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DYNAMIC CAPABILITIES AND THE SUCCESS OF EDTECH COMPANIES IN THE STARTUP MARKET

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ABSTRACT

Purpose: Evaluate whether factors such as age, investments, employees, and location can be facilitating elements to promote the success of Edtechs and analyze their contribution to expanding dynamic capabilities.

Method: This study used analysis of variance (ANOVA) and descriptive analysis. Additionally, the data from the Crunchbase platform was reinforced by exploring the literature using the Scopus database to map the researchers' interests.

Results: Statistical analyses reinforce the theory and provide evidence that the Crunchbase database can concentrate relevant information to measure the success of Edtechs, and support investor decisions and the field of science by updating Edtech foundation data.

Conclusions: This research shows a growing interest on the part of investors, entrepreneurs, and researchers in the sector of Edtech companies. The results reveal the valuable resources that drive digital activities, increasing the competitiveness of these companies. There's also a strong influence of location, development of internal resources, and attracting investments to the permanence of Edtechs in the market. This research contributes by showing elements of the success of Edtechs, highlighting their importance for the economy and interactions between different variables that shape their trajectory in the market for quality education in the online environment.

Practical Implications: Lead to recommendations for Edtech growth and innovation strategies, insights for investors evaluating investment opportunities, guidelines for government policies that promote technology education, or suggestions for educators and educational institutions on the effective adoption of educational technologies.

Keywords: Edtech, education, dynamic capabilities, Crunchbase.

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1. INTRODUCTION

The growing interest of entrepreneurs in scalable business models created in environments of extreme uncertainty can be represented by data from the Association for Private Capital Investments in Latin America (LAVCA) that demonstrated growth of the Edtech market by 146% in 2020. The U.S. Edtechs raised $3.2 billion in 2021 (LAVCA, 2021). According to Abstartup mapping (2020) made by the Brazilian Association of Startups (Abstartup) in partnership with the Innovation Center for Brazilian Education (CIEB), the study points out that Edtechs represent the largest segment among the startup industry in Brazil, with 17.3% of the total companies mapped.

Edtechs are scalable business models developed to create technology-based educational products and services (Mattsson & Andersson, 2019). Often, an educational path is selected to increase the student's knowledge and entrepreneurship. Both analytical lenses indicate a future in which the application of technological tools will establish innovation in education in several senses (Renz, Krishnaraja & Schildhauer, 2020).

The main stakeholders for Edtechs are investors and entrepreneurs who aim to create innovative learning models with technology to leverage and streamline teaching (Williamson, 2016; 2018). Edtechs are constituted by content, tools, and platforms, namely digital games, pedagogical content, and process optimization through the virtual environment (Startup Genome, 2021; Silva & Janes, 2023). Their educational content, tools for educational institutions, specific teachings, teaching financing, new forms of teaching, and platforms for education, among others, are some categories (Abstartup, 2020). Edtechs were born on digital platforms with tools to propose learning concepts appropriate to the new generation of digital students and technological inclusion in education.

Furthermore, the present research brings as a theoretical lens the dynamic and successful capabilities to represent the Edtechs phenomenon (Teece, Pisano, & Shuen, 1997; Hyytinen et al., 2015; Renz, Krishnaraja, & Schildhauer, 2020).

The methodological path of the study included an analysis of variance (ANOVA) and a descriptive analysis of the data (Fishbein, 1975). In addition, the extraction of the data in the Crunchbase platform that comprises commercial and financial information of companies, the literature was also explored using the Scopus database with the term "Crunchbase" to map the relevance that this database represents in the scientific field (Arroyo et al., 2019).

The growth of the set of technology-based Edtech companies emerging in a differentiated way and coexisting in a scenario of dynamic competition is undeniable (Petit & Teece, 2021). The literature brings studies that make use of the Crunchbase database. Among these recent studies, we can cite the research of Rodrigues et al. (2021), which explores the application of six binary classification models to a prediction through machine learning. In addition, Klinger, Mateos-Garcia, and Stathoulopoulos (2021) conducted a mapping of the evolution and geography of general-purpose technology. Another author, Song (2021), focuses on investigating emerging startups in the renewable energy sector.

The areas of study are diverse, and the literature still lacks literature review studies or bibliometric study that presents the field of research of studies already published using the Crunchbase platform to illustrate studies on digital companies, specifically Edtech companies. Thus, this research has as its main interest to explore the growth and success of Edtech companies, an industry that presents growth in the context of digital companies. For the advancement of knowledge, this research seeks to fill the gap of studies proposed by authors Żbikowski and Antosiuk (2021) that suggest research using datasets collected

from Crunchbase to analyze elements linked to growth dynamics and additionally, predict the success of digital companies.

Given the previous considerations, the following question arises: "To what extent can the time of existence, investments, team size, and location work as facilitating factors for the success of Edtechs?" To elucidate this issue, the purpose of this study is to examine the factors that can influence the success of an Edtech, exploring the relationships between the volume of investment, the period of operation of Edtech, its geographical location, and the size of the team.

This study constitutes a significant contribution, to both the theory of dynamic capabilities and the theory of success by enriching the conceptual understanding through integration of two domains in the literature and quantitative research. Regarding the managerial dimension, the findings of this study have potential application to foster the dynamics in the scope of Edtechs, which can result in substantial improvements in the performance of process transformation and the amplification of the impact of technological education.

The structure of this study consists of five sections, beginning with the introduction. The second section covers the theoretical framework, organized into three subsections: Dynamic Capabilities, Startup Success, and Edtech Market. The third section details the methodology adopted in the research. The fourth section highlights the main results obtained in the study. Finally, the fifth and final section presents the main research contributions and limitations and highlights possible directions.

2. THEORETICAL FRAMEWORK

2.1. Dynamic capabilities in Edtechs

The dynamic capabilities theory is relevant to clarifying companies' perceptions of their performance (Teece, 2007; Teece & Leih, 2016). Dynamic capabilities can provide Edtechs competitive advantages in uncertain environments (Teece, 2007; Teece & Leih, 2016). The concept of dynamic capability involves a set of skills, starting with company knowledge, that allows you to build, integrate, and reconfigure skills to face rapid business changes (Teece, Pisano & Shuen, 1997; Teece, 2007; Luo, 2000).

Dynamic capabilities create skills developed through organizational resources (Teece, Pisano & Shuen, 1997). Edtechs can build and establish these skills through the digital capabilities and experience of entrepreneurs (Teece, 2007; 2018; De Noronha, Martins, Iamamoto, and Silva, 2023). To achieve a competitive advantage, it is crucial to define the skills and allocate the necessary resources to develop capabilities that are difficult to imitate and generate value for the company (Luo, 2000; Helfat & Peteraf, 2015; Teece & Leih, 2016).

In Edtechs innovative companies seeking to promote technological education, the dynamic capabilities are linked to digital resources, which become essential elements for success (Khin, 2019). The microfoundations of these capabilities comprise three elements "Sense" (perception), "**Seize**" (harnessing), and "**Reconfigure**" (reconfiguration) (Teece, 2007). "**Sense**" involves identifying threats and opportunities through technology, "Seize" refers to the transformation of opportunities into new products, services, and processes, and "Reconfigure" refers to the reconfiguration of assets and organizational structure for sustainable growth (Zollo & Winter, 2002; Zahra & George, 2002; Eisenhardt & Martin, 2000).

In the context of Edtechs, these micro-fundamentals can intensify in elements such as research and development, technological evolution, and knowledge integration, all transmitted by the company's resources (Silva, Rodrigues, Sampaio, and Noronha, 2022).

In the specific case of Edtechs, digital capabilities play a significant role. These resources can be orchestrated to create innovative skills (Camillo; of Vasconcellos; Amal, 2020; From Noronha, Hayashi, Martins, and Oliveira, 2023). Especially for technology-based Edtechs, the dynamic capabilities in the digital environment span areas such as digital media, web mobility, and big data, driving the creation of new products and services (Renz; Hilbig, 2020).

The development of dynamic capabilities is fundamental to Edtech companies' context. These capabilities, derived from organizational and digital skills, enable Edtechs to achieve competitive advantages in ever-changing environments. By building, integrating, and reconfiguring their competencies in response to rapid change, Edtechs can face complex and uncertain challenges. The successful ability to confront threats, seize opportunities, and reconfigure assets and organizational structures is critical to the survival of these startups. Digital resources such as digital media, web mobility, and big data play a crucial role in creating innovations and promoting the sustainable growth of Edtechs.

2.2. Successes for the survival of Edtechs in the market

A crucial aspect to discern the success of an Edtech, according to the scope of this study, involves the evaluation of its survivability through the analysis of the time of operation and the ability to attract qualified investments to ensure the sustainability and expansion of the enterprise.

Despite the economic importance of Edtechs among young entrepreneurs, they are subject to a rapid decline due to several factors, among them the non-acceptance of the product by the market, the lack of investment for innovation of products or services, as can be seen in startups that were recognized as 99TAXI, which quickly lost space to UBER and had to reinvent itself (Silva, 2017).

According to the survey conducted by StartupFarm (2017), a renowned Latin American accelerator, 18% of startups close their activities within two years, 67% in five years, and 74% after the fifth year of operation. These numbers reveal that the mortality rate of a startup is higher than the reality of other companies. Some of these startup companies are created only to be sold to major brands, as soon as the product/service is accepted by the consumer or has a high number of users (Silva, 2017; Smith & Janes,2021; Noronha, Ferraro & Silva, 2023). This is the strategy to gain scalability and increase technology or capital contribution and investments in personnel. After this process, the company is no longer in a market of uncertainty, so it ceases to be seen as a startup.

This also corroborates the data pointed out by Hyytinen et al., (2015) that startups operate in an extremely risky and competitive way in the business market. The author considers that on average, only about 60% of new companies remain in the market for more than three years and an important factor in determining the survivability of an enterprise is to be able to gather sufficient funding for the sustainability and extension of the business (Hyytinen et al., 2015)

The success of an Edtech can be defined, for example, by the ability to attract new investments (funding rounds), by the exponential speed of sales growth, by participation in M&A processes (Mergers and Acquisitions), and by the IPO (Rodrigues et al., 2021).

As noted by Gaustaud et al. (2019), the definition of "success" in the context of startups, including Edtechs, is a notion that involves several aspects. Investors' perspective is central to this understanding, as they consider Edtechs successful when it manages to achieve a profitable exit, often through an IPO or an acquisition. An indicator

often used to measure the success of startups is the ability to attract investments in subsequent rounds, which demonstrates investors' confidence in the trajectory and potential of the company. Therefore, the evaluation of the success of an Edtech is not only limited to its current performance but also to its ability to attract investments and sustain continuous growth over time.

Authors Sharchilev et al. (2018) agree with this perspective, highlighting that an attractive approach to defining a startup's success is its ability to balance investments with flexibility. As an emerging company obtains more substantial funding rounds, the availability of relevant information increases, which in turn enhances the foundation for predicting its success. In addition, another way to measure success is to look at so-called "Unicorn Startups," which are emerging companies with more than a billion dollars of market cap. These various approaches highlight that the success of a startup is a dynamic trajectory, influenced by its ability to adapt, financial growth, and conquest of a unique place in the market.

Any startup aims to achieve the status of "Unicorn Startup", however, there are few that effectively reach this level. Being a unicorn startup means achieving a market cap of at least a billion dollars. The term "unicorn" was introduced by U.S. investor Aileen Lee in 2013 and has since become popular. In May 2017, Brazil also began to have its first unicorn startups, and there are currently more than 950 companies of this type worldwide, according to data from (Sebrae, 2022).

Being well-positioned and being able to implement strategies for scalability is fundamental and became evident in this context. A startup can be considered successful not only for its current performance but also for its ability to evolve. This can be seen in the approaches to measuring success through subsequent funding rounds and the pursuit of "Unicorn Startup" status (Sharchilev et al., 2018; Sebrae, 2022). These perspectives reinforce that the success of a startup is a dynamic journey where adaptation, financial growth, and consolidation in the market play crucial roles.

2.3. The startup market focused on education Edtechs

Startups in the educational field, known as Edtechs, have as their primary focus the integration of technology with the journey of education stakeholders, including teachers, students, and administrators (Williamson, 2016; Smith & Janes, 2023; Silva & Janes, 2020). These solutions range from applications for learning mathematics by elementary school students to complex data management systems for educational institutions (Canaltech, 2022). While not restricted to teaching and learning, some Edtechs also focus on areas such as marketing, management, and operations in educational contexts.

In recent years, the Edtech sector has undergone important changes, and with a growing acceptance, this phenomenon has given itself due to the importance of the speed of learning and developing skills for the twenty-first century, which has become increasingly recognized. The Brazilian market is an example of this movement, with a 26% increase in the number of education startups in 2020 compared to the previous year (Abstartup, 2020), driven by a large portion of the COVID-19 pandemic that accelerated the adoption of remote learning (Renz, Krishnaraja & Schildhauer, 2020). The growth of the sector is also evidenced by investments, with more than 130 investment rounds held between 2010 and 2020, totaling US$ 175.5 million in educational startups (Edtech Distrito, 2020).

In short, the Edtech landscape represents a promising fusion between technology and education, ranging from simple solutions for students to comprehensive institutional management systems. The significant growth of this sector, driven by the pandemic and the growing demand for twenty-first-century skills, highlights the importance of an innovative approach to education. The rise of Edtechs is also evidenced by the increase in investments and the number of startups in this field, reflecting the confidence and potential expected for an education that can complement existing methods.

3. METHODOLOGY

The methodology used for this research relied on descriptive statistical analysis Guimarães (2008) with the support of the bibliometric technique (Quevedo-Silva, Santos, Brandão & Vils, 2016). From the research problem, data were collected from the *Crunchbase* platform, so we chose to apply data analysis techniques with the support of the VosViewer software for cluster analysis. Additionally, the *Crunchbase* platform database relied on analysis trimmed by the Jasp statistical software for ANOVA analysis of variance (Goss-Sampson, 2019; Wagenmakers & Kucharský, 2020).

The descriptive statistical analysis summarizes some specific characteristics of datasets from the *Crunchbase* database. The course presents a photograph, tables, graphs, and statistical tests to expose the reality and synthesize the data to obtain a broad view that study variables can assume (Guimarães, 2008).

The bibliometric technique is the amalgamation of statistical methods that makes it possible to investigate and organize scientific productions present in the literature, presenting the guidelines and criteria of the methodology adopted, validating the process of descriptive analysis (Pritchard, 1969; Quevedo-Silva et al., 2016). The VosViewer software prioritizes the visualization of bibliometric networks by clusters. Development focused on relational keyword co-occurrence techniques to explore scientific research using the Crunchbasse database (Van Eck; Waltman, 2010).

3.1. Research approach

The methodological approach of this study relied on an analysis of variance (ANOVA) by Sakaguti et al. (1996) to examine elements between the time of foundation, volume of investment, and other factors for the success of an Edtech. Initially, the implications of the data representing this study focused on the *Crunchbase database*.

Some criteria were applied to obtain the main steps of quantitative research, as well as treatment and cleaning of the basis for presentation of the results in table format and transformation of the data for demonstration of design of the macro results. The main paths in the composition of the secondary data of the quantitative research are presented in Figure 1.

Data Survey	Software	Results analysis
Crunchbase Platform	Jasp; Excel	Descriptive exploratory analysis
Scopus Database	VosWiewer; Excel	Analysis of Variance (ANOVA).

Figure 1: Methodological path
Source: Elaborated by authors (2021)

3.2 Sampling and data collection

The focus of interest of the research focuses on Edtechs, so a sample collected gathered secondary data extracted from the Crunchbase platform, *which comprises commercial and financial information of both private and public companies (*Crunchbase, 2021). The date of collection of the quantitative data was November 2021. This choice of the platform as a data source is strategic due to its scope and continuous updating, providing a detailed overview of Edtechs and facilitating the analysis of the variables relevant to this study.

The selection term for search on the *Crunchbase* platform was "Edtech". Due to the limitation of the platform in the export of data for selection of filters comprised the period every 2 years totaling 12 years, from January 2009 to November 2021. The initial sample of data collected presented a total of 4,487 Edtechs, of which 110 countries, have 5,604 founders, and 4,409 numbers of investment rounds (Number of Funding Rounds). The transformation of some data from the portfolio of the Edtech sectors was applied for statistical analysis and will be explained in the following sections.

The survey of the database of 4,487 Edtechs, when compiled, resulted in 828 sectors, representing 18% of the total of the initial base. The path of adaptations and cleaning of the *Crunchbase database* applied according to the Rodrigues et al. (2021) study for presenting consistency in the process of adaptations and contributing to the dynamics of application selected for this research. The *Crunchbase database* presents the absence of some data to minimize the bias and inconsistency of the data selected for analysis. Missing data was excluded to adjust factors for the construction of the variables for the study. Table 1 shows the exclusion steps during the treatment of the data collected on the *Crunchbase platform*.

Table 1: Database cleaning process

Approach to data cleansing	**Deleted records**	**Sample size**
Total sample extracted from the *Crunchbase* platform		4.487
Removal of Edtechs without the term *education* (*Industries*)	462	4.025
Removal of missing records of investment rounds (*num funding rounds*)	248	3.777
Removal of Edtechs without the total funding round (total funding USD)	2468	1309
Remoção Das Edtechs sem o país de origem (*Country_code*)	19	1290
Adjust of Edtechs angel; seed, series A, series B, série C (Last *Equity Funding Type*)	457	833
Withdrawal of Edtechs with foundation date later than the date of (Last *Founding Date)*	5	828

Source: Adapted from Rodrigues et al., 2021

The Edtechs that make up the database of this study, have greater representation by continent in America. The three main cities of the continent of America are the United States at 80%, Brazil at 13%, and Canada at 5%. There is interest from entrepreneurs and founders of Edtechs in this region (*Crunchbase*, 2021). Other studies meet the data represented on the *Crunchbase* platform, for example, StartupBlink (2021) presented a survey with the mapping of global Edtechs, and its results presented the United States leading the Ranking among countries with better performance of Edtech companies. Figure 2 represents the graphical organization of Edtechs, by continent.

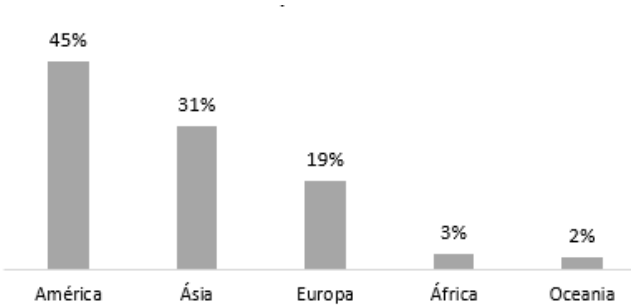

Figure 2: Edtechs by continent
Source: Developed by the authors (2022)

The Crunchbase data platform, *employed as a source of information for this research, reveals that the maximum survival age for Edtechs is 12 years (*Crunchbase, 2021). Figure 3 shows a significant predominance of survival that exceeds 6 years (Abstartup, 2020; StartupBlink, 2021), which indicates that Edtechs with more than 10 years of longevity are usually companies that have achieved a consolidated position in the market.

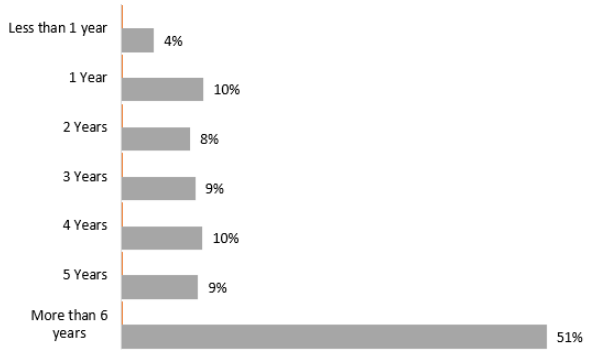

Figure 3: Age vs. market time of Edtechs
Source: Elaborated by the authors (2022)

3.3. Crunchbase specificities for investors

The *Crunchbase* database is a platform that comprises data from startups from various industries. Launched in 2007, based in the United States, the Crunchbase platform *was founded by Michael Arrington, interested in tech startups (*Crunchbase, 2021).

The interest in consolidating solid data is growing in several aspects. Entrepreneurs interested in the challenge of initiating new technology-based business models as represented by Williamson (2018) explore entrepreneurs in Silicon Valley by prototyping fully technological school models. Focused on the technological solutions of Edtechs and with a lens focused on academia, researchers Renz et al. (2020) present studies on the solutions mainly in the virtual platforms useful in the pandemic period by Edtechs.

The interest of investors Liang et al. (2016) in obtaining and providing raw data is whether it proves substantial for the investment journey. The creation of the *Crunchbase* platform enables the grouping of information since the opening of Edtechs. The data presented have as characteristics a photograph of the evolution of startups to promote information dissemination and attract investors (*Crunchbase*, 2020). Figure 4 presents the theoretical model with connections of common interests, for example, the opening of Edtechs, investors, academic researchers, and additionally the use of the *Crunchbase base*.

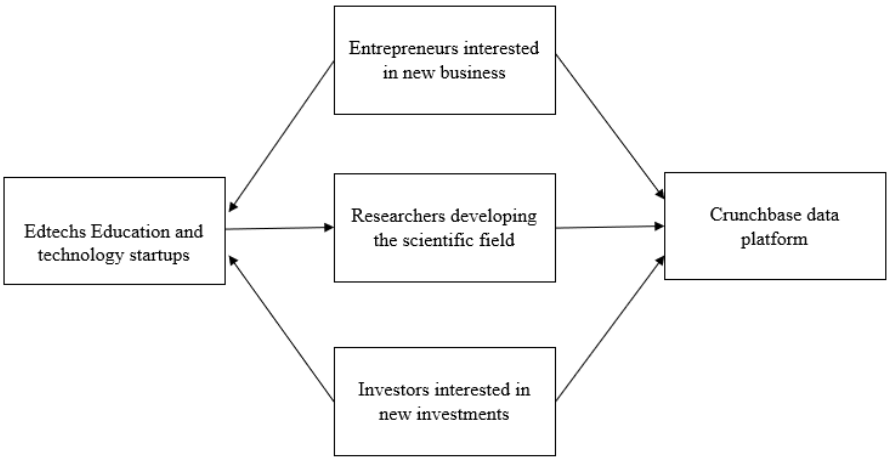

Figure 4: Theoretical Model
Source: Elaborated by the authors

Developed by a dynamic environment, the ecosystem of an Edtech startup is composed of investors who interact in complex ways. The birth of Edtechs occurs with the expressive interactions of investors in the search for new resources (Amoroso, 2021; Rodrigues et al., 2021). The main answer for the investor if Edtech is on a good path is characterized by funding rounds (Rodrigues et al., 2021).

To compose the understanding of the interest of academics by the *Crunchbase* database a small sample was collected in the Scopus database in December 2021. The term used was "*Crunchbase*" and articles, search verified, title, abstract, and keywords were filtered. This extraction returned in a sample of 53 articles. Between 2009 and 2021, publications increased by 30% versus previous years. In a literature review, Dalle, Den Besten & Menon (2017) mapped several databases, finding more than 90 publications that use the *Crunchbase database*. A portfolio was raised in the Scopus database to demonstrate a portion of the researchers' interest in the use of the database, so it could be demonstrated via clusters a cut of the data that could be measured and complemented in the quantitative analysis of this research.

Figure 5 represents the keywords on the main topics of research interest by using the VosViewer software.

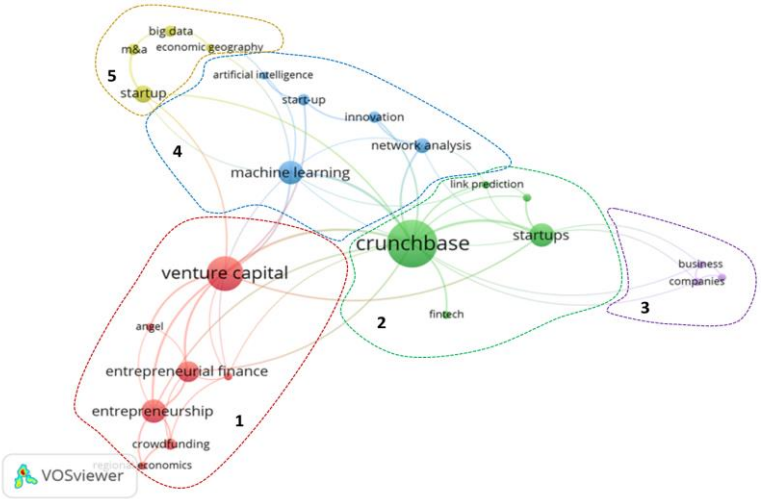

Figure 5: Co-occurrence cluster of journal keywords based on *Crunchbase*.
Source: Elaborated by the authors with VosViewer software (2022).

Cluster 1 demonstrates the initial research that relied on *Crunchbase* data to investigate, and venture capital indicates to the investor and entrepreneur (Ter Wal et al., 2016; Cumming, Werth & Zhang, 2019). Clusters 2 and 3, present a strategic business vision aimed at startups and fintech around *Crunchbase* data (Herck Giaquinto & Bortoluzzo, 2020). Cluster 4 presents studies of characteristics of large data measurements to explore opportunities to drive innovation (Klinger, 2021; Block & Sandner, 2009). Cluster 5 illustrates recent research that proposes investigations to position technology-based companies to achieve sustainability and competitive capabilities by geographic location and other factors for better market positioning (Chae & Olson, 2021; Bishop Mateos-Garcia, 2019).

3.4. Analysis of variance (ANOVA)

The analysis of variance (ANOVA) is a comparative analysis of the average and is based not on the comparison of the average, but on the comparison of the square of the standard deviation, variance (Sakaguti et al., 1996). The variance is the square of the standard deviation, reading the analysis each sample has a variance. So the hypothesis test called analysis of variance (ANOVA) was applied to analyze the survival of Edtechs and the relationships between survival time, investment volume, employees, and location.

The analysis of variance (ANOVA), according to Fishbein (1975), can be defined by the significance of the p-value by the F distribution being composed of the variance. In this sense, if the significance level of the p-value is less than 0.05 the null hypothesis (H0) is rejected, which means that there may be evidence of differences. Conversely, if the p-value is greater than 0.05 the alternative hypothesis is accepted meaning a single phase (Kim, 2017).

4. ANALYSIS AND DISCUSSIONS

The factorial design that contributes to this analysis was constituted by the three criteria, namely:

1: Company status (0 closed and 1 active)
2: Lifespan up to 12 years (<6 and >=6)
3: Total investment in USD (<1,500MM and >=1,500MM)

Initially, the variables of the company's status, lifetime, and investments of the Edtechs were tested to observe if the amount of investment influences the age of the Edtechs, the representation of the p-value was equal to 0.01, being lower than the limit of 0.05. In this sense, the null hypothesis (H0) was rejected, providing the acceptance of the alternative hypothesis (H1) represented in Table 2. It is possible to state that there is evidence that the amount of investment in Edtechs can be considered as one of the factors that influence the success of Edtechs for longer.

The process of attracting investment can be considered as an attractive and important feature for the growth of Edtechs. Authors such as Arruda, et al. (2014) define that the success of Edtech companies positively characterizes the economy, the survival of an Edtech is of interest to both the entrepreneur and the socio-economic. Some factors are paramount to the success of Edtechs, such as good relationships between partners, strategy for attracting investment rounds, and geographic location, among others. In the pursuit of promoting success, attracting investment can be considered important to characterize the company's establishment for success (Sharchilev et al., 2018; Gereto, 2019). A good example of this is that only in Brazil were carried out from 2010 to 2020 more than 130 rounds of investments in this sector, for example, the mapping of the

District (2021) states that there was an increase of 26.1% in the number of Edtechs in the year 2019 to 2021 (Abstartup, 2020).

Table 2: ANOVA Lifetime of Edtechs and total investment

Cases	Sum os Squares	df	Mean Square	F	p
Nom_Lifetime	1581	1	1581	25737	< 001
Nom_ Total investiment	1145	1	1145	18635	< 001
Nom_ Lifetime * Nom_ Total investiment	0.351	1	0.351	5715	0.017
Residual	50927	829	0.061		

Fonte: Elaborated by authors (2022)

Table 2.1: Descriptive of Lifetime and Investment

Nom_Lifetime	Nom_ Total investiment	Mean	SD	N
<6	<1500000	0.957	0.204	232
	>=1500000	0.990	0.100	201
>=6	<1500000	0.828	0.378	204
	>=1500000	0.944	0.231	196

Fonte: Elaborated by authors (2022)

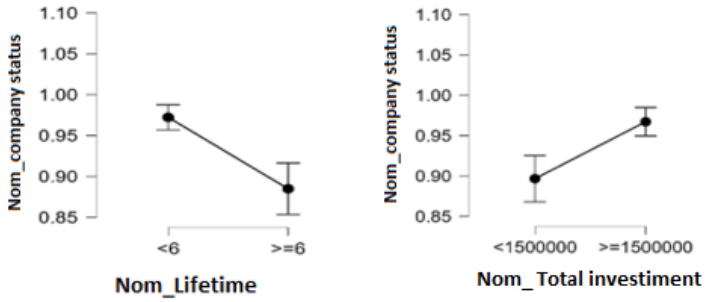

Figure 6: Plot lifetime and investments and total investments
Fonte: Elaborated by authors (2022)

Then the geographical location of the Edtechs was verified. The variables were the age of the Edtechs and location by continent. Allowing us to observe whether the continent where Edtechs are influences the age of the company to ensure success in survival. The null hypothesis (H0) was rejected, allowing the acceptance of the hypothesis (H2), which resulted in the p-value within the limit of 0.05, represented in Table 3.

Binary data on the continents were considered. There is evidence that geographic location can be one of the factors that influence the survival of Edtechs to ensure success. Normally, defining the geographic location of an Edtech can be challenging as Edtechs go through the cycles of evolution their location can change (Begley & Tan, 2001; Startup Blink, 2021). Edtechs tend to be founded in larger cities, mainly because of the greater concentration of entrepreneurs and investors. Generally, studies that consider urban cities for opening Edtechs should consider the size of the population so as not to establish unfair criteria in larger cities (Startup Blink, 2021).

The geographical location that Edtechs are located differs mainly in Africa and Oceania (see Figure 3) The location of Edtechs at both ends 1 and 5 are significantly

different from continents 2, 3, and 4, a contributing factor to this variation was the sample size.

Description of the variables considered:

1: Age of Edtechs_Bin (1 to 12 years)
2: Nominal Continents (1. Africa, 2. America, 3. Asia, 4. Europe and 5. Oceania)

Table 3: Age of Edtechs and geographic location

Cases	Sum of Squares	df	Mean Square	F	p
Continente	242.741	4	60.685	7.078	< .001
Residuals	7098.616	828	8.573		

Fonte: Elaborated by authors (2022)

Table 3.1: Descriptive of location by continent

Continente	Mean	SD	N
1	4.471	2.267	17
2	6.613	3.068	385
3	5.549	2.841	257
4	6.513	2.811	160
5	6.571	2.503	14

Fonte: Elaborated by authors (2022)

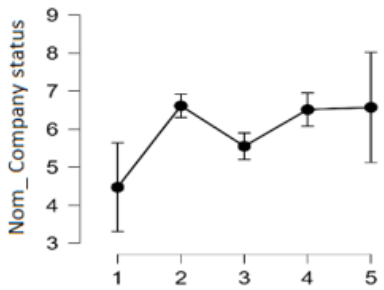

Figura 7: Plots of age and geographic location
Fonte: Elaborated by authors (2022)

The type of investment, employees, and gross investment had a p-value 0.01 lower than the limit of 0.05, allowing the rejection of the null hypothesis (H0), and additionally, the acceptance of the alternative hypothesis (H3) represented in Table 4. In this way, it is possible to affirm that there is evidence that employees and the total gross investment, can be considered as one of the factors contributing to the success of an Edtech.

Some Edtech sectors have larger staffs, for example, education and software. Data collected shows these sectors have between 500 and 1001 employees working in virtual environments (*Crunchbase*, 2021). The resources/employees during their experiences can develop dynamic capabilities that in the case of Edtechs are unfolded into digital capabilities that drive the company to achieve greater competitiveness (Teece, Pisano & Shuen, 1997). It is up to the founding partner and the management team to perceive, transform, and reconfigure the skills developed by the resources/employees to acquire success in the positioning of the company (Teece, 2007).

1: Type of investment (Seed, Angel, and Series A, B, and C)
2: Bin_funcionários (<10 and >=10)
3: Nom_ total investment (<1500MM and >=1500000)

Table 4: Type of investment, employees, and gross investment.

Cases	Sum os Squares	df	Mean Square	F	p
Nom_Lifetime	11.548	1	11.548	21.607	< 001
Nom_ Total investiment	73.576	1	73.576	137.661	< 001
Nom_ Lifetime * Nom_ Total investiment	11.992	1	11.992	22.437	< 001
Residual	436.664	817	0.534		

Fonte: Elaborated by authors (2022)

Table 4.1: Descriptive of employees and total investment

Nom_Lifetime	Nom_ Total investiment	Mean	SD	N
<10	<1500000	1.935	0.336	232
	>=1500000	2.358	0.667	67
>=10	<1500000	1.930	0.516	200
	>=1500000	2.925	1.011	322

Fonte: Elaborated by authors (2022)

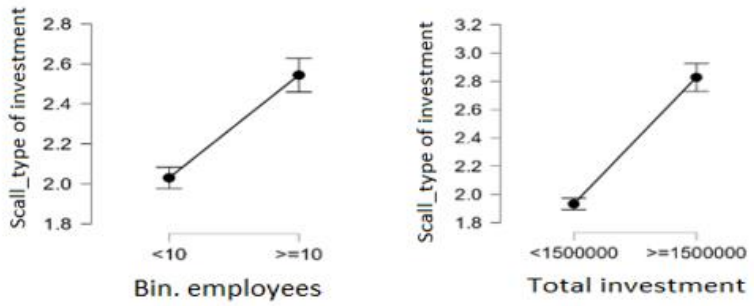

Figura 8: Plots funcionários e total de investimento
Fonte: Elaborated by authors (2022)

In this research, it was analyzed whether the number of employees influences the lifetime of Edtechs. The life span presented a p-value greater than 0.05, in this sense, the alternative hypothesis (H4) was not confirmed, as described in Table 5. Based on the sample, it is possible to state that there is no evidence that the number of employees influences the longer life span of Edtechs. When it comes to the success of Edtechs, previous studies, for example, Gastaud et al. (2019) state that fundraising/employees to predict success can be associated with different stages since the founding of Edtech. Competitiveness can be one of those stages.

Startups work with reduced staff. The strategy that targets smaller resources/employees is part of companies in the ecosystem of companies in uncertain, lean, and rapidly changing scalable scenarios (Shepherd, & Gruber, 2021; Teece 2007). Already the universe of Edtechs that are startups based on technology in education, the staff can be larger according to the sector (Edtechs District, 2020) In this way, it is natural for Edtechs with amount employees above +10001 mainly by the technological need that is operationalized.

Bonaventura et al. (2020) bring contributions from micro companies that in a short time managed to be boosted, one of the relevant factors was shown by the attention to the skills of employee networks. There are two Edtech employees' elements observed, first

the dynamic capabilities acquired during their experiences which are difficult to imitate (Teece & Leih, 2016). Second, raising new resources/employees with market *know-how* to boost and generate greater competitiveness in the technological field for Edtechs (Gastaud et al., 2019).

1: Lifespan up to 12 years (<6 and >=6)
2: Employees below 10 to above 10001 (0 and 1)

Table 5: Effect of employees on the lifetime of Edtechs

Cases	Sum os Squares	df	Mean Square	F	p
Nom_Lifetime	0.051	1	0.051	0.218	0.641
Residual	190.057	819	0.232		

Fonte: Elaborated by authors (2022)

Table 5.1: Descriptive of variable lifetime

Nom_Lifetime	Mean	SD	N
<6	0.628	0.484	425
>=6	0.644	0.479	396

Fonte: Elaborated by authors (2022)

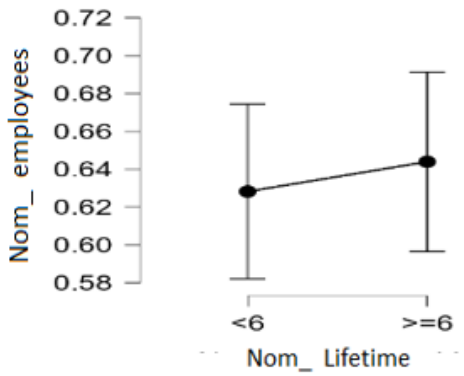

Figure 9: Plots representing employees in a lifetime.
Fonte: Elaborated by authors (2022)

5. CONCLUSION

The objective proposed for this research was to analyze elements that can contribute to the success of an Edtech was been reached. Data from the *Crunchbase platform were investigate*d to support the statistical analysis with descriptive graphical analysis representations of the data. To explore the literature data from Scopus were collected by applying analyses with two Jasp software: analysis of variance (ANOVA) and VosViewer: Analysis of co-occurrence of keywords for the organization of data investigation.

It is noteworthy that during the analysis, in addition to the statistical data, the descriptive analysis of the databases was presented, as well as relevant data to compose and prove the relevance of the variables measured in the study. The statistical analyses reinforce the theory and present evidence that *the Crunchbase* database can concentrate relevant information to measure the success of Edtechs, support the decision of investors, and support the field of science to update Edtech foundation data. Therefore, hypotheses were tested, as seen in Table 6 which presents the four hypotheses elaborated to meet the purpose of the research.

Table 6: Research hypotheses

Hypotheses	Research hypotheses	Status
H1	The amount of investment influences the age range of Edtechs.	Confirmed
H2	The continent where Edtechs are influenced by the age of the company to ensure success in survival.	Confirmed
H3	The employees and the total gross investment can be one of the elements contributing to the success of an Edtech.	Confirmed
H4	The number of employees influences the longer life span of Edtechs.	Rejected

Fonte: Elaborated by authors (2022)

The literature indicated a growth projection in the interest of investors, entrepreneurs, and researchers. The description of the bases and the creation of the clusters showed that Edtechs have rare resources that develop digital capabilities to promote greater competitiveness. The period an Edtech remains in the market is relative to the set of elements namely the location that directly impacts the economy, the capabilities developed by employees during their experiences, and the capture of investment rounds that allow the changes of stages.

6. LIMITATIONS AND FUTURE RESEARCH AGENDA

This research has limitations to be addressed in future research to advance in the scientific field aimed at Edtech companies. *Only a smaller volume of data extracted from the platform could b*e analyzed, due to the missing data in the Crunchbase database. The treatment of the database aligned with the absence of some data was a limiting factor of the study and made the process of transformation of the base time-consuming. Future studies may develop an analysis to investigate greater accuracy in filling in the data from *the Crunchbase* platform to assist the scientific and business fields.

Future research can address a combination of qualitative and quantitative methods. To assess the digital capabilities developed in Edtech, a mixed survey can provide useful information for entrepreneurs to reconfigure their resources to involve a higher level of competitiveness, and obtain greater investment captures.

Overall, this research showed the importance of the *Crunchbase database* for conducting descriptive quantitative research, including in collaboration with the studies of (Sharchilev et., al 2018; Gastaud et al., 2019) that also presents the importance in the search for the success of an Edtech. Hopefully, this study will inspire the advance in the field of knowledge about the elements that can contribute to the success of an Edtech company, as well as to direct future studies, for example, a literature review with the bibliometric character of the journals that used the Crunchbase data platform.

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