model and for its scalability. Class 5 presented a link with the node resulting from Classes 1, 2, 3 and 4. This is understandable, since the decision-making process and use of a governance structure impact on aspects related to human capital (Class 2), the business model (Class 3) and the entrepreneurial environment (Class 4).

Regarding CFA, the two main dimensions (Class 5 and 3) present 56.21% of the segments/words that most explain the factors for achieving the studied agtechs scalability process.

4.3 Qualitative analysis: content analysis

The results below indicate the interviewees' thoughts about each one of hypotheses.

H1. Agtechs in the scale-up phase are participants in the entrepreneurial environment and benefit from it.

According to 80% of the interviewees, the entrepreneurial environment and participation in accelerator and mentoring programs contributed to scalability. Regarding the financial investment component, from the entrepreneurial environment pillar, all the interviewees indicated that receiving financial injections contributed to scalability.

According to E2, “*the participation in programs was good for us to insert ourselves into that world of entrepreneurship. . . we came to better understand the ecosystem, the relevant people, the players, and how to engage them.*” For E4, “*the entrepreneurial environment helped to establish a methodology, learn about innovation, and especially, about capturing investment.*” E11 highlighted the importance of the programs in all stages, including the scalability stage:

We participated in programs in different phases [. . .] each time it gave us a little more maturity. So, I'd say that the programs were fundamental for us being able to understand the difference between being an entrepreneur and being a businessperson. (E11)

E5 listed reasons that justify the importance of participation in an environment that fosters innovation:

The entrepreneurial environment is very important for various reasons [. . .] first, because there is a blend involved when you undergo a good acceleration process [. . .] you stamp your company [. . .] investors and clients will take a different view [. . .] second, in general, this is accompanied by an injection of financial resources [. . .] and third, when you're in the major accelerators, you have a giant networking structure. (E5)

The contrary positions regarding the importance of the entrepreneurial environment for scalability were derived from situations that could be resolved by filtering the information from the environment. For E10, the volume of information passed on by that environment is excessive, which causes problems:

[. . .] actually, in the beginning I participated a lot in the innovation environments [. . .], but, for me, it took more of my time away from what brought me gains. You start to listen to a ton of people, and you forget what the problem is that you're trying to solve. (E10)

These characteristics found in the analyzed *corpus* show the importance of being a participant in the entrepreneurial ecosystem, whether to learn new techniques or to obtain financial investments. [Mikhailov et al. \(2021\)](#) found similar perspectives when they analyzed the importance of the entrepreneurial environment for fostering the accelerated development of agtechs that form part of the Californian innovation ecosystem. For them, the availability of investment and the presence of agents focused on promoting innovations in agriculture enable new products to be quickly tested, developed both for market entry and for increasing market share.

H2. Agtechs in the scale-up phase present a specific validated business model for market traction and gain.

According to all of the interviewees, the presence of a validated business model drove scalability. With the validation of the business model there was an increase in sales volume, expansion of the client base, client retention and the generation of recurrent sales.

According to E8, the validation of the business model was important for scalability, as it enabled key clients to be acquired:

Our business model is validated, we understand that as we already have large accounts [...] those large accounts generate higher tickets for us [...] we're already in the second wave of renewing clients, which has enabled our take-off in the market. (E8)

E7 presents the idea that the scalability derived from a validated business model gives rise to greater product visibility: *"The model is validated since people find support in what we publish on social media, we have become opinion makers in the market, and this has brought gains and structural growth."*

E1 provides a summary of how validation of the model is important for scalability:

Understanding our product, for us, was very important, without a doubt. When we really understood our product, we started to scale up in sales, we increased our turnover and our client base [...] The producer doesn't buy the same product twice if they aren't satisfied. (E1)

For [Reuber et al. \(2021\)](#) and [Piaskowska et al. \(2021\)](#), a business model validated for traction brings competitive advantages for companies in the scalability phase. These advantages are related to the reduction in the restrictions for sustaining competitiveness and to the increase of the company's prominence, both in internal and in external markets.

As in the study of [Love \(2016\)](#) and [Monteiro \(2019\)](#), the gains derived from an increased client base, client retention and recurrent revenue are shown to be important for the scalability of the companies studied in this *corpus*.

One point to highlight in the components that structure the second hypothesis, and that was refuted by the interviewees, was the need to achieve the financial equilibrium point to gain scalability. According to all of the interviewees, the search for financial equilibrium can limit growth, since it can weigh on decisions to search for new markets, launch products and test concepts.

For E2, *"it makes no sense to stop growing to have financial equilibrium."* This idea is shared by E3, when stating that *"I could reach breakeven, but I don't want to reach it so soon."* And also by E12, when stating that *"[...] the company could be at breakeven. Today, if I wanted it to be profitable, it would be [...] but the fact is that we want to invest more than generate cash flow. That's a growth decision."* For [Picken \(2017\)](#), putting financial equilibrium on the back burner may even be understandable. However, entrepreneurs should manage their financial resources carefully, focusing efforts and resources in the most appropriate way possible and showing responsible behavior in the administration of investors' capital.

H3. Agtechs in the scale-up phase have a corporate governance structure.

The presence of governance practices, represented by a decision-making structure and one of support for these decisions, was mentioned by all of the interviewees as a factor that contributed to scalability. The creation of boards of directors was important for 75% of the interviewees.

E6 attributed scalability success to periodic meetings and to the participation of advisers in supporting strategic decisions: “*We usually consult our investors a lot in the advisory council meetings. They don’t make decisions, but they support us with strategic points.*” E11 mentions the relationship between governance practices and strategic decisions and the impact on scale: “*We have a formal board of directors. It’s in that board environment that we discuss governance, we discuss strategies for growth in the market, and we discuss creating new products.*” E9 indicates how modifications in decision-making and in the structure of governance practices enabled scalability:

In the beginning it was something very practical [. . .] everyone said it, we saw that would make our process slow. So, we created an advisory board and governance practices to provide agility. The result couldn’t have been better. (E9)

When studying the impact of the characteristics of the board for the scalability of Chinese startups, [Li, Zhou, Zhou and Chen \(2021\)](#) concluded that there is a positive relationship documented between the frequency of board meetings and startup scalability performance. The meetings are important for safeguarding shareholders’ interests, as well as making decision-making more formal and documented ([Freeman & Engel, 2007](#)).

Help in decision-making, especially with a view to scale, is also important for companies that do not yet present a formal board structure. According to E10, clients help in increasing scalability through strategic recommendations: “*We don’t have a board, but we have the habit of every month having strategic agendas with clients [. . .] We take a lot of decisions that impact our objectives by listening to what those clients expect.*”

Contradicting the importance of having a group for supporting decision-making, but indicating the need for other governance indicators, E3 mentions

We have investors, we receive injections from investment funds as well, but we haven’t adopted a board [. . .], in the future you’ll need to have one, but if you can delay, delay, because it’s really going to hold you back like it’s held us back. Governance practices are not necessarily linked to having boards. (E3)

According to [Khanin and Turel \(2013\)](#), there are numerous studies that report the same difficulties listed by E3, particularly the following conflicts: (1) unfavorable interests and attributions, (2) inefficient collaboration and (3) incompatibility between board members and the company CEO.

H4. Agtechs in the scale-up phase manage their resource allocation in a nonexperimental way.

Agtechs in the scale-up phase have an organized structure that enables resource allocation, they present effective responsibility in each component of the organizational structure, and they have clear processes that seek to interlink strategic, tactical and operational planning. E1 corroborates this idea by mentioning that

We have a departmental structure where the area managers are responsible for allocating activities. The managers are very clear on their role, and that of their collaborators. . . we do an annual plan, and all the people and resource allocations are foreseen in that plan, that’s undoubtedly contributed to the scalability phase. (E1)

The organizational structure also enables speed in achieving goals and, consequently, scale gains. According to E5,

Today we structure in work blocks. In each one of these blocks there are directors. . . the resource allocation decisions within their blocks are taken by them [. . .] the team is moving very quickly, primarily because of that. (E5)

The importance of the structure for scalability is also pointed out by E2 and E12. However, unlike what was found in the previous interviews, these two interviewees believe that a certain level of control is needed in resource allocations.

According to E2,

We have a defined structure, we're kind of an "old school" startup, we don't believe in horizontality for the scalability process. Obviously, it's not a bureaucratic structure, but it's important for you to have a hierarchy and decision-making authorities. We work with a lot of autonomy in the authorities [. . .] if someone wants to do something within their authority, they have 100% autonomy, but clearly there has to be a decision-making structure. (E2)

And, according to E12,

In the scalability process the company saw the importance of having well-defined departments, so we decided to operate in that highly vertical way. There's a hierarchy. (E12)

According to [Demir et al. \(2017\)](#) and [Lee \(2014\)](#), aspects of the organizational structure enable startups to gain scale, since in order to grow, structure and organization are important. Analyzing the interviews, these aspects were also highlighted by the interviewees.

H5. Agtechs in the scale-up phase have a set of internal and external indicators related to the business.

The use of indicators for monitoring activities, the formalization of internal and external processes and the creation of codes of conduct and confidentiality are factors that have impacted the scalability process. These elements were identified by 100% of the interviewees.

For E2, a monitoring and metrics system is important as it contributes to estimating the production capacity of each team and, with this, better managing the teams with a view to scalability:

We've been monitoring metrics using a points system. We manage each team's points weekly. We respect the points so that capacity is full, and we can achieve sustainable scalable growth. (E2)

Considering the importance of creating codes of conduct and confidentiality for scalability, E3 argues that:

[. . .] the most important thing for us in the activity monitoring process, is ensuring that our routines are protected as our work contracts have confidentiality clauses. This gives security so that we can share the tactical activities responsible for scalability with the teams. (E3)

Considering the formalization of processes, E10 argues that adopting these practices may not be important for startups at the start of development. However, for scale-up companies, it is almost an obligation:

We have various processes that, even in acceleration, we've had to bring forward, such as the code of conduct, the use of information, confidentiality [. . .] That might not be common in startups, but we had to do it because of the point we're at. (E10)

E5 presents an important view about the formalization of processes and monitoring activities:

[. . .] maybe that's the most obvious difficulty, that every startup knows they're going to experience [. . .] Because you know there's going to be a problem to be able to grow, if you don't have processes [. . .] and when you start to create processes, everyone who really liked the freedom they had, starts to perceive that it won't be like that [. . .] so that startup transition to scale-up needs to be quite subtle. (E5)

An important assumption in the development of that hypothesis is that intellectual property practices are important for the activity monitoring process and, consequently, for reaching the scale-up phase. However, it was observed that these practices were not important for the studied companies. All the interviewees indicated that they did not seek that path. E2, for example, indicated that: “[...]we’re very cynical about that issue of having to register a patent. . . in Brazil it’s not very effective, you spend energy on it that, later, won’t mean anything for you.” E6 corroborates by saying: “For our business, I don’t think that type of protection is important[. . .] our differential isn’t in the code but rather in how we structure the information and the results we extract.”

The use of indicators for monitoring activities, the formalization of internal and external processes and the creation of codes of conduct seemed to be important for scalability. This evidence was also found by Lee (2014), Barbero *et al.* (2011), Engelhardt and Möller (2021) and Piaskowska *et al.* (2021). Regarding the adoption of intellectual property practices, the findings of this article contradict the indications proposed by IBGC (2019b).

H6. Agtechs in the scale-up phase value human capital and the management of that capital.

All the interviews revealed the importance of human capital for the scalability process. It was clear in the interviews that scalability is only achieved when people are involved in that process.

According to E4: “Until today, the main element responsible for our growth has been people. People who are very motivated to do everything.” E5 also indicates that importance: “Everything in the company was achieved based on the importance of the human capital. . . We made a point of building it with people who had skills for making the company scale up.”

Considering structural aspects of human capital, most of the interviewees believe that experience, especially of the partners, helps in the scalability process. According to E3: “It’s important to have partners with experience, especially when it’s a very complex market: without that, you don’t grow.” E6 indicates, within that same theme, the importance of seeking complementarity of experiences for the founding partners: “Me and my partner had no experience in technology, but we did have technical experiences in the area. In the beginning we really felt that problem and sought someone else to bring the technology part.” According to Zang (2011), the founders’ previous experience helps to attract connections that have skills to gain scale, receive investments and achieve product traction.

When we analyze the other positions of the company, this obligatory experience becomes less impactful. E8 indicates that “in the end, the big secret of a scale-up is you having a multi-disciplinary group, which brings different levels of experience.”

To maintain this human capital, almost 50% of the interviewees mentioned offering talent-retaining packages. E8, for example, mentions that “We have a ‘stock options’ policy for attracting new executives.” According to E5, “all the executives, employees, and board members have an equity stake in the company. That’s a very big differential for you to be able to align interests.” For Li *et al.* (2021), compensation based on an equity stake may be relevant for scale-up companies, since they are not generally able to offer salaries that can compete with established firms.

The practice of training is another characteristic found in these companies that can impact scale gain in. In the studied companies, there is the predominance of internal training to develop human capital. In all the interviews this type of practice was highlighted. According to E11, “We invest a considerable amount in internal training, we do a ‘super onboard’ for the collaborator to understand where we want to go and how they can contribute to that.” However, it is important to highlight that external training also occurs, being indicated in some situations. According to E9, “The training is important in the areas cross-cutting the people’s activity areas, because in an area where the person is technical, they’ll develop alone.”

The findings of these interviews have shown that human capital contributes to breaking down the barrier of the initial conception of the business model, driving companies toward the scale-up phase. This situation was observed by [Hinton and Hamilton \(2013\)](#) and [Barringer et al. \(2005\)](#).

4.4 Building the model

Considering the findings obtained in the field research, a model ([Figure 2](#)) that presents the main elements associated with the evolution of Brazilian agtechs was proposed.

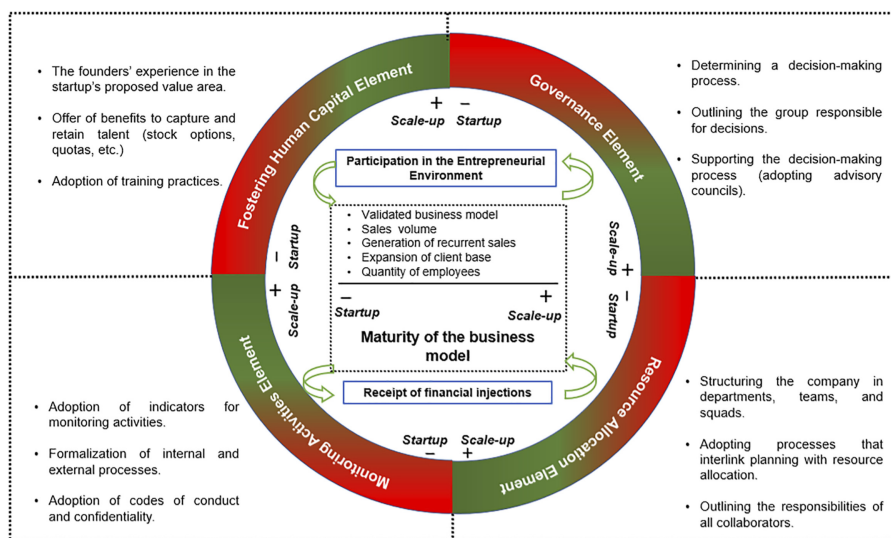
The model was developed considering five elements: (1) governance, (2) resource allocation, (3) monitoring activities, (4) fostering human capital, and (5) business model maturity. All these elements present indicators that enabled scalability by the studied companies. It is inferred that, during the development of the startups, the higher the level of adoption of these indicators, the closer they came to the scale-up phase.

The governance element contains the indicators that reinforce the importance of having structured decision-making processes, outlining those responsible for the decisions and the need for support for more impactful decisions.

The resource allocation element presents the indicators that reveal the importance of the organizational structure for the evolution of the business models. These indicators present themes such as the adoption of processes that interlink strategic planning with resource allocation; the creation of departments, teams or squads for developing the allocated activities and the outlining of responsibilities of all collaborators regarding their activities and actions.

The third element, called “monitoring activities,” presents the following topics: indicators related to the activity metrics; formalization of internal and external processes linked to monitoring activities; and the creation of codes of conduct and confidentiality related to the performance of the activities allocated to each collaborator.

The fourth element, called fostering human capital, sets its indicators based on the importance of human capital for the scalability of agtechs. This element presents the following points: indicators linked to the partners’ experience and related to the company’s



Source(s): The authors

Figure 2.
Model indicating main
elements

value proposal; offering benefits to collaborators, with a view to capturing and retaining them; and the adoption of training practices.

The fifth element is linked to the need for a validated business model. This element is called “business model maturity” and is important in the sense that a scale-up company needs the production and sale of products to be simple and quick so as to generate a large sales volume at scale. The main indicators of this component are the sales volume and generation of recurrent sales and an always-expanding client base.

Two indicators that impact the evolution of agtechs are included in the five elements: (1) participation in the entrepreneurial environment and (2) the injection of financial resources. This observation was made since these elements directly impact all the structures of the model.

Thus, the construction of the model sought to consider the main characteristics that impacted the evolution of agtechs and, consequently, these companies reaching the scale-up phase.

5. Conclusions

In the search for the elements that most contributed to agtechs evolving from the barrier of business model conception to reaching the scale-up phase, various entrepreneurs were interviewed, who indicated the importance of the following elements for scalability: governance, resource allocation, monitoring activities, fostering human capital and business model validation.

The elements presented indicators, which range from determining decision-making processes to the adoption of training, also including structuring the company into departments, teams and squads and adopting codes of conduct.

The core theoretical contribution of this study was to deepen the knowledge regarding the factors that impact the OLC of technology-based companies focused on agribusiness, combining this knowledge and verifying the adherence to the situation of Brazilian agtechs. The resulting product is a model that presents the main structures and indicators that have contributed to the advancement of those companies.

In terms of the practical and management contribution, the developed model can help companies that have not yet advanced from the conception of the business model to the scalability stage, by indicating elements and indicators involved in the scaling up process.

As a limitation, we can mention the sampling space used, which focuses on the Brazilian context, and the agricultural bias adopted.

Finally, following this article, we suggest future research that aims to assess the proposed model. This could be done both in the context of national and international agtechs and in startups from other sectors.

References

- Agriculture Founder [Agfunder] (2019). AgriFood Tech investing report – 2018 (San Francisco). Available at: <https://research.agfunder.com/2018/AgFunder-Agrifood-Tech-Investing-Report-2018.pdf>.
- Bacher, J. S., & Guild, P. D. (1996). *Financing Early-stage Technology-based Companies: Investment Criteria used by Investors*. Wellesle: Babson College: Frontiers of Entrepreneurship Research.
- Barbero, J. L., Casillas, J. C., & Feldman, H. D. (2011). Managerial capabilities and paths to growth as determinants of high-growth small and medium-sized enterprises. *International Small Business Journal: Researching Entrepreneurship*, 29(6), 671–694.
- Bardin, L. (2011). *Análise de Conteúdo*. São Paulo: Edições 70.
- Barringer, B. R., Jones, F. F., & Neubaum, D. O. (2005). A quantitative content analysis of the characteristics of rapid-growth firms and their founders. *Journal of Business Venturing*, 20(5), 663–687.

- Bertucci Ramos, P. H., & Pedroso, M. C. (2021). Classification and categorization of Brazilian agricultural startups (Agtechs). *Innovation and Management Review*, 18(3), 237–257.
- Blanco, T. H. M. (2019). *Agtechs: Uma análise do ambiente de negócio paranaense*. Dissertação de Mestrado. Brasil: Universidade Estadual do Oeste do Paraná, Cascavel, PR.
- Blank, S., & Dorf, B. (2012). *The Startup Owner's Manual: The step-by-step Guides for Building a Great Company, 1*. Pescadeiro: K&S Ranch Publishing Division.
- Brown, R., & Mawson, S. (2013). Trigger points and high-growth firms: A conceptualisation and review of public policy implications. *Journal of Small Business and Enterprise Development*, 20(2), 279–295.
- Camargo, B. V., & Justo, A. M. (2013). IRAMUTEQ: Um software gratuito para análise de dados textuais. *Temas em Psicologia*, 21, 513–518.
- Cavallo, A., Ghezzi, A., Dell'Era, C., & Pellizzoni, E. (2019). Fostering digital entrepreneurship from startup to scaleup: The role of venture capital funds and angel groups. *Technological Forecasting and Social Change*, 145, 24–35.
- Chaves, M. M. N., dos Santos, A. P. R., dos Santos, A. N. P., & Larocca, L. M. (2017). Use of the software IRAMUTEQ in qualitative research: An experience report. In A. Costa, L. Reis, F. Neri de Sousa, A. Moreira, & D. Lamas (Eds.), *Computer Supported Qualitative Research*. Studies in Systems, Decision and Control, 71. Springer.
- Croll, A., & Yoskovitz, B. (2013). *Lean Analytics: Use Data to Build a Better Startup Faster*. Sebastopol: O'Reilly Media.
- Demir, R., Wennberg, K., & McKelvie, A. (2017). The strategic management of high-growth firms: A review and theoretical conceptualization. *Long Range Planning*, 50(4), 431–456.
- Dutia, S. G. (2014). *Agtech: Challenges and Opportunities for Sustainable Growth*. Kansas City: Ewing Marion Kauffman Foundation.
- Endeavor (2015). Scale-ups no Brasil. Available at: https://rdstationstatic.s3.amazonaws.com/cms%2Ffiles%2F6588%2F1441384825RelatorioScaleUps_DigitalFinal103.pdf.
- Engelhardt, P., & Möller, K. (2021). Groupon: Managing a rapidly growing platform with scale-up metrics. In O. Gassmann & F. Ferrandina (Eds.), *Connected Business*. Cham: Springer. doi: 10.1007/978-3-030-76897-3_25.
- Fastellini, G., & Schillaci, C. (2020). Precision farming and IoT case studies across the world. In A. Castrignano, G. Buttafuoco, R. Khosla, A. M. Mouazen, & O. Naud (Eds.), *Agricultural Internet of Things and Decision Support for Precision Smart Farming*. Academic Press.
- Ferasso, M., Takahashi, A. R. W., & Gimenez, F. A. P. (2018). Innovation ecosystems: A meta-synthesis. *International Journal of Innovation Science*, 10(4), 495–518.
- Freeman, J., & Engel, J. S. (2007). Models of innovation: Startups and mature corporations. *California Management Review*, 50(1), 94–119.
- Hinton, M., & Hamilton, R. T. (2013). Characterizing high-growth firms in New Zealand. *The International Journal of Entrepreneurship and Innovation*, 14(1), 39–48.
- Hoffman, R., & Yeh, C. (2018). *Blitzscaling: The Lightning-fast path to Building Billion-dollar Companies*. London: Harper Collins Publishers.
- Instituto Brasileiro de Governança Corporativa [IBGC] (2019a). *Governança Corporativa para Startup and Scale-ups*. São Paulo: IBGC.
- Instituto Brasileiro de Governança Corporativa [IBGC] (2019b). *Governança Corporativa em Startups e Scale-ups: Práticas e Percepções*. São Paulo: IBGC.
- Jingyao, M., Gang, Z., & Ling, Z. (2021). Governance mechanisms implementation in the evolution of digital platforms: A case study of the internet of things platform. *R&D Management*, 12494. doi: 10.1111/radm.12494.
- Khanin, D., & Turel, O. (2013). Conflicts between venture capitalists and CEOs of their portfolio companies. *Journal of Small Business Strategy*, 23(1), 31–54.

- Kohler, T. (2016). Corporate accelerators: Building bridges between corporations and startups. *Business Horizons*, 59(3), 347–357.
- Kon, F., Cukier, D., Melo, C., Hazzan, O., & Yuklea, H. (2014). *A panorama of the Israeli software startup ecosystem*. Technical Report. pp. 1–28. doi: [10.2139/ssrn.2441157](https://doi.org/10.2139/ssrn.2441157).
- Lee, N. (2014). What holds back high-growth firms? Evidence from UK SMEs. *Small Business Economics*, 43, 183–195.
- Li, Q., Zhou, W., Zhou, H., & Chen, J. (2021). Do board characteristics matter for growth firms? Evidence from China. *Journal of Risk Financial Management*, 14, 380.
- Love, H. (2016). *The start-up J curve*. Austin: Greenleaf Book Group.
- Marvin, D. R. (2018). The second green revolution will bring agri-tech breakthroughs to growers. *Industrial Biotechnology*, 14(3), 120–122.
- Mikhailov, A., Oliveira, C., Padula, A. D., & Reichert, F. M. (2021). Californian innovation ecosystem: Emergence of agtechs and the new wave of agriculture. *Innovation and Management Review*, 18(3), 222–236.
- Miranda, J., Ponce, P., Molina, A., & Wright, P. (2019). Sensing, smart and sustainable technologies for agri-food 4.0. *Computers in Industry*, 108, 21–36.
- Monteiro, G. F. A. (2019). High-growth firms and scale-ups: A review and research agenda. *RAUSP Management Journal*, 54(1), 96–111.
- Moschner, S. L., Fink, A. A., Kurpjuweit, W., Wagner, S. M., & Herstatt, C. (2019). Toward a better understanding of corporate accelerator models. *Business Horizons*, 62(5), 637–647.
- Nardes, F. B. S., & Miranda, R. C. R. (2014). Lean startup e canvas: uma proposta de metodologia para startups. *Revista Brasileira de Administração Científica*, 5(3), 252–272.
- Nedumaran, S., Selvaraj, A., Nandi, R., Suchiradipta, B., Jyosthanna, P., & Bose, D. (2020). Digital integration to enhance market efficiency and inclusion of smallholder farmers: A proposed model for fresh fruit and vegetable supply chain. *International Food and Agribusiness Management Review*, 23(3), 319–337.
- Organization for Economic Co-operation and Development [OCDE] (2017). *Entrepreneurship at a glance 2017*. Paris: OECD Publishing.
- Paternoster, N., Giardino, C., Unterkalmsteiner, M., Gorschek, T., & Abrahamsson, P. (2014). Software development in startup companies: A systematic mapping study. *Information and Software Technology*, 56(10), 1200–1218.
- Pham, X., & Martin, S. (2018). How data analytics is transforming agriculture. *Business Horizons*, 61(1), 125–133.
- Piaskowska, D., Tippmann, E., & Monaghan, S. (2021). Scale-up modes: Profiling activity configurations in scaling strategies. *Long Range Planning*, 54(6), 102101.
- Picken, J. C. (2017a). From startup to scalable enterprise: Laying the foundation. *Business Horizons*, 60(5), 587–595.
- Pollman, E. (2019). Startup governance. *University of Pennsylvania Law Review*, 168, 155–220.
- Reinert, M. (1990). Alceste une méthodologie d'analyse des données textuelles et une application. *Bulletin de méthodologie sociologique*, 26(1), 24–54.
- Reuber, A. R., Tippmann, E., & Monaghan, S. (2021). Global scaling as a logic of multinationalization. *Journal of International Business Studies*, 52, 1031–1046.
- Ries, E. (2011). *The lean startup: How today's Entrepreneurs use Continuous Innovation to Create Radically Successful Businesses*. New York: Crown Publishing Group.
- Roure, J. B., & Keely, R. H. (1990). Predictor of success in new technology-based ventures. *Journal of Business Venturing*, 5(4), 201–220.
- Saiz-Rubio, V., & Rovira-Más, F. (2020). From smart farming towards agriculture 5.0: A review on crop data management. *Agronomy*, 10(2), 207.

- Silva, W. A. C., Jesus, D. K. A., & Melo, A. A. O. (2010). O ciclo de vida das organizações: sinais de longevidade e mortalidade de micro e pequena indústria na região de contagem – MG. *Revista de Gestão, 17*(3), 245–263.
- Sullivan, T. (2016). Blitzscaling: The chaotic, sometimes grueling path to high-growth, high-impact entrepreneurship. *Harvard Business Review, 94*(4), 44–50.
- Thiel, P. (2014). *Zero to One: Notes on Startups or How to Build the Future*. New York: Crown Business.
- Vasconcelos, Y. (2019). A força das agtechs. *Revista Pesquisa Fapesp, 287*(21), 21–23.
- Vianna, M., Adler, I., Lucena, B., & Russo, B. (2012). *Design thinking: Inovação em negócios*. Rio de Janeiro: MJV Press.
- Zajko, M. (2017). Challenges of scaling-up process for start-ups. In *10th International Conference on Engineering and Business Education*. Sibiu.
- Zhang, J. (2011). The advantage of experienced start-up founders in venture capital acquisition. *Small Business Economics, 36*, 187–208.
- Zhao, Y., von Deft, S., Morgan-Thomas, A., & Buck, T. (2020). The evolution of platform business models: Exploring competitive battles in the world of platforms. *Long Range Planning, 53*(4), 101892.

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