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The influence of dynamic capabilities on startup growth

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Abstract

Purpose – The purpose of this study is to analyze the relationship between dynamic service innovation capabilities (DSICs) and startup growth in an emerging country.

Design/methodology/approach – This paper used a theoretical DSIC model to process data on 137 Brazilian startups, using a stepwise regression.

Findings – Service startup growth is related to the capability of enterprises to understand market signals, learn from customers and design a scalable, repetitive and profitable business model.

Research limitations/implications – Despite the innovative nature of startups, this paper found that technological and networking capacities are not a determinant of growth.

Practical implications – Managers should commit themselves to improve their competence in terms of understanding market signals, even when they already have a consolidated business model, products and service offerings. The findings also function as a warning about the dangers of an excessive focus on technological capabilities.

Social implications – Innovative startups, which achieve high growth create a disproportionate number of new jobs. Hence, by indicating the dynamic capabilities that are more conducive to firm growth, this paper contributes to society and the economy at large.

Originality/value – The findings challenge the myth of technological capacity and networking skills as the main sources of startup growth. This paper shows that founders and managers of service startups who want to achieve rapid growth should concentrate more effort on other skills. Marketing competence and building scalable business models – abilities that are common to

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successful traditional firms – are more relevant for short-term growth than technological innovation.

Keywords Small business growth, Startups, Dynamic capabilities, Innovation, Services

Paper type Research paper

1. Introduction

Small businesses play a key economic and social role around the globe (Ayyagari, Demirgüç-kunt, & Maksimovic, 2011; Gibb & Davies, 1990; OECD, 2017). These companies constitute 98.5% of all Brazilian businesses, are responsible for 54.5% of formal jobs and produce 27% of the country's gross domestic product (GDP) (SEBRAE, 2017). A consistent theory to explain the dynamics of business growth still does not exist despite the relevance of these enterprises and the growing volume of research conducted in this sector (Demir, Wennberg, & McKelvie, 2017; Dobbs & Hamilton, 2007; McKelvie & Wiklund, 2010). Many studies have intended to uncover a universal formula for small business growth. However, it is clear that developmental trajectories are contextually contingent, so there is no absolute truth about this dynamic (DeSantola & Gulati, 2017).

Despite the lack of a universal trajectory, research shows that several factors influence small business growth, such as entrepreneurial orientation (Eggers, Kraus, Hughes, Laraway, & Snycerski, 2013; Stenholm, Pukkinen, & Heinonen, 2016), the characteristics of entrepreneurs (Colombelli, 2015; Tomczyk, Lee, & Winslow, 2013) and firm age (Davidsson, Kirchhoff, Hatemi-j, & Gustavsson, 2002; Grilli & Murtinu, 2014). Specifically, there are strong indications of the importance of knowledge management (e.g. knowledge acquisition and knowledge integration, etc.) as a driver for innovation and competitive advantage (Grant, 1996; Okhuysen & Eisenhardt, 2002; Salunke, Weerawardena, & McColl-Kennedy, 2019) and, consequently, for the growth of small businesses (Altinay, Madanoglu, De Vita, Arasli, & Ekinci, 2016; Eshima & Anderson, 2017; Miocevic & Morgan, 2018).

In this sense, the dynamic capabilities view (Teece, 2007; Teece, Pisano, & Shuen, 1997), i.e. "the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve and die" (Eisenhardt & Martin, 2000, p. 1107), can explain, at least in part, the survival and growth of small businesses. Many researchers have tried to understand how dynamic capabilities affect firm scaling (Acosta, Crespo, & Agudo, 2018; Arend, 2014; Uhlaner, van Stel, Duplat, & Zhou, 2013). However, most of these have focused on specific contexts (i.e. manufacturing), and neglected the service industry (Den Hertog, Van der Aa, & Jong, 2010; Janssen, Castaldi, & Alexiev, 2016; Tuzovic, Wirtz, & Heracleous, 2018) despite its growing relevance to global GDP (World Bank, 2019).

The dynamic capability view has gained prominence in relation to understanding service innovation-based competitive advantage (Hogan, Soutar, McColl-Kennedy, & Sweeney, 2011; Tuzovic et al., 2018), notably in innovative organizations such as startups or new technology-based firms (NTBFs) (Seo & Lee, 2019). These firms strive to build scalable, repeatable and profitable business models, one of the reasons they tend to be more fluid (Blank & Dorf, 2012).

Despite the acknowledged importance of service innovation for the performance and growth of many businesses (Cainelli, Evangelista, & Savona, 2004; Love, Roper, & Bryson, 2011; Mansury & Love, 2008), differences are expected when it comes to startups. Business model idiosyncrasies (Blank, 2013; Ghezzi & Cavallo, 2020; Ries, 2011) and the contextual dependency of dynamic capabilities (Helfat et al., 2007; McAdam, Bititci, & Galbraith, 2017) and innovation (Blindenbach-Driessen & van den Ende, 2006; Huizingh, 2011) may have a distinct influence on the growth of NTBFs, especially in less developed countries (Marquis & Raynard, 2015; Xie, Qi, & Zhu, 2019). In emerging countries, frequent institutional transitions may change the "the rules of the game" very rapidly (Bruton, Su, & Filatotchev, 2018; Su, Xie, & Wang, 2015), which impacts the performance of new ventures (Peng, 2003). High levels of uncertainty in the business environment, relatively weak legal systems (Choi, Kim, & Kim, 2010), dysfunctional competitive dynamics and governmental corruption (Bruton et al., 2018) are common obstacles to the performance of businesses operating in such contexts. Hence, the influence exerted by dynamic capabilities may change in these environments.

Thus, the purpose of this study is to analyze the influence of dynamic service innovation capabilities (DSICs) on the growth of startups located in a developing country, using the Janssen et al. (2016) model. While other models have been applied to understand the role of dynamic capabilities in specific industries (Tuzovic et al., 2018), our theoretical model is focused on a wider sample, which includes service providers operating across different industries. We selected Janssen et al. (2016) model because it operationalizes the framework of Den Hertog et al. (2010), which explicitly accommodates the idiosyncrasies of services and builds on evolutionary processes of innovation generation that are based on Teece (2007).

Through a stepwise regression, we analyzed 137 Brazilian startups. Our results show that the capabilities of *sensing user needs* and *scaling and stretching* have a positive relationship with NTBF growth. This seems to indicate that the startup growth process is grounded in the ability to continually understand and attend to customer demands while pursuing a scalable business model. Contrary to Janssen et al.'s (2016) conclusions, we found that the other dynamic capabilities (*conceptualizing*, *sensing technological options* and *co-producing and orchestrating*) are not associated with firm growth.

2. Theoretical background and hypothesis development

Over the past decade, research into service innovation has expanded considerably (Carlborg, Kindström, & Kowalkowski, 2014; Vargo & Lusch, 2017). Prior to this, studies prioritized technological innovations related to the production and commercialization of tangible products rather than services (Tuzovic et al., 2018; Weerawardena & Mavondo, 2011). The rise of service-intensive industries has triggered a debate about why and how policies should be formulated to foster service innovation (Janssen & Castaldi, 2018). Currently, much of the research in this field is concerned with how companies strengthen their competitive position by developing capabilities that enable them to design and deliver service-based business models (Cusumano, Kahl, & Suarez, 2015; Den Hertog et al., 2010; Janssen & Castaldi, 2018; Janssen et al., 2016).

This is the case with startups (NTBFs). These nascent businesses, generally small in size and operating in the high-tech industry (García-Cabrera, García-Soto, & Olivares-Mesa, 2019) have, in the most notable cases, business models in which services are indispensable (Suarez, Cusumano, & Kahl, 2013). In this context, creation and delivery of value propositions require a range of activities and competencies, namely, "service capabilities" (Chen, Wang, Huang, & Shen, 2016), that differ from those required in the production of commoditized products (Oliva and Kallenberg, 2003).

These "service capabilities" are not static in the long run. Because the service industry environment evolves very fast, service companies need to continuously improve, expand and reconfigure their skills and resources (Salunke et al., 2019). These skills and resources are called dynamic capabilities, i.e. "organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve and die" (Eisenhardt & Martin, 2000, p. 1107). Dynamic capabilities generate new knowledge configurations that allow service providers to develop innovations in collaboration with their customers that meet market demands and provide competitive advantages (Khaksar, Shahmehr, Khosla, & Chu, 2017; Maklan & Knox, 2009).

Several studies indicate that innovation has positive effects on the performance and growth of small businesses (Acs & Audretsch, 1990; Audretsch, 1995; Rodríguez & Nieto, 2016) – although this premise is not always true (Freel & Robson, 2004; Parker, Storey, & van Witteloostuijn, 2010). Dynamic capabilities have been linked to the innovation capacity of firms and their survival in turbulent environments (Drnevich & Kriauciunas, 2011; Teece, 2014), for instance, by driving companies to stay aligned with the market needs (Drnevich & Kriauciunas, 2011; Teece, 2014). The DSIC model, developed by Den Hertog et al. (2010) and operationalized by Janssen et al. (2016), connects all these constructs. It combines elements of theoretical frameworks developed specifically for the service sector (Janssen, Castaldi, & Alexiev, 2018). The five dynamic capabilities operationalized in this model are *sensing user needs; sensing technological options; conceptualizing; co-producing and orchestrating;* and *scaling and stretching* (Den Hertog *et al.*, 2010; Janssen et al., 2016). Each of the dimensions and the hypotheses generated from the literature review will be detailed in the next section.

2.1 Dynamic capabilities: the five-dimensions model

The first DSIC, *sensing user needs*, is related to firms' capacity to understand the demands of existing or potential clients (Janssen et al., 2018). To generate a competitive advantage, service providers are increasingly taking a customer-oriented perspective by integrating service offerings into their customers' business processes (Matthyssens & Vandenbempt, 2008; Salunke et al., 2019). Thus, the capability of *sensing user needs* seems to be essential for strategies aiming to both expand existing markets and create new products and services (Barbero, Casillas, & Feldman, 2011). Based on this argument, we hypothesize the following:

H1. The *sensing user needs* DSIC positively and significantly influences the growth of startups located in emerging countries.

The capability of *sensing technological options* enables a service provider to identify new technological opportunities to improve and/or create services (Khaksar et al., 2017), i.e. the capacity to articulate promising technological options for new service configurations (Janssen et al., 2016). Many researchers have evaluated the potential of technological options and capabilities to support innovation performance and business growth (Dibrell, Davis, & Craig, 2008; Higón, 2012; Khaksar et al., 2017; Parida & Örtqvist, 2015). Dibrell et al. (2008), for example, found evidence that, in addition to having a positive influence on small business performance, information technology mediates the impact of innovation (product and process) on firm performance and Parida and Örtqvist (2015) found that information and communication technology capability, coupled with networking capability and financial slack, has a positive impact on the innovation performance of technology-based small businesses.

These pieces of evidence corroborate Poudel, Carter, & Lonial (2019) perspective on the importance of technological capabilities for business performance. These authors state that entrepreneurial organizations, for which these capabilities form their core competence, grow and thrive in three ways:

(1) Based on yields derived from pioneering and innovative products.

(2) Using technological capability to address business-related disadvantages, such as the high opportunity costs of various resources (including financial and human resources).

(3) Applying technological innovations in dimensions other than product innovations: for example, improving production processes to meet future demand at a lower cost.

Based on these assumptions, we propose our second hypothesis:

H2. The *sensing technological options* DSIC positively and significantly influences the growth of startups located in emerging countries.

The third DSIC, *conceptualizing*, is related to the essence of service innovation, which is to provide a new value proposition for a specific customer or group of customers through combining new and existing resources (Janssen et al., 2016). This involves detailing and visualizing service offerings, as well as aligning this new offering with a firm's organizational structure, resources, partners, delivery systems, markets and other business propositions, to develop the service, pricing and revenue model (Den Hertog et al., 2010; Love et al., 2011). This capability is, therefore, central to service innovation, an activity that encourages experimentation, prototyping and "thinking out of the box" (Den Hertog et al., 2010). As Janssen et al. (2018, p. 435) show, the *conceptualizing* capability is mobilized to transform the information gathered through *sensing capabilities* (user needs and technological options) into viable solutions for later application in service innovation processes. Given the relevance of the *conceptualization* capability in this context, we hypothesize the following:

H3. The *conceptualizing* DSIC positively and significantly influences the growth of startups located in emerging countries.

The fourth DSIC, *co-producing and orchestrating*, refers to a company's ability to manage service innovation across the organization and engage in networking. This DSIC is embedded in the combinatory nature of service innovation (aggregating elements of different services to offer a new solution or experience) and the consequential need for co-production with customers and other service providers (Den Hertog et al., 2010).

As access to resources (knowledge, financial, human, etc.) is limited for startups, these organizations need to constantly adapt and integrate external resources to survive market pressures and expand their businesses (Dubini & Aldrich, 1991; Lechner, Dowling, & Welpe, 2006; McGrath, Medlin, & O'Toole, 2019). Entrepreneurs often rely on their own and their partners' social capital as an alternate to overcome this resource scarcity (Almus & Nerlinger, 1999; Baum & Silverman, 2004; Hite & Hesterly, 2001; Maurer & Ebers, 2006). Developing an appropriate network built on strong and weak ties (Granovetter, 1977) can enable a young company to access resources that are typical to larger and more established companies, thus overcoming the liability of newness and smallness (Baum, Calabrese, & Silverman, 2000). In this sense, the development of co-producing and orchestrating capability should be expected to favor the growth of these small businesses. Thus, our fourth hypothesis is as follows:

H4. The *co-producing and orchestrating* DSIC positively and significantly influences the growth of startups located in emerging countries.

In a scalable business model, a firm's activities and transactions can be replicated in such a way that the company is able to increase its revenue at a much higher rate than its costs (Monteiro, 2019). The *scaling and stretching* DSIC is especially important for large-scale (semi-)standardized service operations because the processes embedded in these operations have a human component that is hard to standardize (Lyons, Chatman, & Joyce, 2007). Thus, scaling is related to the company's ability to offer its services in a similar manner across all channels. *Stretching*, in turn, is linked to the communication and brand power that a company has. An established brand can be valuable for developing new services and entering new service markets because the company relies on its current brand reputation to boost the launch of the new offering (Den Hertog et al., 2010). This is why the *scaling and stretching* DSIC involves "the diffusion of service innovation in other businesses and industries where business partners perform to extend the advantages of innovation" (Khaksar et al., 2017, p. 747). Thus, our fifth hypothesis is as follows:

H5. The *scaling and stretching* of DSIC positively and significantly influences the growth of startups located in emerging countries.

Following the rationale of our hypotheses, we argue that the role of DSICs is to provide new knowledge configurations that enable companies to increase the efficiency of their innovation and value creation processes (Eisenhardt & Martin, 2000). Thus, service providers must constantly invest to enhance their DSICs, remaining aligned with market needs and ahead of competitors (Salunke et al., 2019), and to increase performance and growth (Wu, 2007). Figure 1 presents our conceptual model with the formulated hypotheses.

3. Methodological procedures

The objective of this research is to analyze the influence of DSICs on startup growth in an emerging country, Brazil. Challenges related to these environments require different resources and capabilities (Bruton et al., 2018; Choi et al., 2010; Peng, 2003). Following Harrison-Walker (2019), we used stepwise regression to analyze the influence of each of the five DSICs on business growth. We adopted this technique because it is designed to find a parsimonious set of predictors that effectively measure the results that are of interest. It is also used for determining relationships, which have not been tested before. This stepwise regression removes non-significant variables during the model building process and maintains only the ones that make a significant contribution to the dependent variable (D'Souza, Taghian, & Sullivan-Mort, 2013).

We then applied the bootstrapping method to the regression models calculated to acquire the confidence intervals of the derived sensitivity coefficients (Chen, Yang, & Sun, 2017). This technique assesses the accuracy of an estimator by randomly resampling the original data set (Tian, Song, Li, & de Wilde, 2014). Replication of 1,000 bootstrap samples was

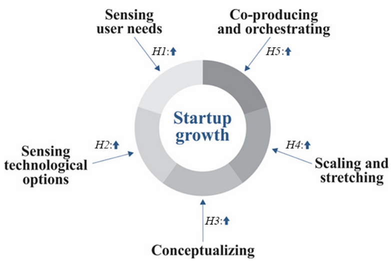


Figure 1. Conceptual model

determined based on the stability of the non-standard regression coefficient for each model factor. Analysis was performed with 95% confidence intervals. Finally, we performed Kruskal-Wallis tests to assess possible growth differences in terms of firm age, the type of direct support received (incubation, acceleration or both) and the current phase of the business (operation, traction and scale-up).

3.1 Data

The emergence of startups in Brazil, the focus of analysis in this research, is relatively recent. According to the Brazilian Startup Association (ABStartups), this movement began in 2011 and has been strengthening entrepreneurship in the Brazilian context ever since (ABStartups, 2017a). Unlike established and/or large companies with extensive resources and market visibility, these organizations are early-stage, technology-based businesses with intensive knowledge and significant economic and social impact (GEM, 2014). They are also known for developing innovative products to expand business in scalable markets (Paternoster, Giardino, Unterkalmsteiner, Gorschek, & Abrahamsson, 2014). Given the innovative potential of these organizations, startups go against the general trend of layoffs and production reductions, generating more jobs and income (GEM, 2014). This movement has been growing and consolidating rapidly in Brazil, bolstered by recent government incentives such as the Innovation Incentive Law (BRASIL, 2016) and the expansion of several innovation ecosystems.

As this research focuses on startups, the subjects surveyed are startup managers and/or founders. At the time of this survey, the Brazilian startup population consisted of 4,231 firms (ABStartups, 2017b). To obtain the necessary data for the research, we first prepared a database using information available on the websites of incubators, technology parks, co-workings and other innovation sites. We sent the survey form to all 3,676 startups identified. In total, three emails were sent to each business, with an interval of seven days between each email wave. Visits were also made to innovation ecosystems located in four Brazilian states (Rio Grande do Sul, Santa Catarina, Paraná and São Paulo) to encourage startups to participate in the research. At the end of this process, we had 137 valid responses, which is sufficient to test the scale and relationships between constructs, given that the criterion of five responses for each variable was met (Hair, Babin, Money, & Samuel, 2005). Table 1 presents the main characteristics of the sample.

3.2 Scale

We performed some procedures prior to data collection to ensure that Janssen et al.'s (2016) scale would yield reliable results within the scope of Brazilian startups.

First, the instrument was translated and retranslated from English to Portuguese by different specialists with fluency in both languages to obtain a definitive version of the scale in Portuguese, the native language of managers surveyed. Different translations were then compared to verify possible differences of understanding, and the final version of the instrument was produced. This Portuguese version was sent to 10 specialists in this research field for evaluation. Three specialists made suggestions for improving the instrument, which were implemented. Finally, a pre-test was performed. The instrument was applied to four startups to verify the need for possible adjustments. Minor semantic adjustments were made. In Appendix, we present the scale used in this research.

We also applied and tested the instrument with all 18 items initially foreseen by Janssen et al. (2016) to verify whether the behavior of these variables would be maintained in the context of Brazilian startups. It was also decided to change the Likert scale from seven to five points because it is less confusing for respondents and increases the rate and quality of

Year of foundation	*N*	(%)	No. of employees	*N*	(%)
1998–2002	1	0.73	Up to 10	117	85.4
2003–2007	5	3.65	11–20	14	10.22
2008–2012	17	12.41	21–30	3	2.19
2013–2017	114	83.21	More than 30	3	2.19
Total	137	100	Total	137	100
Support received	*N*	%	*Business phase*	*N*	%
Incubation	65	47.45	Curiosity	1	0.73
Acceleration	9	6.57	Ideation	16	11.68
Both processes	14	10.22	Operation	52	37.96
No support	49	35.77	Traction	43	31.39
			Scale up	24	17.52
			Other	1	0.73
Total	137	100	Total	137	100

Source: Research data

Table 1. Sample characteristics

responses (Babakus & Mangold, 1992; Devlin, Dong, & Brown, 1993). In addition, a group of questions was prepared to characterize the profile of managers (age, gender and education) and organizations (firm age, existence (or not) of incubator and accelerator support, number of employees and type of business) according to the ratings of the ABStartups (This data is available on demand).

3.2.1 Scale validity. To certify the convergent and discriminant validity of the scale for this context, a factorial analysis of the data was performed, paying special attention to the composite reliability and mean variance extracted from constructs. The first test conducted to verify the suitability of the sample for the variables was the Kaiser-Meyer-Olkin, which generated a coefficient of 0.810 ($p < 0.001$). The correlation between variables and their respective constructs was preliminarily analyzed. In this phase, the VAR08 and VAR18 variables were eliminated because they did not significantly correlate with the other items of their respective constructs – as happened in Janssen et al. (2016) study. However, the VAR11 and VAR14 variables presented enough correlations to remain in their respective constructs. Thus, 16 items remained on our scale.

From these assumptions, we proceeded to the tests that proved the convergent validity of the scale that is the extent to which the various measurement items of the same construct are related. For this, we first analyzed the percentage of total variance extracted. This showed that our model explains 60.836% of the variance, which indicates that the Janssen et al. (2016) model is suitable for the scope of Brazilian startups. It was then necessary to analyze the correlation between the model variables in this research (16 items) and their factors to understand the nature of these particular constructs. We looked at the factor loads rotated by the varimax method, which provided a simplified factorial structure. From these factor loadings, the composite reliability was also verified and the average variance extracted from the constructs. Table 2 summarizes the results of the factor analysis.

To verify the discriminant validity of the scale, the correlation between constructs was analyzed. Table 3 presents the output of this analysis, the results of which prove that the correlations between each pair of constructs are statistically different from 1 ($p < 0.05$). These analyzes confirm the discriminant validity of the scale (Schmitt & Stults, 1986). Thus, we conclude that the scale is valid for the context studied.

4. Results

To examine the effects of DSICs on the growth of Brazilian startups, a stepwise regression analysis was performed. In this stage, we removed from the sample all startups, which had not begun commercial operation at the time of data collection. For this analysis, we inserted the independent variables as possible predictors of startup growth, in accordance with the proposed model. We also added control variables to verify the possible effects of firm age and size on these relationships. One of the advantages of this analysis method is the removal of independent variables, which do not fit the model (Harrison-Walker, 2019). Thus, the *conceptualization* and *co-producing and orchestrating* DSICs were eliminated at this stage, as well as the control variables, which did not significantly affect the model relations. It should be noted that our results differ from those of Janssen et al. (2016). These differences can be explained by the following causes:

- Janssen et al. (2016) study reflects the reality of a developed institutional context (The Netherlands) – which is less hostile to businesses when compared to the context of emerging countries (Choi et al., 2010; Peng, 2003) – which, therefore, may require different resources and capabilities.
- Our research focuses exclusively on a specific type of startup (NTBF). The results of our analyzes are presented below (Table 4).

Removal of the *conceptualization* DSIC was not expected. One explanation for this result is that different DSICs and resources are needed at different business stages (Boccardelli & Magnusson, 2006; Cavallo, Ghezzi, Dell'Era, & Pellizzoni, 2019). The *conceptualizing* DSIC may be more important in the early stages of startups, when service solutions are being designed and developed. At this stage, results tend to be more substantial in terms of generating innovations rather than sales or profits, as the decision to innovate can jeopardize short-term financial performance in anticipation of long-term rewards (Freel & Robson, 2004). In this sense, this DSIC seems to be more relevant for the development of new

Table 2. Summary of factor analysis results

Tests	SUN	STO	Constructs CON	COP	SCS
Composite reliability	0.84	0.76	0.79	0.75	0.85
Variance extracted	0.64	0.52	0.56	0.50	0.60
Factorial loads	0.76–0.84	0.66–0.80	0.71–0.78	0.57–0.78	0.78–0.80

Source: Research data

Table 3. Correlation analysis

DSICs	SUN	STO	CON	COP	SCS
Sensing user needs (SUN)	1				
Sensing technological options (STO)	0.380***	1			
Conceptualization (CON)	0.394***	0.392***	1		
Co-producing and orchestrating (COP)	0.309***	0.322***	0.327***	1	
Scaling and stretching (SCS)	0.457***	0.314***	0.477***	0.411***	1

Note: ***The coefficient is significant at the 0.01 level
Source: Research data

solutions (Den Hertog et al., 2010; Janssen et al., 2016), which can translate into financial performance and growth over time. Thus, *H3* was not supported.

The stepwise method also led to the removal of the *co-producing and orchestrating* DSIC from the proposed model. In contrast to what is indicated in the extant literature (Baum *et al.*, 2000; McGrath et al., 2019; Walter, Auer, & Ritter, 2006), we found that this DSIC, which conjures up the networking capability, did not directly influence startup growth. This phenomenon seems to have at least two possible explanations. First, the impact of networking capability on small business growth appears to be indirect. Zacca, Dayan, & Ahrens (2015), for example, found that the effect of this capability on firms' performance is mediated by competitive aggressiveness and innovativeness. Second, according to Parida, Patel, Wincent, & Kohtamäki (2016), an abundance of network connections may actually hinder the growth of small businesses. These authors point out that due to the generally low networking capability of these companies (note that the *co-producing and orchestrating* capability ranked the lowest DSIC – Table 5), entrepreneurs may not be fully able to process the various resources stemming from these network relationships. Information and knowledge overload can negatively influence startup growth. *H4* was, therefore, also not supported.

The capability of *sensing technological options* also presented a contradictory result. Although not significant, this variable remained in the proposed model and presented a negative effect size ($\beta = -0.559$; $p > 0.05$). This fact might be explained by recent evidence, which indicates that high-tech companies are not more likely to grow than traditional firms (Coad, Daunfeldt, Hölzl, Johansson, & Nightingale, 2014; Rannikko, Tornikoski, Isaksson, & Löfsten, 2019). The role and value of technology have changed over time, and

Dependent variable Coefficients	Estimate	Growth (GRO) Std. error	*t*-value	*p*
Intercept	1.752	1.374	1.274	0.207
Sensing user needs (SUN)	0.532	0.228	2.338	0.023
Sensing technological options (STO)	−0.559	0.339	−1.646	0.105
Scaling and stretching (SCS)	0.442	0.181	2.450	0.017
Residual standard error	1.005			
Multiple R^2	0.246			
Adjusted R^2	0.210			
F-statistic	6.846 ($p < 0.001$)			
N	67			

Source: Research data

Table 4. Stepwise regression analysis

Descriptive statistics	SUN	STO	CON	COP	SCS	GRO
N	137	137	137	137	137	67
Mean	4.36	4.62	4.34	3.76	3.80	3.15
Standard deviation	0.63	0.44	0.59	0.75	0.79	1.13
Minimum	1.67	2.67	2.67	1.00	1.75	1.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00

Source: Research data

Table 5. Descriptive statistics

commoditization has become a factor in the field. This makes technological capabilities a weaker indicator for business performance (Chae, Koh, & Prybutok, 2014). In this sense, growth has to be explained by factors other than purely technology (Coad et al., 2014). Indeed, an excessive emphasis on technological capabilities can lead to organizational myopia.

It is also important to consider that companies focused on radical innovations need more time and resources to search for and develop technologies that can be successfully launched in the market. This is why they may present a lower performance in the short-term when compared to other innovators that are less technology-intensive (Lukeš, Longo, & Zouhar, 2019). In addition, companies that promote their growth through technology-related strategies tend to accept more risks, something that might destabilize their growth path (Fombrun & Wally, 1989). Thus, *H2* was also not supported.

As predicted in the initial model, the *sensing user needs* DSIC had a positive influence on startup growth ($\beta = 0.532$; $p < 0.05$). Unlike the three capabilities previously reported, *sensing user needs* is important both for the effective generation of innovations (Janssen *et al.*, 2016, 2018) and for business growth. This result reinforces the importance of continually learning from customers to create superior value in all business phases (Salunke et al., 2019). It also indicates that startups that want to grow should have a high level of capability in terms of detecting market needs. This DSIC helps them to adjust their service offerings, ensuring the company's survival and competitive advantages. Hence, *H1* was supported.

The *scaling and stretching* DSIC was shown to influence startup growth positively and significantly ($\beta = 0.442$; $p < 0.05$). This result reinforces the startup idea that strives for scalable, repeatable and profitable business models (Blank & Dorf, 2012). However, less than 30% of all startups worldwide have proven the ability to scale up (Marmer, Herrmann, Dogrultan, & Berman, 2012). In this study, similar behavior was observed. The *scaling and stretching* DSIC was one of the rarest among those evaluated (Table 5). This highlights the need to monitor and review the scaling process in these organizations to find possible alternate ways of improving performance. These results challenge the myth that technological capacity is the main source of startup growth. We show that the capability to *learn from customers* and *design a scalable, repeatable, profitable business model* is much more important for growth than technological capability. Thus, *H5* was supported. Table 6 summarizes the hypothesis analysis.

To acquire the confidence intervals of the derived sensitivity coefficients to test possible sample biases, we applied the bootstrapping method to the regression models (Chen et al., 2017). This robustness test corroborated the stepwise regression results. It confirmed the validity of the effect sizes (beta value) of the *sensing user needs* and *scale and stretching capabilities* DSICs. It also refuted the validity of the beta value of the relationship between

Hypothesis	Expected relationship	Result	Note
H1	SUN > GRO (positive)	Supported	–
H2	STO > GRO (positive)	Not supported	Non-significant
H3	CON > GRO (positive)	Not supported	Non-significant
H4	COP > GRO (positive)	Not supported	Non-significant
H5	SCS > GRO (positive)	Supported	–

Source: Research data

Table 6.
Summary of hypotheses

sensing technological options and growth. Figure 2 illustrates the beta distribution in the bootstrapping resampling process.

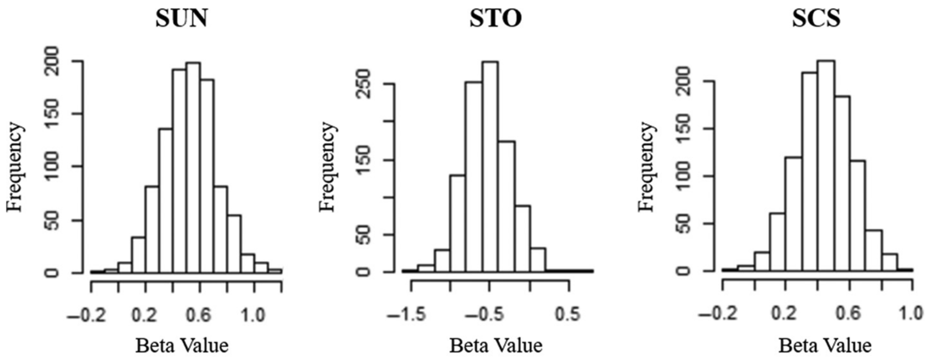
5. Discussion and conclusion

The aim of this paper is to promote an understanding of the relationship between DSICs and the growth of startups located in emerging countries. To fulfill this purpose, 137 Brazilian startups were investigated. Our results led to partial confirmation of the initial research assumptions. The hypotheses relating to the *sensing user needs* and *scaling and stretching* DSICs were confirmed: these capabilities were found to have a positive and significant influence on startup growth. However, contrary to what has been found in other contexts (Janssen et al., 2016, 2018), the other DSICs did not show the same result.

Our main contribution is the following: we found that the *sensing user needs* and *scale and stretching* DSICs are the most important for service startup growth. This indicates that startups should strive to further develop their ability to detect market needs. By doing so, they can adjust their service offerings and improve company performance. Additionally, the significance level of the *scale and stretching* DSIC shows that the capacity to develop and execute a scalable, repeatable, profitable business model is key for service startups that want to grow.

It should be noted that our results do not dismiss the importance of the other DSICs in different business phases and contexts. For instance, even though we found that the *sensing technological options* and *conceptualizing* DSICs do not directly affect startup growth, previous studies have indicated that they can induce innovation (Janssen et al., 2016, 2018). Finally, these results challenge the popular myth that technological capacity is the main determinant of startup growth. Our evidence suggests that growth in this context is more closely related to the *capacity to learn from customers* and *designing a scalable, repeatable and profitable business model*.

Our study has four main limitations. First, we did not investigate the role played by institutional context in the relationship between DSICs and startup growth. Future studies could evaluate the influence of public policies, financing availability and accessibility, tax incentives and other institutional variables on the growth of these businesses. Second, we



SUN BCa Intervals LowerCL	UpperCL	STO BCa Intervals LowerCL	UpperCL	SCS BCa Intervals LowerCL	UpperCL
0.133	0.918	−1.103	0.024	0.093	0.782

Source: Research data

Figure 2.
95% bootstrapping bias-corrected CI (BCa)

applied a comprehensive growth measurement scale that does not cover dimensions extending beyond financial and market aspects. In our literature review, we did not find a fitting scale for this purpose. We, therefore, also suggest that researchers develop one. Third, our study presents a temporal mismatch between the measures used in our model. This issue is intrinsic to the ex post facto method. Capabilities were measured at the time of the assessment, whereas growth necessarily refers to the period before the assessment. Finally, we stress that the results of our study cannot be generalized as our sample was non-probabilistic.

5.1 Theoretical implications

Our research sheds light on the relationship established between DSICs and startup growth, with a specific focus on the service sector in an emerging country, Brazil. We show that not all DSICs influence startup growth. Our findings suggest that different sets of DSICs must be mobilized at different business stages. In addition, despite the innovative nature of startups, *technological capacity* is not significant for growth. The growth phenomenon seems to be more closely related to the *capacity to identify market demands* and *develop an appropriate business model*. Finally, the *co-producing and orchestrating* DSIC does not seem to influence the growth of these businesses. This finding contradicts most earlier studies (Baum et al., 2000; McGrath et al., 2019; Walter et al., 2006). It highlights the *low networking capacity* of these organizations. The lack of such competence makes it difficult to absorb external knowledge and resources, which are both recognized as being important for overcoming barriers often associated with the newness and smallness of startups.

5.2 Managerial implications

Our findings suggest that managers should progressively invest in improving their skills and techniques to understand market signals, even if they have a well-developed business model and product and service offerings. As business environments are becoming increasingly dynamic, it is necessary to constantly review and adapt the business model and market offerings. Our results also warn about the dangers of an excessive focus on technological capabilities. We found that startup growth is more related to business model design and marketing competencies than technology. Hence, a myopic focus may hinder business growth.

5.3 Social implications

Innovative startups provide new, better and cheaper products and services to wide segments of the population (Blank, 2013; Ries, 2011), improving their living standards, quality of life and economic productivity. Fee-free credit cards, social and professional internet-based networks, rideshare apps, environmental-related technologies and solutions to increase the productivity of farms (Dutia, 2014; Jensen, Lööf, & Stephan, 2020) are only a few examples of how innovative startups may influence the lives of millions of people in a very positive way. At the same time, new and innovative firms that achieve high growth create a disproportionate number of new jobs (Barbero et al., 2011; Haltiwanger, Jarmin, & Miranda, 2013; Li, Goetz, Partridge, & Fleming, 2016) – for instance, according to Ledbetter (2018) the fastest-growing 12% of firms generate half of the new jobs in the US economy. Hence, by indicating the dynamic capabilities that are more conducive to startup growth, we contribute to society and the economy at large.

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Appendix

N°	Construct with underlying items
SUN	Sensing user needs – independent variable
VAR01	We systematically observe and evaluate the needs of our customers
VAR02	We analyze the actual use of our services
VAR03	Our organization is strong in distinguishing different groups of users and market segments
STO	Sensing technological options – independent variable
VAR04	Staying up-to-date with promising new services and technologies is important for our organization
VAR05	To identify possibilities for new services, we use different information sources
VAR06	We follow, which technologies our competitors use
CON	Conceptualizing – independent variable
VAR07	We are innovative in coming up with ideas for new service concepts
VAR08	We find it hard to translate raw ideas into detailed services[a]
VAR09	Our organization experiments with new service concepts
VAR10	We align new service offerings with our current business and processes
COP	Co-producing and orchestrating – independent variable
VAR11	Our organization has problems with initiating and maintaining partnerships
VAR12	Collaboration with other organizations helps us in improving or introducing new services
VAR13	Our organization is strong in coordinating service innovation activities involving several parties
SCS	Scaling and stretching – independent variable
VAR14	We are able to stretch a successful new service over our entire organization
VAR15	In the development of new services, we take into account our branding strategy
VAR16	Our organization is actively engaged in promoting its new services
VAR17	We introduce new services by following our marketing plan
VAR18	We find it difficult to scale up a successful new servicea
GRO	Growth – dependent variable
VAR19	In comparison to our competitors, our organization generated a higher return on equity in the past year
VAR20	In comparison to our competitors, we had more profit growth in the past year
VAR21	In comparison to our competitors, we had more turnover growth in the past year
VAR22	In comparison to our competitors, we had a faster growing market share past year
–	Control variables
–	Firm age – number of years since business start
–	Firm size – number of employees

Note: [a]Items removed from the final scale
Source: Adapted from Janssen *et al.* (2016)

Table A1. The scale items (English version)

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