

## ACCESS TO PUBLIC FUNDING FOR INNOVATION: The role of commercialization capabilities

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## ABSTRACT

Small and Medium-sized Enterprises [SMEs] are still the ones that least access funds made available by public funding for innovation. The literature review identified the capacity to commercialize technologies in all stages of new product development in Information Technology [IT] companies, including fundraising. This research, therefore, aims at verifying the practice of this capability in obtaining reimbursable public financing. Therefore, we conducted a qualitative study based on interviews with SMEs managers and entrepreneurs in the IT sector who were granted reimbursable lines of public funding focused on innovation by a development bank. The results suggest that the capabilities in commercializing new technology are supported by understanding the criteria of funding notices, by the company's capability to present its product's innovative potential and social-economic impact to the Bank, and in the capability of displaying the solidity of its business. Such capabilities are highly associated with the proposal's credit approval.

**Keywords:** Commercialization capability. Innovation. Public Funding. SMEs.

## ACESSO A FINANCIAMENTO PÚBLICO PARA INOVAÇÃO:

### O papel da capacidade de comercialização

## RESUMO

As Pequenas e Médias Empresas [PMEs] continuam sendo as que menos possuem acesso ao financiamento público para a inovação. A revisão da literatura identificou a capacidade de comercialização de tecnologia em todas as etapas do desenvolvimento de novos produtos em empresas de Tecnologia da Informação [TI], incluindo na fase de captação de recursos. Esta pesquisa, portanto, visa verificar a prática dessa capacidade na obtenção de financiamentos públicos reembolsáveis. Diante disso, foi realizado um estudo qualitativo baseado em entrevistas com gestores e empreendedores de PMEs do setor de TI que contaram com linhas reembolsáveis de financiamento público, voltadas para a inovação, de um banco de fomento. Os resultados sugerem que as capacidades de comercialização de novas tecnologias estão amparadas no entendimento dos critérios de editais de financiamento, na capacidade da empresa em apresentar ao banco o potencial inovador de seu produto e no impacto socioeconômico e na capacidade de mostrar a solidez de seu produto. o negócio. Esses recursos estão altamente associados à aprovação de crédito da proposta.

Palavras-chave: Capacidade de comercialização. Inovação. Financiamento público. PME.

## 1 Introduction

Actions aimed at developing innovation and technology request support from the National Innovation System [Sistema Nacional de Inovação - SNI] to define the policies of growth and development enacted by the public and private spheres (Lundvall, 1992). Therefore, the regional network plays a vital role in public policies for innovation.

The products offered by small and medium-sized enterprises [SMEs] are perceived as less innovative when compared to those offered by large companies. This perception is supported by eventual technical and managerial inefficiencies and the processes' limited resources and know-how regarding the creation and commercialization of significant technology (Acs & Audretsch, 2005). Therefore, private financial institutions have shown little interest in granting funds to innovation, especially for intangible capital-intensive SMEs (Filho, Pieroni, Antunes & Bomtempo, 2012). According to Santos (2012), approximately 60% of innovation funding proposals are not granted due to the lack of "real guarantees," which restricts the funding sources (Rapini, 2013).

In this context, public policies are fundamental because they offer input into the innovation process and influence the demand for its results (Aschloff & Sofka, 2009). Despite this fact, large companies not only have their resources (Corder & Salles-Filho, 2006), but they are also the ones that most access public funding and tax incentives for research and development [R&D] in Brazil, which further hinders the SMEs competitiveness in creating innovation (Meirelles, 2008).

The low access to public funding might be associated with the inefficiencies in new technology commercialization capabilities (Dey, Kinch & Ogunlana, 2007). In general, innovation managers focus on the technical risks of the product, not giving attention to the product's marketing and financial risks (Park & Ryu, 2015). Therefore, the lack of these capabilities is reflected in the whole process of developing new products (Datta, Mukherjee & Jessup, 2015; Aarikka-Stenroos & Lehtimäki, 2014), including fundraising, for example, from public funding.

Previous studies have already explored the background of these capabilities, such as the entrepreneurial culture (Conceição, Hamill & Pinheiro, 2002), manufacturing capability (Zahra & Nielsen, 2002), innovation characteristics, and the impact of the commercialization of innovation in the companies' performance (Park & Ryu, 2015; Park & Rhee, 2013; Chen, 2009). However, there is a gap in the comprehension of the role of these capabilities in accessing resources in the early stages of new product development, such as public funding for innovation.

Therefore, this research aims to understand how the new technologies' commercialization

capabilities affect access to public resources allocated to SMEs' innovation. This study was guided by the following research question: *how do the capabilities of commercializing new technology influence the process of raising public funding for innovation?*

To answer this question, a qualitative study (Myers, 2013) was conducted with Information Technology [IT] companies that were granted funding through reimbursable lines of credit from a regional development bank. Furthermore, agents linked to the process of funding were interviewed, such as credit analysts working in the Bank, representatives of the sector's regional associations, and consultants who help these companies in the creation of proposals.

This research contributes to the literature by understanding how public funding evaluates SMEs' commercialization capabilities, such as product positioning, business solidity, and the social and economic impact of the innovations. Prior studies have shown those capabilities in different stages of the new product development (Aarikka–Stenroos & Sanberg, 2009; Do et al., 2017); however, the literature knows very little about their application in fundraising in public funding.

Following this introduction, the second section presents the literature review regarding the importance of innovation for SMEs, public funding for innovation, and the commercialization capabilities of these companies. The third section describes the methodological stages of the qualitative study. The fourth section presents the results of the analyses of the interviews, and the fifth section includes the discussion between the study's findings and theory. Finally, the main conclusions and some remarks for future studies are presented in the last section.

## **2 Theoretical Framework**

This section discusses the role of the SNI in developing innovation strategies, public funding for innovation in small and medium-sized enterprises, and the commercialization capability of small and medium-sized enterprises.

### **2.1. The role of the National Innovation System in developing innovation strategies**

The degree of connection between the state, universities, research institutes, and companies defines the capability to create innovation and the level of learning, knowledge, and diffusion of new technologies (Nelson & Winter, 2012; Cassiolato & Lastres, 2000, 2005; Nelson, 1993). The maturity of the SNI is directly influenced by political, historical, and socioeconomic factors. In recent years, the local economic development has fostered debates

around strategic actions for innovation, especially those related to valuing assets and organizational capabilities (Akgun et al., 2012, Vaccaro et al., 2012).

There are signs that point to efforts of micro-innovation among Latin American countries, given the difficulties in establishing links between government, entrepreneurs, and academia (Arocena & Sutz, 2000). Analyses suggest that Brazil is still in an immature stage and that, even with the increase in technological hubs, the country does not display a capability for interaction between academia and companies, which results in a low transference of technology to society (Marques, Cavalcanti & Silva, 2021; Suzigan & Albuquerque, 2008).

It is the role of the SNI to foster innovation and entrepreneurship aiming at economic growth and to improve the understanding of the technical, managerial, and political needs of entrepreneurial activity (Autio et al., 2014; Acs et al., 2014, Zahra & Wright, 2011; Dosi et al., 1988). Government support is paramount for the technological development of SMEs because it stimulates regional economies through solid social relationships, as well as companies' competitive advantage, once they achieve the capacity of following market tendencies (Szczygielski et al., 2017; Doha & Kim, 2014; Liao & Rice, 2010).

It is often the case, in developed countries, for governments to intervene to increase access to debt and equity financing, primarily due to the hardships SMEs face when trying to obtain credit (Kaivanto & Stoneman, 2007). When facing a financial crisis, access to credit by innovative SMEs was hindered (which was felt particularly sharply by non-innovative companies), which characterizes a cyclical phenomenon (Lee, Sameen & Cowl, 2015).

There are different practices SMEs can promote in order to promote knowledge in strategic and operational levels: long-term activities, strategic procedures for developing proposals, and monitoring innovation projects (Brunswicker & Vanhaverbeke, 2015; Cohen & Levinthal, 1990). Successful innovation strategies use the knowledge acquired to commercialize their innovation (Love & Roper, 2009; Cassiman & Veugelers, 2006).

Therefore, it is essential that companies based on technology and innovation display commercial and managerial capability of seizing market opportunities and mitigating risks (Ganotakis & Love, 2012). Moreover, to go through with their actions, it is essential for innovative companies to properly allocate assets to enable investments in riskier projects (Wiklund, Patzelt & Shepherd, 2009).

## **2.2 Public funding for innovation in small and medium-sized enterprises**

The fostering of innovation happens both through the allocation of non-reimbursable funding (which does not need to be paid back) and through traditional funding instruments,

which consist of private (at a low-interest rate) and government financial support. If the innovation is radical, prone to a paradigm shift, the risk of the operation is high, and the access to non-reimbursable funding is frequent; if the innovation is incremental, based on improving something that already exists, the risk is moderate and reimbursable funds are more likely to be used (Schumpeter, 1982).

The elements that favor innovation in small companies are distinct from those of large ones (Doha & Kim, 2014). In conditions of heightened technological opportunity and competitiveness, SMEs excel in generating innovation because they are more flexible to change, and due to the increased speed of their innovation process, as is the case of the IT sector (Avellar & Botelho, 2016; De Jong & Marsili, 2006; Doha & Kim, 2014; Fleury & Fleury, 2003).

SMEs are more innovative in what concerns certain kinds of innovation and operation markets (Doha & Kim, 2014). The IT sector, for instance, demands investment in intensive R&D and excels at developing technology with a high degree of innovation (Tidd & Bessant, 2018; Weber, 2013; Biancolino, Maccari & Pereira, 2013; Antonini & Saccol, 2012), which presupposes higher levels of uncertainty and difficulties in decision-making.

Therefore, SMEs are considered a high-risk group due to the high degree of vulnerability resulting from own insufficient resources, entire dependence on few clients, and the lack of credit history (Doha & Kim, 2014). Many projects also fail because the risks are not systemically managed (Bouncken, Fredrich, Ritala & Kraus, 2018; Lombardi & Brito, 2010; Baccarini, Salm & Love, 2004).

Thus, due to the uncertainties, the specificity, and the nature of the SMEs' assets, many companies seek partnerships to share the risks or raise funds (Raza-Ullah, Bengtsson & Kock, 2014). The innovations display, therefore, a great sensibility to credit limitations, especially due to the risky conditions and the lack of guarantees on payback (Ferraz, Além & Madeira, 2013), which makes SMEs in the IT sector invest their own capital (Filho et al., 2012; Santos, 2012; Ferrary & Granovetter, 2009; Kayo, Teh & Basso, 2006).

The development of public instruments to foster innovation, which is funding, is essential to mitigate the SMEs' demand for resources (Avellar & Botelho, 2016; Liming, 2011). In this context, development banks become a solution, as they support regional and national interest sectors and feature elevated risk and uncertainty, which need long-term resources for innovation (Ferraz, Além & Madeira, 2013; Luna-Martínez & Vicente, 2012).

This way, it is possible to positively impact profitability and the development of innovation, especially in smaller companies, which are more dependent on external capital and

have greater difficulty accessing private capital (Cornaggia, Mao, Tian & Wolfe, 2015). However, funding instruments tend to create R&D costs to acquire new processes and products, with low effectiveness in the stages of commercialization of innovation (Kauffman & Tödting, 2002). In other words, there are few market-oriented instruments focused on product commercialization created through innovation (Nawelaers & Wintjes, 2000).

Furthermore, most SMEs seem to have individual managers competent from a technical perspective but lack management and promotion terms (Park & Ryu, 2015). That skill seems to be severely lacking in these companies (Santos, 2012).

### **2.3 Commercialization capability in small and medium-sized enterprises**

The promotion of new information, processes, products, and methods must happen quickly, with flexibility and trustworthiness. According to Preusler, Costa & Crespi (2020), one of the possible strategies is establishing relationships with different actors, such as universities, public and private companies, competition, clients, suppliers, and research institutes.

The performance of these relationships depends on the institution's ability to develop skills and exchange information that establishes mutual trust and generates value for the business (Preusler, Costa & Crespi, 2020). The most important aspects of defining innovation are network, supply chain, relationship, organization, value creation, solutions, processes, clients, supply, platform, brand, location, and innovation-prone environment (Souza-Pinto et al., 2014). For Cavalcanti et al. (2014), innovation is established on four grounds: technological, commercial, organizational, and institutional.

The daily routines of decision-making and finding solutions bring positive results to companies (Cassol, Gonçalo, Santos & Ruas, 2016) that are directly dependent on the knowledge, experiences, and abilities of those implementing them, their managers. From this observable behavior, the capabilities that can improve the companies' performance become evident (Freitas & Odélius, 2018).

The SMEs' capacity to find and explore potential market opportunities has already been identified as a determining factor for the success of innovation (Do et al., 2017; Kirzner, 1997). However, this capacity is restricted by the lack of information, processes, informal decisions, and commercialization capabilities (Duhamel, Reboud & Santi, 2014), which is even harsher in the case of SMEs (Wheelen et al., 2017; Park & Ryu, 2015).

The technology commercialization capabilities of SMEs were the object of several studies (Do et al., 2017; Ho, Fang & Lin, 2011; Park & Rhee, 2013; Zahra & Nielsen, 2002), due to their importance in the new products development. This way, technology commercialization

can be understood as:

a series of processes in which ideas are acquired and extended to knowledge for the development, manufacturing, and marketing of products (Mitchell & Singh, 1996) and is taken into account as a follow-up process that transforms various types of technology assets such as patents, designs, and know-how into profits (Park & Ryu, 2015, p. 339).

Thus, technology commercialization encompasses the whole new product development process, from the definition of the innovation to the introduction of the product to the market, and it offers a competitive advantage (Park & Ryu, 2015). Therefore, the capability of technology commercialization is the company's capacity to quickly and efficiently transfer its products to the market.

For Aarikka–Stenroos & Sanberg (2009), commercialization capabilities must be faced as part of the new product development process because they affect different stages of such process. After all, the commercialization stage is where the success of investments in innovation is determined (Park & Ryu, 2015). However, this capability is also in fundraising and the preparation of the product for the market (Do et al., 2017; De Zubielqui, Lindsay & O'Connor, 2014).

An essential characteristic of IT companies is their significant dependency on skilled labor (Katz, 2004). Thus, employees who initially worked as technicians take on managerial positions, which compromises the strategic management of the companies of the sector (Agrawal, Khatri & Srinivasan, 2012), since innovation managers in IT focus on the technical risks of the product/service, disregarding the financial and market risks (Dey, Kinch & Ogunlana, 2007).

### **3 Research Methods**

This study was developed based on interviews, thus constituting qualitative research. Interviewing is a traditional method applied by qualitative researchers. To generate and collect data, the questionnaire needs to be well developed, which can be achieved through open-ended questions made in this paper (Chenail, 2011). This strategy was applied because our goal has a premise for the research question “how”. Thus, open-ended questions allow the interviewees to talk and explain details beyond the questions inquired. Our interviews have been pursued catch opinions, perceptions, and attitudes about the specific topic (Glesne, 1997), especially how to work the reimbursable public financing.

Such studies allow for the comprehension of the actions and decisions of managers and business administration professionals in their routines while also enabling the analysis of the



possible motivations of the actions under investigation (Myers, 2013; Guba & Lincoln, 1994).

Thus, we seek to understand in greater depth the process undertaken by IT companies to raise funds for innovation through a regional development bank. This section was structured in three parts: I) selecting the interview subjects; II) data collection; III) data analysis. Furthermore, following Zhang & Shaw (2012), we pursued the following subsections explaining every procedure through three C's: completeness, clarity, and credibility.

### **3.1 Selection of the interview subjects**

For this research, we have selected a local public financial institution, which is the primary source of reimbursable funding for innovation in the entire state of Minas Gerais. This Bank currently offers five reimbursable financing lines of credit for innovation (see section 4.1 Context). Among the companies covered, the IT sector leads both in accepted and denied requests for credit. Due to this, we have chosen this sector to analyze the problems related to getting credit from this Bank. Thus, our choice link SME's and the leading Bank of Minas Gerais that offers reimbursable funding for innovation, helping the innovation development in one of the regions more critical to the Brazilian economy.

The companies were selected based on a local IT association that had previously mapped, among its associates, the companies that had gotten credit through reimbursable financing lines from the development bank. We chose the IT sector because it contributes to the efficiency of data management, allowing improvements in general management of the business, services, market, and industry, especially in purchasing, delivery, and attendance. These features are essential to the state of Minas Gerais because it is a strategic place with many chains, such as agribusiness, construction civil, automotive, metallurgy, steelworks, and other services, which depends on good infrastructure.

The Bank in question in the study did not grant access to the names of the companies that applied for credit due to the institution's confidentiality conditions. There was an attempt to choose companies with different products and degrees of technology (radical and incremental innovations) to offer a broader view of the phenomenon (Langley, 1999).

### **3.2 Data collection**

The Bank faces difficulties regarding reimbursable lines of credit for innovation, among which are the high indexes of unregulated processes, denials of credit offer, or withdrawal by the companies (Santana & Gonçalves, 2014). Thus, the present research aimed at investigating the main difficulties faced by entrepreneurs who sought funding from the Bank. To that end,

we identified entrepreneurs in the IT sector who managed to apply for credit.

To select the companies which sought financing lines of credit from the Bank, initially, 14 companies were appointed by a local class association, out of which eight agreed to take part in the study. Those who did not partake justified their withdrawal by claiming contractual obligations to partner companies that granted them financial contributions and confidentiality regarding projects still under development.

In the exploratory stage, three unstructured interviews were conducted: one with the Bank's analyst responsible for the lines of credit for innovation; the second with a representative of a regional IT sector association; and the last with a representative of a regional organization that fosters innovation and entrepreneurship among SMEs. They are all part of the Bank's heterogeneous and multidisciplinary evaluation council responsible for analyzing the innovation projects submitted for funding.

A semi-structured script was made based on that information, which allowed for data collection employing in-depth interviews. We conducted one interview per company due to the process of securing credit being undertaken by either the proprietary or the person responsible for innovation.

According to Patton (2002), having few interviews per company might reduce the amplitude of analyzing the phenomenon. On the other hand, regardless of the quantity, the interview allows us to investigate a particular theme in greater depth (Myers, 2013). Furthermore, we must also keep in mind that small companies have particularities and objectives that differentiate them from large companies (Kull, Kotlar & Spring, 2018). In general, we believe that our interviewing's work had the main features proposed by Mason (2002): I) interactional exchange (face to face); II) informal discussion-style; III) topic centered; IV) the knowledge and many means and symbols about our topic were constructed during the interaction with the interviewees.

Most SMEs are managed by the owners themselves or by a small number of managers (La Porta, Lopez-De-Silanes & Shleifer, 1999) with vast business knowledge. The functional structure of the company tends to be more centralized, which sees the decision-maker play multiple roles with greater autonomy and authority, giving room to the figure of the key respondent who has a vast knowledge of the company's processes and activities (Kull, Kotlar & Spring, 2018).

Apart from the interviews in the companies, three important actors in the process were interviewed. Two of them directly assist companies in crafting proposals for innovation funding; one is a consultant, and the other a manager in a local class association. The third

specialist is a credit analyst at the Bank. This procedure allows the triangulation logic, focused on interviews (Yin, 2014).

Owing to this, the perspective of different actors allowed for a broad and balanced view of the phenomenon, which contributed positively to the internal validity of the analysis (Myers, 2013; Patton, 2002; Yin, 2014). A Confidentiality Agreement was submitted, certifying that the names of companies and individuals would not be made public, including the regional development bank, from here on identified as “Bank”.

Thus, 14 professionals were interviewed – 13 of them had face-to-face interviews, and only one was interviewed remotely through Skype software. In all interviews, the subjects allowed the recording of the conversation. After the data collection, the interviews were transcript, and during analysis, the subjects' speeches were used in their entirety, being altered solely to preserve the anonymity of the people and institutions. This disclosure transparency contributed positively to analysis objectivity and reliability. Regarding the interviewed' SMEs, all of them were the principal manager or the founder; this choice was essential because they are the sponsors by the financial' request.

### **3.3 Data analysis**

The interviews were then coded and analyzed according to Corbin & Strauss's open coding (2008), based on the content analysis technique. The inductive method proposed by these authors was adopted to develop the analysis, building categories using techniques based on grounded theory.

According to Randall & Mello (2012), the process of analysis proposed by this method is not guided by any single theoretical model – the results come from the field itself. Thus, the data analysis of this research has taken the following steps: I) detailed transcription of the interviews, II) coding of the concepts, III) tabulation and data analysis, and IV) interpretation of the results.

The data analysis is inspired by Miles, Huberman & Saldana's work (2014) and follows three particular phases outlined by Corbin & Strauss (2008). In the first phase, the categories and subcategories of the data collected in the interview were identified, and each researcher individually codified the interviews, discussing the results with the group.

In the second phase, these categories were narrowed down to avoid duplicity or irrelevant categories for the explanation of the phenomenon. Finally, an analysis of the relationships between the categories and the subcategories was conducted. By the end of the process, two more significant categories, six properties, and twelve dimensions were identified this way.

## 4 Results

This section was structured based on Corbin & Strauss's open coding (2008). Throughout the interviews with managers and specialists, several codes and subcodes emerge in their raw form; the researchers refined the wash until they reached their final version: the first category, **1. "Product's adequacy to the financing lines"** describes the interview subjects' perception of the implications of the degrees of incremental and radical innovation for the process of getting credit from the Bank's reimbursable lines of credit (Table 1).

The second category, **2. "Capabilities of commercialization of new technology"** describes the impact of knowledge of the Bank's concept of innovation, the comprehension of the notices, and the entrepreneur's commercial and managerial skills in accessing public credit for innovation (Table 2). The following section analyzes each of the two categories found and its relationships with their properties and dimensions. From these relations, some propositions emerged, which were presented in the discussion session.

### 4.2.1 Products' adequacy to the financing lines

Each of these has different criteria to qualify the proposals. Among the most used criteria is the products' degree of innovation, which can vary between incremental or radical (Bouncken et al., 2018). The Bank seeks to fund proposals that match the criteria of an innovative product, which can create the misconception in entrepreneurs that the radical innovations more easily fit the criteria, which would render them preferable for getting credit.

**Table 1. Category "Products' adequacy to the financing lines", its properties and dimensions**

Properties	Dimensions	Representative quotes
<b>1.1 Degrees of Innovation</b>	1.1.1 Incremental	"Easily, incremental (product innovation). I think that the reasons for us not getting access to this non-reimbursable money for innovation were exactly due to not having a radical innovation". (COMP2).
		"We try, with the Bank, to send incremental stuff. Because putting radical stuff on credit, even though the Bank has cheap credit, it's still expensive credit for innovation, and you end up with competitiveness ". (COMP4).
	1.1.2 Radical	"So, when we have a radical innovation, it is funded by the buyer himself, someone is buying and will pay us up front, or through subsidy. While with credit we use only for incremental (innovation)". (COMP4).
		"So, there are problems that have no solutions in the market. Client X (name redacted) has problems that the market hasn't anything ready for. So, we have to develop (radical innovation) from research (de facto research, we have to develop theory, algorithms), to delivery. Some are incremental, more geared to the world's internet and web, where our concern is developing new business models, which make more money than new

		technologies. So, we have both things. More radical innovation is very risky timewise; it takes longer. Incremental, on the other hand, you can have a quicker cash flow with lower risk. So, everything is balanced". (COMP4).
<b>1.2 Types of Financing</b>	1.2.1 Reimbursable	"I changed the format of the strategy. I couldn't get reimbursable funding from the state for development, but I got a working capital line with the Bank, which of course must be paid back, but the interest rate is lower than that of commercial banks". (COMP2).
	1.2.2 Non-reimbursable	"You don't get financing for R&D. R&D you do differently. Why? When you are developing R&D, you are developing a product you don't necessarily know will result in a product that you can commercialize. And whether this product will work out or not. R&D is research, and research does not necessarily have to have an outcome that works. [...] So, I don't recommend getting a loan for these cases". (COMP1).

However, products deemed radical innovations are perceived as more liable to failure, not attaining the project's initial goals (COMP1; COMP4). Consequently, many companies avoid reimbursable funding for these products because they are not sure of the financial results of the projects (CON1). One of the alternatives is to use the company's own resources (COMP6) or share the risk with partners (COMP4).

"When you are getting funding from financing to develop innovation, the uncertainty level is too high in the development process. So, the project might not even happen, and you end up with financing to pay". (CON1).

"No, no line of credit (was used to finance the products). We have a culture of aversion to credit risk. We have preferred all these years to always grow organically instead of leveraging. The only exception was the loan we got to buy furniture for our office". (COMP6).

"So, from there (at the end of new product development), with a product that is already in the market. That the market demands, then the product becomes interesting for venture capital. So, before that, when you have a "PowerPoint company", no one will invest in it. That is, nobody ever invests in an idea, but in things that are real". (COMP1).

In general, proposals based on products with incremental innovation tend to accept more reimbursable financing lines of credit. That happens because the product has already been tested in the market, has a consolidated customer base, and a more evident foresight of investment return (COMP1; COMP2).

The credit offered by the Bank is cheaper than the private credit options, which makes it more attractive to the entrepreneur with a lower degree of innovation in the product. According to Doha and Kim (2014), private credit charges higher interest rates for SMEs due to the high return risk and the few guarantees offered. Development banks, then, become instruments that enable the funding of these innovations (Abdalla, Calvosa, & Batista, 2013).

Furthermore, it is not uncommon for companies to show confusion regarding the

difference between an improvement version of a product and incremental innovation. This is one of the main factors for products not obtaining financing since improvements are seen as adaptations of the product/service to better suit the market in a way that is relevant to the company; while innovation relies on relevant evolution, in a regional scale, to differentiate a product/service from others in the market, not as simply an evolution of the company (COMP2; ACB1; GES1).

“We call it innovation because it's something new for us, something new for our clients, and then we can offer something new to the market. [...] If we are thinking about the market as a whole, okay, it's not something new. However, for the public that we cater to, it would be”. (COMP2).

“What we, for example, usually tell IT guys is that simply integrating functions or functionalities, to talk in IT lingo, cannot be considered an innovation. [...] So, in actuality, we will always look at the project's different perspectives. We will assess if there are risks, we will see if there is merit, if something similar already exists in the region, right”?! (ACB1).

“Incremental innovations in the software are new languages, new development tools, let me see what else... New communication protocols. From the basics, all projects, all products that come out, derive from these innovations”. (GES1).

Among the different subjects of the study, there is no consensus on definitions. OECD (2002) acknowledges the difficulty in specifying R&D actions in the software segment, in which a new application is not necessarily a technological or scientific breakthrough. In this sense, the principle of novelty must be reinforced when considering the uncertainties of development while applying the scientific method.

It is common for innovative small and medium enterprises to have easier access to commercial credit when compared to those in traditional sectors (Bönte & Nielen, 2011). However, innovation practices in smaller companies of innovation technology demand more attention due to their reliance on external knowledge, leadership, and team procedures – all of which are intangible aspects (Rose, Jones & Furneaux, 2016). The strong need for following market tendencies clouds the comprehension of concepts and hinders the creation of fostering propositions.

Regional development relies on regional and public policies that promote economic growth, directly affecting governmental investment decisions (Cooke & Leydesdorff, 2006; Leydesdorff & Etkowitz, 1998; Bresenham & Trajtenberg, 1995). These are justified by the need to preserve the SNI and foster the innovation environment, correcting flaws in the movement of innovation (Nelson, 1959; Arrow, 1962; Hagedoorn, 2002). Especially among

high-risk SMEs, such as those in the information technology sector, often face financial duress (Kaivanto & Stoneman, 2007).

#### *4.2.2 Capability of commercialization of new technology*

To be granted access to the Bank's funding, we identified that entrepreneurs have difficulties presenting a clear proposal, where the innovation and the social and economic impact of their products are explicit (CON1; GES1). Therefore, the proposals are denied because their author does not seem to understand the criteria and cannot present the capacity for generating revenue with the innovations they propose and the solidity of the business as a whole (Table 2).

“Many entrepreneurs have excellent business ideas, even without a radical technological innovation. The concept of their business is good, it's innovative, but they can't sell the idea. They can't show the Bank that their project is innovative, that it creates social and economic impact”. (CON1).

“No, they don't know how to write. Sometimes, although they don't have difficulties explaining what their technology is verbal, the entrepreneur may find it challenging when explaining what his technology is in a specific format for a plan or a proposal because the relative information is not there. For example, the Bank issues a form asking about the innovative aspects of the product. This is broad, but at the same time, it is pretty restrictive. The guy will fill it up with nonsense”. (GES1).

Furthermore, the exploratory phase of the research had already suggested that there are difficulties in comprehending the criteria for the reimbursable financing lines of credit (EXP1), considering that the evaluation of the proposals is done by an evaluation committee that has no standardized analysis and approval system for submissions (EXP2, EXP3). This points out the low complexity of the financial system, which justifies the financing gap small companies face and intensifies distortion (Liming, 2011).

What is regarded as an innovative product is not equal between entrepreneurs and the development bank (COMP7; COMP8; COMP1; GES1). For the Bank's credit analyst, the proposals must have an innovative character for the region. Therefore they cannot be new versions of a previously existing product (ACB1). Because of this, the funding banks must assure public resources foster the development of the country and/or region (Abdalla, Calvosa & Batista, 2013). However, many entrepreneurs face these modifications as incremental innovations, which causes their proposals to be denied by the Bank (COMP6; COMP3).

“I have helped different companies, different projects that, under the scope of these manuals (OSLO), were innovative. However, the Bank did not see that project as innovative. [...] The Bank should explicitly state: I don't fund software rewrites.

Moreover, they're right; this is not innovation. However, this is not written anywhere. And then what?". (GES1).

"We will evaluate the project in terms of innovation related to the business model, the product, the service, or another result that doesn't yet exist in the state of (redacted). So, I mean, we don't have to, for example, usually tell IT guys is that simply integrating functions or functionalities, to talk in IT lingo, cannot be considered an innovation. This is even on the Bank's website". (ACB1).

The products in the IT sector have more significant difficulties in showing their innovation because a simple change in a code might be a new product or just a new version, depending on the perspective (COMP7). This way, the entrepreneur's capability to show the Bank the innovation potential of its product becomes determinant and his capability to show how the product will be introduced into the market (COMP1).

"When they think of the product, this is normal for an IT company, they sometimes think of the product as a whole. [...] The core of the product, the main part... they can't describe what that is. It's hard to get this from an entrepreneur. What does your product have that be relevant to the market, and what technology are you offering that the market accepts and will willingly buy?". (GES1).

**Table 2. Category "Capabilities of commercialization of new technologies", its properties and dimensions**

Properties	Dimensions	Representative quotes
<b>2.1 Comprehension of the notices</b>	2.1.1 Hard comprehension	"What they don't consider an innovation project is clear, but within what they don't consider an innovation project, there are things we understand as innovation. So, one of the things they say is that innovation is not just a new version of the product. But, many times, for a new version of the product, we have to make another product, as if I were developing a brand-new product. So, this is a project that is difficult to evaluate. I agree that their case is "when in doubt, don't do it". We, for example, don't even call it a new version, but a new product. Could it be considered a new version of the previous product? It could! But with the series of innovation in it, we need to call it new". (COMP3).
		"We had many difficulties in understanding the paperwork. It is a little confusing. It took a lot of interaction with the Bank to get everything right. So, I think this is an issue applicant has to deal with. Ideally, you would follow or read a manual or something and submit it without any doubts". (COMP4).
		"Our greatest difficulty is to framing our ideas in the criteria of the public notices". (COMP6).
		"We presented it (the proposal), but it was not accepted because they (the Bank) did not consider our idea an innovation, but rather an improvement of our system". (COMP6).
	2.1.2 Easy comprehension	"It's not (a complicated notice), so much so that I have never had problems in getting funding and working capital. So, I think it is obvious, and their methodology, as someone who benefits from it,



		is fair to me. Maybe if I hadn't gotten it I wouldn't have this vision". (COMP8).
<b>2.2 Ability to present the innovation of the proposal</b>	2.2.1 Hardship in presenting the innovation	"[...] the fact that a product is innovative does not guarantee funding from the Bank. The Bank also evaluates if the product is capable of being introduced to the market, because if it isn't... "Oh, it's innovative, but are you yet to begin research?" That way the Bank has no guarantee that the product will reach the market and will generate revenue to allow the company to pay the Bank". (COMP1).
	2.2.2 Ease in presenting the innovation	"The main thing when submitting a proposal does not depend on the project, it depends a lot on the relationship. Talking beforehand, understanding beforehand, gathering information, the paperwork... First, to understand what do we want it for, why do we need it, how is this money going to be invested. And talking a lot to the Bank, understanding what the options are, having a close relationship, which is something we try to have with the Bank". (COMP7).
<b>2.3 Ability to present the solidity of the business in the proposal</b>	2.3.1 Hardship in presenting the solidity of the business	"When I got to the bank, he looked at me and said: "but you have no revenue?" So, the Bank looks into the past, they do not look to the future. Other companies are generating revenue, and none of them used loans nor non-reimbursable funding sources". (COMP1).  "The Bank does a full analysis, and if your product is not ready to hit the market, they deny the loan in a premeditated fashion. If the business has no way of generating revenue for the company to repay the Bank, they will default on payments, and this isn't good for anybody". (COMP1).
	2.3.2 Ease in presenting the solidity of the business	"So, you have mechanisms to show, not reputability, but to give the Bank security that it is investing in a company that has conditions to lead a project and (investment) returns. The Bank is taking a risk there, it puts a low rate, and if you go bankrupt you won't be able to pay it. And it offers a lower rate because it wants you to succeed. The whole issue of this guarantee, it's not even a financial guarantee of returns, but that the company is solid. They get one project or another with neat little ideas, but this alone will not charm the Bank". (COMP8).

Despite the divergences regarding the difficulties in understanding the notice's documents (COMP4; COMP6; COMP8; COMP5), entrepreneurs report that the Bank offers enough support for understanding the criteria (COMP1; COMP4). It is up to the entrepreneur to seek this help, finding the most suitable line of credit and framing the product within its criteria (COMP7).

SMEs need to innovate both in their products and in their competence to improve the efficiency of their operations (Pullen et al., 2012). Thus, it is common to categorize innovation based on its technological capability to develop functionalities and its commercial capability, which relates to understanding the usefulness of the innovation (Subramanian & Chai, 2011; Veryzer, 1998). The company's role is to understand what strategies must be deployed to build

the needed relationships and competencies (Preusler, Costa & Crespi, 2020; Walsh & Linton, 2011).

Defining the suitable measure of technical and commercial competencies demands an understanding of the context of the company's activity concerning its market (Subramanian & Chai, 2011), and it has been demonstrated that the expected returns of innovative SMEs are strongly related to formal commercial management that glimpses opportunities and improves the chances of success (Kizber, 1997). However, it is often the case for SME's for there to be a strong need for developing their commercialization capabilities (Wheelen et al., 2017; Mazzarol et al., 2014).

Innovation activities only create a competitive advantage if they promote shifts in market placement and engagement (Liao & Rice, 2010). In other words, it can be said that organizational performance is fostered by innovation when there are transformative results.

When the company displays innovation capabilities, it can constantly respond to market shifts (Slater, Hult & Olson, 2010; Rajapathirana & Hui, 2018), especially when supported by organizational strategies and structures, which shows the significant relationship between resources and innovation efforts, and performance (Gloet & Samson, 2016).

## 5 Discussion

Development banks are considered necessary instruments of public policies for funding innovation (Ferraz, Além & Madeira, 2013). They fill in for the low participation of private financial institutions (Santana & Gonçalves, 2014) supported by their aversion to risk regarding businesses involving innovation (Ferrary & Granovetter, 2009), funding businesses, and socially strategic sectors (Luna-Martínez & Vicente, 2012).

The results of this research aid this realization because they suggest that the innovation potential contributes to the approval of the proposal. This creates the perception among some entrepreneurs that the Bank prefers products with radical innovations, for they would more easily fit the criteria of an innovative product. On the other hand, products with incremental innovation could be understood as improvements on previously existing products, which is not considered an innovation by the Bank. Thus, the following proposition can be made:

**Proposition 1: A better presentation of the product's potential for innovation is highly associated with the approval of the funding proposal.**

The innovation potential also defines the financing line of credit sought out by the entrepreneur. The proposals for products with radical innovations seek non-reimbursable lines

of credit, which mitigates the risk of not fulfilling the obligations towards the financial institution. These perceptions aid Raza-Ullah, Kraus, and Bouncken's (2014) work that associates these innovations to more significant risks and uncertainties in the investment.

The strategies adopted to obtain funding in these cases are using the company's own capital or establishing partnerships. For Bouncken et al. (2018), sharing risks with partners in projects of radical innovation mitigates the uncertainties regarding the returns of these projects, as long as mechanisms and safeguards against opportunistic actions are defined (Le Roy & Fernandez, 2015; Raza-Ullah & Bengtsson, 2014).

Incremental innovations are more prone to taking on financial commitments since the products are already market-tested and have higher predictability regarding revenue. According to Ritala, Kraus & Bouncken (2016), incremental innovations have fewer uncertainties regarding the return of the investments, and SMEs are considered a vulnerable group in the private credit market.

Aside from the technical influences of the suiting of the product to the financing lines, the research points to the SMEs' lack of commercialization capabilities. A fragility in displaying the innovations of the products were identified. This happens because the entrepreneurs do not understand the notices, cannot present the product's capacity for innovation, do not show the social and economic impact of the innovation, or still, do not convince the Bank that the company can reimbursing the loan. Due to this, it is possible to establish the following propositions:

**Proposition 2. A better comprehension of the notices is highly associated with the proposal's funding approval**

**Proposition 3. A better capability in presenting the solidity of the business is highly associated with the proposal's funding approval**

The low level of these capabilities among innovative SMEs has been previously evidenced by Do et al. (2017), Park & Rhee (2013), and Park & Ryu (2015). However, these studies discuss this topic in advanced stages of the new product development process and do not contribute to understanding how these capabilities interfere with fundraising (Do et al., 2017; Aarikka–Stenroos & Sanberg, 2009).

The Bank must guarantee that the companies pay the reimbursable loans. SMEs are ranked as a high risk for private loans (Doha & Kim, 2014; Santos, 2012), which increases the importance of public credit for these companies (Ferraz, Além & Madeira, 2013). Therefore,

knowing how to present the product's proposal and how to display the solidity of the company contributes positively to raising public funds.

This way, it is possible to establish the fourth proposition:

**Proposition 4. Higher levels of commercialization capabilities for new technology are highly associated with the proposal's funding approval.**

## 6 Conclusions

Through this qualitative study, based on interviews with IT sector SMEs, we have investigated the role of commercialization capabilities in obtaining access to public funding for innovation from a regional development bank. The main finding of this research was to present that, apart from the innovation of the product itself, the Bank also evaluates how the company will introduce the product into the market, the solidity of the business, and the social and economic impact of the innovations.

As a contribution to the literature, the results of this research indicate that the SMEs' commercialization capabilities impact the approval of proposals for public funding for innovation. Although previous studies have shown that competencies are present in all stages of developing new products, including fundraising, this study adds to the importance of getting public funding. This could imply that the improvement of these capabilities might reduce the discrepancy in access to funding between SMEs and large companies.

In terms of practical contributions, the results suggest that the companies who take credit from the Bank are more zealous concerning the overall administrative operation of applying for credit. Thus, companies need to submit better-structured proposals from a technological standpoint and from a commercial and managerial perspective.

In the results, it was possible to identify some companies attempt to develop or adapt these capabilities through different means. Some companies sought help from external consultants to create their funding proposal, some had support from commercial associations in their sector, while others sought professionals with more commercial and marketing experience.

As a limitation of this paper, the study does not compare small and medium enterprises in accessing private credit. It also does not allow for identifying whether there are different perceptions between companies whose proposals were accepted and those whose were denied. Future studies might explore these comparisons, as well as quantitatively test the propositions established in this research. Another possibility would be to understand the differences between each line's criteria of analysis, with the possibility of proposing a standardization of the notices.

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