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Mobilizing adaptive competencies in hackathon teams

Mobilização de competências adaptativas em equipes de hackathon

Movilización de competencias adaptativas en equipos de hackathon

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ABSTRACT
This paper aims at identifying the competences mobilized by team members in a Hackathon in the light of the adaptability theory, through a qualitative research with participants of an event organized by the Public Ministry of a state in Northeast Brazil to propose solutions to combat corruption. The data collection procedures involved non-participant observation and fourteen semi-structured interviews with members of five of the twenty teams that participated in the event. Five adaptive competences mobilized by the team members were identified: theoretical-practical knowledge; self-learning; problem solving; socio-emotional adaptability; and situational leadership. The findings contribute to the elaboration of management and people development programs in open innovation environments.
Keywords: hackathon; competencies; adaptability; teams; open innovation.

RESUMO
Este artigo objetiva identificar as competências mobilizadas por membros de equipes em um Hackathon à luz da teoria da adaptabilidade. Trata-se de uma pesquisa qualitativa feita com a colaboração de participantes de um evento organizado pelo Ministério Público de um estado do Nordeste brasileiro. Os procedimentos de coleta de dados envolveram observação não participante e a realização de catorze entrevistas semiestruturadas com integrantes de cinco equipes que participaram do evento. Foram identificadas cinco competências adaptativas mobilizadas pelos membros das equipes: (1) conhecimento teórico-prático; (2) autoaprendizagem; (3) resolução de problemas; (4) adaptabilidade socioemocional; e (5) liderança situacional. Os resultados do estudo contribuem com a elaboração de programas de gestão e de desenvolvimento de pessoas em ambientes de inovação aberta.
Palavras-chave: hackathon; competências; adaptabilidade; equipes; inovação aberta.

RESUMEN
Este artículo tiene como objetivo identificar las competencias movilizadas por los miembros del equipo en un Hackathon a partir de la teoría de la adaptabilidad, a través de una investigación cualitativa en un evento organizado por el Ministerio Público de un estado en el Noreste de Brasil para proponer soluciones para combatir la corrupción. Los procedimientos de recolección de datos involucraron la observación no participante y catorce entrevistas semiestructuradas con miembros de cinco de los veinte equipos que participaron del evento. Se identificaron cinco competencias adaptativas: conocimientos teórico-prácticos; autoaprendizaje; resolución de problemas; adaptabilidad socioemocional; y liderazgo situacional. Los resultados del estudio contribuyen con la elaboración de programas de gestión y desarrollo de personas en entornos de innovación abierta.
Palabras clave: hackathon; competencias; adaptabilidad; equipos; innovación abierta.

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1 INTRODUCTION

Organizations have been looking for strategies to intensify their competency to innovate. Open innovation is one of such strategies in which organizations seek external sources of knowledge in order to gain competitive advantage (in the context of private organizations) or to generate social value (in the context of public organizations) (Chesbrough, 2003; Chesbrough & Crowther, 2006; Dahlander et al., 2021).

One of the important antecedents for the development of innovation is related to the competencies of the professionals involved (Chatenier et al., 2010; Bogers et al., 2018). In line with this idea, Chesbrough (2003) advocates that qualified professionals are key factors in driving the shift towards open innovation. In agreement, Chesbrough (2003) advocates that qualified professionals are key factors in driving the shift towards open innovation. Digital transformation processes and innovation involve agility and flexibility at different levels (individual, team and organization), as well as contributing to the development of a new generation of professionals and the need to reflect on the competencies required to work in innovation environments involving a good measure of uncertainty and unpredictability (Alrasheedi et al., 2022). At the same time that human talent is recognized as a critical factor in the open innovation process, characterized mainly by the ability to deal with technological changes, the literature points to the need for more studies on the subject. (Hafkesbrink & Schroll, 2014; Peris-Ortiz et al., 2018; McPhillips & Licznerska, 2021; Wikhamn et al., 2022).

One of the strategies to foster the process of open innovation, whether in the private or public sector, is the Hackathon, an event that enables the development of innovative solutions from learning based on teams that collaborate intensively (Briscoe & Mullingan, 2014; Byrne et al., 2017; Nandi & Mandernach, 2016), and which usually involves “prototyping some digital artifact” (Byrne et al., 2017, p. 51).

During a Hackathon, several teams are motivated to develop meaningful solutions with the potential to contribute to organizations and society. Worldwide, Hackathons have become an activity organized by companies, as well as cultural and government organizations as an approach to encouraging the digital transformation of their assets and resources (Briscoe & Mullingan, 2014).

The development of a project in a Hackathon can broaden the understanding of the dynamics regarding the performance of teams and their members in innovation environments, in which the speed of change (Tabrizi et al., 2019), innovation (Angarita & Nolte, 2020), and creativity (Briscoe & Mullingan, 2014) are intensely present. This requires a strategy to compose teams and increase the organization’s ability to adapt to environmental changes (Burke et al., 2006). The characteristics of this environment culminate in cognitive and emotional demands that require significant human adaptation for performance (Pulakos et al., 2006; Park & Park, 2020).

Hackathon events are configured as opportunities to develop individual and collective competencies from adapting to unpredictable and uncertain situations. In addition, learning processes in a Hackathon context are experiential, marked by cooperation and competition, and occur informally (Nandi & Mandernach, 2016), that can be a significant learning space to understand the course of action in which teams act, especially when they interact under pressure. Thus, this study aims to identify the competencies mobilized by team members in a Hackathon in the light of adaptability theory. The event was organized by the Public Ministry of a State in the Northeast of Brazil with the objective of proposing technological solutions in order to fight corruption.

This study is motivated by the gap found in the literature on the development of professional competencies in open innovation processes and, in particular, in Hackathons events (Briscoe & Mullingan, 2014; Bogers et al., 2017; Del Giudice et al., 2018; McPhillips & Licznerska, 2021; Wikhamn et al., 2022). The theoretical contribution lies in expanding the understanding of competencies regarding adaptability theory in open innovation environments. From a practical point of view, it can help researchers and practitioners to understand the dynamics of mobilizing adaptive competencies in teams during a Hackathon, as well as serving as a reference for event organizers, since the study reveals the competencies demanded by teams in the innovative solution to a problem of organizational or social interest. Moreover, it is expected to contribute to overcoming cognitive and organizational barriers during the open innovation journey, based on the understanding that the competencies of those involved are critical factors for this process (Peris-Ortiz et al., 2018; Wikhamn et al., 2022). In this way, these contributions reveal the potential of the study for competency-based management programs, as well as in people management processes, aimed at the performance of teams in environments of innovation and intensive knowledge, allowing organizations to develop more assertive strategies for selection, retention and development of their employees.

2 OPEN INNOVATION AND HACKATHONS

Organizations, whether public or private, have been seeking strategies to generate new ideas with the purpose of obtaining competitive advantage and/or adding value to society. In this sense, organizations, from the perspective of open innovation, see the environment beyond their borders, aiming to collaborate with external stakeholders through the iterative exchange of knowledge, technology and resources (Chesbrough & Crowther, 2006; Bigliardi et al., 2020).

Chesbrough (2003) called open innovation the joint action of several sources in the innovation process, which uses at the same time the company's internal competencies, not only to carry out P&D, but also to seek, select and access opportunities and assets external to the company. According to Chesbrough (2006, p. 1), open innovation is defined as "the use of purposeful inputs and outputs of knowledge to accelerate internal innovation and expand markets for external use of innovation".

Although the concept emerged in the context of private organizations, public sector has also been incorporating this process, with the aim of leveraging external resources and knowledge through contributions from citizens or other stakeholders for innovation to help solve problems and contribute to the creation of public value (Yuan & Gasco-Hernandez, 2021).

One of the strategies for opening the innovation process is the promotion of events such as Hackathons. This type of event is aligned with the idea of *crowdsourcing*, in which collective knowledge is used to solve problems by outsourcing activities, ideas and solutions. This type of strategy contributes to the reduction of P&D costs, shares the risks of innovation and can increase the speed with which new innovative products and services are introduced in the market or in the public service (Temiz, 2021).

For Briscoe and Mullingan (2014, p. 1), "the Hackathon phenomenon emerged as an effective approach to encourage innovation with digital technologies in several different spaces (music, open data, fashion, academia and others)". Briscoe and Mullingan (2014), as well as Nandi and Mandernach (2016), highlight that Hackathons emerged in the late 1990s. The term Hackathon is a combination of the words *hack* and *marathon*. The term hack is associated with the exploratory and investigative sense of programming (Briscoe & Mullingan, 2014). Other types or versions of Hackathons are *hackfest*, *game jams*, *design jams*, *jamming sections*, *culture hacks* and *codefast*. Each of these types of events has a specific purpose and/or context (Briscoe & Mullingan, 2014; Yuan & Gasco-Hernandez, 2021).

Hackathons involve pre-defined themes and time limits, in which participants from different areas and expertise form teams to work on projects that involve solving contemporary problems and the search for innovation (Kollwitz & Dinter, 2019; Angarita & Nolte, 2020). In this context, Hackathons are considered open innovation tools, which range from the collection and evaluation of relevant problems, the search and evaluation of solution ideas, to the development of prototypes. In this way, Hackathons have a significant impact on the culture of digital innovation, encourage experimentation and creativity, and they can be challenge-oriented (Briscoe & Mullingan, 2014; Rodrigues et al., 2022).

In the private sector, Hackathons are promoted primarily with the aim of achieving competitive advantage. As for the public sector, organizations aim to improve the performance of the service provided to citizens (Yuan & Gasco-Hernandez, 2021). The effects and objectives of Hackathons in the public sector are diverse and involve increasing transparency, generating innovations, strengthening the innovation environment, improving institutional image, reducing costs, social participation, learning, accelerating organizational changes, improving quality decisions, improving awareness of social problems, formulating policies, among others (Ferreira & Farias, 2019).

There is a tendency, in complex and dynamic environments, such as that of a Hackathon, to adopt project-based work teams, in which members with different expertise work collaboratively to solve a problem or develop a product or service. This scenario requires adaptability, both to maintain adequate performance in the face of uncertainties, and to work with people with different abilities, and different experiences and interests (Ployhart & Bliese, 2006). Reflecting on the links between adaptability and competency mobilization is essential for understanding projects and teams in digital transformation processes.

3 COMPETENCIES AND ADAPTIVE PERFORMANCE

Innovations brought about by digital transformation encompass profound changes taking place in society and industries through the use of digital technologies. Technology itself is just one part of this complex process, which also includes changes in its structure, processes and culture (Vial, 2019). These changes lead professionals to assume roles that were traditionally outside their functions. It is common, for example, for non-IT people to take the lead in technology-intensive projects, while IT people are expected to become active participants in the business dimension (Vial, 2019).

One of the prominent features of this process is uncertainty, intensive knowledge and rapid changes (Tabrizi et al., 2019). These uncertainties are unlikely to be analyzed a priori, requiring professionals to be able to adapt to deal with changes (Abankwa et al., 2019).

In this scenario, there is a need to broaden the understanding of performance, which includes the ability to continually adapt to changes in work situations. Thus, the concept of adaptive performance (Baard et al., 2014; Jundt et al., 2015; Pulakos et al., 2000; Park & Park, 2020; Ribeiro et al., 2022) emerged from the need to insert components into the taxonomy existing performance models. Baard et al. (2014) define adaptive performance as cognitive, affective, motivational and behavioral changes carried out in response to new demands for changing the environment.

Pulakos et al. (2000) were one of the main precursors in understanding the dimensions of adaptive performance, serving as a reference for several subsequent studies (Charbonnier-Voirin & Roussel, 2012; Baard et al., 2014). Supported by evidence from a study that involved diverse

situations at work, the authors identified the following dimensions: (1) creative problem solving; (2) coping with uncertain and unexpected situations; (3) learning new tasks, technologies and procedures; (4) demonstration of cultural adaptation; (5) demonstration of interpersonal adaptation; (6) coping with stress; (7) coping with unforeseen and crisis situations; (8) physical adaptation (related to the environment).

Another important theoretical model was proposed by Ployhart and Bliese (2006), called I-ADAPT. According to the authors, understanding individual differences in adaptability is useful for improving human performance in complex and changing environments. Such adaptation involves ability, willingness and motivation to adjust to environmental, social and task characteristics. However, the authors consider adaptability to be a reasonably stable individual characteristic that influences how a person interprets and responds to different situations (Ployhart & Bliese, 2006).

Technological changes and new knowledge-intensive ways of working require professionals to continually update their competencies and knowledge. In this scenario, there is a need to reflect on the concept of professional competence and the importance in which situational events gain in these work environments (Zarifian, 2001). Such events can occur during work situations that are normally unpredictable and unique. Zarifian (2001, p. 42) states that “work is the competent action of the individual in the face of an event situation”.

Faced with the unpredictability arising from the rapid changes of projects and the change of these environments, professionals can put at risk the fulfillment of project objectives. This requires adaptability not only of team members at an individual level, but also team adaptation at a collective level (Burke et al., 2006; Baard et al., 2014; Christian et al., 2017). In this regard, from the theoretical integration between competencies and adaptive performance, we bring the concept of adaptive competencies as those that are mobilized and combined by the members both to adapt and to contribute to the team adaptation.

In this way, adaptive competencies are anchored in the dimensions brought by the adaptive performance construct for the understanding of professional performance in teams. From the analysis of works on adaptive performance, we consider that competencies also follow a multidimensional perspective that involves resources linked to skills, attitudes and behaviors that enable individual and collective adaptation. These resources are associated with technical, social, emotional, attitudinal and dispositional issues, such as: accepting new challenges, adapting to team differences, learning new competencies, being resilient, knowing how to deal with uncertain situations, being flexible in relation to new ones. ideas and approaches, among others (Baard et al., 2014; Jundt et al., 2015; Park & Park, 2020; Pulakos et al., 2000).

4 THE METHODOLOGICAL PATHWAY

This research is characterized as exploratory, and followed a qualitative approach (Merriam, 2009). The study was carried out in a Hackathon event, characterized by a context marked by instability, which allowed a reflection on how team members mobilize their competencies according to the assumptions of the adaptability theory.

4.1 The Research Context

The Hackathon event that characterizes the context of the research aimed to propose innovative solutions, involving data science, to fight corruption, and it was organized by the Public Ministry of a State in the Northeast of Brazil. Professionals and students from the areas of Software Development, Law, Administration, Public Management, Design and Art/Media attended the event. The marathon was attended by around 160 people, who were linked to more than 20 teams. The teams were defined through a *brainstorming* involving ideas for the elaboration of projects the day before the event. Each team had the engagement of four to eight members.

During the event, the teams remained in a place with restricted access, called Navigation Ship. Each team, composed of 3 to 9 people, occupied a table. The structure intended for the teams also included food and water, in addition to professionals from various specialties, called coaches, who provided technical support related to the development of the project, as well as clarified the doubts about resources used by the teams.

The Hackathon took place over a weekend. On Saturday, from 08:00 to 23:00, and on Sunday, from 08:00 to 18:00. On the last day of the event, each team developed and presented a *pitch* with the proposed solution for fighting corruption.

4.2 Procedures for data collection

The research was carried out in two stages. The first involved non-participant observation during the marathon, and the second involved semi-structured interviews. These two data collection strategies were adopted to broaden the perception of the phenomenon. On the first day of Hackathon, the observation was carried out by two researchers, a doctor and a doctoral student. On the second day, a third researcher, a doctor, joined the team to provide assistance to the observations.

In the observation process, a script was used based on the research objective, with the objective of apprehending appearances, events and/or behaviors (Godoy, 2013). The objective of non-participant observation involved the choice, among the 20 participating teams of 5 (five) of them to be part of the research. They were chosen

for convenience considering the position of the tables in the Navigation Ship, that is, they were positioned in a way that it was possible to establish an adequate visual field for observation.

Non-participant observations were carried out following an observation protocol with some questions, such as: What is the action environment? When and how does the action take place? What is happening (activities, participant behaviors, organization, support)? Who's in charge? How does communication take place? Do the participants have differing opinions? How do they demonstrate such divergence? What practices, competencies and action methods do participants employ?

Ethical research criteria were adopted in order to preserve the identity of the participants. To identify the teams that participated in the study, letters of the Greek alphabet were used (Alpha, Beta, Delta, Gamma and Omega), and fictitious names were used to refer to excerpts from the participants' speeches. The observation was carried out by the researchers on a table outside the Navigation Ship and a *notebook* was used to record the field notes.

The semi-structured interview was the data collection strategy used in the second stage of the research and that served as a basis for the presentation and discussion regarding the research results. It was prepared a script with questions that addressed the professionals' competencies and the teams' performances in the Hackathon. Despite the use of a script to guide data collection, the observations carried out during the Hackathon Marathon were also considered, which made it possible to question the participants about some specific aspects related to the situations they experienced during the event.

The contact with the members of the five teams that participated in the observation phase took place one day after the event, through an email with an invitation, indicating the purpose of the research and some ethical procedures of this data collection phase, in order to preserve participants' identities and guarantee the confidentiality of their participation in the study. 30 invitations were sent, of which 14 responded confirming their availability to collaborate with the research. The interviews were carried out through the *Hangout* or *Skype* platforms.

The total length of the interviews with the 14 participants was 09 hours 28 minutes and 45 seconds. Regarding the profile of the interviewees, seven of them were between 21 and 29 years old, and the others between 30 and 38 years old. Four participants had a master's degree and two had a doctorate in the area of Computing. Three were completing their degree in Computing. One of the participants had a degree in Design. The others were trained in courses linked to the area of Computing. All interviewees worked professionally in various contexts, such as university laboratories, development projects and software companies in both public and private contexts.

During the interviews, we observed that data saturation occurred in the tenth interview, and it was observed that conducting new interviews contributed little to increase the quality of information about the object of study. Thus, we consider that the number of 14 interviews was sufficient to characterize the competencies mobilized at the event.

4.3 Data analysis procedures

Data analysis is a process that requires the use of a method capable of helping researchers to understand the phenomenon. In this study, we chose to use Thematic Analysis (Braun & Clarke, 2006). This method is suitable since it allows the researcher to identify, analyze and report patterns (themes) from the data. Identifying themes helps to reveal categories and meanings about the data in relation to the research question. The Thematic Analysis method is structured in six phases: (1) familiarization with the data, through careful reading of the transcribed interviews, which allows the researcher to approach the data and make initial impressions about the subjects' speeches, searching for meanings and standards; (2) generation of initial codes, which allows the identification of an initial set of ideas about the data and the definition of codes to identify an important characteristic; (3) theme search, which consists of organizing different codes with the potential to reveal likely themes that can be combined to generate a higher level of explanation; (4) review of themes, which covers the refinement of candidate themes that were identified in the previous phase. Such themes can be grouped or subdivided into others; (5) definition and naming of themes, which involves identifying the essence of meaning that the theme represents in relation to the data; and (6) production of the report, in which the final analysis regarding the themes is written, indicating the evidence that supports them.

Although data analysis is organized in phases, the process is not linear, but recursive, as there is an interrelationship between them according to research needs. To support the coding and definition of themes, the *Atlas.ti* tool was used. The categories identified in the data analysis process involve the five adaptive competencies mobilized by team members and are presented in the next section.

5 RESULTS

Data analysis made it possible to identify themes and their main meanings, which are indicated in Figure 1. A total of five adaptive competencies were identified and represent the main dimensions of the findings: (1) theoretical-practical knowledge; (2) self-learning; (3) problem solving; (4) socio-emotional adaptability; and (5) situational leadership.

Despite being presented independently, adaptive competencies have relationships of interdependence, indicating that they can be combined and mobilized in different situations regarding teamwork.

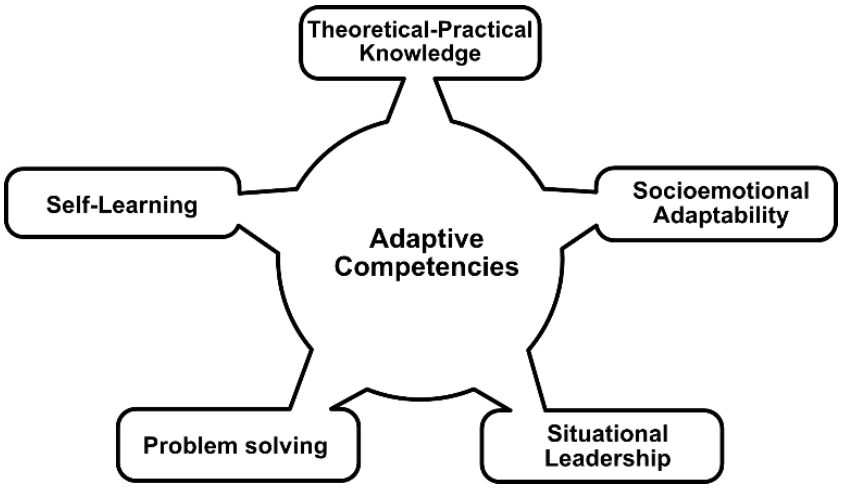

Figure 1. Adaptive Competencies Mobilized in Hackathon
Source: Elaborated by the authors.

The Figure 1 represents the adaptive competencies identified in the open innovation event, the Hackathon, carried out by the Public Ministry of a State in the Northeast of Brazil, and it is configured as a dynamic frame, in which there are attributes that are present in more than one competency, the example of proactivity, initiative and performance. In addition, the combination and integration of the five competencies enhance the team adaptive performance, as illustrated by the results presented below.

5.1 Theoretical-Practical Knowledge

Technical and practical knowledge based on experience were pointed out as fundamental by the interviewees for competent performance. Due to the rapid changes in technologies, professionals need to have solid knowledge about the fundamentals inherent to the software development activity. This is a *sine qua non* resource for professionals to have the competency to autonomously and quickly learn other technologies necessary for the project they are involved in, as well as allowing them to be able to work in different roles within the team. These aspects were identified, for example, in the speeches of Saulo and Marcelo, when they state that a “good base” and a “technical mastery of the fundamentals of the area” are necessary.

Jarbas also indicates that the competent professional is a “versatile person, who knows a little about several things. He is a person on the inside of emerging technologies”. Versatility is aligned with the professional's ability to adapt. Rafael highlights the importance of professionals understanding “how things work, not just in a specific area”. Adaptation requires a holistic knowledge that involves the different phases of the project development lifecycle.

Another meaning that emerged concerns the importance of practical knowledge as a result of a process regarding living experiences in a professional environment. As Thiago mentions, being competent is related to “the technical part”, “baggage”, “experience” and “living”. In other opportunities, it is highlighted the experiential learning that goes beyond what is learned in formal education. As Luiz points out it, “it was the experience” that made him consider himself competent and that he felt that the university would not teach him how to “deal with people” and to “how to be somewhat tolerant of change”.

5.2 Self-Learning

The proactive behavior aimed at learning emerged as a relevant meaning, as new projects demand the need for the professional to learn technologies involved and the processes inherent to the business in which the project serves. Vanessa’s speech, for instance, reinforces how a proactive behavior to study is a differential. According to her, "every new project you need to study" and "proactivity is a very big differential". Other meanings are related to a professional who “can learn” (Jarbas), who “studies by himself/herself” (Mônica), who “is constantly updating” (Sérgio), as well as being linked to the idea of having the initiative and willingness to learn. Evidence indicates that proactivity is an influential attribute for self-learning, which demands theoretical-practical knowledge in solving problems, and becomes essential in adaptive processes, since it is related to the initiative to learn, to lead (in an informal and situational way), and to help the team perform well adaptively.

The interviewees also highlight the professional’s competencies to be “self-taught” (Jarbas and Paulo) and “to learn quickly” to “fulfill the activities” (Mônica). Saulo, for example, considers that the professional “does not necessarily need to know everything”, but he/she needs to have a “good enough foundation” to “be able to learn

quickly". Two meanings stand out here: learning quickly and learning easily.

For self-learning, several strategies can be adopted. One of them is to seek help within someone's own team or outside it. Patrícia reports a situation in which she tried to solve a demand for which she was responsible, and the fact that she was not able to, she sought help to solve the problem, thus being able to fulfill her goals in the project. As for Ricardo, he mentions "less diploma and more attitude" to learn, revealing the importance of a proactive behavior and a favorable attitude for self-learning.

5.3 Problem solving

This theme was conceived from the meanings linked to the competency of team members to solve problems. Related to this competency, meanings emerged such as the ease in identifying and addressing the "right problems" (Emanoel), the competency to "model, abstract and formalize problems" (Marcelo), as well as "propose solutions". Jarbas associates problem solving with the professional's competency to "progress easily" and "ease in learning new technologies" (Jarbas). This set of competencies is considered relevant, as each project involves unique problems to be solved (Lin et al., 2015).

Being proactive within the team was a recurring meaning in several statements, both in the "competency to reach consensus" (Tiago), and in the competency to assume and be responsible for tasks within the team. They are also related to the "capacity to solve problems" (Tiago) and to "deliver beyond what was asked" (Mauricio). These behaviors contribute to the team achieving project goals.

The ability to analyze critically also emerged as a meaning associated with problem-solving competency. Rafael emphasizes that "the critical analysis of the problems is fundamental", so that the professional in fact understands the basis regarding the problem so that he/she can reach an adequate solution. In his speech, he highlights "that understanding how something works makes all the difference" and that it is essential to understand the problems that occur during the performance of a *software* development task. Tiago also evidences the capacity for critical analysis, when he states that the professional must be "able to take the problem and analyze it critically".

5.4 Socioemotional Adaptability

Adaptability is a capability that varies according to the characteristics of team members. In the survey results, this becomes evident when Paulo highlights that there are teams with "people who are more open to dialogue", and others that "do not talk much". This participant understanding reinforces the influence of collective cognitive states on individual actions, illustrated when he highlights that "sometimes you have teams with greater openness". The results reveal that the mobilization of an adaptive competency occurs when the member is able to adapt to the different styles of each member regarding the team he/she integrates.

Some meanings revealed by Jarbas involve "having interpersonal skills", "knowing how to deal with people" and "understanding people", meanings that are related to the professional's capacity to adapt to individual differences. Another aspect that was considered relevant involves communication, an essential attribute for carrying out teamwork, which includes "knowing how to work well in a team, (...), knowing how to deal well with people, knowing how to listen, knowing how to give opinions, knowing how to position yourself" (Monica). Communication is also highlighted as essential in teamwork, and how competency is associated with "knowing how to communicate your opinion well, and convince others" (Emanoel), "ability to listen and prepare to discuss as a team" (Sergio).

Communication is also associated with learning, which is evident in Patrícia's report – "getting tips from her team", or as Mônica mentions, "being able to both contribute and be helped", or "know the right time to ask for help", and also as Emanoel says – "knowing how to communicate problems". Such findings indicate that the competency of self-learning, related to seeking help, is combined with the competencies of socio-emotional adaptability.

An analysis of the research findings also reveals, in the decision-making processes, the "ability to reach consensus" (Thiago) and "knowing how to accept" (Mônica) what was decided by the team. This team-oriented attitude is a relevant characteristic for a professional to be legitimized as competent.

Ricardo, a member of the Gama team, reports that at the decisive moment for the completion of tasks, Rafael "closed himself (...) he did not want to listen", that is, he neither accepted nor gave up his opinion, which led Ricardo to solve the demand by himself. The example is used by Ricardo to illustrate that given the scarcity of resources (such as time), it is essential to accept some decisions, which may allow the team to adapt to the situation more quickly.

Socio-emotional adaptability is an adaptive competency that requires the team member to perceive the learning needs of others, considering their levels of experience, which requires the ability to exercise empathy. It is a process that requires the ability to understand the member needs, which also requires patience to explain something to one of its members, as Patrícia highlights: "I do not have much patience to explain something that the person should know". Another report that illustrates this meaning is identified when Paulo reports a negative experience with someone who had no patience with the team and therefore "was unable to lead (...), due to lack of kindness, lack of tact with the staff". These findings indicate that lack of patience is associated with several factors, such

as the member's inability to deal with stressful situations or manage their own emotions.

An analysis of other discourses from the interviews also revealed how interpersonal competencies are linked to self-regulation. As Rafael points out, it is important to “know how to understand and realize when the other is not having a good day”. For Emanoel, it is necessary to “know how to receive criticism, evolve with it, differentiate personal problems and focus on the work of the group”. It becomes evident in Jarbas’ report that some conflicts within Alpha Team occurred when one of the members "raised his voice a little".

5.5 Situational Leadership

Encouraging the emergence of leaders during a Hackathon in a natural way (Briscoe & Mullingan, 2014) is fundamental and, in the context of this study, leadership emerged explicitly when the interviewees highlighted its importance during the teams’ performances in Hackathon. The research results showed that leadership can be legitimized by experience and/or technical knowledge, in a situational way. Sérgio, for instance, proposed solutions based on his experience, which created a relationship of trust for the other team members and legitimized him as someone with leadership competencies. For him, leadership came "naturally."

The same happened with Marcelo and Jarbas in the Alfa team. Marcelo points out that experience and technical knowledge helped him solve critical problems and led him to be perceived as an informal team leader since, according to him, “he already had experience and they did not”. Jarbas highlights that he “was leading the way”, but Marcelo took it over during the event by means that “he had a *know-how* in this part of data analysis”. It is evident in the reports the fact that the context can favor the mobilization of an emerging competency (leadership), and the lack of resources (experience, knowledge, ability etc.) or other personal factors make it difficult to mobilize them in professional action.

During Saulo’s interview, we asked why he and Tiago took the lead, and as a response for that question he highlighted that the technical knowledge about the project gave the team security, which gave them greater authority in decision-making and, therefore, triggered an informal and situational leadership process. Tiago reveals that this happened for the fact that Saulo positioned himself in the team, becoming its “main reference”. This assertive and purposeful positioning, added to the social competencies, made this member become an informal leader within the team. Tiago mentions that “he took a stand, (...) he is a very coherent guy” and tried to “convince people with arguments”, “without harmful impositions”.

These aspects were also found in two other Hackathon teams. For Rafael, from the Gama team, experience, the ability to solve problems and collaborative behavior, contribute to leading a member to assume leadership in the team. The link between experience and leadership is also reinforced by Patrícia, who indicates that the team member stood out as a leader because she “knew how to explain very well” the features and “answered questions from the team”. For Mônica, the ability to help, “to be available to answer many questions”, legitimized the other member as a leader who stood out and became a reference.

The performance of activities by some team members who are inexperienced, have a difficult personality or for their role in the team, demands the performance of a leader, whether formal or informal. In the Beta team, for example, Saulo exercised informal leadership, proactively, due to his experience and technical knowledge, guiding and advising those who were more reactive. His performance impacted on improving the performance of some members and helped in the team's adaptation process.

Despite the Gama team having defined, a priori, a formal leader, during the event, another member took the lead due to his systemic view associated with the tasks performed by the team, since he was “understanding more what each one was working on” (Paul). This vision helps in the coordination and communication of the team, placing this member as a situational leader at that moment. This aspect was relevant because “it was able to do this midfield, let's say, and the team is coordinating well, you know” (Paulo). For Ricardo, the professional who assumed the informal leadership was “trying to keep the team motivated and organized” and acted as a guide for the team to reach its goals.

6 DISCUSSION

The results of this study revealed that five adaptive competencies were mobilized in the context of the action regarding the team members and that the combination and integration of these competencies characterizes a competent professional during innovation events such as the Hackathon. The results reveal the potential contribution of open innovation events in the development of professional competencies, through processes of generating new knowledge in a collaborative way (Chatenier et al., 2010).

The analysis of these competencies in the light of adaptability highlights the professional's attributes and capabilities linked to his/her adaptation process. Table 1 presents the factors that characterize the mobilization of adaptive competencies in Hackathon.

Table 1

Adaptive Competencies Mobilized in Hackathon Teams

Adaptive Competencies	Factors that characterize the mobilization of competency in the Hackathon Team
Theoretical-practical knowledge	- Solid knowledge of computing fundamentals act as a prerequisite for good individual performance and team support. - Individual knowledge collaborates in adapting to new demands that require rapid learning, whether of a technology or a specific method for a given task. - Practical knowledge based on a member's experience, which enhances the mobilization of resources to lead and act proactively, with initiative to solve critical project problems.
Self-Learning	- Reacts quickly and remains open to learning to adapt appropriately and solve problems. - Facility to learn autonomously to suit project demands. - Recognition of one's own limitations to go in search of self-development. - Search for help within the team, when necessary, in the face of dynamic events in the context.
Problem Solving	- Uses personal resources of the team member to promote proactive action in situations, anticipating problems, taking the initiative and improvising so that project objectives are achieved. - Ability to find solutions and develop creative approaches to solve complex, undefined and atypical problems. - Ability to identify and address problems assertively, enabling the team to focus efforts in the right direction. - Proactive behavior to solve problems. - Team problem solving, social support to team members and taking the lead in terms of organization or coordination. - Ability to critically analyze problems.
Socioemotional Adaptability	- Interpersonal competencies such as listening, communicating, convincing, accepting criticism, understanding the abilities of others, etc. - Ability to work in a team, contributing in general to the harmony and balance of the team. - Self-regulation of emotions as an intrapersonal skill, which involves the ability to perceive the needs of others and influence them positively, have patience, and deal with stressful situations. - Emotional control as a basis for conflict management.
Situational Leadership	- Emergence of informal leadership from acting in a team, through a process of social legitimation, which depends on support for team members, trust and mutual respect. - Leadership legitimacy occurs naturally, through experience and/or technical knowledge. - Assertive and purposeful positioning, added to social competencies, makes the member an informal leader within the team. - Experience, problem-solving competencies and collaborative and motivating behavior allow a member to take the lead in the team. - The systemic vision, the situational and dynamic character of the leadership in the team adaptation process contribute to the achievement of objectives. - Leadership, especially informal, depends on a member's ability to assume project responsibilities and have an attitude of commitment to the team. - Leadership occurs in emergency situations in which the team needs to present satisfactory adaptive performance.

Source: Elaborated by the authors.

Table 1 reveals the breadth of the perspective adopted in this study, which integrated themes such as competency and adaptability, which are treated independently in the literature. This 'new look' to understand professional performance in a Hackathon context confirms the study's potential contribution to understanding the dynamics of team formation and management in open innovation environments, incorporating the participation of external agents in the generation of knowledge as already highlighted Chatenier et al. (2010).

Specifically, it is observed that acting in a team demands theoretical-practical knowledge from its members, which, in addition to a theoretical basis, also depends on the ability to create, innovate and take initiative. These attributes are fundamental for the mobilization of competency, since participation in innovation events such as the Hackathon involves experiential learning processes that contribute to the development of competencies in action (Silva, 2009). This finding reveals that open innovation events are a space for the application of theoretical knowledge, and the experience ends up collaborating with practical knowledge. These results reveal that Hackathons can be characterized as informal learning environments (Nandi & Mandernach, 2016).

The experience allows the professional to have a more comprehensive view of the different types of activities that permeate software development. As Zarifian (2001, p. 72) argues, competency is "a practical understanding of situations that is based on acquired knowledge and transforms it as the diversity of situations increases". This definition by Zarifian (2001) reveals that when theoretical knowledge is articulated with experience in practice, the professional begins a process of developing competency in action that favors adaptive performance.

According to Pulakos et al. (2006), Jundt et al. (2014), and Christian et al. (2017), domain-specific knowledge and experience are considered predictors of adaptive performance. Thus, we start from the premise that the professional's theoretical and practical knowledge are prerequisites for other adaptive competencies to be mobilized.

Theoretical and technical knowledge, associated with professional practice, support the competencies for adaptation. The lack of experience or specific knowledge linked to the project limits the mobilization of adaptive competencies by the members, which can also negatively affect the adaptive performance of the team. The more dynamic the environment, the greater the number of situational events that require individual and team adaptation (Christian et al., 2017), which consequently demands a greater mobilization of adaptive competencies.

This process also involves the adaptive competency of self-learning, related to a process of self-development and the ability to learn how to learn. It can be seen that continuous technological innovation requires professionals to have a favorable attitude to prepare in advance for future challenges, both for new projects and for new jobs and functions. For this, they need to prepare their self-development and have an attitude oriented towards self-learning (Charbonnier-Voirin & Roussel, 2012).

As Pulakos et al. (2000), Charbonnier-Voirin and Roussel (2012) and Huang et al. (2014), authors of the adaptability theory, state, many situations require the individual to be able to react quickly to adapt appropriately. Therefore, the ability to self-learn quickly is a relevant attribute for adaptive competencies. By mobilizing these competencies, members can adapt to new situations imposed on projects that require innovative solutions in the use of technologies, processes, methods and tools.

It is also noteworthy the interpersonal dimension of self-learning, which demands social interaction in the processes of communication and help-seeking. The act of seeking help, inside or outside the team, is considered a self-directed learning strategy (Stockdale & Brockett, 2011), and a behavior that is part of the professional's adaptation process (Kozlowski et al., 2009). In this case, emerging states at the collective team level can serve as facilitators or inhibitors of this behavior. For instance, teams with higher levels of psychological safety tend to be more likely to seek help from each other.

To follow their self-learning trajectory, it is necessary for the professionals to identify and recognize their limitations and learning needs. This idea applies to both transient and emerging short-term needs related to tasks and a specific project, as well as long-term needs such as their professional career development. Thus, being competent in dynamic environments is also related to the awareness and attitude of self-development, that is, to seek to remain competitive in the world of work (Raemdonck et al., 2014).

Adaptive problem-solving competency is critical in open innovation events, as the collective knowledge management process begins with identifying a problem, gathering information and proposing innovative solutions. In this study, it was evident that the team members, in order to find a solution to the problem in the Hackathon, combined individual resources for generating ideas, with proactivity, initiative, assertiveness, creativity, critical sense, leadership and self-learning. These results corroborate the perceptions of Pulakos et al. (2000) and Chatenier et al. (2010).

The proactivity of the members contributes to the adaptation of the team itself, which involves the ability to identify, propose and implement creative solutions to solve problems that are often undefined, unstructured and atypical (Pulakos et al., 2000). Parker et al. (2006) emphasize that proactive behavior is related to the proposition of problem solutions.

In the IT area, especially, problem solving is seen as a core competency (Li et al., 2011; Lin et al., 2015). A problem is defined as a gap between an existing state and a desired state. Problem solving is defined as work processes to reduce this gap (Lin et al., 2015). Each project is unique, which involves different problems that arise throughout its process. This characteristic creates an instability that involves the team adaptation and its members, who need to be able to identify the sources of problems, generate and validate alternatives, implement the selected solutions and evaluate their results (Lin et al., 2015).

In problem-solving processes, socio-emotional adaptability emerged as an adaptive competency characterized by the ability of team members to mobilize intrapersonal and interpersonal resources. Intrapersonal ones are linked to self-regulation, emotional control in stressful situations and patience. Lepine et al. (2008) emphasize that emotional control contributes to the reduction of affective conflicts in the team.

From an interpersonal point of view, communication, argumentation, teamwork is crucial to deal with the uncertain demands of innovation processes in the context of the Hackathon, which has determined deadlines and expected results in a short period of time. Social-emotional competencies emerge as fundamental in the processes of socio-emotional adaptability and the attributes that characterize these competencies adhere to the socio-emotional competencies regarding emotional awareness, emotional regulation, emotional creativity, emotional self-control and social awareness proposed by Macêdo e Silva (2020).

When team members do not develop emotional intelligence, social interactions are impaired, which makes it difficult to mobilize competencies linked to collaboration, coordination and leadership. The strong links between intrapersonal and interpersonal attributes reveal the essence of the socioemotional adaptability competency.

The results suggest that internal self-regulation is crucial in mobilizing competencies in the adaptation process. The development of the professional's competencies to manage pressure in the face of working conditions, marked by agility and unpredictability, includes

the ability to positively influence colleagues in certain situations (Charbonnier-Voirin & Roussel, 2012).

Socio-emotional adaptability is a competency that illustrates the complexity of the team members performance, which requires intense social interaction, especially in the development of knowledge-intensive projects. It is a context in which emotions mediate the performance and quality of team interactions (Reus & Liu, 2004). The research results show the role of emotional intelligence in the performance of professionals working in the development of projects in the technology area, a context that requires flexibility and autonomy. For Mayer and Solovey (1995), emotional intelligence is the ability to perceive, understand and regulate emotions to promote personal growth.

The adaptive competency of situational leadership emerged in the results as a process of informal social interaction, which demands a proactive attitude, characterized by assertiveness, social support, collaborative, motivating and systemic thinking in carrying out team tasks. This process is socially constructed, favors team coordination and communication, and is characterized by processes of social legitimation. Legitimation occurs from the perception that a team member assumes responsibility for project activities and commits to collaborate in the search for innovative solutions. It also supports team members, instills trust and acts with mutual respect. For Day (2000), one of the bases of leadership development is trust and mutual respect, which was evident in the recognition of the team and in the legitimation of acting as situational leaders. Situational leadership, in this context of open innovation, is emergent and characterized by an adaptive behavior that occurs in action from the diversity of events during the Hackathon.

The findings reveal that situational leadership is linked to the commitment of one of its members to the project's objectives, as well as to their ability to assume responsibilities (Zarifian, 2001), perform critical tasks and assume a proactive stance. These attributes increase team engagement and empowerment, legitimizing the member as a leader in the decision-making process (Chang & Liu, 2008; Benson et al., 2016). The process of engaging participants in open innovation processes collaborates with the generation of new ideas to transform them into innovation, which requires a coordinated effort and the combination of resources to generate new knowledge in a collaborative way (Chatenier et al., 2010).

An analysis of works on adaptive performance revealed that leadership does not emerge as a component at the individual level, but as a team process (Burke et al., 2006). The results of the study suggest that leadership is an adaptive competency for the fact that the member who assumes the role of leader in a given situation collaborates with the team's collective adaptation process. The study by Maynard, Kennedy and Sommer (2015) confirms the role of the leader in the result of team adaptation, as he acts in collective processes (communication, backup, coordination). However, the study refers to formal leadership. In the study carried out at the Hackathon, the role of situational leadership was evident.

The adaptive competencies identified in this study can support learning processes in open innovation programs and collaborate to define the profiles of the professionals who will form the teams.

The adapted competencies identified in this study can support learning in open innovation, as well as the programs can serve as a reference for teaching and evaluation in professional education curricula, especially the development of strategies based on teaching actions. Additionally, they can also collaborate to define the profiles of the professionals who will form the teams. In this direction, the performance of the team depends both on how the individual competencies will be complementary among the members, but also on how the environment will demand from the professionals regarding the different situational events. Understanding the process of mobilizing adaptive competencies in a context such as the Hackathon can also help organizations plan the development of their human capital towards the construction of an innovative, creative, dynamic and adaptable environment to the changes that are required in a context of innovation.

7 CONCLUSIONS

This study aimed to identify the competencies mobilized by team members in a Hackathon in the light of adaptability theory. Based on the analysis and discussion of the results, an adaptive competency in open innovation events can be defined as the ability of participants to mobilize, combine and integrate theoretical-practical knowledge, self-learning, problem solving, socio-emotional adaptability and situational leadership with the objective of adapting and contributing to the team adaptation in a collaborative way.

In the organization of innovation events, individual and social requirements are necessary for the definition of team members. The main individual requirements are autonomy, assertiveness, commitment, initiative, proactivity, responsibility and critical thinking. Social attributes are more relevant during the event and include social support, conflict management, teamwork and the legitimation process, which characterize a social learning process. The mobilization of self-learning competencies and socio-emotional adaptability demand from the participant good levels of socio-emotional competencies, which are important elements to adapt to situational events and maintain good levels of individual and collective performance.

In practice, adaptive competencies involve knowledge, skills, behaviors and resources from team

members, which are mobilized, combined and integrated into the Hackathon environment. This finding indicates that the adaptive competencies of this study also characterize competencies in action (Zarifian, 2001; Le Boterf, 2003). The combination of these competencies in the context of teams that work in innovation events such as the Hackathon reveals in practice those members who will be perceived by the other participants as professionals of reference for the team and who start to exercise situational leadership.

It is noteworthy that the study was developed in a specific innovation event and the adaptive competencies identified can serve as a reference for the analysis of other Hackathon events, especially in the process of training and monitoring teams in the development of new knowledge and innovative solutions for public and private organizations. New studies with other epistemological and methodological perspectives can complement and contribute to the results and the discussion on the topic.

The main theoretical contribution of the study involves the articulation between the development of competencies in open innovation events in the light of the adaptability theory. The results found can help in the development of new studies in other contexts that involve intensive knowledge and constant changes, outside the Hackathon environment. From a practical point of view, there is a contribution to the area of people management, especially in the structuring of competency development programs mediated by learning. The use of open innovation events in the university environment can also make a significant contribution, from a social point of view, since it can collaborate in the academic and professional training of students from various areas of knowledge. In this perspective, different higher education courses, for instance, can approach the Hackathon as an active teaching strategy with the purpose of developing adaptive competencies.

Future research can analyze the collective competencies learning and development processes of the team using adaptability as a base theory to broaden the understanding of the complexity of the learning processes in teams of intensive knowledge and that integrate open innovation projects, as well as the identification of facilitating and limiting factors for the mobilization of adaptive competencies in the context of professional action. There is also the possibility of quantitative investigations using psychometric scales to measure adaptive performance (Ribeiro et al., 2022) and socio-emotional skills (Macêdo & Silva, 2020) for analysis of relationships with other variables.

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