

# Innovation in information technology (IT): Results of innovation in IT companies in Paraná, Brazil

Marco Antonio Sartori<sup>1</sup> (Universidade Estadual do Oeste do Paraná) [msartoridc@gmail.com](mailto:msartoridc@gmail.com)  
Emanuel Campigotto Sandri<sup>2</sup> (Universidade Federal do Paraná) [emanuel.sandri@hotmail.com](mailto:emanuel.sandri@hotmail.com)  
Amanda Vezzano<sup>3</sup> (Fundação Getúlio Vargas) [amanda.vezzaro@gmail.com](mailto:amanda.vezzaro@gmail.com)  
Elizandra da Silva<sup>4</sup> (Universidade Estadual do Oeste do Paraná) [elizandra.silva@unioeste.br](mailto:elizandra.silva@unioeste.br)

## ABSTRACT

Innovation has been consolidated as a critical element in the strategy of organizations in the most diverse segments of the market. Investing or not in innovation is a decision that can influence the competitiveness and sustainability of the business, as well as the permanence of a company in the market. Due to the great importance attributed to innovation, the objective of this paper is to draw a comparison between the initiatives related to investments in innovation in a set of IT companies in the state of Paraná and the main innovation alternatives listed in the literature national and international levels, evaluating the impacts caused by these investments, taking as the exploratory research the methodology addressed. Based on the results obtained, it has hoped that IT service companies will be able to increase their competitive potential and ensure the sustainability of their businesses.

**Keywords:** Competitiveness; Innovation; Services; Information Technology; Software

## 1. INTRODUCTION

Despite the complex economic situation in Brazil in recent years, the services sector in 2017 has taken small steps to overcome the crisis. On the other hand, not all activities related to the sector showed good results during this period.

According to the IBGE (2017), while the services segment for families grew around 5.9%, information and communication services decreased by approximately 1.8%.

During the year 2016, the telecommunications, communications and IT sectors had a turnover of R\$ 438 billion, equivalent to 7% of Brazil's GDP (IDC, 2017 and Brasscom, 2017).

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<sup>1</sup> Attending Master's Degree in Business Administration, Universidade Estadual do Oeste do Paraná

<sup>2</sup> Attending Doctor's Degree in Business Administration, Universidade Federal do Paraná

<sup>3</sup> MBA in Project Manager, Fundação Getúlio Vargas

<sup>4</sup> PhD in Business Administration, Universidade Federal do Paraná

According to data from IDC and Brasscom, Brazil is the largest IT market in Latin America, with a market share of approximately 36%. The forecasts for the year 2017 were encouraging, with growth expected at the house of 2.5% which, according to a survey conducted by IBGE (2017), was not confirmed in practice.

Looking for consolidation in the market and constant growth, companies in this sector have invested aggressively in new technologies, process improvements, as well as in tools that allow them to innovate and present competitive differentials that guarantee the sustainability of their businesses. In addition, the literature review by Bruno-Faria e Fonseca (2014) has demonstrated that the search for concepts and theoretical models about innovation is something that has drawn the attention of companies that continuously seek to evolve their performance and achieve greater competitive advantage.

In this context, innovation was consider essential for organizations to achieve improvements in their performance and competitive advantage (Bruno-Faria & Fonseca, 2014). More than that, innovation encompasses the planning and goals of the most diverse sectors of the economy, including the services sector in the areas of technology.

In this way, the competence to innovate is reflected in the companies' competitiveness, since it is the recurrent capacity to develop innovations. In this way, there is an increase in the net revenue of these companies, which now stand out against the competitors in the market in which they operate (Zen, Machado, López, Borges, & de Menezes, 2017). In addition, differentiation and innovation strategies, along the lines of GIS (Management and Control Systems), which are related through formal controls and innovation, have strong connections with the development of companies (Beuren & Oro, 2014) and with the sustainability of the business.

In this sense, among the several actions performed by these companies, one can highlight the investment in partnerships, so that one can take advantage of the benefits that their networks of relationships can offer (Cortezia & de Souza, 2011). An example of this is the tendency of relationships between large companies and startups, in the search for a more open innovation process (Varrichio, 2016).

Despite the innumerable benefits of these initiatives, Brazil still lacks public policies that can encourage the emergence and evolution of startups, mainly because they are considered great sources of knowledge, new ideas, and have other characteristics that inspire innovations for the country (Varrichio, 2016).

Another positive aspect of the partnerships between organizations for innovation lies in the fact that they positively influence competitiveness in global markets, also contributing to the improvement of innovation and processes in domestic market contexts (Yoon, Lee, Yoon, & Toulan, 2017).

In this scenario, this study is justified by the fact that innovation has been the goal of several types of organizations, considering the particularities that each area has within the services sector. For this reason, it is fundamental that new research be carried out in order to foster and eliminate barriers that may prevent innovation from occurring (Bruno-Faria & Fonseca, 2014), either naturally or from a strategic planning in which this is the main objective.

Due to the great importance attributed to innovation, the objective of this paper is to draw a comparison between the initiatives related to investments in innovation in a set of IT companies in the state of Paraná and the main innovation alternatives listed in the literature national and international levels, evaluating the impacts of these investments on the organizational context. Based on the results obtained, it is expected that IT service companies will be able to increase their competitive potential and ensure the sustainability of their businesses, aiming at constant innovation.

## **2. THEORETICAL REFERENCE**

Over the years, a number of studies on the topic of service innovation have been conducted in several countries. In the following subsections, there will be presented studies that support this research, addressing the theme of innovation focused on companies in the area of information technology and have as main characteristics the intensity of knowledge and a high level of proximity to its customers.

### **2.1 INNOVATION IN SERVICES**

The service sector has been growing, not only in Brazil, also in several countries, occupying a fundamental space in society, and employing a large portion of the population (Rezende Júnior & Guimarães, 2012; Klement & Yu, 2008). For this reason, a series of studies has been carried out, mainly focused on the service sector in general, without considering the several areas covered by it (Venâncio, Andrade, & Gonçalves, 2014).

This phenomenon sometimes undermines many learning processes related to innovation in services, since many relevant points, including geographical issues, for example, are concealed by the absence of a greater level of detail about each category or niche of service available in the market (Vargas & Zawislak, 2006).

In a study published in 2006, Vargas and Zawislak state that the innovation process must be appropriate to the set of specialties that exist within the context of the service sector. In addition, the authors have shown that this process has limitations in relation not only to geography, but also to the culture and social environment in which the organization is inserted.

Although the increase in the volume of studies is noticeable, it was from 2008 that the innovation in services came to be the focus of research. Among the published studies, 48% focused on technological and marketing innovations (Venâncio et al., 2014). One of the main motivating factors for the research is the fact that the task of measuring innovation in services is quite complex (Rezende Júnior & Guimarães, 2012; Lima & Vargas, 2012). A complex environment with a high level of uncertainty makes this task even more complex, directly affecting the management of innovation within organizations (Tidd, 2001).

A striking feature of service innovation is the strong presence of technology. Whether in the context of education, health, or in the areas of information, the role of technology is fundamental for innovation to take place (de Carvalho & Ferreira, 2017; Lima & Vargas, 2012). For Lim et al. (2018), this is because the service sector presents itself as a context that favors the digitalization of the interactions that occur between clients and suppliers. This also contributes to an easier creation of value, favoring the occurrence of an innovation process.

The management of innovation within companies becomes a compulsory discipline and must contemplate a complete understanding of the resources available in the organizational environment. In the current scenario, not innovating can be a difficult barrier to be overcome by companies that wish to conquer, or even maintain, their place in the market (Zen et al., 2017).

## 2.2 INNOVATION IN IT COMPANIES

Information Technology (IT) companies have one of their main characteristics being knowledge intensive. As innovation processes become more complex, this knowledge, sometimes documented through patents, becomes even more relevant to the efforts made to become more innovative and more competitive (France, Barroso & Politano, 2014).

Improving the capacity for innovation in a knowledge-based economic context is not only a competitive advantage; but also, it can be the main factor responsible for the sustainability of the business and the permanence of the company in the market (Ikenami, Garnica, & Ringer, 2016).

Another striking feature of these companies' lies in the fact that, in most of them, the relationship with customers is close at all stages of software development or consulting projects.

For this reason, there is great willingness to adapt the services provided so that the specific needs of users can be met in a personalized way. This attitude favors the increase of revenue gains from customized services and products (Tether & Hipp, 2002). The improvement of results obtained from the use of a business model in which the customer can

have their needs met as part of a policy that includes the focus on flexibility and quality, not just on price (Tether & Hipp, 2002).

This closeness to customers is also beneficial from the perspective of access to knowledge. From the information obtained through a series of relationship channels, new forms of relationship can be developed, aiming at better strategies for segmentation and obtaining new clients (Hoeber & Schaarschmidt, 2017; Zhao, Zhou, & Ci, 2017). A large part of the evolution of these strategies occurred from the development and popularization of networks and mobile devices, arousing people's interest and gradually becoming part of their lives (Zhao et al., 2017).

Another point in favor of the great dynamism present in the IT service companies is the fact that other organizations that have great intensity of knowledge and technology, invest little in machines or equipment. Its focus is on IT solutions (Tether & Hipp, 2002). This allows these organizations to act by creating value from data, including in this process key factors such as data sources, data collection processes, analysis, sharing among key users, use of information (Lim et al., 2018).

Among the most innovative solutions presented by the IT industry in recent years, several solutions based on the concept of cloud computing can be highlighted. The innovation present in this new way of thinking about software and services contributes not only to consumers of IT services, but also to the companies that provide these solutions themselves. From the cloud initiatives, large IT companies have focused on developing collaborative strategies that can ensure their sustainable growth (Yoon et al., 2017). Service providers and their software as a service (SaaS) offerings have matured and consolidated as one of the most important platforms for service and business innovation around the world (Ali, Warren, & Mathiassen, 2017).

## 2.3 KNOWLEDGE MANAGEMENT

As knowledge becomes more important for business development, more attention needs to be paid to the processes from which it is created, evaluated and disseminated (Nonaka, 1994). This is one of the reasons why knowledge management starts to play an important role within organizations.

Despite the great importance, companies need to create mechanisms for knowledge management to thrive, seeking to maintain good levels of market competitiveness (Davenport & Prusak, 2003) and encouraging the creation of joint knowledge between people and companies (Nonaka, 1994).

The importance of knowledge to the organization is also justified by the results found by Trierveiler, Sell and Pacheco, in a study published in 2015. According to the authors, six

main factors contribute to increasing the chances of success of innovation initiatives. Among them, five are directly linked to knowledge, and they are:

- Detailed knowledge of the business model in force in the company;
- The incorporation of knowledge acquired by trial and error based on organizational knowledge;
- The knowledge acquired by past experiences;
- Knowledge of business opportunities and;
- The flexibility of the business model obtained through the incorporation of aggregate knowledge from internal and external sources.

The sixth factor refers to the organization's investments in research and development (Trierweiler et al., 2015).

From a set of functional management mechanisms, the main organizational factors capable of fostering innovative processes in the organizational environment can be identified, realigning processes, indicators and contributing to the process of learning and experimentation of innovation (Kurtmollaiev, Fjuk, Pedersen, Clatworthy, & Kvale, 2017).

### **3. METHODOLOGY**

In order to meet the objectives of this paper, it is first necessary to know the methodology to be adopted, from which will result the discussion of the topic, the analysis of its result and its conclusions.

This article is classified as one of the exploratory research as (Gil, 2008), aims to present an overview of the presented theme and serves as a basis for future investigations through systematized processes.

The research subjects are information technology companies responding to the questionnaire applied by the *Bússola da Inovação*<sup>5</sup>, operating in the state of Paraná. The companies respond voluntarily and anonymously to the questionnaire, and the results are disclosed through the publication of a series of reports on the official website of the program.

This model is adherent to the present study, considering its exploratory and/or qualitative characteristics, where it is presumed that the researched ones can represent the universe under study (Gil, 2008).

The data used as a basis are part of the study carried out during the year 2017, in which 74 companies from the information technology sector were interviewed, as well as 429 from other sectors including capital goods, metal mechanics and construction, among others.

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<sup>5</sup> Project that aims to help the industries of Paraná to grow and improve every year. Through specific information on innovation in the state to direct support initiatives to companies.

### 3.1 BÚSSOLA DA INOVAÇÃO

*Bússola da Inovação* is a research carried out every two years, whose objective is to help Paraná companies from the most diverse sectors and remain in the market, constantly evolving and innovating.

In addition to the general picture presented in the reports obtained through the research, the participating companies can count on information specifically designed for their business, in order to enable process improvements, products quality improvements, or increase of their profits.

In order to complement the possibility of the actions that can be developed by the companies, the researchers also indicate a set of tools and methodologies that allow to identify failures in the process of innovation, contributing to make it better and more effective (Fiep, 2018).

The company's proprietary partners, followed by the directors, managers and other managers of the strategic and tactical levels of the organizations, with a maximum 19 employees (Fiep, 2017), mainly answered the survey conducted in 2017.

In the next section, the results obtained through the research with companies from Paraná will be presented, in addition to those identified in the publications carried out over the last years in Brazil and abroad.

## 4. RESULTS AND DISCUSSIONS

The companies that operate in the field of information technology have as one of their characteristics the fact that they are knowledge intensive and generally present a profile with strong characteristics that favor innovation. More than the interest of the executives of these companies, innovation is a market-imposed need in which consumers seek resources and tools that can make their work simpler, faster, less costly and more effective.

Innovation, known as the successful exploration of new ideas, consists of the integration between the knowledge acquired by the company and the actions that seek to make it operational (Sinha, Kakkar, & Gupta, 2015). In general, an activity presents a high level of risk, especially from the perspective of product innovation. Despite risks, well-executed projects become a great competitive advantage for organizations, in addition to boosting their profits (Sinha et al., 2015; Edison, Wang, & Abrahamsson, 2016; Edison, Wang, Jabangwe, & Abrahamsson, 2017).

For this to happen, innovation processes must be conducted in an organized, purposeful and systematic manner (Edison et al., 2017) , counting on the organizational members to support in the accomplishment of the management tasks of the assets necessary for the good progress of the activities, including knowledge management (Sinha et al., 2015) .

Although it is considered of fundamental importance to maintain the competitiveness of organizations, Davenport & Prusak (2003) state that for knowledge management to thrive, we need companies to create mechanisms to perform the work to acquire, distribute and use this knowledge. According to the authors, this is a complex but essential task for the expansion of knowledge (Nonaka, 1994), considered as one of the main drivers of innovation.

Although IT companies from Paraná, between 2014 and 2015, develop many projects, 39% of the organizations participating in the *Bússola da Inovação* have stated that they have abandoned innovation projects. Considering that innovation is a constant pursuit in this sector, 77% of companies affirm that they have innovation projects in progress by the end of 2015. In order for this to be possible, it is necessary that all areas of the company collaborate among themselves. In addition, an adequate infrastructure must be available, not only in the internal environment of the company, but also in the context in which it is inserted (Fiep, 2017).

To innovate, it is fundamental that companies have the ability to determine strategies that allow them to manage the innovation process. In this scenario, one of the alternatives is the elaboration of a model for the management of research, development and innovation (R&D&I) (Weber et al., 2017). In order to make research activities more effective, getting results in a shorter amount of time, many companies have invested in partnerships with universities, or private companies.

R&D partnerships involve activities that can result in innovations critical to the technological advancement of firms (Daoud, Tsehayae, & Fayek, 2016). In the context of IT companies in Paraná, 70% of the study participants perform research and development activities. For 18 of the 74 companies often carry out these activities, and 15 of them have teams dedicated to these activities.

Although relevant to the innovation process, partnerships, including those between groups of companies, universities and governments, should be regularly re-evaluated (Daoud et al., 2016). This is necessary so that the parties involved can identify the destination of the invested resources, as well as the effects that these activities have on their results.

According to the innovation profile that is sought, there is a more adequate partnership modality: cooperation with clients and universities, for example, are considered the most rewarding, being great motivators for innovation and products, with predominance of radical and exploratory innovations, whereas cooperation with other companies does not have such a positive effect (Saenz & Pérez-Bouvier, 2014).



In many cases, larger companies seek support from startups that operate within their organizational physical spaces, in order to contribute mainly to the product innovation process (Edison et al., 2016).

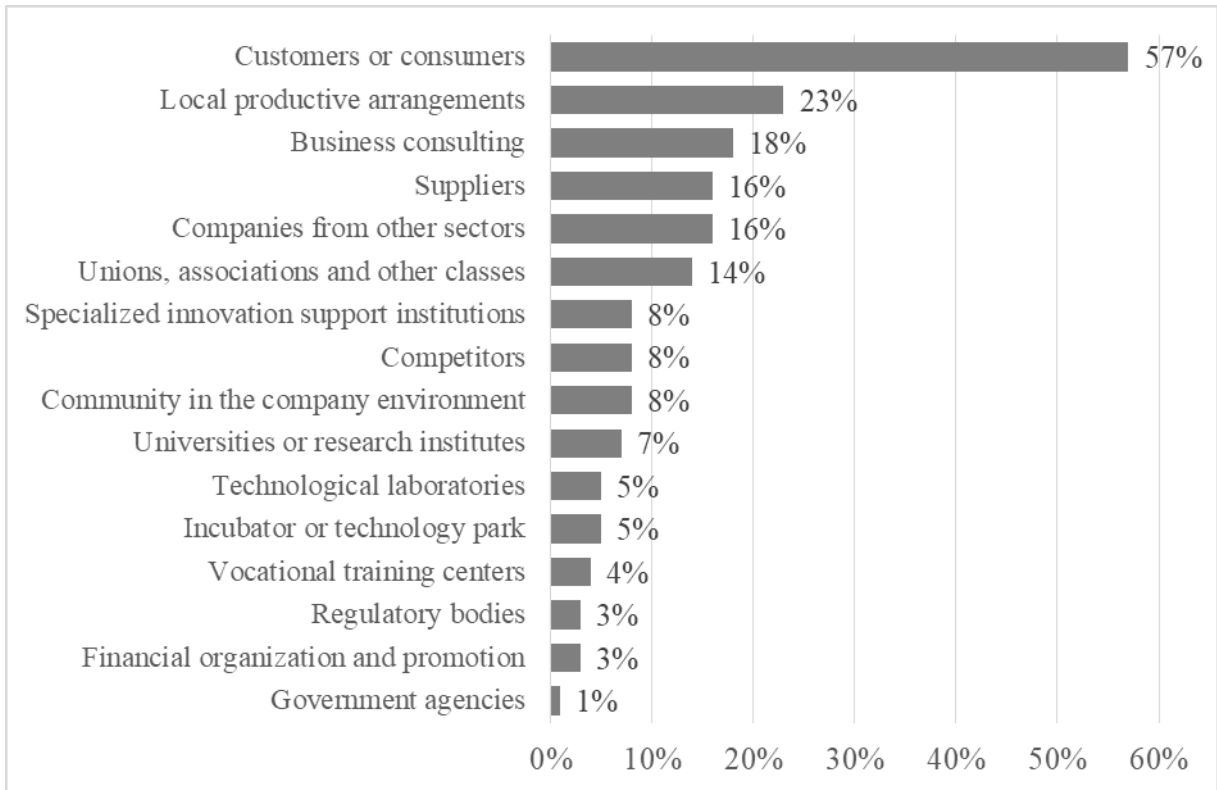
Despite the evidence that the path must be the opposite, IT companies in Paraná present a higher level of interaction with local productive arrangements (APL) than with universities. While 23% of companies claim to participate in APL, only 7% have some kind of link with universities and research institutes. In addition to the APL, the main alternatives listed by the entrepreneurs regarding the partnerships are interactions with clients and specialized consultancies (Figure 1).

As presented by Silva, Andrade and Aragão (2017), seeking to propose several projects in partnerships, universities could disseminate the exchange with the technological parks. Where technological parks are most in contact with universities, the advantages of this interaction will be better served by research and teaching institutions and companies present in parks.

Regardless of the form of association or interaction chosen by the company, it is of utmost importance that there be exchanges of ideas and knowledge sharing. Companies whose culture of knowledge management and sharing is mature are usually presented as the most innovative (Sinha et al., 2015). However, for this to happen in the business environment, senior management must commit to KM initiatives.

One of the ways to facilitate the spread of knowledge is the use of networks of relationships established between companies, through benchmarking practices, networking, as well as joint product management and market analysis activities.

Figure 1: Main interaction with social actors for innovation



Source: Adapted from Fiep (2017)

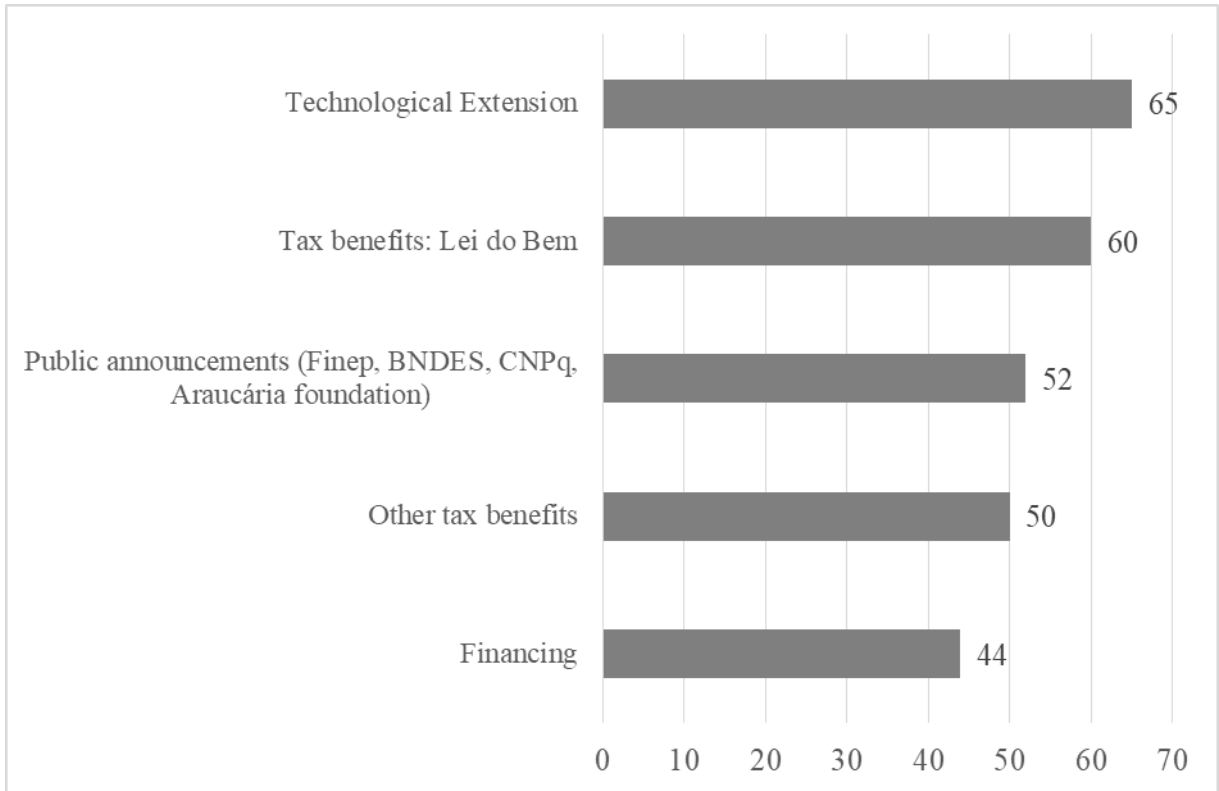
To support research, companies have sought to retain highly qualified people, including masters, doctors (24 companies) and experts in their key areas of interest (37 companies) in their teams.

Given the importance of R&D initiatives, be they social or economic effects of countries, the level of R&D funding has been increasing in recent years (Daoud et al., 2016). Nevertheless, in the context of Paraná, 47% of the companies surveyed stated that they had difficulties in raising funds, which caused great damage in the development of their innovation projects.

Among the main reasons cited by the companies for the difficulty in obtaining resources, the main ones were the difficulty in drawing up fundraising projects (44.59%), lack of knowledge about available lines of credit for innovation (43.24%), lack of knowledge about the existence of notices of development (39.19%), as well as deadlines, payment methods and/or interest not attractive (37.84%).

Still from the perspective of fundraising, it is possible to observe that the forms of dissemination and promotion of them in the business context is still deficient. Proof of this lies in the fact that the vast majority of the research participants never used or knew a few of the incentives available in Brazil (Figure 2).

Figure 2: Unused laws and incentives for the development of innovation.



Source: Adapted from Fiep (2017)

Initiatives for innovation may be the most diverse, however, the main ones refer to internal entrepreneurship, knowledge sharing, internal organizational risk, as well spin-offs and crowdsourcing (Kaltenecker, Hess, & Huesig, 2015; Edison et al., 2016). However, for each of these initiatives, there are a number of challenges to be considered and overcome (Table 1).

Table 1: Challenges of innovation initiatives

Initiative	Challenges
Organizational innovators	<b>For managers:</b> Change in management style, accepting failure as a learning process, balancing the freedom to work differently and monitored. <b>For employees:</b> Receive the confidence of managers
Bootlegging	<b>For managers:</b> Identify and manage the process <b>For employees:</b> Obtain the support of superiors in order to guarantee the necessary resources
Research and Development	Scope limitation to existing technologies, balancing the time and effort to implement ideas from joint initiatives.

Internal entrepreneurship	Configure the innovation project, define project members, define processes and resources.
Subsidiary	To finance the development of a new product, manage the lack of focus on the project, and manage the costs of managing the internal market.
Joint ventures	They should not be used to promote product innovation, but to expand markets.
Venture capital	Risk of investors using the results obtained to cause losses to the companies.
Spin off	Create the new company, allocate resources, define members, technology, among others.
Crowdsourcing	Get people involved and ensure that they are focused on value creation just for the company.

Note. Source: Adapted from Edison et al. (2016)

It is worth emphasizing that there are essential roles for innovations to take place in the organizational context. As far spin offs are concerned, for example, their importance lies in the fact that they allow an organization to more easily manage potentially disruptive innovations (Kaltenecker et al., 2015).

On the other hand, it is important that the company have initiatives aimed at strengthening partnerships, recruiting innovative staff, and interacting with customers. In order to guarantee the effectiveness of these actions, it is important that the organization seeks the opinion of experts, and finds in its leaders, people capable and willing to collaborate with the growth and evolution of the business, always seeking the leadership (Kaltenecker et al., 2015).

Although IT companies in Paraná still have great difficulties in managing and executing innovation projects, many advances have been made in recent years. Among them, attention to standards and standards, improvement in product quality, improvement in health and safety conditions in the work environment, as well as increased productivity and meeting market demands can be highlighted.

Better results could still be obtained from an increase in the value invested by these firms in innovation. Of the 74 companies participating in the survey, 59% do not invest more than 5% of their turnover in innovation initiatives. As a reflection of the low investment, the return generated by these innovations also fluctuates in the range of 5%.

## 5. CONCLUSIONS / FINAL CONSIDERATIONS

The involvement of private companies, public companies and the universities themselves proved to be decisive for the success of innovation actions in the perception of the respondents. However, even if these companies are aware of these movements, most companies do not develop the real partnership models. There is thus an opportunity for a closer approximation of these that represent the industry before each other to better share knowledge and interaction among them, seeking to elaborate innovation projects.

The results of this study point as a relevant contribution in that the quest to develop innovation projects has helped companies to improve in several areas such as standards and standards, improvements in existing products, working conditions, as well as productivity growth the demands of the sector. Therefore, the search for the new one opens not only the possibility of creating a new product or service, but also helps the development of existing processes, refining and increasing the perception of companies by the markets in which they act or seek to act.

Another point to be observed is that, even if there are fiscal and financial incentives, governmental and private, that stimulate innovation and foster its development, the precarious disclosure and reach of the actions of the same do not reach their target audience effectively (information technology companies), as presented in the research conducted, thus limiting the effectiveness of the applicability of resources and their results. Therefore, the evolution of the criteria and the structuring of the criteria are necessary, so that companies adopt a more robust position regarding the innovation they want to generate, through requests for technological projects involving larger ones (Da Costa, Puffal, & Puffal, 2015).

This article presents information technology innovation, measuring its results in IT companies in the state of Paraná, represented by a well-structured sector, which presented the difficulties and opportunities they face in their market, but it is not possible to generalization of these conditions for the whole segment, due to the limitation that the method presents and the worked sample. However, this limitation allows the possibility of extending the research work in companies in a national as well as international context to the intuition of identifying the stimuli to innovation and its results in the companies that practice it.

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