



FRUGAL INNOVATION IN BUSINESS INCUBATORS: UNDERSTANDING AND PERSPECTIVES FROM THE MANAGERS' POINT OF VIEW

A INOVAÇÃO FRUGAL EM INCUBADORAS DE EMPRESAS: COMPREENSÃO E PERSPECTIVAS SOB O PONTO DE VISTA DOS GESTORES

INNOVACIÓN FRUGAL EN VIVEROS DE EMPRESAS: ENTENDIMIENTO Y PERSPECTIVAS DESDE EL PUNTO DE VISTA DE LOS GERENTES

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Abstract

The Objective of the study: To identify incubator managers' understanding and perspectives on the phenomenon of frugal innovation in these institutions.

Methodology/approach: This is a qualitative research of exploratory nature, with data collection carried out through semi-structured interviews. The interview transcripts were analyzed using categorization and Similarity Analysis using the Iramuteq software.

Originality/Relevance: Given the importance of frugal innovation and its impact on product and service development, it is worth studying this phenomenon in environments that naturally disseminate innovation, since there are still questions to be explored.

Main results: The results demonstrate that the term frugal is not used in the day-to-day incubators, however, it was verified the existence of the practice of frugal innovation in these environments. It is concluded that there is a prevalence of a positive view of managers about this type of innovation and that the practice of frugal innovation in the development of products and services is considered a competitive advantage for the incubated ventures.

Theoretical and methodological contributions: Contributes to a future research agenda with the themes: of frugal innovation practices; Mobilizing frugal innovation by the lack of resources and; Frugal innovation through apps in technology incubators.

Contributions to management: This research allows incubator managers to understand the aspects involving the theme so that they can develop strategic actions for their incubators using frugal innovation.

Keywords: Frugality. Business incubation. Competitiveness.

Resumo

Objetivo do estudo: Identificar a compreensão e perspectivas dos gestores de incubadoras sobre o fenômeno da inovação frugal nestas instituições.

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Metodologia/abordagem: Trata-se de uma pesquisa qualitativa de caráter exploratório, com a coleta dos dados realizada por meio de entrevistas semiestruturadas. As transcrições das entrevistas foram analisadas por meio de categorização e Análise de Similitude pelo software Iramuteq.

Originalidade/Relevância: Dada a importância da inovação frugal e seu impacto para o desenvolvimento de produtos e serviços, cabe estudar esse fenômeno em ambientes naturalmente disseminadores da inovação, uma vez que ainda existem questões a serem exploradas.

Principais resultados: Os resultados demonstram que o termo frugal não é utilizado no dia a dia das incubadoras, no entanto, verificou-se a existência da prática da inovação frugal nestes ambientes. Conclui-se que há prevalência de uma visão positiva dos gestores sobre esse tipo de inovação, sendo que a prática da inovação frugal no desenvolvimento de produtos e serviços é considerada como uma vantagem competitiva para os empreendimentos incubados.

Contribuições teórico-metodológicas: Contribui com uma agenda de pesquisas futuras com os temas: Práticas de inovação frugal; Mobilização da inovação frugal pela falta de recursos e; A inovação frugal por meio de aplicativos em incubadoras tecnológicas.

Contribuições para gestão: Esta pesquisa permite que os gestores de incubadoras compreendam os aspectos que envolvem o tema, para que possam desenvolver ações estratégicas de suas incubadoras com a utilização da inovação frugal.

Palavras-chave: Frugalidade. Incubação de empresas. Competitividade.

Resumen

Objetivo del estudio: Identificar la comprensión y las perspectivas de los gerentes de incubadoras sobre el fenómeno de la innovación frugal en estas instituciones.

Metodología/enfoque: Se trata de una investigación cualitativa exploratoria, con recolección de datos realizada a través de entrevistas semiestruturadas. Las transcripciones de las entrevistas fueron analizadas mediante categorización y Análisis de Similitud utilizando el software Iramuteq.

Originalidad/Relevancia: Dada la importancia de la innovación frugal y su impacto en el desarrollo de productos y servicios, vale la pena estudiar este fenómeno en entornos que difundan naturalmente la innovación, ya que aún quedan temas por explorar.

Resultados principales: Los resultados demuestran que el término frugal no se utiliza en el día a día de las incubadoras, sin embargo, se verificó la existencia de la práctica de la innovación frugal en estos ambientes. Se concluye que prevalece una visión positiva de los gestores sobre este tipo de innovación, y la práctica de la innovación frugal en el desarrollo de productos y servicios es considerada como una ventaja competitiva para las empresas incubadas.

Aportes teórico-metodológicos: Contribuye a una futura agenda de investigación con los temas: Prácticas de innovación frugal; Movilización de la innovación frugal por falta de recursos y; Innovación frugal a través de aplicaciones en incubadoras de tecnología.

Aportes a la gestión: Esta investigación permite a los gestores de incubadoras comprender los aspectos que involucran el tema, para que puedan desarrollar acciones estratégicas para sus incubadoras utilizando la innovación frugal.

Palabras clave: Frugalidad. Incubación de empresas. Competitividad.

1 Introduction

Adopting different innovation models and concepts by companies undergoing incubation processes may represent a profound mechanism capable of transforming their innovative ideas into competitive advantages. From this perspective, this article presents a study conducted with managers of business incubators in the state of Paraná. The study enabled the

understanding of innovation associated with resource restriction, called frugal innovation (Radjou & Prabhu, 2014; Weyrauch & Herstatt, 2017).

Although the concept of frugal innovation is gaining popularity and prominence in both practical and academic discourse, research involving this type of innovation in business incubators is still incipient (Koerich & Cancellier, 2019). Recent research such as that of Mvuirwenande and Wehn (2020) has addressed frugal innovation in incubation programs, demonstrating the complexity of this frugal incubation process and its impacts on the development of enterprises.

Even though there is no consensus on the definition of frugal innovation, most authors agree that this way of innovating is linked to the development of affordable, easy-to-use, sustainable products and services created from needs and resource scarcity (Hossain, Simula & Halme, 2016). They are considered innovations adapted to the economy and the restriction of resources, where the results are the creation of products or services considerably cheaper and that satisfactorily serve a larger group of people.

Because they are naturally disseminators of innovation, business incubators are possibly encouragers of frugal innovation. Such potentiality to disseminate innovations is related to the characteristics of the incubator model, where the goal is to be an environment conducive to the development of new technologies or improvements of existing ones. They are qualified environments to support nascent companies in the initial development of their product or new technologies (Carmo & Rangel, 2020). In this context, frugal innovation can become an alternative and potential for the development of incubated companies and incubators (Weyrauch & Herstatt, 2017).

Once determined the main concepts are addressed for this study, the following research question becomes evident: What are the understanding and perspectives of incubator managers concerning the phenomenon of frugal innovation at their institutions? To answer this question, the objective was proposed to identify the understanding and perspectives of incubator managers concerning the phenomenon of frugal innovation at these institutions.

To contribute to this research question, the managers of four incubators of companies in the state of Paraná were interviewed. The interviews were transcribed and the content was analyzed with descriptive analysis and similarity analysis with the support of the Iramuteq Software. Results point to the existence of the practice of frugal innovation in these environments, the prevalence of a positive vision of managers concerning the theme, and also to the understanding that frugal innovation may guarantee competitive advantage.

As a practical and theoretical contribution, this study helps advance academic and managerial discussions about frugal innovation in innovation environments. It also contributes to a future research agenda with the following themes: frugal innovation practices; Mobilization of frugal innovation by the lack of resources; and frugal innovation through applications in technological incubators.

2 Frugal innovation

The concept of frugal innovation is not something entirely new in academic studies. The terms used are usually scattered, but still part of a general concept of the same interest such as increasing accessibility, social inclusion, digital inclusion, and the conquest of new markets (Mazieri, 2016). Despite the growing number of publications on frugal innovation, authors such as Koerich and Cancellier (2019) and Mvulirwenande and Wehn (2020) recognize the lack of instruments and mechanisms for measuring this phenomenon.

Some common terms were observed in the development of this research, characterized as precursors of frugal innovation and often cited in the works found in the literature, such as inclusive innovation, extreme accessibility, open innovation, user-centered innovation, and reverse engineering. Verifying, therefore, that the essence of frugal innovation is not a relatively new concept in the interest of academic research (Bhatti & Ventresca, 2013).

Frugal innovations originated mainly in the context of emerging markets, where the main idea was to develop products and services that were suitable for these markets with special needs and requirements and that were cheap enough to give non-wealthy customers consumption opportunities (Weyrauch & Herstatt, 2017). They can be considered vitally important for customers in developing countries with little purchasing power, but who seek low-cost and robust products (Prabhu & Gupta, 2014). In general, they are developed for low-income markets and with different visions than innovations for developed markets (Hossain et al., 2016).

One of the thoughts shared by several authors indicates that frugal innovation can lead to the development of products or services with disruptive and innovative characteristics, capable of serving a new group of consumers using existing materials and technologies (Zeschky, Widenmayer & Gassmann, 2011). The creation of innovation through frugality is based on economy of scale with a focus on resources and inclusion of a part of the population unserved so far, thus creating not only economic value, but also social value (Soni & Krishnan, 2014).

Frugal innovation can be related to much more than a strategy, but rather as an ability to do more with less for more people and at less cost (Pastor Pérez & Balbinot, 2021; Radjou & Prabhu, 2014). Companies tend to adopt frugality in times of low revenues or diminished profits induced by competitiveness (Koerich & Cancellier, 2019). Frugal innovation does not consist of improvisation, on the contrary, it requires ingenuity and skills to rethink innovation and how it is developed in an environment of constrained resources such as time, materials, costs, and processes.

It is therefore understood that frugal innovation can provide functional solutions through few resources in complex or extreme contexts, providing a means to practice innovation by a different approach than the conventional innovation approach commonly practiced in more developed contexts (Bhatti & Ventresca, 2013; Pisoni, Micheline, Martignoni, 2018).

Based on these arguments, we derive the following **proposition**: Enterprises that develop products, processes, or services with frugal innovation have more competitive power.

Another characteristic definition of frugal innovation is related to reducing natural resources, increasing accessibility, and sustainability. This type of innovation is not only about reducing costs but also consists of creating mechanisms to increase the accessibility of these products for the consumer (Tiwari et al., 2017). It should also encourage local entrepreneurship, enabling self-sufficiency and sustainability (Bhatti, 2012; Howard, 2011).

Relevant characteristics to be evaluated with the practice of frugal innovation are constantly associated with cost reduction (Tiwari et al., 2017; Weyrauch & Herstatt, 2017). The cost factor involved in innovating with frugality is related to the paradox of producing more in a more economical way and with less social impact (Rosca et al., 2017). This can occur either by using low-cost materials or by reducing labor or technology costs (Hossain et al., 2016). They highlight, for example, the low cost of production, materials with a simpler, cheaper design, focusing on less sophisticated functionalities, which consequently represent innovation in cost (Zeschky et al., 2011).

There are many reasons to adopt the practice of frugal innovation in all types of economies, including emerging ones such as Brazil, which include: a) slow growth in economies, which may increase the demand for frugal innovations; b) environmental constraints, which will increase the demand for more frugal models of production and consumption; c) society aging faster, which will require new, frugal approaches to health care; d) understanding that the fastest growing markets are in developing economies, where the

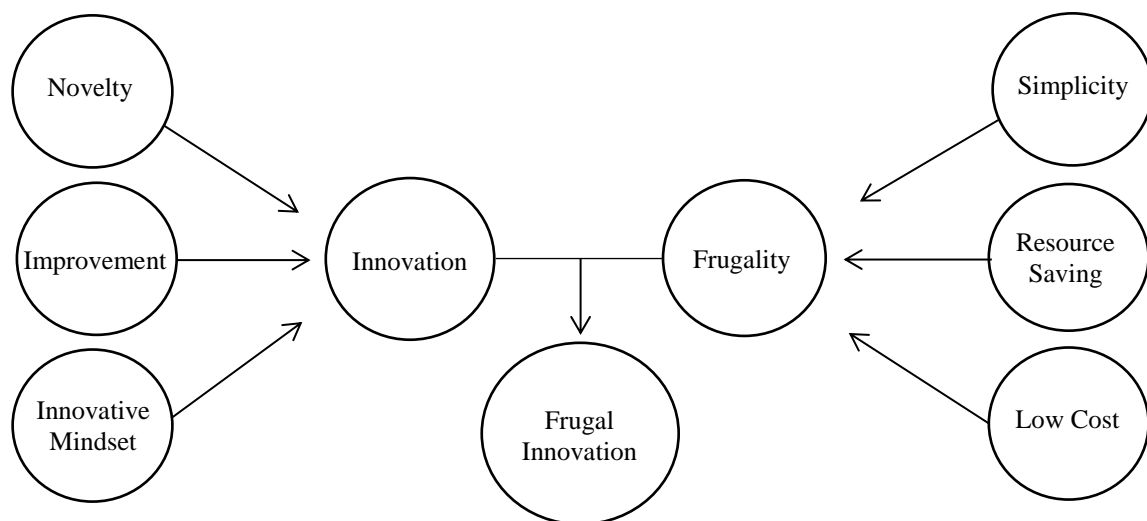
demand for frugal products and services is high (Bound & Thornton, 2012; Koerich & Cancellier, 2019).

Overall, the benefits of frugal innovation are related to its ability to serve unserved consumers, strengthen supply chains, and build inclusive markets (Radjou & Prabhu, 2014). Frugal innovations increase market competition, which inevitably results in lower prices by engaging a completely new group of customers (Hossain, 2018). Developing frugality-based products improves corporate profitability in an environment increasingly concerned with cost and financial sustainability (Rao, 2013).

The approach to frugal innovation in this theoretical reference sought to contextualize how frugality and innovation can be combined to conceptualize the term frugal innovation. Figure 1 shows the concept of the combination of frugality and innovation:

Figure 1

Conceptualization of frugal innovation



Source: Research data (2021).

It is evident that frugal innovation can address problems in the most varied sectors, being considered as the innovation of more accessible products or services, meeting the basic needs of a specific population, developing products and solutions at low cost and with the use of fewer natural, financial, and raw material resources, contributing to social and environmental sustainability.

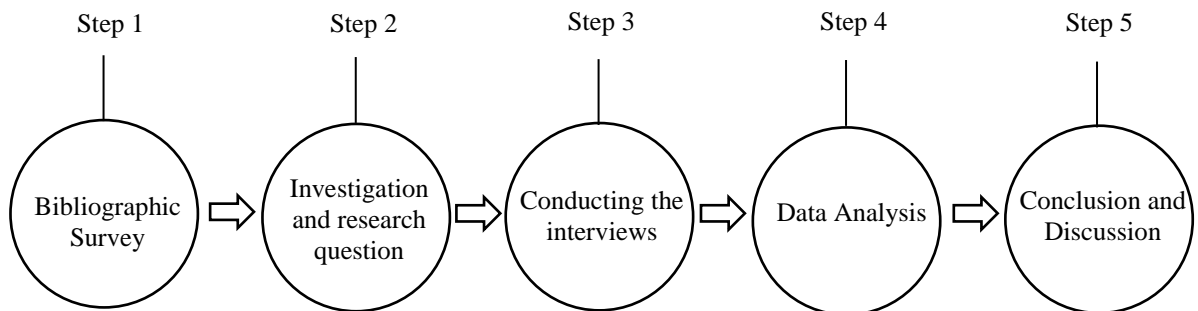
3 Method

This is a qualitative and exploratory study, where the interview technique was used for data collection (Prodanov & Freitas, 2013). The research was divided into four main stages. In the first stage, a bibliographical survey was carried out on the pertinent subjects to contextualize the theme. In a second stage, a survey of the cases that sought to satisfy the objective of this study was carried out to elaborate on the research question (Sinkovics & Alfoldi, 2012). In the third stage, the interviews were carried out in openly to extract the intention of extracting opinions from the interviewees (Creswell, 2007).

Step four was the compilation and transcription of the interviews, followed by the conclusion and discussion of the results. The demonstration of the stages of this study can be seen in Figure 2:

Figure 2

Research steps



Source: Research data (2021).

To choose the research population for this study, only incubators of companies of the State of Paraná that are certified by CERNE - Reference Center for the Support of New Enterprises - were considered. However, for this study, four incubators were chosen by convenience, two of which are located in the west, one in the southwest, and another in the central region of the state, all of them technology-based incubators. Of the four incubators, two are installed in federal public universities.

The chosen incubators are CERNE 1 certified, and the choice of these study objects was since incubators certified at the CERNE 1 level have greater maturity in the incubation process, with continuous improvement improvements, systematically generating innovative and successful ventures (Anprotec, 2022). The same maturity reflects a certain degree of structuring

that shows that these institutions form an entrepreneurial environment, propitious for innovation.

The initial approach with incubators occurred using of electronic correspondence, requesting that interviews be conducted without detailing specific issues concerning the research question, so as not to influence interviewees during the future interview process. After the affirmative response of the four incubators, the interviews were conducted with the managers of these incubators, using video call resources, which occurred in March 2021.

The conduct of the interview followed a semi-structured script and was characterized by flexibility regarding the structure of the questions designed by the researcher (Manzini, 2004). The structure of the questions was built based on the elements extracted from the theories that emerged from this study, which are present in the theoretical framework, and involve: the understanding of what frugal innovation is, that is, if managers understand the meaning of the term, given the difficulty of measuring the phenomenon (Koerich & Cancellier, 2019; Mvulirwenande & Wehn, 2020) In addition, about the existence of frugal innovation in these incubators, for being installed in an emerging country (Weyrauch & Herstatt, 2017) and the managers' perspectives on this type of innovation (Koerich & Cancellier, 2019; Pisoni et al., 2018). Based on this structure of questions, the categories presented in this study emerged from the research *corpus* using content analysis, comprising the practice of frugal innovation by incubators, the mobilization of frugal innovation due to lack of resources, and the execution of frugal innovation by means of applications at technological incubators.

The interviewer's intervention was minimal, merely to keep the interviewees within the scope of answering the question at hand and allowing the interviewees to feel at ease to express their ideas and opinions. With a manner to maintain the anonymity of the interviewees, during the course during study, incubator managers were identified by alpha numeric coding, such as (G1) and (G2) for the managers of incubators 1 and 2 respectively, both located in the western region, (G3) referring to the manager of incubator 3 located in the central region and (G4) for the manager of incubator 4 located in the southwestern region of the state.

The interviews were recorded, generating 2:09 hours of audio, being later transcribed manually, however, denaturalized, because the interviewer's lines were later removed and the texts were corrected according to the language used, to ensure a better content analysis. The interviews, after being transcribed, generated seven Word pages, which were then transformed into a database in .txt format. (Nascimento & Steinbruch, 2019; Oliver et al., 2005). This file

was called the research *corpus* and was used for Iramuteq and manual analysis of the categories found.

The processes of analysis of the data obtained in the interviews were carried out through content analysis, enabling a better understanding and extracting the most important moments through systematic and objective procedures to describe the contents of the messages (Bardin, 2016). That is, the first analysis was manual, extracting from the text the most relevant categories for the research question.

Additionally, a Similarity Analysis was performed using the software Iramuteq 0.7 Alpha 2 (*Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires*). This analysis is presented by a word network, which makes it possible to identify the occurrences of words, their connections, and their representation structure in the text (Marchand & Ratinaud, 2012).

Next, the analyses and findings of this research are presented. Firstly, the categories found in the research *corpus*, using content analysis, and likewise, findings concerning the perspectives of managers concerning frugal innovation at incubators. Soon thereafter, the Similarity Analysis is presented, concluding with a research agenda concerning the theme.

4 Presentation of the interviews

The presentation of the results is divided into three parts, the first presenting the categories found in the text, the second the managers' expectations about frugal innovation, and finally the Similarity analysis of the texts transcribed from the interviews.

4.1 Analysis categories

The first category to be analyzed is **frugal innovation practices** in incubated companies. The interviewees were asked whether in the incubator there are companies that develop innovation with some kind of resource constraints. Or that the development process of these products or services used reduced technology, that is, with aspects of frugal innovation (Radjou & Prabhu, 2014; Zeschky et al., 2011) In this case, the answers obtained from the managers were unanimous in affirming the existence of this type of innovation.

[...] usually, the entrepreneurial business ideas we get, almost always seek to solve some simpler problem, they are viable ideas, but in general, simple to develop (G1).

[...] the technologies needed to develop these business ideas are relatively simple and inexpensive (G2).

[...] if it is in that sense, many of our companies do this kind of innovation in their business, most of our companies perform some kind of process that adopts resource savings (G3).

[...] in this case yes, we have this type of innovation under development in the companies of our incubator (G4).

All managers responded that there was somehow the development of innovation with frugal concepts by pre-incubated or incubating companies, thus characterizing the existence of the practice of frugal innovation at the interviewed incubators. Based on the replies of those interviewed, one notices that even if managers do not understand the concept of the term frugal in the literal sense, one may state that there is an understanding of this practice at these incubators.

This finding is not consistent with what was expected from the literature, because by regularly dealing with innovative projects, and by the very nature of an incubation process where there is an increment and transfers of technologies (Barbosa & Hoffmann, 2013) It was expected that managers would have a clear understanding of the term frugal and its implications. However, even though the concept of frugal innovation is presented with different terms (Mazieri, 2016) its characterization is still not clear (Tiwari et al., 2017) This may be one of the determining reasons for the lack of understanding of the term.

When comparing the responses of managers to the concepts of innovating with frugality raised in the theory, it is evident that at some point there are entrepreneurs developing this type of innovation. This practice confirms the theory, as entrepreneurship is constantly tied to a scenario of extreme competition and uncertainty (Ries, 2018) entrepreneurs are sometimes forced to make decisions and act with limited financial, human, and technological capital (Ghezzi, 2020).

The second category found in interview texts concerns the **mobilization of frugal innovation due to the incubators' lack of resources**. Of the four incubators interviewed, two are maintained by public universities, and based on the reports of Managers 2 and 4, it is understood that due to the scarcity of resources destined by universities to incubators, the development of innovations with frugal concepts occurs.

Still related to the restriction of resources, another finding is that of the entry of entrepreneurs who are regular students and graduates of the institution, and who, according to the managers, do not always have sufficient initial funds to develop their business idea. These

students need to develop their business ideas with few financial resources, that is, with concepts of frugality found in the theory presented, for example, by Bhatti, (2012), Pastor Pérez e Balbinot, (2021) e Weyrauch e Herstatt, (2017).

[...] because we are maintained by a public institution, we do not always have enough financial resources to support these projects, in these cases these businesses end up developing with the few resources they have (G2).

[...] usually pre-incubation projects with ideas that need little investment (G2).

[...] you see, our incubates are mostly students or university graduates, so if you look at it from this perspective, yes, we do frugal innovation regularly (G4).

[...] these students do not always have enough resources to launch themselves in the market, so their business ideas are simple, but with great potential for innovation (G4).

[...] this idea will not go to the market if it is not viable, even if it is simple (G4).

One realizes that the cost of producing these innovations in public incubators is low and limited by the funds made available to advise and foster these ventures. These restrictions are presented by Hossain and Sarkar (2021 as "institutional voids" where institutional support cannot effectively play its role in supporting innovation. As a result, the innovations practiced in these situations tend to seek savings in the development process of the innovative idea, and this aspect is shared as a form of low-cost and frugal innovation, however, without loss of quality (Bhatti, 2012; Tiwari et al., 2017).

A third category was observed in the texts: **frugal innovation using applications in technological incubators**. Because the incubator is technology-based, many of the incubated companies work in the development of applications through software or apps. This characterizes a way to innovate with few resources and increments of already existing technologies and is in line with what is discussed in the literature by Hossain, (2020) and Zeschky et al. (2014).

[...] our focus is the development of any technology-based project, which adopts new technologies in the prototyping of its business, but we have received many innovative projects where the company needs only application development (G2).

[...] this makes the company spend a few resources to validate its product in the market (G2).

In this scenario, the development of apps by the incubates with concepts of frugality is presented by Bortolazzo (2020) as "frugal technology" where innovations and technologies are instantaneous and low cost, not restricted to products and services only. The main characteristic of frugal technologies is precisely in the development of innovations with the least possible

resources allied to the optimization of time, according to Ferreira (2015) and, based on the interviewees' reports, this practice occurs at the incubators.

Complementing the presentation of the interview results, another point observed in the study deals with the managers' perspectives on frugal innovation and is addressed in the next item.

4.2 Managers' perspectives on frugal innovation at incubators

Regarding the perspectives of managers on frugal innovation, it is visible the recognition of these managers that this type of innovation has positive aspects, and is of great importance for business development. When managers were asked to present their perspectives on the frugal innovation mode, the following statements were recorded:

[...] the incubation process of companies sometimes has its difficulties. [...] many companies cannot finish an incubation process due a lack of resources (G1).

[...] there is a lot of competition and companies often do not have the funds to develop their business, so I understand that this innovation with cost reduction can be advantageous to the company (G1).

In this reply, Manager 1 argues concerning the difficulties faced by entrepreneurs in the incubation process. Besides competition from large companies already established in the market, there is still the financial factor influencing the development of new products. He concludes that it may be an advantage for the enterprise to think of a new business idea considering that this idea may have a reduced development cost.

A similar consideration is presented by Manager 2, when commenting that incubated ventures must always seek different models of innovation to be competitive, inferring, therefore, that frugal innovation might be one of these different modes of innovating, which confirms Radjou and Prabhu's understanding (2014) about the need for flexibility in the process of thinking about innovation to meet people's real needs.

[...] I see that for a business to be competitive nowadays, we have to look for different ways to innovate (G2).

[...] this is not a choice, it is almost a rule (G2).

[...] I always tell our entrepreneurs that we have to look for solutions that are differentiated in the market (G2).

Managers 3 and 4 agree that the use of low-tech and cost reduction strategies can result in benefits for companies. Such innovation development strategies considering aspects such as

cost reduction, focus on core functionalities, and optimized performance are also considered frugal innovations (Weyrauch & Herstatt, 2017).

[...] Yes, I understand that this can be an advantage, we are always looking for a way to develop entrepreneurial ideas that have high scalability power, but that at the same time do not need high technology or large investments, this is very good for companies (G3).

[...] As I told you, I did not know about frugal innovation, but I understand that this type of innovation process can be very important the incubated companies, especially for ours that develop technologies focused on service provision. [...] surely this practice can yield good results (G4).

These positive perspectives presented by the interviewees are consistent with the theory of recognizing that frugal innovation can be considered a positive and dualistic vision for the development of firms. That is, not only creating more affordable products or services, contributing to their competitiveness and sustainability (Audy, 2017; Knorrington et al., 2016; Tidd & Bessant, 2015).

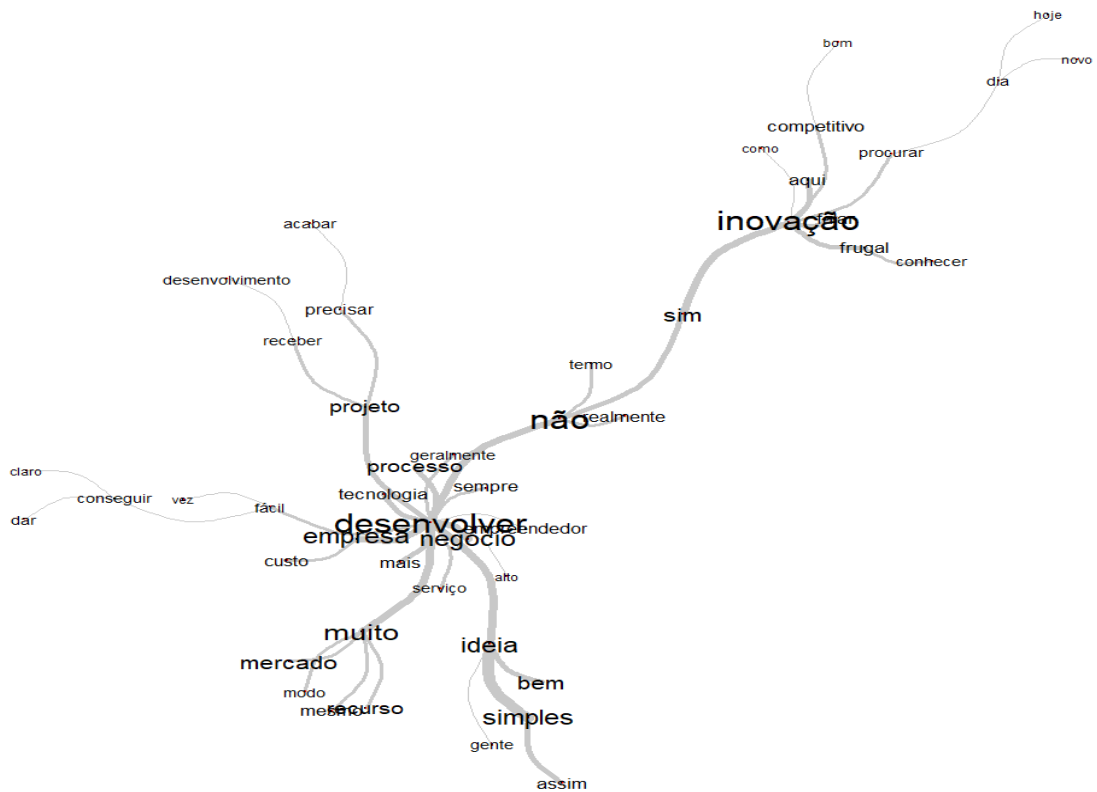
In fact, it is expected that innovation environments, such as business incubators, are promoters of actions and strategies that provide incubated companies with real chances to compete. These environments contribute to the development of early-stage companies, and by allowing these companies to access essential infrastructure and services without large financial investments, they become facilitators of frugal innovation (Ahuja & Chan, 2016).

4.3 Similarity analysis

The similarity analysis by the text complements and validates the results found and already discussed. This analysis makes it possible to identify the connections and occurrences by the words most used in the text, with concepts and perceptions related to the object of the study. In Figure 3, some similarities have been established that can be observed in the research, these words are attached to the nodes and are formed from the main words: "develop", "idea", "very", "no", and "innovation".

Figure 3

Results of the Similarity Analysis



Note: Real data from the interview conducted in Portuguese.
Source: Research data (2021).

Through the similarity graph, the central core of the verified content is observed, with the words "no", "develop" and "innovation". In peripheral areas, the terms "very", "idea" and "simple" stand out. Based on this distribution and on the relationship that the words assume with the links between them, forming the clusters, we can infer some analysis with the help of cuttings of the text made with the help of the program.

The word "no" at the center of the tree is directly related to the first question posed to the interviewees, in which we aimed to find out if managers knew or understood what the term frugal innovation was all about. As already presented, the managers did not understand the exact definition of the term: "Look, I don't remember having heard of this term" (G1), also according to the report of manager 2: "No, I don't know, I'm not sure what it could be, I can't tell you what it really means.

Around the word "develop", words like "company" and "business" are strongly linked, something expected since the interview was conducted in an environment in a business context.

However, an important branching point linked to the word "develop", is related to the words "idea" and "simple", which corroborates the findings of the study, where we state that there is frugal innovation in these innovation environments and that can be observed in the managers' speech: "the ideas are relatively simple and cheap, (...) So I think it can be this type of innovation yes" (G1), "Yes, in this case so we have this type of innovation and development in the incubator" (G2).

4.4 Contributions of the research and agenda for future studies

It was possible to identify in this research the presence of three categories that help to understand the concept of frugal innovation in the incubator environment: Frugal innovation practices; Mobilization of frugal innovation by the lack of resources; Frugal innovation through applications in technological incubators.

Regarding frugal innovation practices, it was identified that they occur at incubators, although managers are not aware of the concept. Regarding the second category, it was clear that for managers the lack of resources in these environments is a motivator for such innovations, which is also pointed out by the literature as a trigger for frugal innovation (Radjou & Prabhu, 2014; Weyrauch & Herstatt, 2017).

And the third category raises a suspicion that frugal innovation may be happening with the use of applications. The fact that this technology is increasingly accessible and with low investment, appears as a way both for frugal innovation and for the competitiveness of companies, that is, frugal innovation with available resources (Hossain, 2020; Zeschky et al.). As these resources can be understood in different ways, and have been little understood, they also configure a possibility for studies within the theme.

One of the recurrent comments in the interviews was that of the perception of managers that this innovation process might be a source of competitive advantage for incubated companies. This might occur when developing their products with restricted resources, which corroborates findings in the literature concerning the advantages of innovation with frugality to increase competitiveness (Bhatti, 2012; Bessant & Tidd, 2015). This result, therefore, confirms the proposition raised in the referential of this study, that enterprises that develop products, processes, or services with frugal innovation have more competitive power.

Another finding, which complements the analysis of the managers' perceptions about this type of innovation, is demonstrated in the analysis of similarity in the cluster formed by the word "innovation". One notices the presence in its ramifications of words like "frugal" and

"competitive". In the clippings found in the texts, these occurrences are linked to the positive perspectives that managers have about this type of innovation: "so we have to look for any kind of innovation that is competitive" (G3), and "It can yield good results for these companies, they can be more competitive in the market" (G4).

It is understood that the three categories found, as well as the relationship between frugal innovation and competitiveness, should serve as future research agendas. What was raised in this study were results of a specific environment, which should be understood in other environments for a deeper theoretical contribution. The development of this theme still requires further studies that delve into topics such as Practices, Mobilization due to lack of resources, and the use of technology for frugal innovation.

5 Final consideration

Based on reports presented by managers, one can verify that frugal innovation is present at incubators, even if implicitly. It is concluded that, even if the term frugal is not known or used in the incubator's daily routine, there is the practice of frugal innovation on the part of the ventures.

The results indicate that managers have a good perspective of the benefits of innovating with the use of frugality concepts, understanding it as something advantageous for the ventures, even if sometimes the adoption of frugality in innovations occurs due to institutional restrictions of incubators or entrepreneurs' resources. Such affirmations, therefore, answer the research question and objective of this work.

One has a research limitation, the reduced number of incubators interviewed in the state, which provides the opportunity to conduct future studies with more incubators or different innovation environments, seeking to understand how the frugal innovation phenomenon occurs in different regions of the country. It is also suggested, as a possibility for future studies, an approach concerning frugal innovation from the perspective of the members of incubated companies and the impacts on the development of their products and services with the use of this type of innovation.

Authors' contributions

Contribution	Pellin, A.	Meneghetti, M. R.	Lago, S. M. S.
Contextualization	X	X	X
Methodology	X	X	X
Software	X	X	----
Validation	X	X	X
Formal analysis	X	X	----
Investigation	X	----	----
Resources	X	----	----
Data curation	X	----	----
Original	X	X	X
Revision and editing	X	X	X
Viewing	----	X	X
Supervision	----	X	X
Project management	----	X	X
Obtaining funding	----	----	----

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