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Overview of Hackathons in Brazil

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RESUMO

Objetivo – O presente estudo tem como objetivo geral analisar os motivos que levam as organizações brasileiras a realizarem Hackathons e identificar o que é feito com os produtos vencedores após o evento.
Referencial Teórico – As práticas de inovação aberta promovidas por empresas brasileiras conhecidas como Hackathons, tornaram-se populares desde o ano de 2014. A pesquisa contribuiu para avanços na prática de Hackathons no país, contribuindo para a disseminação da inovação aberta nas empresas brasileiras.
Desenho/Metodologia/Abordagem – uma pesquisa de natureza exploratória e qualitativa foi utilizado um estudo baseado em entrevistas em profundidade para atingir seus objetivos. Foram realizadas entrevistas com seis empresas promotoras de eventos de Hackathon, três consultorias que atuam na organização de Hackathon e vinte participantes individuais.
Resultados – Observou-se que os eventos têm como benefícios: a melhoria da imagem da organização perante a sociedade e seus stakeholders; apoiar o desenvolvimento de uma cultura organizacional focada na inovação e na retenção de novos colaboradores criativos.
Pesquisa, Implicações Práticas e Sociais – Os participantes apontaram como vantagens, a ampliação da rede de relacionamentos com empresas e outros agentes do Hackathon, a troca de habilidades e a possibilidade de contribuir com causas sociais.
Originalidade/Valor – Identificou-se, na pesquisa, que o hackathon é utilizado como método de retenção de mão de obra especializada por empresas privadas, que entendem ser uma oportunidade de conhecer, na prática, o comportamento e o conhecimento de potenciais trabalhadores. Outra motivação para a prática do hackathon é a oportunidade de testar e validar seus produtos ou entender melhor seus problemas, pois muitos participantes externos podem ser ou ter sido clientes da empresa promotora.
Palavras-chave – inovação, inovação aberta, hackathon.

ABSTRACT

Purpose – *The main purpose of this study is to analyze why Brazilian organizations hold Hackathons and to identify what happens to the winning products after the event.*
Theoretical Framework – *The open innovation practices promoted by Brazilian companies known as Hackathons, have become popular since 2014. The study has contributed to advances in holding Hackathons in Brazil, contributing to the spread of open innovation in Brazilian companies.*
Design/Methodology/Approach – *Exploratory and qualitative research was used a study based on in-depth interviews to achieve its objectives. Interviews were conducted with six companies that promoted Hackathon events, three consultancies who organize Hackathons and twenty individuals who have participated.*
Findings – *It was found that the events brought benefits, such as improving the organization's image namely to the company itself and its stakeholders; supporting the development of an organizational culture focused on innovation and the retention of new creative employees.*
Research, Practical & Social Implications – *Participants identified networking with other companies and other Hackathon agents as advantages, along with an exchange of skills and the possibility of contributing to social causes.*
Originality/Value – *It was identified, in the study, that a hackathon is used by private companies to retain specialist labor, where the company sees it as an opportunity to find out, in practice, the behavior and knowledge of potential employees. A hackathon can also be held so that companies can test and validate their products or understand their problems in more detail, as many external participants may be or have been clients of the company promoting the event.*
Keywords – *innovation, open innovation, hackathon.*

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1. INTRODUCTION

The relationship between innovation and the competitiveness of organizations has been highlighted by several authors (VALENCIA; JIMENEZ; Valle, 2012; LIAO, 2016; CHIU; YANG, 2019). Especially in the last two decades, open innovation is on the rise. It is about the sharing of forces and knowledge to obtain a new product or service. Open innovation is born as a model of innovation management, 21st century specific, in which companies may choose not to fully invest their capital in their research and projects, but choose for the purchase or licensing of projects or for innovation processes that occur through relationships with other organizations, universities or research institutes. (IVASCU; CIRJALIU, DRAGHICI, 2016; PILAV-VELIC; MARJANOVIC, 2016; ZHU; XIAO; DONG; GU, 2019).

For Chesbrough (2003), open innovation is a process in which the external and internal conditions of a system are combined. In wich way, the organization takes advantage of external knowledge in order to obtain a better performance in its own production processes.

There are several factors that move organizational dynamics such as a new product development, process adjustments, employee training, new mergers and so on as to the ongoing procedures of an enterprise. However, when dealing with open innovation, issues such as competitive strategy, mission and vision of the organization should not be left out. (CHESBROUGH; VANHAVERBEKE; WEST, 2006).

As digital technology advances, many companies are trying to adapt to this new scenario. Rogers (2017) emphasizes that access to tools, such as software and arduinos, makes it easier and faster to test and launch new ideas on the market. In this direction, one of the possible actions that companies can bet on to optimize the process of portfolio generation with the use of open innovation is the implementation of Hackathons events. Moreover, there is a market need to understand how these events can be better used, as well as the opportunity to bring new theoretical perspectives to Open Innovation.

Kolog, Sutinen and Nygren (2016) define Hackathon as an event where computer programmers collaborate to work on or build new software solutions within a limited time frame. The main goal of any Hackathon is to have a minimum viable product at the end of the event.

Although they have become increasingly frequent on Brazilian companies' practices, the search for studies using the term "Hackathon", in international databases, shows a relatively low number of articles. In these articles, no texts on “Hackathon in Brazil” were found. Such being the context, this research seeks to answer the following question: what are the objectives of Brazilian organizations when holding Hackathon events?

With a qualitative focus, the research uses the multi-disciplinary study on six companies that promoted the Hackathons and three consultancies that offer support in the organization of events, as well as twenty individual who were a part of hackathon events were interviewed. The article is justified by its contribution to the literature in dealing with a relatively new phenomenon, which has become more and more frequent as a practice in business organizations.

The scenario, in which digital technology evolves and innovation becomes increasingly important for the competitiveness of organizations, research on the subject can contribute not only to the generation of scientific knowledge, but also to the dissemination of events in the context of organizations and to becoming better known. In addition, the qualitative approach is appropriate insofar as the research deals with a subject that is still little explored, since few articles have been produced, and may serve as a basis for the deduction of hypotheses in future works of a quantitative nature.

2. THEORETICAL FOUNDATION

2.1 Open Innovation

The customer's contribution to open innovation has an important influence on the development of new products (SANDMEIER, MORRISON; GASSMANN, 2010). For much of the mid-20th century, companies kept operating in the closed innovation system. Trade secrets and patents could only remain within the organization; however, the adoption of open innovation and the need to grow into new technologies together have changed the business culture and strategy. (RAYNA; STRIUKOVA, 2015).

In closed innovation, the whole process of research and development is the company's own; thus, the creation of ideas and their development is controlled by it. The more open an organization is to external knowledge, the better it tends to have its monetary return. (KAFOUROS; FORSANS, 2012).

The open innovation for Chesbrough (2006) is a collaborative process in which there is an exchange of information from various external and internal actors and is related to the company's greater connection with suppliers, customers and other sources of knowledge such as universities, incubators or innovation hubs, seeking to value internal ideas by selling them or presenting them to the market. In this way, they develop an integration in co-creations with clients or alliances with companies and *joint ventures.*

With increased competition between innovative products and market adherents being added to the scenario, organizations seek external partnerships. Therefore, it is assumed that a company cannot innovate alone. It must have an interaction with different partners in order to obtain an exchange of ideas and materials from the outside so that it may keep up with the competition. (CHESBROUGH, 2003; GASSMANN; ENKEL; Chesbrough, 2010; DAHLANDER; GANN, 2010; SILVA; SILVA, 2015; FREEL; ROBSON, 2017). According to Chesbrough (2006), innovation and creation are necessary factors within any conglomerate. Companies that have products of high technological content should adopt open innovation even more. The authors Dahlander and Gann (2010) divide the studies related to open innovation into four axes, as shown in Table 1.

Table 1 - Visions on open innovation according to various authors

Authors	**What is Open Innovation**
Henkel (2006)	Open innovation is a way out for companies that have good internal resources for the external environment.
Chesbrough and Rosenbloom (2002)	Open innovation can be configured as an advantage of positive aggregation to the product, from the perspective of the market.
Frey and Birkinshaw (2005)	Open innovation is related to the external environment and to the exchange of experiences that the company may have with suppliers, customers, competitors, consultants, universities, public research organizations and others.
Chesbrough and Crowther (2006).	Open innovation can be an alternative for acquiring new innovations and contributing to the innovation process through formal and informal relationships.

Note: Authors.

According to Roper and Arvanótiz (2012), for some services, processes or products to be correlated to the innovation value chain, they need to be developed from knowledge management and companies that wish to have with their products and services in focus on the market must perceive and retain the desire of their consumers. This way, it is assessed that the future of open innovation will be even longer, collaborative, structured and with a variety of participants, since the company will benefit in all its sectors.

Organizations will note that in order to develop new products in an environment where other companies practice open innovation, the research and development laboratory shall be the only alternative. (GASSMANN; ENKEL; CHESBROUGH, 2010).

With the increased connection of digital platforms in the open innovation environment, new opportunities arise in different sectors such as consumer software, entertainment and household appliances and even in health and energy. It is considered that because new technologies develop even more interactions, open innovation becomes a mechanism for reducing research costs, decreasing risks and raising the form of commercialization. (NAMBISAN; SIEGEL; KENNEY, 2018). Online communities can be a strong strategy for companies as they offer the conditions to create new ideas and to reduce the cost of R&D, valuable points in organizations.

Another valuable way for the company that adopts the online community in its process of open innovation is in the customization of its products since, in the past, mass customization meant asking each consumer their preference among a wide range of options.

With the adoption of online communities, the participants themselves develop the products with others; therefore, mass customization can be achieved through the customers themselves. Another change in the access to online communities relies in its democratization, that is, large and small companies can make use of the digital tool and impact the external community. (RAYNA; STRIUKOVA, 2015).

In the current system, internal resources should not be considered as the only source of innovation; a vision for other sources of innovation collaborates to the evolving of marketing relations amongst all organizations. With recent advances in information technology and the emergence of social media, consumers have had greater interaction with their peers in online communities. It is estimated that companies still do not take advantage of such a bank of information, that is, they do not take advantage of groups of people generating discussions that could become sources of references for new products and processes.

Thus, it is believed that the development of online communities promotes the sharing of information, experiences and knowledge about a new product and this can engender strategic and economic factors for companies to plan ahead (BUGSHAN, 2015). The reasons that motivate companies to incorporate open innovation into their strategy correlate with the possibility of lower cost to improve time and risk sharing with external partners. (CHESBROUGH, 2006). Therefore, the business strategy that dictates the company must interact with external sources is growing.

The company's strategy towards open innovation emphasizes this exchange of flows of technology inputs and outputs so that, consequently, there is growth in the internal innovation. Working with open innovation reduces the chances of mistakes because there is a sharing of risks. Implementing an innovation strategy is a dynamic process in complex organizational and contractual circumstances (SIKIMIC; CHIESA, FRATTINI; SCALERA, 2016).

When evaluating the company's management study, the use of open innovation should be implemented gradually, mainly evaluating the organization's plan and balancing external resources with internal R&D resources. In addition, it is necessary to consider the size of the company as well as its total assets, age, quality and human capital in order to reach the ideal formula of open innovation balance. (ZHANG; YANG; OJU; BAO; LI, 2018).

2.2 Hackathons

In Brazil, the Hackathon event is related to the Campus Party technology, innovation and entrepreneurship festival, first held in São Paulo in 2008. This event received approximately 8 thousand people, becoming traditional in the capital's calendar, being known for gathering technology sympathizers who, for a week, camp and participate in lectures, technological challenges and Hackathons.

The Hackathon event in Brazil is becoming more and more popular, since only in the public sector, between 2012 and 2016, 47 Hackathons were held, and the region that most concentrated the marathons was the State of São Paulo. (FERREIRA, 2017). Known as an event where technological solutions are created, Hackathon has several definitions, as shown in Table 2.

Table 2 - Definition of Hackathon

Definition	**Author(s)**
A union of two words in English, hacker and marathon, its combination literally represents a marathon of programmers.	Briscoe and Mulligan (2014)
A team competition to code and complete a project that can last a night, day or weekend. Participants, mostly computer programmers, seek to solve a problem.	Robinson and Johnson (2016); Weinberger (2017)
A hacker marathon, usually sponsored by a company or investor, in which computer experts aim to meet a certain technological challenge, such as the creation of software.	Guerrero (2016)
Popular event format, especially in the field of computer science and engineering. A Hackathon is a short event, occurring during a day or weekend, usually around an open goal. These goals can be very broad, such as creating interesting applications for smartphones, or more focused, such as building classification models for biological phenotypes based on high productivity or genomic data.	Doshi-Vellez and Marshall (2015); Kolog, Sutinen, & Nygren (2016)
A collaborative software design competition. The term Hackathon is very broad - it is a combination of "hack" (computer programmers' slang for software exploratory projects) and "marathon" - and encompasses an ever-expanding category of events in which technical experts converge on a predetermined location, establish temporary partnerships, and work intensively together for a limited period to solve technical, social, or socio-technical problems.	Pogačar and Žizek (2016)

Note: Authors.

Each Hackathon is unique. Therefore, at one time the group of developers must create a mobile application and at another work with genome data. One of the factors that encourages participants to attend such an environment is the experience, many times more than the prize. What differs a Hackathon event from a simple data analysis environment is the participants' quest for creativity in developing a new solution, promoting learning, a spirit of collaboration and developing a network of individuals engaged to respond to new challenges (DOSHI-VELEZ; MARSHALL, 2015).

According to Sakhumuzi and Emamanuel (2017), Hackathon translates a byproduct of an open source community for organizations as a way to get "out of the box" ideas and encourage staff to improve their skill sets. For participants, these meetings provide networking with other professionals and exchange experiences. At the end of the marathon, a minimum viable product is expected. Furthermore, it is important to emphasize that Hackathons have positive effects on civic engagement (JOHNSON; ROBINSON, 2014) and entrepreneurial citizenship (IRANI, 2015).

There is no standard format for a Hackathon, as it depends on factors such as: time, size and resources of the organizers. The competitors are divided into teams and the generation of ideas begins, which brings up a concept that will ultimately bem ade into functional prototype. A characteristic of these events is the variety of free food, prizes, gifts, relaxing facilities and good internet connection.

According to studies by Briscoe and Mulligan (2014), six factors are considered for the success of Hackathon's competitions:

a) Definition of the problem to be worked on at the event: if the organizers are unable to adequately communicate the problem area, the participants may fail to develop the required solution;

b) Final prize: the type of reward for the winning project can act as an incentive for people to participate and, when in the contest, do their best;

c) Complementary team in skills: the more complementarity, the more opportunity to develop solutions with more execution capacity;

d) Identification of the skills of the participants by the Hackathon organization: assess how capable the teams are in executing the presented problem;

e) Technical capacity of the jury: a jury with a solid academic and professional background should be available so that the best projects are the ones awarded;

Entry requirements: Organizers must make clear what the criteria of the event are. According to researchers, all six conditions are very valuable to achieve success at Hackathon, but defining the problem that will be addressed at the event is one of the most influential. Having a team with complementary skills is important, since the final solutions always need a multidisciplinary approach. It is essential to have mentors with knowledge about the theme being presented at the event to inspire and motivate the development of the

best solution. The study concludes that in each new event the six factors must be well highlighted for Hackathon's success.

According to Briscoe and Mulligan (2014), there are six themes in Hackathons events that can be applied separately or together:

a) Unique applications: focuses on developing only one solution, for example, creating applications or developing a programming language;

b) Type of application: there is a specific platform to develop an application, video game or web system;

c) Technology-specific: technologies that use a very specific and unique computer language;

d) Society oriented: it seeks to contribute to the resolution of more social problems such as public services or crisis management;

e) Specific demographic information: they are aimed at local groups of people, such as women, students or adolescents so that, from their problems and experiences, it is possible to develop some project linked to the digital part;

f) Company internal: companies that, within their infrastructure, organize Hackathons events among their employees.

Finally, Guizardi *et al.* (2018) argues that the perception that Hackathons essentially promote technological development, in a dynamic space and with broad creative potential. However, a well-defined design regarding the challenge is needed, since hackathons are activities that require clear guidance. In this sense, the redirection and expansion of the potential of this event does not simply suggest a borrowing from other areas of activity, but also the need to choose specific methodological strategies, guided by the outlined objectives. Also, for the authors, some characteristics were confirmed as structuring the methodology: collaborative work, intensiveness, informality, focus on innovation and application and technological development.

To a lesser extent, competitiveness can also be highlighted. In addition, hackathons are capable of promoting a dialogue between areas, providing a multifaceted view of the issues raised by the challenge. This factor allows for a favorable environment for the creative aspect itself, which expands the innovative capacity for products made in marathons. Finally, the methodology seems to have an interesting training potential, as its central elements are

collaboration and innovation, which is particularly important when used in challenges with great social relevance (GUZARDI *et al.*, 2018).

3. METHODOLOGICAL PROCEDURES

As to type, the research can be classified as descriptive research, since the objective is to describe the characteristics of a phenomenon for the study carried out. For Flick (2009), the main aspects of qualitative research are in the choices of both theory and method, in the overview of the subject studied, in the critical perspective of the researcher on the study for the production of knowledge and in the Search for a variety of results.

The present study is based on in-depth interviews, since the Hackathon phenomenon was discussed in different contexts and perspectives. As for the analysis units, the organizations that promoted the events, the consultancies that help in the organization of the events and the participating individuals are studied.

The data collection was based on interviews, participant observation and the analysis of the edicts related to the promotion of the events. For the development of the research protocol, the previous notices of Hackathon events were used as sources of information, which are public documents presenting the structure of the competition (these notices contain the challenge that was proposed, the profile of the participants, the issue of intellectual property, awards and evaluation criteria).

The interviews were conducted through a script of questions in person at the end of events, lasting about thirty minutes per respondent. Data were transcribed within one day after the interview so as not to lose empirical elements of the observations during the interviews. The number of respondents was defined as a function of the exhaustion of variations in the answers at a point that proved to be sufficient to allow inferences and reflections on the results obtained.

Regarding the promoting organizations, 6 professionals working in innovation, human resources and technology positions were interviewed. As for the consultancies, an internet search was carried out in order to identify which ones organized such events, obtaining the acceptance of interviews in three of them, all interviewed by the owners of these companies. Regarding the participants of Hackathon events, 20 people were interviewed; this number is due to the time limitation of the research.

The multiple sources of evidence (interviews, participant observation and analysis of the edicts) were one of the main concerns of the research in order to engender a solidly grounded chain. Another care for the validity of the research was in the review and transcription of the interviews so that all the information collected was stored and then used in the analysis of the investigation.

The categories (and subcategories when applicable) for data analysis were:

- Area of activity, company category and number of employees;
- Hackathon Goals;
- Post-Hackathon Planning;
- Evaluation of the main benefits generated in the Hackathons: benefits of a Hackathons derived company;
- Perception of post-Hackathon: how the projects behave after the event;
- Motivations to continue participating in the Hackathons (network; learn; prize; social impact; leave the routine; getting to know the company; fun; theme; improve skills; create new products; knowing innovation; collaboration; challenge; friendship; fun; experience)
- Positive points (network; learn; create new products; cocreation; contact human resources; challenge; prize; fun; social themes; area exchange to solve problems; unique; recognition);
- Negative points (no post Hackathon; infrastructure; unprepared mentors; tiredness; very competitive; only 1 prize; choice of ideas, not prototype in the jury; solutions already brought developed; lack of feedback; intellectual property; weak prizes; there is no negative point; marketing event and not innovation; charge to enter).

4. RESULTS

4.1 Companies participating in Hackathons

The Table 3 presents the area of operation, whether it is public or private capital and the total number of employees working in these companies.

Table 3 - Area of activity, company category and number of employees.

Company	Field of action	Category	Number of employees
1	Technology	Private company	> 500
2	Technology	Public company	100 – 500
3	Technology	Private company	> 500
4	Education	Public company	21 – 91
5	Logistics	Public company	> 500
6	Entertainment	Private company	> 500

Note: Authors.

Although a Hackathon is a technological event, other branches of companies can also participate, such as: education, urban logistics and entertainment. Thus, it is analyzed that there is no restriction as to the sector of the organization, however when talking to the interviewees, it is clear that the goals of the marathons is to develop solutions related to the digital technology segment. As for the category of organizations, it can be observed that 50% are private companies and 50% public companies.

The main difference between them is that public institutions depend a lot on sponsorship or the opening of a bid for the approval of the financial resource for Hackathon; the private company has a differentiated resource by the department of innovation, marketing or human resources; this way it can be understood that the process of execution in the public sector is more time consuming than in the private.

Regarding the size of the organizations interviewed, according to the number of employees it can be observed that most can be classified as large organizations, with the exception of the company related to the area of education that fits as small. In this case, it is interpreted that the promotion of Hackathon was correlated to the fact that the board of the institution encourages its students to have contact with innovation. It can be concluded that more companies in the technology field seek to hold Hackathon events as a priority, but it was observed that other followers also bet on the marathon. In relation to the company's goals, Table 4 shows the results obtained.

Table 4 - Hackathon Goals.

Company	Goals
1	Hiring skilled people with an innovative profile.
2	Being able to create digital products to be applied later in municipal services.
3	Test your products, hire people and participate in technology groups.
4	Encourage your students to work with real technology and innovation projects.
5	Bring innovation to the urban mobility segment and thus make alliances with local innovation agents.
6	Promote the company's image in the technology community and prepare for digital changes.

Note: Authors.

One of them is to have an environment where it is possible to bring together innovative and committed people to develop technological solutions. For Rayna and Striukova (2015), the formation of a community strengthens the company's strategy in reducing research and development costs or in customizing its products. Another point observed is the promotion of a "knowledge exchange" for employees. According to Altman and Tuchman (2017), in the transition companies are facing, generating greater connections between people can be a factor for success in organizations.

In addition, bringing together such a community of participants with diverse thoughts and visions makes it opportune for the one who has outstanding characteristics for the company, a job invitation. This is one of the goals pointed out by the interviewees when promoting Hackathon, since they can observe how future employees work in practice.

When companies try to identify human resources at Hackathon events, they must understand the motivations of future employees to be developing a solution at the weekend. Hackathon can be a place to identify opportunities for hiring human resources, however, this practice is observed only in private institutions, as there is a flexibility in the hiring process; in public institutions, there is a requirement to go through a tendering process.

A company's declared goal - at an open innovation event - was to develop solutions and later on implement them. In this context, Chesbrough and Crowther (2006) and Christensen, Olesen and Kjær, (2005) state that open innovation is associated with the company's alternative in acquiring new innovations through relations with the external environment.

Another point that Hackathons provide for organizations is the improvement of their image, thus concluding the existence of a marketing linked to innovation. One of the spheres is the positioning of the company on the way in which the brand introduces its products and services in the market.

Thus, having an organization that promotes actions for the development of new products and stimulate digital innovation can be very well seen by stakeholders and society. In short, companies 2 and 5 have similarity in their Hackathon objectives, that is, to create digital solutions in their area. Companies 3 and 6 have an objective the search of proximity with the technology communities.

Furthermore, it was observed that the intellectual property in Hackathon events belongs to the participant himself, only the second company divides the intellectual property from the result. However, company 2 attests that if the product can be applied in the city where it was created, it can be implemented with or without the help of the participants, but it can be used in another city, by its creators, without any impediment.

According to Rayna and Striukova (2015), managing intellectual protection is perhaps one of the greatest challenges for companies embracing open innovation. For Hall (2010), companies must have a sound strategy regarding intellectual property, especially in the direction of open innovation.

A possible solution could be a two-pronged strategy: openness and incentives. According to Farrell and Shapiro (2004), in the incentives process, the projects are fractioned and step by step are presented to all involved (participants and companies). In the open, the participant enters with the creativity and the company with the execution. In this modality, the most developed projects are the open software and design.

Finally, as shown in Table 5, it can be identified that of the companies interviewed, the public companies sought to continue in the post-Hackathon. The private companies, on the other hand, did not demonstrate to carry out or continue with the projects after Hackathon.

Table 5 - Post-Hackathon Planning.

Company	Post-Hackathon Planning
1	No post-hackeaton planning.
2	Yes, projects that have synergy with the organization can be implemented; there have already been projects of the first Hackathon that were implemented.
3	No post-hackeaton planning.
4	Yes, the projects are currently incubated and the teachers provide support so that they can be further developed.
5	Yes, the company has created a laboratory so that the best projects can be incubated for a period of 6 months.
6	No post-hackeaton planning.

Note: Authors.

According to the interviews, no organization has used, for example, the Good Law (11.196/05) which aims to encourage greater access to projects related to the digital area or even the agencies that promote innovation, such as the Foundation for Research Support of the State of São Paulo (FAPESP), which through the program in micro, small and medium-sized enterprises in the State of São Paulo (PIPE) supports embryonic projects, typical of Hackathon. It is understood that there is a lack of post-event planning and a greater search for sources of internal or external support from the company so that innovation can reach the market. Thus, a possible way of using financial resources, for Hackathon projects, could be in the PIPE program.

4.2 Consulting companies that organize Hackathons

One of the main points to be analysed, according to the evaluation of the consulting interviewees, are the reasons why companies promote Hackathons.

For consultancy 1, the government and NGOs, in general, seek another solution that has a social theme. On the other hand, companies and universities want to generate a positioning and marketing to show their stakeholders, besides some actions of talent selection.

Consulting 2 states that all Hackathons started from problems that the companies really had and wanted the external community could help to solve. Finally, for the

consultancy 3 approximately 90% of the companies that seek the consultancy, do not have clear why they want to do a Hackathon; many have seen a company do it, noticed that they have to innovate in some way and want to have visibility in front of their competitors or simply want a ready-made product from such event.

It is observed that many organizations still do not know the reasons why they promote a Hackathon. This characteristic is found in the process of mimetic isomorphism. According to the authors Oyadomari, Cardoso, Mendonça Neto and Lima, (2008), mimetic isomorphism is related to the doubts that companies have about the market in which They operate and, with these issues at stake, they end up identifying practices of other companies and copying them.

This behavior reflects the insecurity of companies regarding the real promotion and subsequent implementation of projects, a consequence of the lack of strategic planning in relation to innovation. According to Altman and Tushman (2017), the change in the current innovation strategy is related to a greater connection of people and the transition that companies are facing between closed to open innovation, and this process is a decisive factor for the success of the organization.

In the view of the consultancies, the direction of the activities to the clients must be clear with the presentation of a script before, during and after an Hackathon, in order for it to be more successful in the innovation process. The traditional model, which deals with the process of technological innovation, represents it in a single cycle, i.e. the need and opportunity for some improvement should be identified for later, knowledge and restrictions of technological, economic and social environments to be incorporated into it to see if it results in an invention. In the future, when the product is introduced in the market, the invention becomes an innovation and becomes widespread.

The Table 6, in turn, presents the evaluation of the benefits that the Hackathon event can generate for companies, according to the researched consultancies.

Table 6 - Evaluation of the main benefits generated in the Hackathons

Consultancy	Benefits of a Hackathons derived company
1	Marketing to be an innovative company and this appears in various media and within the organization itself before employees.
2	Exchange of information and interaction with a younger market and resolution of internal problems with other perspectives.
3	Having specialists to work with the issue of different digital technologies, contact with the young public and search for qualified human resources.

Note: Authors.

One of the interviewees believes that there is a strengthening of the image of an innovative organization. A company with characteristics of innovation, besides acting in the change of products and processes, can exert transformations in terms related to its business model, its strategy, its leadership style or its image (IYER; LAPLACA; SHARMA, 2006).

It is true that if the Hackathon event is a part of the organization's strategy of change to stakeholder thinking and action, the technology marathon can be a pillar to be added to the company's image; however, if the perspective of change does not exist, Hackathon will be more of a one-off event not generating organizational transformation.

Another point assessed as beneficial is direct contact with qualified human resources. Consultancies provide the introduction of companies into an innovative environment and, especially, into the relationship with participants. Regarding the effects of post-Hackathon projects, Table 7 presents the results obtained.

Table 7 - Perception of post-Hackathon

Consultancy	How the projects behave after the event
1	The consultancy can provide support after Hackathon, but companies do not seek to continue the legacy of the event; one of the reasons would be the difficulty of interaction - of the teams - after the marathon.
2	If the client wants to continue any project, the consultancy gives full mentoring to make it happen. In the last edition, one of the groups continued the project with the company.

3	There is still no post-Hackathon thinking in companies, but those who organize more than one marathon edition per year can, at the second moment, identify better opportunities to grow the projects.

Note: Authors.

Guizardi *et al.* (2018) argue the perception that Hackathons essentially promote technological development, in a dynamic space and with ample creative potential, but it was observed that few companies have the concern to validate or implement the projects developed at Hackathon, although it is important to emphasize that structured post event procedures still need to be structured.

Finally, according to table 8, the innovation generated in the company by a Hackathon is very much related to the impact that the event can generate on its employees and, consequently, on innovation within the company.

Table 8 - The innovation generated at Hackathon

Consultancy	The innovation that generates the event
1	Hackathon is a way to stimulate human resources, new products and innovation. Hackathon serves as the first step in thinking about structured open innovation and thus impacting your employees.
2	Companies that compete in the same sector can unite in these events to seek to understand more about the problems of the market and, from this, each one innovates according to the identification of opportunities.
3	The company that participates in a Hackathon is ahead of its competitors when it comes to innovation, even more digital. A Hackathon is not an innovation, but paves the way for it to emerge in the company.

Note. Authors.

One of the differentials of consultancies is to know their audience, i.e.: developers, designers, entrepreneurs and innovation sympathizers. According to Bugshan (2015), community development promotes the sharing of information, experiences and knowledge about a new product and this can provide strategic and economic factors for companies to plan for the future, i.e., the social gains are broad.

4.3 Participants of Hackathon events

As for motivations to participate in new events, table 9 illustrates that 50% seek to create a network, 45% want to learn more, and 25% feel motivated by the prize available. A participant may also be in an intrinsically open innovation event, that is, to develop something in a collaborative and non-competitive way, not observing the prize as a fundamental factor. In fact, the collaborative environment of the Hackathons stimulates the exchange of knowledge and personal and professional contacts, generating an atmosphere of motivation.

Table 9 - Motivations to continue participating in the Hackathons

Current motivation	**Interviewed**	**% of replies**
Network	1, 3, 4, 5, 10, 11, 14, 16, 17 e 19.	50%
Learn	2, 3, 5, 9, 12, 13, 14, 15 e 19.	45%
Prize	3, 5, 8, 11 e 20.	25%
Social Impact	1, 10, 13, 15,	20%
Leave the Routine	2, 4 e 15.	15%
Getting to know the Company	4, 8 e 11.	15%
Fun	3 e 15.	10%
Theme	6 e11.	10%
Improve skills	7 e 9.	10%
Create new products	8 e 16.	10%
Knowing innovation	17 e 18.	10%
Collaboration	12 e 16.	10%
Challenge	17	5%
Friendship	18	5%
Fun	15	5%

Experience	10	5%

Note: Authors.

An important element, pointed out in table 10, is that 65% of participants find it positive to expand their network. According to Sakhumzi and Emamanuel (2017), in an open technology event, there is an opportunity to conceive an idea "out of the box", in addition to the exchange of experiences providing networking with other professionals. For 45% of those interviewed, the fact that they are in an environment where one can learn about issues related to technology or areas linked to it is something positive and 40% stated, as a highlight, the creation of new products, since there are opportunities to obtain detailed explanations about the problem or to find professionals who complement the group.

Table 10 - Hackathons - positive points

Positive Points	**Interviewed**	**% of replies**
Network	1, 2, 4, 6, 7, 9, 10, 12, 14, 16, 17, 18 e 19.	65%
Learn	1, 2, 3, 4, 6, 10, 11, 12, 16	45%
Create new products	1, 3, 4, 6, 9, 10, 11, 17,	40%
Cocreation	1, 13, 14, 19	20%
Contact Human Resources	4, 7, 8	15%
Challenge	14, 18, 19	15%
Prize	9, 14 e 20.	15%
Fun	2, 12	10%
Social themes	9	5%
Area exchange to solve problems	5	5%
Unique	15	5%
Recognition	17	5%

Note: Authors.

According to Doshi-Velez and Marshall (2015), what differentiates a Hackathon event from a simple data analysis environment is the participants' search for creativity to develop a new solution, in addition, learning is promoted and the spirit of collaboration is developed in a network of individuals engaged to respond to new challenges.

It is clear that working in an environment full of information, with technological tools and with participants presenting different knowledge promotes the formation of new products that can even reach the market, however, the Hackathons still have many obstacles such as lack of planning and dedication in the post-Hackathon of both the organizing company and the groups formed.

A Hackathon event also has negative aspects according to respondents. Usually there is a short term and well-defined roles for the creation of ideas, but if the company wants to hold a more complete event, it must have, in its strategy, the intention to develop a long-term relationship with the participants in order to maintain an innovative community around them.

The Table 11 presents the main negative aspects of the events, among which thirty percent of those interviewed stated that there are events with a poor infrastructure: absence of a place to sleep, internet, ergonomics or food. The complaint may be associated with the fact that 20% of the interviewees evaluated the event as a negative point as being tiring.

For 20% of the participants interviewed, one of the major problems of the Hackathons is in the jurors who will evaluate the projects, because many seem not to be prepared for the evaluation, since in some events, points were judged that were not related to the edict, and the academic background of the jurors is not compatible with the area.

Table 11 - Hackathons - negative points

Negative points	**Interviewed**	**% of replies**
No post Hackathon	1, 10, 12, 14, 15, 16, 17	35%
Infrastructure	7, 9, 12, 13, 14, 16	30%
Unprepared Mentors	1, 7, 14, 20	20%
Tiredness	1, 2, 4, 8	20%

Very competitive	13, 15 e 19	15%
Only 1 prize	4, 10	10%
Choice of ideas, not prototype in the jury	5, 6	10%
Solutions already brought developed	17, 19	10%
Lack of Feedback	7, 18	10%
Intellectual property	1	5%
Weak prizes	8	5%
There is no negative point	11	5%
Marketing event and not innovation	12	5%
Charge to enter	3	5%

Note. Authors.

Regarding the concern with intellectual property, 65% of the interviewees continued the projects developed in the Hackathons, although most of the participants started their projects in an unstructured way and without support from the promoting companies. In fact, no concrete example of a solution has been seen that has reached the market.

When asked about intellectual property concerns, 65% of participants said they select the events that have already defined whether the final project will be owned by the company, the participant or both. Many participants understand that leaving intellectual property with the sponsoring company may reduce their chances of having a startup in the future, for example. According to the respondents, many companies use the projects or part of them in their processes or products. One example, commented on by several competitors, was a Hackathon promoted by a bank that, at the end of the event, ended up using the four best projects to create a digital product related to the bank account, without the partnership of the teams.

According to Hall (2010), having a secure strategy in relation to intellectual property is fundamental for the company, even more so in managing open innovation. Therefore, it is

of vital importance, for the success among the components of a team, the clarity in the way in which the evolution of prototypes is conducted.

If there is a clause in the participation notice regarding the intellectual property developed in favor of the promoting company, the participant is less likely to make its solution grow. Thus, it was observed that the concern with intellectual property was greater in the first competitions, decreasing with the passing of new Hackathons. It must be remembered that the future of the event is very much related to the benefits provided to all the actors, especially the companies that promote it.

5. CONCLUSION

The main objective of this master's research was to analyze the reasons why Brazilian organizations carry out Hackathons. The results of the research indicate that Hackathon is considered a stimulus for innovation, mainly for bringing together people who know technology and have different backgrounds such as: computing, engineering, business, designer and others.

Regarding what is done with the winning products, after the event, it was observed that there is a separation between public and private institutions. In the public organizations interviewed, there are initiatives so that the winning products can go through a pre-incubation process and, who knows, reach the market. As far as private companies are concerned, it was observed that there is no intention to continue developing the best solutions.

Intellectual property is treated differently at Hackathon events. It was found that there are edicts that do not mention to whom the developed project will belong. It was identified in the research that Hackathon is used as a form of human resources retention by private companies, who see this as an opportunity to investigate, in practice, the behavior and knowledge of possible workers. This point was much cited in the responses from companies, consultancies and event participants alike.

Another motivation for Hackathon's practice is the opportunity to test and validate its products or to understand its problems more, since many external participants may be or have been customers of the promoting company; therefore, people with different views collaborate directly for the development of a new product or service.

It was noted that some organizations use the event as a way to create communities of new solution developers. This partnership between company and people represents an intangible value that awakens a trend related to the digital era. Thus, even companies that do not have a real reason to promote Hackathon do so because of the need to innovate and to match other organizations, competitors or not, that promote such initiative.

In the social field, it is understood that participants can be engaged to solve social problems with the help of technology. One could see examples of interviewees whose motivational factor in participating in such events is their willingness to contribute to the causes of society. In addition, it was perceived that the event could be a form of professional qualification and greater contact with the labor market.

As a managerial contribution, it is also suggested that Hackathons can take place led by private companies or public institutions. In this sense, for this event to be carried out with more efficiency and quality, some elements need to be observed: the choice of a strategic location, with quality infrastructure, since participants will spend night (or nights) in this place. An event support team also needs training and knowledge of procedures. Likewise, the event's rules, the form of evaluation of the results and how they will be applied need to be very clear to the participants, elements in the research being a point of analysis as to whether there will be adherence or not by the participants.

The research supports the literature's perspective that hackathons are a good time to put ideas into practice and get feedback on how they can be applied. This fact is an important contribution to entrepreneurship. In addition, through these events it is possible to develop other actions that favor entrepreneurship, such as the creation of a Minimum Viable Product shared with other participants and having feedback from mentors and colleagues and improving teamwork skills, in addition to contacts established professionals.

Furthermore, it was possible to observe the absence of strategies and documentation regarding Open Innovation in the analyzed events. In this way, losses can be caused, such as distrust in the interaction with other actors in the environment, lack of clarity in the posture that internal professionals should adopt in conducting or participating in collaborative processes, thus damaging one of the pillars of the Open Innovation process.

Theoretical research contribution is based on deepening the knowledge generation process within open innovation. It was identified, in the research, that the hackathon is used as a form of retention of human resources by private companies, which they understand to be

this is an opportunity to find out, in practice, the behavior and the knowledge of potential workers. Another motivation for hackathon practice is the opportunity to test and validate their products or understand their problems more, as many external participants may be or have been clients of the promoting company.

As a limitation, the fact that this is an exploratory study in which there was no further deepening of the relationship between the concepts is cited. For future works, it is suggested that quantitative studies be done in order to analyze the objectives of companies promoting Hackathons, as well as the possible benefits after the event. This paper opens up the possibility of deepening studies that demonstrate the role of event governance in stimulating product development and the role of event organizers to stimulate entrepreneurship and co-creation of new products. Understanding the role of the Hackathons event organizer as a decisive actor in the governance structure as a driver for innovation can bring important insights to the product development literature.

Finally, it is important to emphasize that future studies related to the number of events that generated software or product registrations, formalization of the hiring of participants and the financial value generated by the solutions created can contribute to building knowledge based on the findings of this research.

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