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The impact of event design choices of an online women-focused hackathon on participants and mentors

Recife

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Trabalho apresentado ao Programa de Pós-graduação em Ciência da Computação do Centro de Informática da Universidade Federal de Pernambuco como requisito parcial para obtenção do grau de Mestre em Ciência da Computação.

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Orientador (a): Kiev Santos da Gama

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Lavínia Francesca Paganini

“The impact of event design choices of an online women-focused hackathon on participants and mentors”

Dissertação de Mestrado apresentada ao Programa de Pós-Graduação em Ciência da Computação da Universidade Federal de Pernambuco, como requisito parcial para a obtenção do título de Mestre em Ciência da Computação. Área de Concentração: Engenharia de Software e Linguagens de Programação.

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To my family, friends and cats. We made it!

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"Not a single one of us here today has done it alone. We are each a patchwork quilt of those who have loved us, those who have believed in our futures, and those who showed us empathy and kindness or told us the truth even when it wasn't easy to hear." (SWIFT, 2022).

ABSTRACT

Hackathons are often viewed as not being inclusive to women, who have low participation in these events. Reasons for this include low self-esteem in STEM fields, toxic environments, bad sleeping habits during the event, and a competitive atmosphere. Hackathons also can be a valuable opportunity for undergraduate students to improve their skills, but a lack of gender diversity can prevent women from taking advantage of these opportunities. Usually, hackathons include mentoring to support the participants in improving their skills during the event. Recently, initiatives have been implemented to increase the number of women participating in hackathons, such as women-only events, balancing participants by gender during the selection process, and using feminist and social themes for the hackathon. Our qualitative study investigated how event design choices (Focus on Women; Event support activities such as mentoring and pre-pitch; and Event warm-up activities) can influence the participant's and mentor's experience in a women-focused hackathon. Data was collected through surveys and semi-structured interviews with participants and mentors.

Keywords: time-bounded collaborative events; gender; hackathons; computer-supported collaborative work.

RESUMO

Hackathons são frequentemente vistos como não inclusivos para mulheres, dado a baixa participação delas nesses eventos. Algumas das razões para isso incluem baixa auto-estima no campo de STEM (ciências, tecnologia, engenharia e matemática), ambiente tóxico, poucas horas dormidas durante o evento, e um ambiente competitivo. Hackathons também são uma oportunidade valiosa para alunos da graduação de melhorarem suas habilidades, mas a baixa diversidade de gênero pode se tornar uma barreira para mulheres aproveitarem essas oportunidades. Usualmente, hackathons incluem mentorias para ajudar os seus participantes a melhorarem as habilidades técnicas durante o evento. Recentemente, várias iniciativas foram feitas para aumentar o número de mulheres nesses eventos, como por exemplo eventos com participação apenas de mulheres, equilibrar as vagas na hackathon por gênero durante a seleção de participantes e a hackathon possuir temas feministas e sociais. Nosso estudo qualitativo investigou como escolhas feitas no design do evento (Foco em mulheres; Atividades de suporte ao evento como mentoria e pré-pitch; Atividades de aquecimento) podem influenciar a experiência de participantes e mentoras num hackathon focado em mulheres. Dados foram coletados através de questionários e entrevistas semi-estruturadas com participantes e mentoras.

Palavras-chave: eventos colaborativos limitados por tempo; gênero; hackathons; trabalho colaborativo apoiado por computador.

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LIST OF ABBREVIATIONS AND ACRONYMS

MLH	Major League Hacking
STEM	Science, Technology, Engineering, and Mathematics

CONTENTS

1 INTRODUCTION

1.1 THEME INTRODUCTION

Diversity is necessary for the modern world, where a person will make a small contribution to complex tasks (PAGE, 2008) and innovation and performance are critical for companies (HAMEL; GETZ, 2004; LEIFER et al., 2000). Although diverse teams can have more conflicts and require more coordination efforts, they have more radical innovations and are more productive (PAGE, 2008; PELLED; EISENHARDT; XIN, 1999; HUNT et al., 2020; HOFSTRA et al., 2020; DÍAZ-GARCÍA; GONZÁLEZ-MORENO; SÁEZ-MARTÍNEZ, 2013). Diversity is also necessary to avoid unintentional bias. For example, problem-solving skills can be clustered by gender, whereas the software can unintendedly include gender bias because of the cognitive style that it supports (STEINE-HANSON et al., 2019).

Rodríguez-Perez et al. defines perceived diversity as characteristics you are born with (e.g., gender, age, race, and nationality), that a person can have prejudice or bias if that is noticeable in the other person (RODRÍGUEZ-PÉREZ; NADRI; NAGAPPAN, 2021). In the case of Computer Science, a noticeable pattern is the lack of gender diversity, a perceived diversity characteristic. Although gender is one of the most studied factors in Software Engineering (SILVEIRA; PRIKLADNICKI, 2019), the gap in women's participation is still present. In 2017, the women's participation in the Brazilian Information and Communications Technology workforce was only 20.90%, besides being 60.33% of the general workforce share of the country. Gender diversity became a priority in companies, where recruitment policies and reports are made to give space for women (2022..., 2022; APPLE..., 2021; EMBRACING..., 2022). However, women in higher education in Computer Science, starting to have contact with the industry through internships, face exclusionary behaviors in the workforce, discouraging them from continuing in the field (SERON et al., 2016). In a survey with 252 people from IT Companies in Poland, although the presence of women in Software Development teams is perceived as creating a more friendly environment, 12.3% of men responded that they prefer man-only teams (BLINCOE; SPRINGER; WROBEL, 2019).

On the other hand, software development can be done outside companies and their traditional form of teamwork, as a way to attract women in software development and sustain their participation, as seen in being done open-source software (CROWSTON; HOWISON, 2003; QIU, 2022) and hackathons (PAGANINI; GAMA, 2020). Hackathons are time-bounded events, typi-

cally lasting 24 to 48 hours (BRISCOE, 2014). These events can have different objectives from the organizers, from promoting a technology, learning new skills, applying concepts seen in the classroom, and as an informal way of learning (OLESEN; HALSKOV, 2020). Hackathons are a way to overcome organizational challenges and create innovation in a short-time frame (FREY; LUKS, 2016; TEMIZ, 2021). Participants usually form multidisciplinary teams (programmers, designers, etc.) to develop a proof of concept until the end of the event. Although multidisciplinary, these events often have few women (OLESEN; HALSKOV, 2020) and are usually viewed as not gender-inclusive (KOS, 2019; PRADO et al., 2020).

Throughout the years, some initiatives have tried bringing more women to these events: women-only events, balancing participants by gender during the selection process, and feminist and social themes for the hackathon (D'IGNAZIO et al., 2020; RICHARD et al., 2015). The design choices for organizing hackathons can turn them more inclusive, such as having women as mentors and creating a safe space for women. Women and LGBTQIA+ groups historically use the term safe-space for a place where people can meet and share their experience without being judged (FLENSNER; LIPPE, 2019). Safe spaces are designed to protect historically marginalized groups.

Previously in 2019, the author studied in-person hackathons in Recife, Pernambuco, to create the first female-focused hackathon in the city, Hack GRRRL. With Hack GRRRL, it was possible to investigate the reasons for the low participation of women in hackathons, including women being a minority, toxic environment, and low self-esteem (PAGANINI; GAMA, 2020). A co-located second edition was planned for the future objective to improve the first event, increase the public attending the event, and allow people that were not students. Since, during the pandemic, it was not possible to have co-located events, an online edition was planned with new challenges, such as maintaining the learning experience, mentoring, and a safe environment for participants. The second edition, where this study was conducted, happened in 2021. Part of this study focusing on analyzing participants' experience was peer-reviewed and published as a research article (PAGANINI et al., 2023).

1.2 MAIN OBJECTIVES

Through Action Research in a women-focused online hackathon, Hack GRRRL, which has the theoretical fundament in the literature of hackathons. The author wanted to see how the design choices affected the experience of participants and mentors of this hackathon, trying to

stimulate the interaction between teams, make women join other hackathons after the event, and inspire them with other women with more experience in their area.

The design choices refer to Focus on Women (Women-focused participation, Women-only mentors, Hackathon theme/challenge addressing women), Event support activities (mentoring and pre-pitch), and Event Warm-up (Workshops, Team-formation dynamic). We analyzed data collected with participants and mentors through a survey and semi-structured interviews.

1.2.1 General Objective

As a way to improve women's experience in hackathons, design choices were made on Hack GRRRL to see both the perceptions of mentors and participants of the event. This was the event's first edition in the online format, and the experience could improve other hackathons that want to be more inclusive.

1.2.2 Specific Objectives

This study has the following specific objectives:

- Improve the experience of women's participation in online hackathons, measured by their willingness to join future hackathons
- Understand the motivations for being a mentor in a women-focused hackathon
- Explore and identify the benefits of being a mentor in a women-focused hackathon

1.2.3 Research Questions

- RQ1. How did the event design choices influence the participant's experience in a women-focused hackathon?
- RQ2. How did the event design choices influence the mentor's experience in a women-focused hackathon?

1.3 DISSERTATION STRUCTURE

The dissertation is structured into six chapters. After this introduction, we have Chapter 2 - which presents the theoretical foundation of the work. This chapter shows the reader the historical and social reality of female participation in computing, state of the art in the subject, and data referring to the study area.

Chapter 3 introduces the reader to the research methodology, with design choices made at work and data collection carried out with mentors and participants.

Chapter 4 presents the result of Action Research, presenting the codified results of the interview and results of the questionnaire separated by design choice.

Chapter 5 presents the discussion of the work, answering the research questions, similarities between mentors and participants, and limitations of the work.

Finally, chapter 6 presents the conclusions of this work, the future changes for the subsequent interaction of Action Research, and possible ways to complement this work.

2 BACKGROUND AND RELATED WORK

This chapter will introduce the history of women's participation in STEM, with some initiatives proposed to mitigate the problem in both academic and industry areas. Then, a background of hackathons will be shown, together with their applications, how is the environment of these events for women, and proposed solutions to increase their participation. Lastly, other types of time-bounded events and their proposed women-focused solution will be shown.

2.1 WOMEN'S PARTICIPATION IN STEM

The STEM sciences have a small participation of women, besides having many initiatives for increasing these numbers (BLACKBURN, 2017). The STEM Depiction Opportunities reported in 2016 that women "comprise 70% of college students but less than 45% of STEM degrees" (HOUSE, 2016). In 2020, women received 60% of the Bachelor's degrees in the US; however, looking for bachelor's degrees in Computer Science and Mathematics, this number decreased to only 26%. In Brazil, the Computer Science course went from 47% participation of women in 2001 to 21% in 2011, where in 10 years the number has decreased in half (MONARD; FORTES, 2013).

Women's participation in the technology industry is also low, where these numbers are usually available in diversity reports. Apple reported 24.4% of women's participation in Technology roles for the 2021 Diversity report (APPLE..., 2021). Google reported 33.5% of women's participation in their general workforce for 2022 (2022..., 2022). Facebook and Microsoft reported 25.8% of women's participation in Technology roles for their 2022 Diversity report (EMBRACING..., 2022; DIVERSITY..., 2022).

In 1991, the reasons found for the low participation of women in Computer Science already included societal factors (stereotypes, gender bias, different expectations between women and men), masculine environment, gender in language, and problems with proposed solutions at the time — especially related to affirmative actions and distrust of qualifications (SPERTUS, 1991). These stereotypes are often identified in different contexts, from childhood to professional careers. Explicit bias was found in a study with children from 7 to 18 years old, associating programmers with being men, social, and likes to play videogames (WIT; HERMANS; AIVALOGLOU, 2021). Subtle bias also exists, with faculty members making more eye contact with

men students and women being more interrupted than men (SPERTUS, 1991). There is also the stereotype spread by the media of programmers, usually having a single focus on coding, being a genius, masculine, and having physical features such as being unattractive and wearing glasses (CHERYAN et al., 2013).

Global groups such as Girls Who Code[1], Women Who Code[2], Anita B.org[3], and PyLadies[4] wants to engage more women in the technology area. This is possible through creating local groups (where all those mentioned are present in Brazil) that organize events, workshops, and mentoring sessions for women who want to join the field and those who are already in technology and want to advance their careers. An example of a large-scale event is the Grace Hopper Celebration (GHC)[5], which Anita B.org is responsible for organizing. GHC is the largest gathering of women in technology, with more than 26,000 attendees in the 2019 edition, happening yearly in the United States. During the event, they have mentoring, a career fair, talks about challenges women face in different career phases, and an Open Source Day for those who want to start contributing to Open Source Software.

Local initiatives worldwide include she++, from the University of Stanford, dot diva, focusing on high school girls and have received funding from the National Science Foundation (CHARLESWORTH, 2011), and Geek Girls Carrot. Initiatives for increasing women that started in Brazil includes Reprograma[6], Meninas Digitais[7], Emilias [8], M.I.N.A.S[9], and Cintia[10].

2.2 INTRODUCTION TO HACKATHONS

The term *hackathon* appeared in 1999, coming from the words *hack* (mostly due to the exploratory nature of the world) and *play*, beginning to spread in the early 2000 (BRISCOE, 2014). They can be divided into the goals of the hackathons, e.g. Tech-centric and Focus-centric (BRISCOE, 2014; NOLTE et al., 2020).

In recent years, the popularity of hackathons has increased. These events can have different names— e.g., codefests, hack days, and code camps—and focus on college students,

[1] <https://girlswhocode.com/>
[2] <https://www.womenwhocode.com/>
[3] <https://anitab.org/>
[4] <https://pyladies.com/>
[5] <https://ghc.anitab.org/>
[6] <https://reprograma.com.br/>
[7] <https://www.sbc.org.br/2-uncategorised/461-Meninas-Digitais>
[8] <https://utfpr.curitiba.br/emilias/>
[9] <https://www.instagram.com/portodigitalminas/>
[10] <https://sites.google.com/cin.ufpe.br/cintia>

corporations (PE-THAN et al., 2018), and academia (THAN et al., 2018). The most well-known format is a co-located event, with a duration between 24 to 48 hours, where participants can focus on the event's objective (BRISCOE, 2014). Hackathons attract people for the possibility of creating prototypes, learning new skills, personal growth, networking, and collaboration (BRISCOE, 2014; KOMSSI et al., 2014; TAYLOR; CLARKE, 2018). Hackathons can also be used to learn, especially computer science students, applying the concepts seen in the classroom (GAMA et al., 2018). They can have specialized mentors who support participants on how to find solutions for possible problems during the event (NOLTE; HAYDEN; HERBSLEB, 2020). Hackathons are also a source of informal learning and can allow undergraduate students to improve their background in their early college years.

During the COVID-19 pandemic, hackathons started to be organized online. This format was rare due to the strong preference of hackathons participants for face-to-face (F2F) interactions (BRISCOE; VIRANI; DIMA, 2015). The social focus ("hack for good") was increased as the world tried to create new solutions for the pandemic (BRAUNE et al., 2021) or create new methodologies for usual co-located activities, i.e., academic disciplines (GAMA; ZIMMERLE; ROSSI, 2021).

Some limitations of these types of events include *technical solutionism*, that it's an implementation of technological solutions for problems that do not exist, or the caveats not being properly analyzed (MOROZOV, 2013) and short amount of time to learn software engineering skills (e.g., software maintainability) (WARNER; GUO, 2017).

A guide on creating a hackathon is available, focusing on the decisions before the event (NOLTE et al., 2020). The guide gives two examples of a hackathon's timeline, an entrepreneurial and a community hackathon, which serve different purposes.

2.3 WOMEN PARTICIPATION IN HACKATHONS

Historically, women's participation in hackathons has been low. A survey made in 2014 with 150 hackathons participants from the United States showed that women were only 11% of the attendees (BRISCOE, 2014). In the 2018 season, one of the main organizers of these types of events in North America and Europe, the Major League Hacking (MLH), with more than 90,000 attendees in 215 hackathons, reported that 24% of the participants were women (Major League Hacking (MLH), b). The low rate of women's participation can prevent the informal learning experience, which is decisive for women's persistence in the STEM field (RICHARD

et al., 2015; GRIFFITH, 2010). Furthermore, hackathons are also used as recruitment for companies (RICHARD et al., 2015), so the lack of gender diversity makes women lose employment opportunities and fosters the feeling of non-belonging in the tech industry.

One of the possible reasons that can prevent women's participation in the *hackathon culture*. Literature appoints differences between the vision of risks participating in hackathons, where women consider their health at risk — including poor quality food, sleeping arrangements, and sleep night (HARDIN, 2021). The common hackathon format has a dedicated weekend where logistic challenges are common for women, especially with associated tasks by their gender, e.g., family care. (TAYLOR; CLARKE, 2018; HARDIN, 2021).

Throughout the years, strategies have been used to increase the number of women, such as making hackathons around social themes *(hack for good)*, including *healthcare* and *breastfeeding* (RICHARD et al., 2015; D'IGNAZIO et al., 2016), encouraging the participants to submit their motivation to join the hackathon (LINDBLOM, 2015), having different types of participation during the event (KOS, 2019), brainstorming during the ideation process (FILIPPOVA; TRAINER; HERBSLEB, 2017) and making women-only hackathons. The Spotify hackathon had a 50/50 ratio of women and men in their hackathon, (DIVERSIFY..., 2015) showing that it is possible to reduce the difference in this proportion by recruiting people outside tech and having questions such as "Why diversity is important". It is worth mentioning that female-only hackathons - such as the *International Women's Hackathon*, sponsored by Microsoft - may end up further segregating the area and moving away from the focus of increasing participation of women(RICHARD et al., 2015).

Some considerations with the online events are that they could increase the participation of women, since they don't have the feeling of being *"the only women in the room"*, provide the option to control the sleep spaces and healthier options of food (HARDIN, 2021). MLH reported an increase in the percentage of women participation during the pandemic, from 21% in 2019 to 39% in 2020 (Major League Hacking (MLH), a). However, it's unclear how the online experience was for their participants and if other issues related to gender have appeared.

2.4 WOMEN PARTICIPATION IN TIME-BOUNDED EVENTS

Game Jams are events like hackathons - time-bounded but focused on the game area. The main difference is the event's focus, where innovation and experimentation are prioritized, bringing a more playful side(GODDARD; BYRNE; MUELLER, 2014). It's a way to attract people

from different areas, sharing the passion for games, and it usually doesn't have a competitive nature or prizes(KULTIMA, 2015).

Game Jams also lacks diversity. A poll was taken at the 2013 Global Game Jam, and only 12.54% of people identified as women - compared to 85.97% as men (FOWLER et al., 2013). In Recife, between 2017 and 2018, female participation was no more than 19%, with an average of 13.1%. This number only increased with events made especially for this audience - Game Jam das Minas and Women Game Jam (DUTRA; GAMA, 2018). Some recommendations for both types of events include focusing on collaboration instead of competition, stimulating technical and soft skills during the event, defining an inclusive code of conduct, and having women in the organization team (PAGANINI et al., 2021).

A similar case to increase interest in programming is the *Girls Coding Day*, a one-day workshop for women that did not choose computer science as their major but had an interest in learning how to program (QIU; WEN; NOLTE, 2021). The event had a similar duration to a hackathon. However, they have a more specific curriculum where the language is already defined (HTML/CSS or Python). Another important point is that only one mentor was assigned per group, which was perceived as insufficient during the workshop. Still, the mentoring experience was viewed as the most useful during the workshop.

3 METHODOLOGY

In this chapter, we will introduce the chosen methodology to answer both research questions, Action Research. A brief introduction of the history of the method, its origins, and how it was instantiated in this dissertation will also be present. Next, an introduction of the design choices made for the research will be done, together with the data collection instruments and how the data was analyzed.

3.1 ACTION RESEARCH

We needed a method that could help answer the *RQ1. How did the event design choices influence the participant's experience in a women-focused hackathon?* and *RQ2. How did the event design choices influence the mentor's experience in a women-focused hackathon?*. This method must be empirical, have a participatory design, and support the *critical* epistemological perspective. Following (STOL; FITZGERALD, 2018), where the methodology can be identified by two dimensions (obtrusiveness and generalizability), where we have a pre-existing setting (hackathons) with some level of manipulation (design choices). One recommended method is Action Research (AVISON et al., 1999). This method, summarized in Figure 1, allows the participants to be involved and gives voice to historically underrepresented groups, being appropriate to localized problems (MERRIAM; TISDELL, 2015; LEWIN et al., 1946).

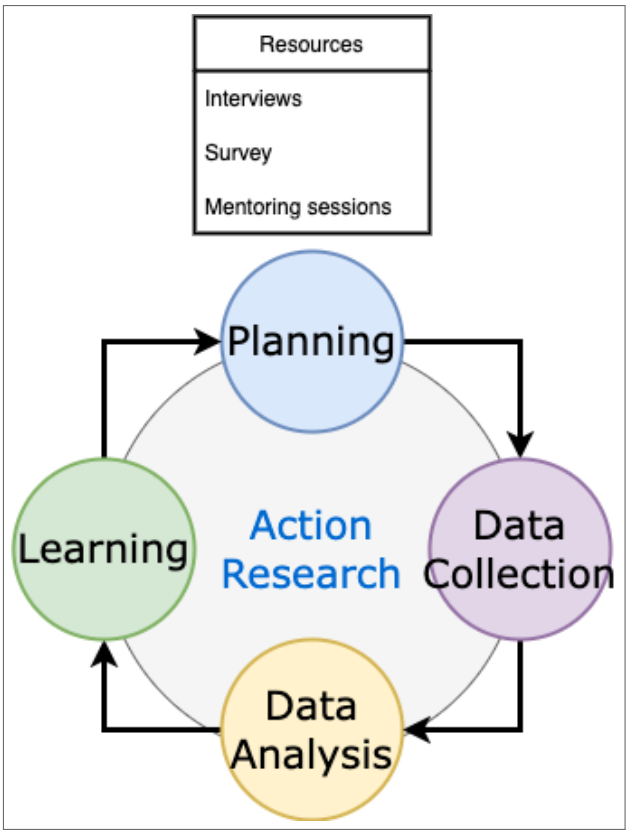
Action Research has a social science background, adopted in the Information Systems community around 1972 to 1997, addressing different epistemological perspectives than positivism (LAU, 1997). The choice of the methodology is also appropriate in the *critical* epistemological perspective, with the purpose of changes in the hackathon's environment for women (MERRIAM; TISDELL, 2015; LAU, 1997).

Compared to other empirical methods from Software Engineering, Action Research differs in obtruding a real environment, where the problem needs to be *authentic* and having *knowledge outcomes* for their participants (EASTERBROOK et al., 2008). Another peculiarity of Action Research is that the lead researcher is an insider in the community being studied, improving the community and practice, which happens in this study as the lead researcher is also the co-founder of the hackathon (MERRIAM; TISDELL, 2015).

The four main steps in the Action Research cycle are *Planning*, *Data Collection*, *Data*

Analysis, and *Learning*. Some authors also include the *Diagnosis* step to understanding the desires of change, such as Baskerville (BASKERVILLE, 1999), which was not made in this dissertation due to a previous study case being made about women's participation in hackathons (PAGANINI; GAMA, 2020). The step of *Planning* specifies the plan of changes made to improve the current setting with the desired outcome. The *Data Collection* step can also be defined as the *Action Taking*, where the planned actions occur and the research instruments are applied. In the case of this study, all the instruments are qualitative. After the data is collected, the *Data Analysis* is made, determining if the changes are successful and if the changes were the sole cause of success. Lastly, the *Learning* step takes place, where the organization knows more about its culture, and if any step has failed, it can start preparing another Action Research cycle (MERRIAM; TISDELL, 2015; BASKERVILLE, 1999). This dissertation will describe from the *Planning* until the *Learning* step of the research.

Figure 1 – Steps involved in one iteration of Action Research



Source: The author (2023)

3.2 PLANNING STEP

In this step, planning the hackathon, choosing the design choices, and preparing instrument construction for the data collection took place. The hackathon planning started in August 2020, together with the organization team, consisting of six people involved, being focus centered (BRISCOE, 2014). The hackathon was held online during the social distancing phase of the COVID-19 pandemic in April 2021. It was organized to last 48 hours from the opening to the closing ceremony. The hackathon was held on Discord, where participants could use open channels to communicate with each other, mentors, and the organization. A support online hackathon platform *Shawee* was also planned to be used by both participants — to register their teams, submit the final project, and receive feedback from the jury — and mentors — to add notes and impressions about the mentoring and check-in session.

3.2.1 Event design choices

The event had some differences from traditional hackathons. We grouped these differences into three groups of design choices — **Focus on Women**, **Event Support Activities**, and **Event Warm-up**. The motivation for choosing them was the previous experience in the co-located edition of the hackathon (PAGANINI; GAMA, 2020), where we adapted to the online environment. The details of the groups and the design choices that fall into those categories are presented in the next sections.

3.2.1.1 Focus on Women

This event had **women-focused participation** in which men could participate at a minor rate. The hackathon had a **theme/challenge addressing women**: *"Ethics on Marketing for Women"*. Teams had to propose solutions around this topic. This was disclosed during the opening to avoid solutions being created before the event. The organizers shared supporting documents related to the theme in one of the Discord channels, aiming to guide the participants, as shown in Figure 2.

The support team was **women-only mentors** - one motivation for that is, according to Cheyran *et al.*, interacting with women in non-stereotypical roles has a positive impact on the vision of other women for success in STEM area (CHERYAN et al., 2011). Mentors were

Figure 2 – Example of auxiliary material on Discord

Source: The author (2023)

recruited by invitation (9 mentors) and through an open call (12 mentors) on the website, based on expertise in one or more of the following areas: *development, design, marketing, and business*. The full profile of the mentors is available in Table 1.

Table 1 – Number of mentors, by area of the hackathon

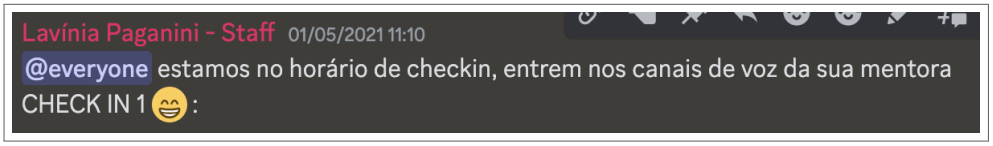
Mentors of the hackathon			
Main area of mentoring	Invited	Registered	Total
Developer	6	5	11
Designer (UI/UX)	2	3	5
Marketing	0	1	1
Business	1	3	4
Total	9	12	21

Source: The author (2023)

3.2.1.2 Event support activities

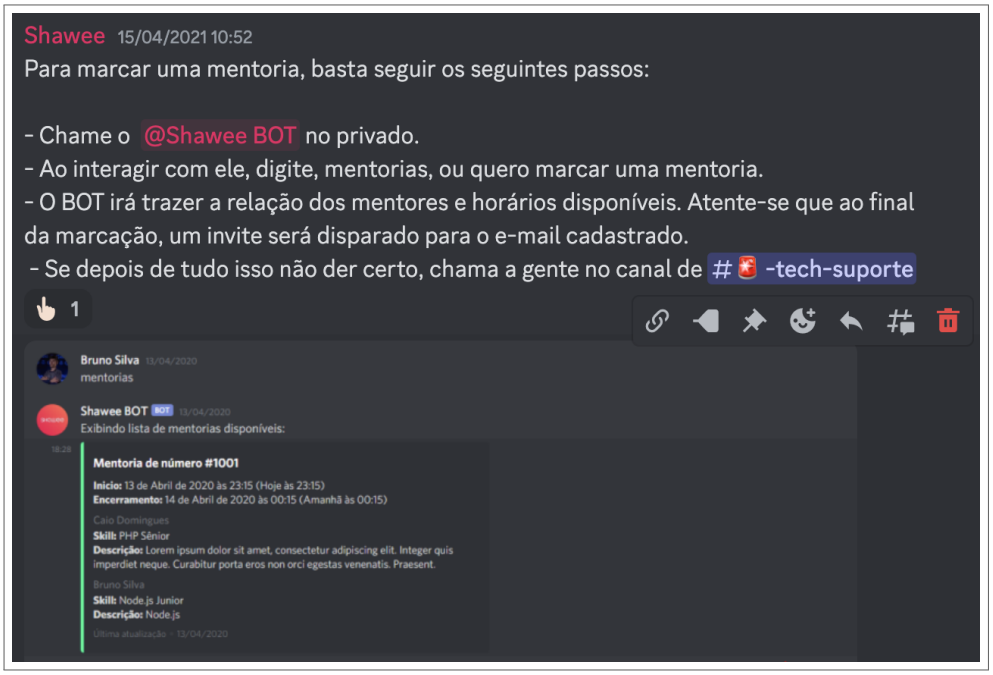
The participants could have **mentoring** in 3 ways: check-in, on-demand, and pre-pitch. The check-in is a moment where a pair of mentors (ideally from different expertise) are randomly assigned to a group during the event and during one of the four assigned moments, would ask about the progress of the project, understand the group needs, and answer possible questions during the event. You can see an example of the announcement of the check-in moment for the participants in Figure 3. The on-demand interaction was to request a time slot (30 minutes) of the mentors' schedule, using a Discord bot to assist in the process. The bot shows the time slot, the area of the mentor, and a short description of the participants. The instructions for scheduling a mentoring session are shown in Figure 4. After the mentoring session was scheduled, the mentor would receive an email and could use any platform for this interaction with the team.

Figure 3 – Annoucement of check-in moment on Discord



Source: The author (2023)

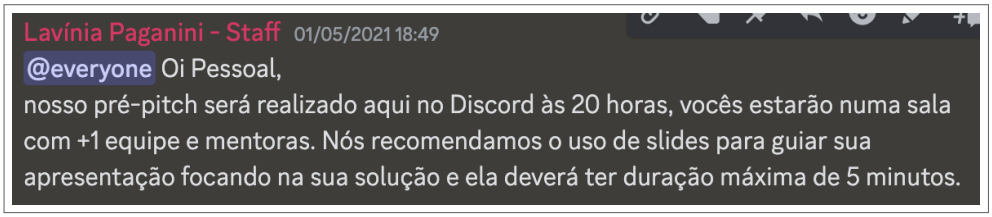
Figure 4 – Example of scheduling mentoring with the bot on Discord



Source: The author (2023)

The **pre-pitch** moment occurred with two mentors different from those assigned during the check-in process, where the teams needed it to present their idea and progress until that point - each channel for the check-in had two teams to stimulate the teams to interact with each other. A reminder for this moment was sent to the participants, also indicating the duration of the presentation (5 minutes) and recommending the usage of slides, as shown in Figure 5.

Figure 5 – Reminder of the pre-pitch moment on Discord



Source: The author (2023)

3.2.1.3 Event Warm-up

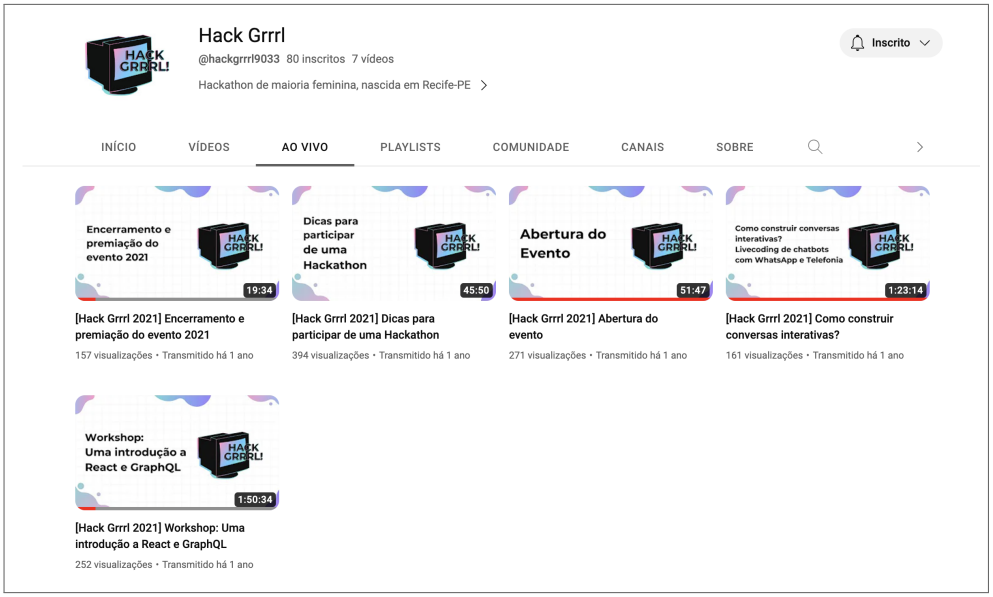
For the **workshops**, opening, and prizes ceremony - where people that didn't participate in the hackathon could watch and have the recordings, we opted for live streams on Youtube. We offered two technical workshops before the event – one on *React.Js* and *GraphQL*, and another one on creating chatbots using *Twilio* – and one in the day of the event, focused on expectations and how to participate in a hackathon. The workshops were available for the general public through Youtube livestreams and were recorded, as shown in Figure 6.

For the **team-formation dynamic**, we suggested creating a team on the first day, meeting new people, and having no option in the enrollment form to join as a team. We held a session after the opening ceremony to help people know each other. The dynamic was carried out in the official Discord of the event. We had two mentors in 7 of 14 available channels for participants, with them setting up a general knowledge quiz and games such as Gartic or Stopots as ice-breakers. After one game round, we left the participants in the room, so they could freely chat and get to know each other.

3.2.2 Instrument Construction

We planned two types of instruments as resources for the research: a survey and interviews. These two moments offer a different level of detail about participants' experience in the

Figure 6 – Workshops available in the hackathon's Youtube channel



Source: The author (2023)

hackathon, in which the survey explains the general feeling of the event. At the same time, we explore the topics in the interviews. The correlation of interventions in the two moments for the participants is shown in Figure 7. A similar version was applied for the mentors, removing the questions focusing on teams.

3.2.2.1 Survey

First of all, we wanted to know more about the population (the hackathon attendees and mentors), with a numerical evaluation of their experience during the event, motivations to join, and their previous contact with a hackathon. A survey meets the objectives, with a questionnaire being prepared following Kitchenham and Pfleeger (KITCHENHAM; PFLEEGER, 2008), in this particular case being a *Cross sectional* one — where the instrument is applied at a certain time. Part of the questions was already validated by previous research in hackathons (FILIPPOVA; TRAINER; HERBSLEB, 2017; ELLEMERS; KORTEKAAS; OUWERKERK, 1999; ELLISON; STEINFIELD; LAMPE, 2007), being translated into Portuguese for this particular study.

To help understand perceptions of design choices on participants, we asked the closed question for people without experience in hackathons *"Why you didn't join hackathons before?"*, with the options based on previous research on women's participation in hackathons (PAGANINI et al., 2021).

To understand the perception of the hackathon community and why people would join a women-focused hackathon, we had two questions, the first one being *"About the general (mixed) hackathon community, to what extent do you identify with these statements?"* with the options going from *Strongly disagree* to *Strongly agree*. The statements were: I identify with other members of this community, I am like other members of this community, This community is an important reflection of who I am, I would like to continue working with this community, I dislike being a member of this community, I would rather belong to another community. The second question was *"Why did you participate in the hackathon?"* going from *Not at all* to *Completely*, with the statements being: Having fun, Making something cool/Working on an interesting project idea, Dedicated time to get work done, Learning new tools or skills, Meeting new people, Seeing what others are working on, Sharing your experience and expertise, Advancing my career, Becoming part of a community, Getting immediate feedback, Joining friends that participate, Getting through personal problems, Felling needed, and Having a safe space to work (NOLTE et al., 2018).

From the Event-Warmup, we asked *"Which of these did you attend or watch the record?"*, including the options Workshop: React and GraphQL, Workshop: chatbots, Workshop: hackathon participation, Team formation dynamics, Fun night!, Coffee breaks, and None of them.

During the survey, the question *"Do you plan to participate in similar events/hackathons in the future?"* was made to the participants to see if our hackathon promoted women to continue as part of the hackathon audience, using the scale from *Definitely not* to *Definitely yes*.

In the mentor's survey, some questions were the same as the ones applied to the participants. The question *"About the general (mixed) hackathon community, to what extent do you identify with these statements?"* to understand the sense of belonging from the mentors, where the sense of belonging in STEM is related to the retention in a community (ESPINOSA, 2011), *"About the general (mixed) hackathon community, to what extent do you identify with these statements?"*. The survey also had the question about previous experience in hackathons, and for those who did not have, the question *"Why you didn't join hackathons before?"* was available.

The questions limited to the mentors were *"Why did you decide to be a mentor in Hack Grrrl?"*, being an open question to understand their motivations. They were also asked *"How can the event be improved?"* and *"In your opinion, what was good about the event?"* as an open question, where they could share their vision on the design choices and the event.

Another point to understand their motivation to be a mentor in a women-focused event is the open question *"Why did you choose to participate as a Hack Grrrl mentor? Have you mentored at any other time-limited events?"*. Lastly, they were asked if they joined the first Hack GRRRL in 2019 and which role they had.

3.2.3 Interview

The interviews were semi-structured, where a script is available, but new topics can appear and be handled in the middle of the interview (MERRIAM; TISDELL, 2015). They were performed in the participant's and mentor's native language (Portuguese). The script started with demographic questions: name, age, the location where the person lived in Brazil, current job, and if the person graduated in both interviews.

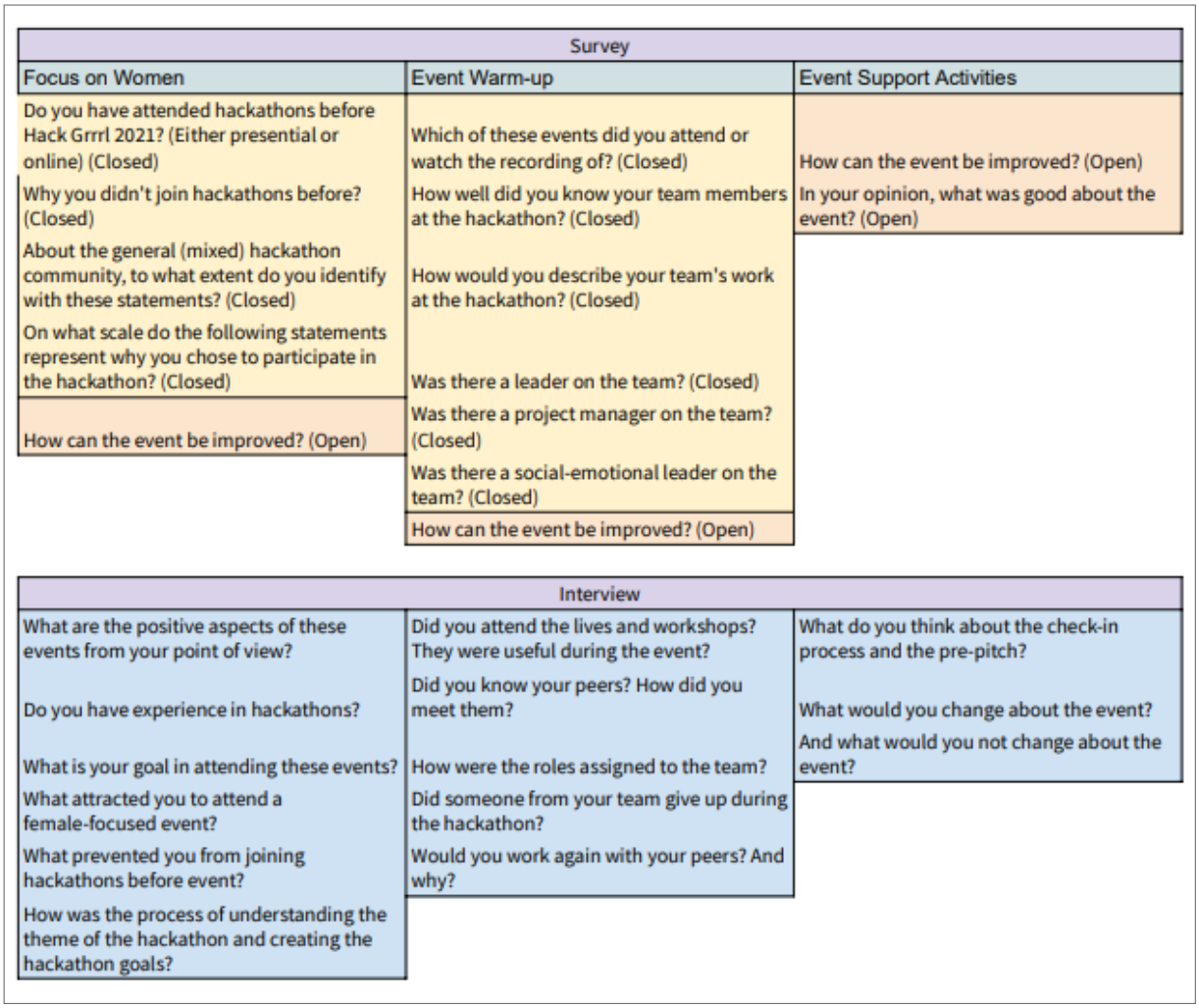
Then, we had questions about their experience in hackathons ("What are the positive aspects of these events from your point of view?", "Do you have experience in hackathons?", "What is your goal in attending these events?", "What attracted you to attend a female-focused event?", and "What prevented you from joining hackathons before Hack GRRRL?") — to understand their motivations to attend a hackathon and if the fact of being women-focused influenced their choice. We also had a specific question about the Hackathon theme ("How was the process of understanding the hackathon theme and creating the hackathon goals?"). Regarding the Event Warm-up, we asked a direct question about the workshops: "Did you attend the lives and workshops? Were they useful during the event?". For the Team-formation, besides asking, "Did you know your peers? How did you meet them?", we also wanted to understand more deeply the team dynamics with other questions ("How were the roles assigned to the team?", "Did someone from your team give up during the hackathon?", and "Would you work again with your peers? And why?"). For the mentoring and pre-pitch sessions, we had the question, "What do you think about the check-in process and the pre-pitch?".

For the mentors, the interview did not have questions about team formation, however, we also asked about their previous experience in hackathons. We also had the question *"How did you start to do mentorships in your area?"* to understand their motivations to be a mentor, similar to the survey question.

3.3 DATA COLLECTION

The data collection happened with the participants in two moments: a survey and interviews. All interview recordings were transcribed with the help of the Microsoft Word transcription tool and then verified manually by the authors.

Figure 7 – Questions related to interventions in the Survey and Interview



Source: The author (2023)

3.3.1 Participants

Survey: The participant's survey was available from the end of the event until the winner's ceremony (5 days), sent in the Discord channel and as an email to the participants.
Interview: The interviews took place after the events, so they would not be interrupted during the project ideation and execution. The survey was voluntary, and participants were asked for

their email at the end if they were willing to participate in an interview. 12 of them shared their contact, 10 answered the email follow-up, and 9 of those showed up for the interviews conducted via *Zoom*, which were recorded, and the participants were encouraged to keep their cameras on.

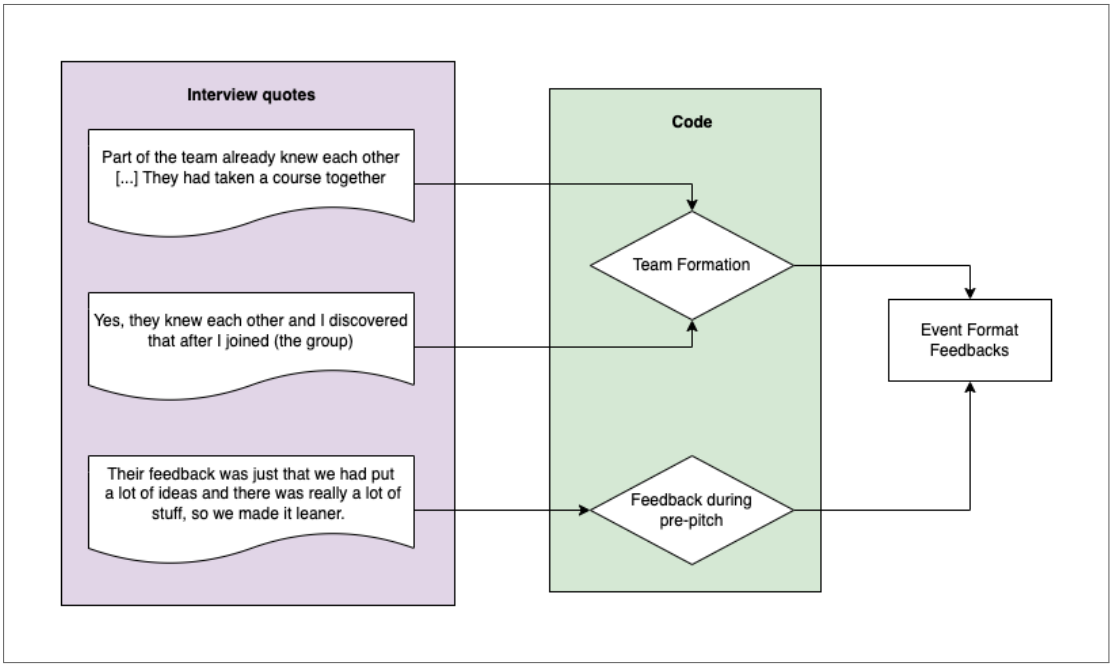
3.3.2 Mentors

Survey: The mentor's survey was sent to the Mentor's private channel on Discord and as an email two weeks after the event, being available for five days, the same time frame as the participants. The survey was voluntary, and mentors were asked for their email at the end if they were willing to participate in an interview. 6 of them shared their contact, and 5 showed up for the interviews conducted via *Zoom*, which were recorded, and the participants were encouraged to keep their cameras on.
Interview: The interviews with the mentors happened 3 weeks after the event, so the author was able to finish all the interviews with the participants.

3.4 DATA ANALYSIS

Survey: We converted the closed questions to their corresponding scale, then a visualization of the answers was made using stacked bars to see the answer distribution (ROBBINS; HEIBERGER et al., 2011).
Interviews: Open coding was made in the transcriptions, adding labels for relevant parts of the interviews, aiming to answer the research questions (MERRIAM; TISDELL, 2015). Then, we proceeded to create groups for the labels created in the *open coding* phase, called *axial coding* (THORNBERG; CHARMAZ et al., 2014). During the process, it's necessary to merge different labels with the same meaning and create newer ones if their meaning is unclear (MERRIAM; TISDELL, 2015). Codes and quotes were translated from Portuguese into English. An example of the coding process can be seen in Figure 8.

Figure 8 – Example of coding and categorization



Source: The author (2023)

4 RESULTS

In this chapter, the results for both the participants and the mentors will be presented, showing the data analyzed from the survey and interviews. The result sessions are divided by the design choices, presenting first the survey results and then the codes extracted by the interviews, following a quote that generated that code. For the participants, we will also present their willingness to join future hackathons as part of the results. The summary of the codes of mentors and participants can be found, on 18.

4.1 PARTICIPANTS

The hackathon was attended by 55 people, with different intended roles in the event, as shown in Table 2. For the survey, we had 30 participants (54.54% of the hackathon participants), with their full profile available at 3. The interview participants had different areas, with two being developers during the hackathon, five being designers, one being in the marketing area, and one being a developer, with a total of 9 (16% of the hackathon's participants). They were part of six different groups from the 12 groups of the hackathon. The age range was from 19 to 41 years old, with most of them being between 20 to 28 years old. The full profile of the interviewed participants is available in Table 4.

4.1.1 Focus on Women

1) Survey: *On what scale do the following statements represent why you chose to participate in the hackathon?* The answer that represents better the motivations according to the participants is "Making something cool/Working on an interesting project". Another relevant statement in the same question is "Becoming part of a community". The full distribution is available in Figure 9.

About the general (mixed) hackathon community, to what extent do you identify with these statements? This question represents the sense of belonging to the general hackathon community. The full distribution is available in Figure 10.

Why did you not join hackathons before? This question (shown in Figure 11) was prompted for those with no previous experience in hackathons, 13 of 30 participants in the survey. The

Table 2 – Number of participants, by area and gender of the hackathon

Participants of the hackathon			
Desired role in the event	Total	Women	Men
Developer	18	17	1
Designer (UI/UX)	16	15	1
Marketing	12	12	0
Business	9	8	1
Total	55	52	3

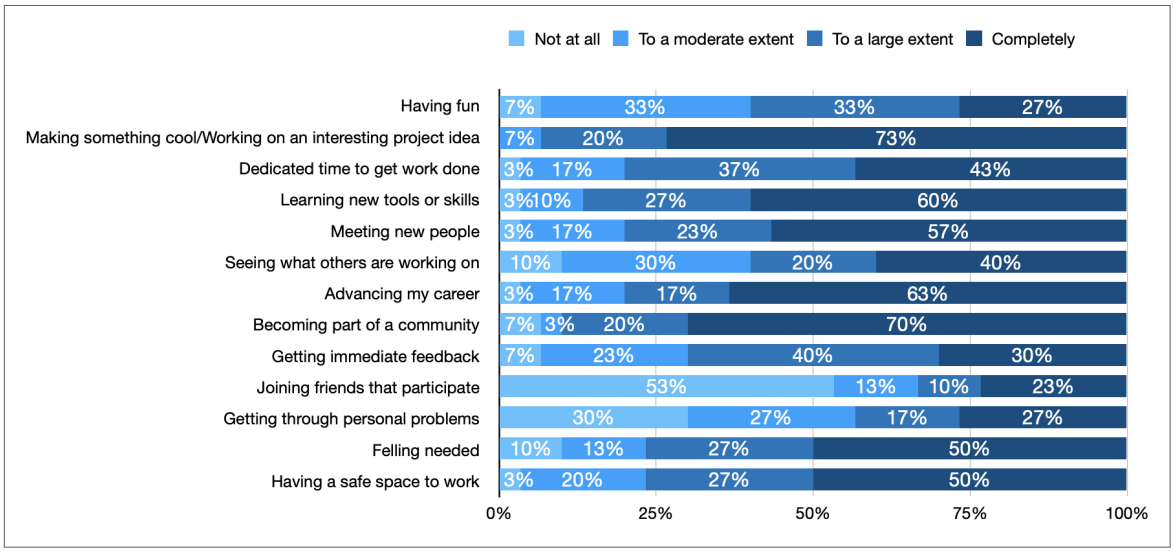
Source: The author (2023)

Table 3 – Number of participants, by role and gender of the survey

Participants of the survey			
Role in the event	Total	Women	Men
Developer	10	10	0
Designer	10	9	1
Marketing	4	3	1
Business	6	6	0
Total	30	28	2

Source: The author (2023)

Figure 9 – Answer distribution for the question "On what scale do the following statements represent why you chose to participate in the hackathon?"



Source: The author (2023)

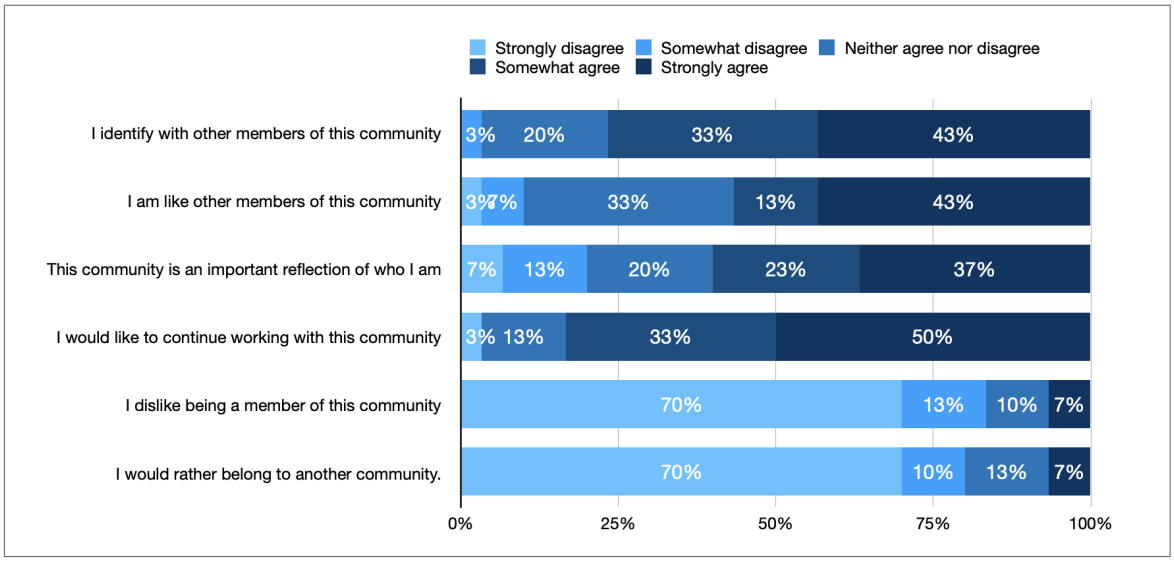
answer with more agreement is "Didn't feel that I have the technical skills to collaborate with the team". On the other end, the answer with less agreement is "Didn't feel comfortable to work with people that I don't know".

Table 4 – Participants interviewee's profile, by role, age, and group

Participants interviewee's profile			
Code	Role	Age	Group
P1	Designer (UI/UX)	24	G1
P2	Marketing	31	G2
P3	Developer	30	G3
P4	Designer (UI/UX)	22	G4
P5	Designer (UI/UX)	28	G5
P6	Designer (UI/UX)	25	G5
P7	Business	19	G6
P8	Designer (UI/UX)	41	G6
P9	Developer	20	G6

Source: The author (2023)

Figure 10 – Answer distribution for the question "About the general (mixed) hackathon community, to what extent do you identify with these statements?"

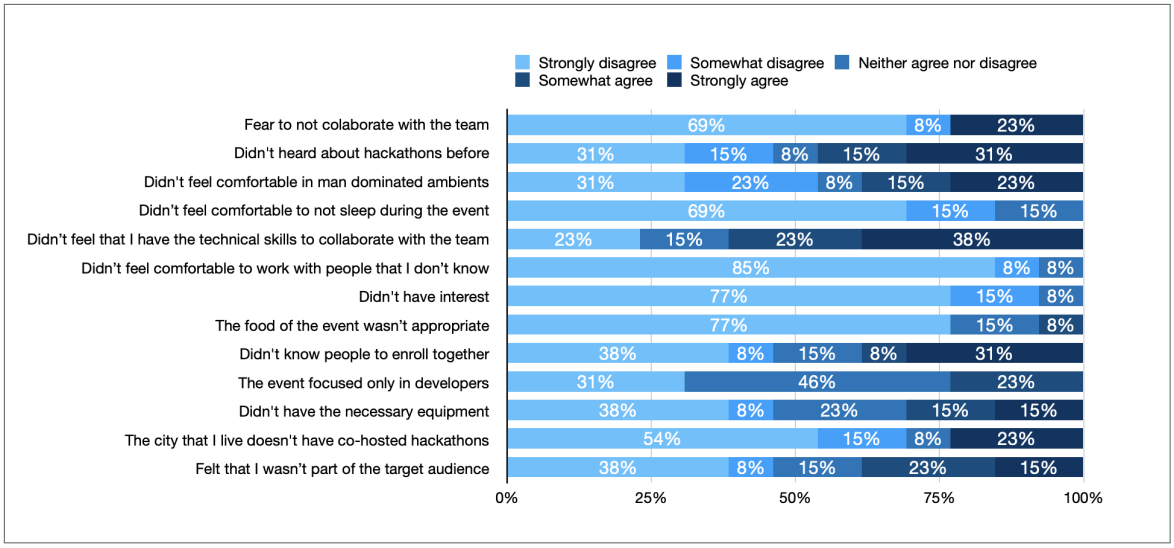


Source: The author (2023)

2) Interview: *Motivations to participate:* From the open coding process, the reasons to join the hackathon that appeared in the interview are Networking, Curiosity, Gaining experience, Apprenticeship, Career Transition, Personal challenge, Award, Social themes, Applying concepts learned in the project, Curiosity, Making friendship, and Creativity. Most of them reflect the options in the survey (Figure 9). The career transition code gives more insights into how participants may use hackathons to advance their careers and join the technology area even if they are not developers, as shown in the quote below.

"I'm in a moment of career transition and I'm looking to migrate to a more

Figure 11 – Answer distribution for the question "Why did you not join hackathons before?"



Source: The author (2023)

> *technology area. I think the hackathon is a good place to get experience for that."* (P2)

The personal challenge code gave more details on how some participants can tackle personal problems during the hackathon, such as trying to code again after leaving the area.

> *"Challenge me because it was the first time in 10 years that I coded something on my own."* (P3)

During the interview, we also received comments about the hackathon's social theme as a motivation to join the event. The P9 also had previous experience with hackathons with social themes.

> *The idea that I can help other people with my knowledge, and people in vulnerable situations, things like that, like minorities in general. In general, with technology, we can help by doing all of this - so I can acquire knowledge, share my knowledge, and still help other people with this, so I think it's very cool.* (P9)

Hackathon format benefits: The hackathon format codes reflected on benefits that may happen in hackathons and are found in the previously mentioned literature. The codes are Product development, Soft-Skills Development, Networking, New concepts during the event, Knowledge Exchange, Meeting people from other areas, Collaboration beyond borders, and Collaboration between groups after the event.

Benefits of Hackathon focused on Women: Being more specific on the benefits of the hackathon is focused on women, the following codes emerged: Apprenticeship, Reception, Representation, Comfort to talk about themes considered "taboo", Learning Environment, Cooperation, Friendship bonds, Safe Space, and Identification. For those who did not participate in previous hackathons, the fear of not having the technical skills to collaborate with the team was the most agreed answer (Fig 11). In the code **Safe Space**, participants explained the environment and the impact it had on sharing their technical skills with their team and on collaboration during the event.

> *"An environment that only had women made me feel more comfortable in giving ideas. So I can talk about the skills I have, and the skills I don't have and be able to talk too and learn. I felt more comfortable, I felt more is... As if I didn't feel judged for the lack of skill I had."* (P7)

Another related code is **Learning environment**. This also aligns with the objectives found in the survey (Figure 9 and Hackathon Format Benefits). However, the participants reinforced this even if a team had conflicts during the hackathon.

> *"We were there with the idea of learning so much that we reinforced it several times when we got to those moments of conflict [...] It's when we got to those moments, we still reinforced look at this here is a learning environment, we're here learning, we're more learning than aiming for the podium then. Yes, the girls and I, practically the whole team had this learning perspective, even though they had more experience."* (P7)

The code **Reception** shows the perception of the organization team and mentors being women, how they reacted when facing challenges during the project, and being able to submit a project.

> *"I felt a warm reception, I liked it a lot, especially seeing all the female mentors as mentors. I love seeing women in positions of power like this"* (P6)

> *"When I entered Discord I saw that the mentors were there, you stayed there until dawn and I was like, 'okay, if they're here it's all right, let's go there' and I continued."* (P9)

Although the goal of meeting new people appears in the survey (Figure 9), some teams went beyond and made **Friendship bounds** that went beyond the event in some cases.

> *"We did, I think these days I sent them a message in the group, kind of asking how they were doing, what they felt about the end of the hackathon, the solutions and I don't know what... We talked for a while little, it wasn't just professional"* (P1)

The code **Cooperation** also appeared in the interview, also associating a person wanting leadership as a negative sign. This code also shows the opposite of fear from people that never joined a hackathon before (Figure 11).

> *"We encouraged each other (...) there was a relief, we were always talking about amenities and relieving the pressure, so I think it was much more cooperative than a team that has that person wanting leadership, you know?"* (P6)

While talking with each other, an interviewee mentioned the **Comfort to talk about themes considered "taboo"**, such as menstrual periods.

> *"So sometimes they made a little joke about menstruation or something like that, which I didn't quite understand but I laughed because I didn't understand, you know?"* (P1)

The point of having a women-focused theme impacted the proposed solutions, where the code **Identification** emerged in the interviews.

> *"I always try to participate in events aimed at women because I identify with the group. When I think of a solution, I already think of something that as a woman, as a minority, would be good for me, what would be good to help this group of people."* (P9)

Event format feedback: The theme "Ethics on Marketing for Women", which addressed challenges faced by women, received a mixed reaction from participants. The code **Vision on the theme** reflects their opinion on the topic. Some thought it was hard to create a technological solution to the theme and spent hours of the hackathon.

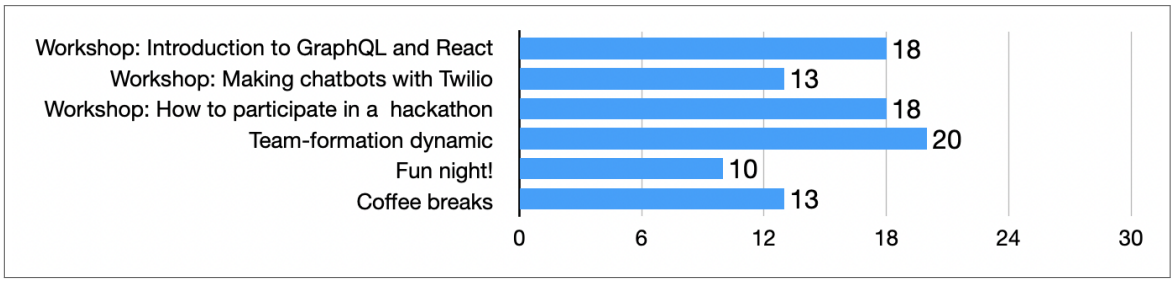
> *"It was extremely difficult, so much so that it was the reason we generated some intrigue during the event because we literally spent about 12 hours defining what we were going to do."* (P7)

> *"(...) Wow, what a difficult subject. It's a problem that exists, but it was difficult to think of a solution for it."* (P2)

4.1.2 Event Warm-up

1) Survey: *Which of these events did you attend or watch the recording of?* Every survey participant attended at least one of the events (Workshops, Team-formation Dynamic, Fun night!, and Coffee breaks), as shown in Figure 12. The event with the most engagement was the Team-formation dynamic, and the event with less engagement was the Fun night.

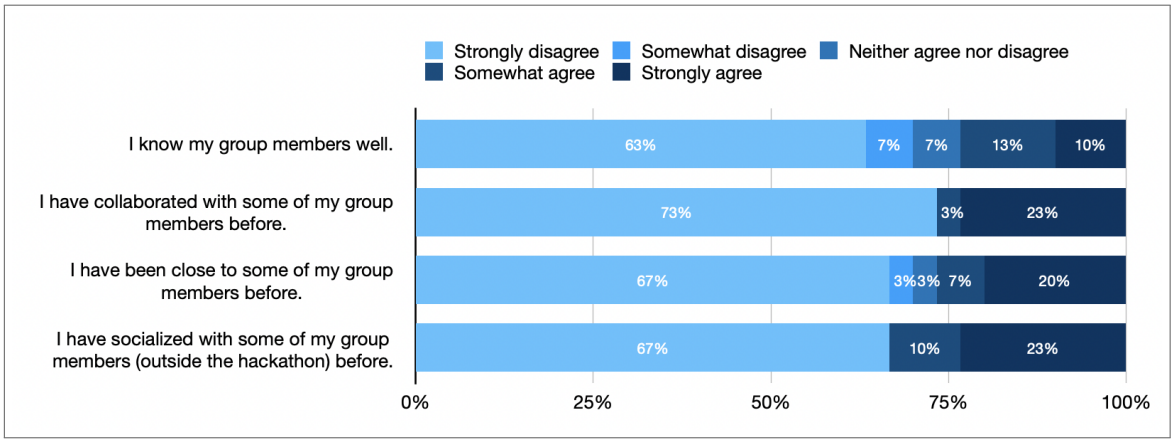
Figure 12 – Answer distribution for the question "Which of these events did you attend or watch the recording of?"



Source: The author (2023)

How well did you know your team members at the hackathon? To understand previous relations, we asked how well the participants knew the other members of their team. As detailed in Figure 13, the less agreed option was "I have collaborated with some of my group members before". Most of the participants did not know their peers, befitting the motivation of Networking.

Figure 13 – Answer distribution for the question "How well did you know your team members at the hackathon?"

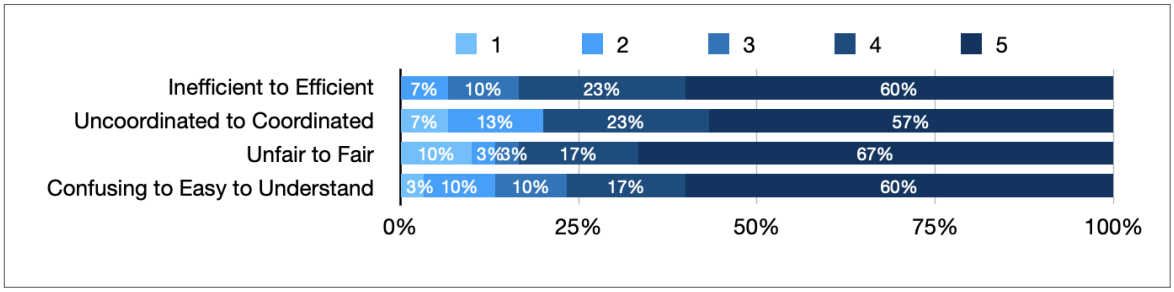


Source: The author (2023)

How would you describe your team's work at the hackathon? The survey participants were asked about the team's work in different measures, such as efficiency, coordination, fairness,

and comprehension. Although most responses have been on the positive side (Figure 14), some participants mentioned the unfairness during the team's work, although on a smaller scale.

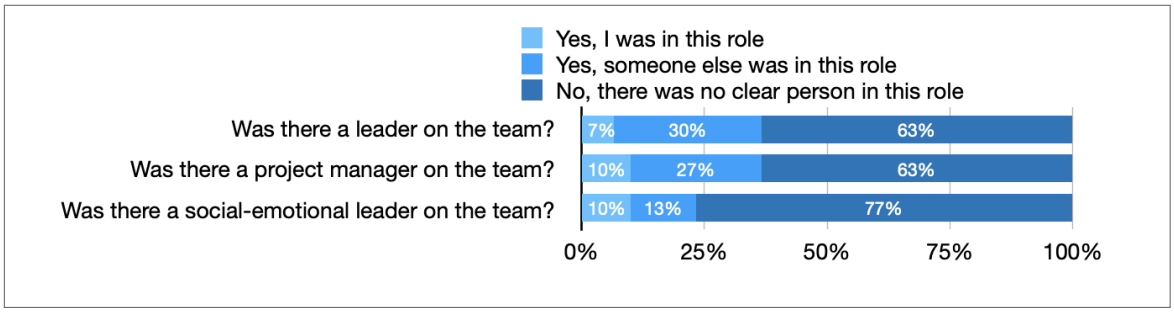
Figure 14 – Answer distribution for the question "How would you describe your team's work at the hackathon?"



Source: The author (2023)

Roles during the hackathon The participants were asked about the presence of roles (Leader, Project Manager, and Social-emotional leader) during the event. Although some participants acknowledged the presence of these roles in their teams, the majority answered that was no clear person in the roles. The entire distribution is shown in Figure 15.

Figure 15 – Answer distribution for the questions "Was there a leader on the team?", "Was there a project manager on the team?" and "Was there a social-emotional leader on the team?"



Source: The author (2023)

2) Interview: *Obstacles during the event* From the open coding, we had the following codes emerge related to obstacles during the hackathon: Absence of communication within the group, No voice in the team, Erasure of work made during the hackathon, Competitiveness, Judgment within the team, Isolation of developers, and Environment is not so safe.

In the code **Absence of communication within the group**, the participant shared the creation of other communication forms besides the official Discord and the absence of contact with the team.

> *"I felt a little isolated at one point, as we created a group for the 4 of us on WhatsApp just to talk about the hackathon. I saw that there were times when*

> *they solved things that I wasn't aware of, so it seemed that they had another group and I wasn't participating."* (P1)

The code **No voice in the team** was created after some participants said their opinions were not heard. Some even mention less influence in their work, even with the hackathon theme being shared on the same day of team formation.

> *"Sometimes, like, I wrote there in the group, it wasn't heard very well, the mentors would come and say something very similar to what I had written down at that time"* (P4)

With G6, the code **Erasure of work made during the hackathon** was created where by the end of the hackathon, they changed the final presentation, leaving behind the work of some participants.

> *"All the stuff I've been a part of, it doesn't show up in Pitch. It doesn't show up, it's like I didn't even exist at work you know?"* (P8)

> *"Because we finished, we had everything ready to be able to deliver but one of the participants did not like the final result of the Pitch and she decided, at the last minute, to redo the whole video and it ended up that we had even delivered the project a few minutes delayed because of this detail."* (P7)

The code **Competitiveness** also explained the different motivations of some participants who do not always correspond with their peers, leading to frustration.

> *"I just want to learn, I want to compete, I want to create a product that I say 'Look, I'm proud of what I've done', you know, but so far I haven't been lucky enough to join a group where everyone has the same vision."* (P8)

The code **Judgment within the team** also explored the judgment of some peers of the hackathon, also leading to frustration of the participants and leading interrupt of workflow.

> *"Our work could be much better presented if they had let me work"* (P4)

However, not all teams had the same problem of judgment, with some teams being more open to teamwork.

> *"They never judged me or that I would be inferior in some way for never having participated or for being such a newbie in the business."* (P5)

The code **Isolation of developers** came from participants that were non-developers in the hackathon, noticing the absence of developers in important moments of ideation and check-ins.

> *"When we did the visual identity part, the brainstorming, they didn't participate in this process.(...) I don't understand programming but nobody codifies anything from scratch, what will she code? What did she decide she was going to do?"* (P8)

> *"Developers sometimes leave the call to do their part"* (P4)

The code **Environment is not so safe** represents the expectations of a less competitive environment because of the majority of women in the hackathon.

> *"Because I always have the hope that if there are more women, we'll have a more empathetic team. That's my hope but I've already realized that it's not exactly how it works."* (P8)

Event Format Feedbacks The code **Team formation** emerged when asking about the peers and previous relationships. Some participants mentioned the Team formation event and never met anyone in their team, while others knew previously at least one person (as shown in Figure 13).

> *"It was a group that didn't know each other, we had never, never met before, we formed the group at the hackathon and I thought it was a very cool group formation"* (P2)

A suggestion was made to have the organization decide on the teams before the event by one participant.

> *"I understood the idea of why you let us choose our team, which has to do with autonomy, with interaction and everything - but I would find it much more interesting if the team was already pre-made."* (P3)

It is important to note that two groups (G4 and G6) with participants having trouble voicing their opinions and showing their work had members who did previous work together.

"Part of the team already knew each other [...] They had taken a course together" (P4)

"Yes, they knew each other and I discovered that after I joined (the group)" (P8)

4.1.3 Event Support Activities

1) Survey: We had two open questions for the participants to give feedback on the event format. In question *How can the event be improved?*, the suggestions included a clear disposition of information, where the check-in would be made in the Discord platform, and less interruption for the check-in. In question *In your opinion, what was good about the event?*, the participants mention the preparation of mentors, the check-in moment, and the reception from the mentors.

"Interaction dynamics, parallel challenges, attention to teams, attention to projects, tone of voice, the experience of mentors, event theme and quick responses from the organization."

2) Interview: From the open coding, the *Event Format Feedbacks* also included some feedback for the Event Support Activities. These codes are Feedback during pre-pitch, Fear of having the idea stolen during pre-pitch, Progress of other groups during pre-pitch, and Mentors.

When asked about **Feedback during pre-pitch** from other teams, as we created this intervention for teams to interact with other teams in the online environment, most interviewees mentioned the other team being silent and not interacting.

"We didn't have much contact. We only saw the other group. And each one congratulated each group, you know, we congratulated the group, and the group congratulated us, but nobody said anything at all." (P5)

Only one person mentioned in the interview that their team received feedback from other participants.

"Their feedback was just that we had put a lot of ideas and there was really a lot of stuff, so we made it leaner. So the feedback they gave was good." (P9)

One possible explanation that emerged in the interviews was the **Fear of having the idea stolen during pre-pitch**. The mentors annotated groups' progress, so the organization could

address it if someone attempted to steal the idea. However, this did not avoid the tension of having another team watching the presentations.

> *"For example, if I were to participate again, I would certainly be super calm, but because we have this background, of other hackathons that are not so receptive, we have that spirit of its all mine. All mine, and it's not supposed to be this way."* (P6)

> *"The only thing I was kind of like, although we have this idea of women collaborating, I confess that I was a little afraid of another group watching the pre-pitch"* (P2)

The code **Progress of other groups during pre-pitch** also showed how some participants managed their hackathon time and used the moment of seeing other projects to compare their progress. This also contrasts with the results of coordination available in Figure 14.

> *"We didn't think it was bad, it's nice to see other ideas... I thought it was cool because we thought we were too late, we found out that it wasn't just us, everyone was in the same boat, in the same situation, right? Then we thought wow, it's not just us who are so lost, everyone is lost."* (P8)

The code **Mentors** gave the positive aspects of having support during the event, not only with technical advice but their presence during the night. The code also aligns with the opinion in the survey's open question.

> *"They (check-in moments) were very important for us to be able to get the idea from the mentors, we needed their help to be able to orient ourselves within the theme, (...) to realize that we were getting very open, when in fact we had to narrow our search a lot for a challenge."* (P2)

> *"When I entered Discord I saw that the mentors were there, you stayed there until dawn and I was like "ok, if they're here it's all right, let's go" and continued (working on the project)."* (P9)

Obstacles during the event Besides the motivation of Learning and Being Part of a Community (Figure 9), **Hackathons viewed as competition** resonated in some of them:

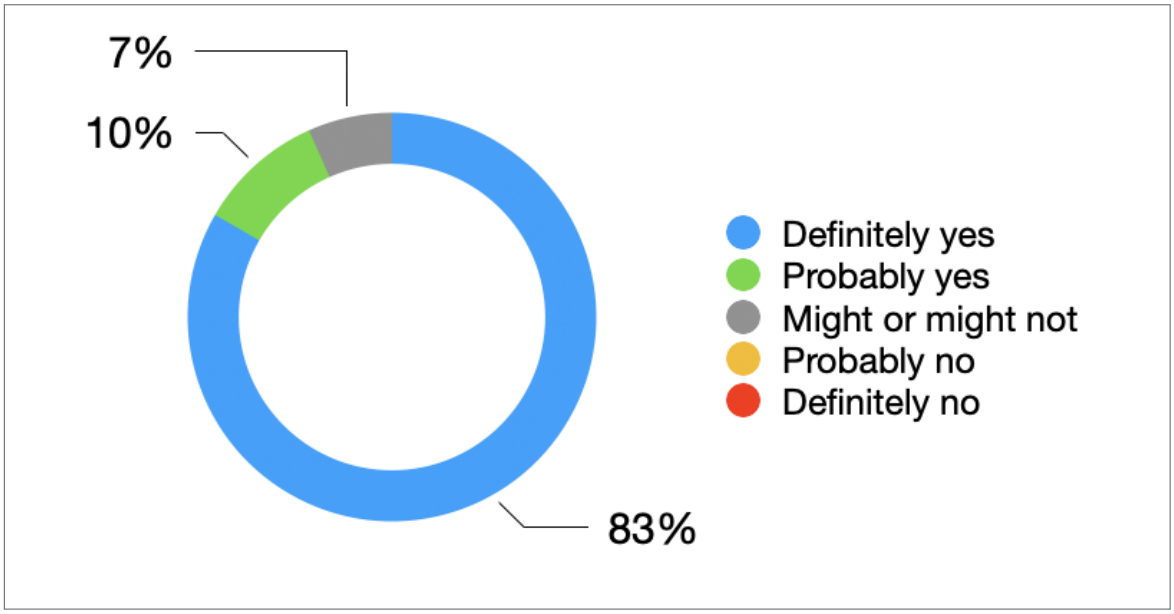
> *"Because after all, it's a competition, right?"* (P2)

"So it really is time to put this test in a competition that demands the maximum" (P6)

4.1.4 Future participation in hackathons

In general, participants had a positive perspective of hackathons, where 25 (83,3%) of survey participants answered "Definitely yes" to joining hackathons/similar events in the future. The full results are available in Figure 16.

Figure 16 – Answer distribution of participants for the question "Do you plan to participate in similar events/hackathons in the future?"



Source: The author (2023)

4.2 MENTORS

The interview participants had different areas, with 1 focused on development during the hackathon, 2 being designers, and 2 focused on the business area, with a total of 5 (23% of the hackathon's mentors). The age range was from 22 to 26 years old. The full profile of the interviewed mentors is available in Table 5.

4.2.1 Focus on Women

1) Survey: In the open question *"Why did you choose to participate as a Hack Grrrl mentor? Have you mentored at any other time-limited events?"*, we could see the mentor's motivations to join a women-focused hackathon. The answers covered different areas such as "traditional" ones for hackathons (i.e., personal challenge, networking, sharing their knowledge), being invited to be a mentor, identification with the cause, previous participation in the event, and having no time available for being a hackathon participant.

For the closed question *About the general (mixed) hackathon community, to what extent do you identify with these statements?*, the mentors have a more positive identification with the hackathon community. The full distribution is available in Figure 17.

For the question *"How can the event be improved?"*, a mentor shared their worries about the theme of the hackathon.

> *"I found the subject difficult and quite broad. I think the next issue might adopt an easier theme that is fun to build a solution on top of. It's important to address issues related to women in technology, but sometimes the issues are too complex to be resolved during a hackathon."*

On the question *"In your opinion, what was good about the event?"* had answers about the hackathon theme, having a safe environment, and interaction between the mentors.

> *"I really enjoyed the interaction and, of course, I loved the theme. The organization proved to be very professional and helpful right from the start. Even though I didn't know anyone, I felt respected."*

> *"I loved the interaction between the mentors."*

2) Interview: *Event format feedback:* During the interview, we were able to get more details about their opinion on the **Vision of hackathon theme** code, which is a topic associated with everyday life.

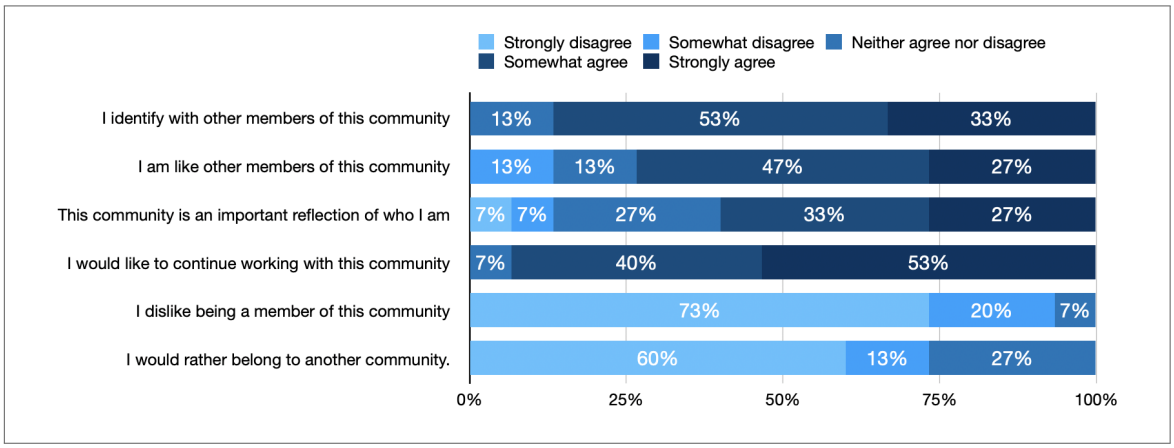
> *"I found it very pertinent, and it is a topic that causes us to have several points of reflection. So bringing it to the gender side as well, we have to stop to think, analyze, understand, so I think that transcended even the competition."* (M4)

Table 5 – Mentors Interviwee's profile, by area, and age

Mentors interviewee's profile		
Code	Role	Age
M1	Business	22
M2	Designer (UI/UX)	23
M3	Designer (UI/UX)	26
M4	Business	24
M5	Developer	24

Source: The author (2023)

Figure 17 – Answer distribution of mentors for the question "About the general (mixed) hackathon community, to what extent do you identify with these statements?"



Source: The author (2023)

However, some pointed out that it could be hard to find a technological solution for the theme, leading to projects being similar.

> *"I think many have tried to go for the problem itself, and in practice, it ends up being a problem. Probably in the evaluation in the creativity part, when you try to solve the problem in a more macro way, you end up with very similar solutions."* (M3)

Motivations to be a mentor: The code **Personal challenge** appeared as a motivation to be a mentor.

> *"My motivation as a mentor was to challenge myself, because it's something I've never done before."* (M3)

Another motivation cited by the mentors was **Having fun**.

"When you mentor, it's a lighter job, it's a job that gives me more pleasure"

They also mention the **Time Constraint** as a motivation to join the hackathon as a mentor instead of being a participant.

> *I wanted to be a mentor more because I think the routine is too heavy. (...) As a mentor, you can be more relaxed and contribute similarly.* (M1)

Another key role was **Sharing their knowledge**, being able to help the hackathon community, or consolidating concepts they help teams with.

> *So I feel that I consolidate more when passing by, seeing what's happening, understanding (...). In passing (the knowledge) on to the team, I undoubtedly learn a lot. I like.* (M2)

> *"I think it makes a lot more sense for me to contribute because as a mentor, I can help several teams with different solutions, and if these people want to continue with these solutions, I will have helped."* (M1)

The mentors are also mentioned in the code **Helping the women community** as a motivation.

> *"How can I give something back to the community, some help."* (M5)

> *"I think that expanding this exchange between women. It's because unfortunately our society still has this issue that women live in opposite scenarios and such. In fact, we can complement each other, help each other."* (M4)

Benefits of Hackathon focused on Women: The code **Comfort to talk about themes considered "taboo"** appears again in the mentor's interview, again with menstrual periods.

> *"In several other hackathons, I also had colic, and I always didn't speak, with shame, because it was a mixed group. I said I had colic in this group of girls, and everyone was super ok. So I felt very welcome in this regard because you feel free and safe to talk about your generality as a woman. So I think events that have women are very important."* (M4)

The mentors also perceived having a women-majority space as being **Safe Space**.

> *"Anyway, it is a safe space for us to participate either as a mentor or as a participant."* (M4)

An important point about having men at a nominal rate was also discussed during the interview in the code **Feedback of women-focused hackathon**, where one of the interviewees made a misandry comment.

> *"I always joke with my friends that if I could get men out, I would. Nor would there be a male participant. I don't like."* (M1)

4.2.2 Event Warm-up

1) Survey: On the *"How can the event be improved?"*, a mentor pointed out that some participants did not know the event would not assign a team.

> *"I think that in the next editions, there could be a moment where the entire hackathon process would be explained to the participants (like a briefing), to explain everything that will happen (processes, icebreakers, check-in, how to use the platform, etc.), this would help first-time participants who found it difficult to get a team (because they thought the organization that divided the teams)"*

2) Interview: In code **Workshop Participation**, one of the mentors watched the React.JS workshop, even not being a developer. The others mentioned they did not watch but joined the opening or closing Livestream.

> *"I'm going back to programming, so it was interesting. [...] At first, as a hobby."* (M4)

4.2.3 Event Support Activities

1) Survey: The open question *"How can the event be improved?"* had feedback about the mentoring on-demand and guidance on what was expected from the mentors in the three days of the hackathon.

> *"I don't know if the mentoring on-demand worked. At least I was called only once, and that was because the participant had already made contact with me before."*

> *"I suggest creating a kind of manual (as if it were a wiki) to update the information during the hackathon as needed. For example: add a list of teams to which mentors are allocated, how each milestone works (check-in, pre-pitch, pitch), and what they are for. The goal is to centralize information and prevent it from being lost in communication channels, such as discord and telegram."*

The other open question *"In your opinion, what was good about the event?"* made the mentors voice their opinions about the interaction between mentors.

> *"The interaction between the mentors, the willingness of the participants to put into practice (their ideas), their energy, and desire to learn more from some groups."*

> *"Encourage non-competitiveness among participants, mentors to participate in Discord and the close mentoring of teams."*

2) Interview: The code **Check-in moment** represents the view of mentors, what could be improved on the organization side, and the contact with participants.

> *"I really enjoyed having that moment. I didn't even know that this was something that wasn't normal for hackathons because I keep thinking, imagine you being there and you only see the person on Friday, delivery on Sunday, and you don't see the team, only if you go after it. I think it's super important, especially for women new to hackathons."* (M5)

The mentors also voiced their opinion of the check-in being at a fixed time during the event, from their schedule to how this could impact their mentored teams.

> *"I've participated in many others (hackathons) in which the organization forced us to join the team that was there co-creating thinking, and we ended up interrupting this process. When it is an organized process, there was a check-in time, we would advise, and we would already start, so I think that the process (of the team) is not harmed."* (M4)

> *"I don't know if having a set schedule is the best model for me. For teams, it might work for some and not for others. There was a day that they (the team) did not participate. We did not know about them for a long time. (...) I got a little lost*

> *when it came to scheduling my mentoring appointments because it couldn't be anything at check-in (...), and I ended up doing a few mentoring outside."* (M2)

During the event, the organization met with the mentors after check-in. However, it was not planned in the schedule, coming with the necessity to share their opinion and ask for advice from other mentors.

> *"There was also an issue that we held meetings after check-in. I did not know that."* (M1)

A mentor also shared that they did not know what was expected during these moments before the hackathon.

> *"I just think maybe it should have been a little clearer to both the mentors and the teams what the purpose of these check-ins was."* (M3)

To complement the information about check-ins, we have the code **Check-in in pair**, where they mentioned the experience of having another person to guide the teams during the hackathon.

> *"I think it would have been important for me to have met this mentor earlier because maybe I knew her strengths or the points I could contribute."* (M5)

> *"I thought the format was cool, having two people (...). It was also interesting that she was from another area. (...) She managed to guide in the code part and I guided in the other areas."* (M1)

> *"I don't know if I should have had (contact) at some other time, but we spoke quickly via chat. But (...) I think there could have been a moment when we could have talked alone to get to know each other. We didn't have such a big exchange. It was more of a moment."* (M3)

For the code **Pre-pitch moment**, the mentors shared their views about how the participants presented their projects and had two teams in the same room.

> *"In general, in the pre-pitch, I thought that few solutions were presented. Nobody showed any screens, I don't know how much it was already evolved or not, but they showed much more the idea and a simpler presentation."* (M3)

"It's very important because there are people who are there for the first time and don't know what a Pitch is." (M4)

"And this issue of having 2 teams presenting pre-pitch in the same room, I didn't think it was a big deal. I understand who has this kind of reaction if it comes from other participants, so unfortunately, the person has this thought." (M5)

"I wanted to give feedback but I didn't. There were four mentors and I saw that there was no space for each one to speak." (M1)

In the code **Feedback during pre-pitch**, the mentors shared what happened between the teams during the pre-pitch and if they gave feedback to their peers.

"I think there was a group that interacted with one another. Not the 2, but one interacted. But most of the time it was the mentors talking." (M4)

"The teams interacted a little. We commented at the end. I don't remember feedback from one team to the other. I don't know if we encouraged enough. We could have tried to pull a little more. But I don't remember having it. It was respectful." (M2)

The code **On-demand mentoring** shared if they had scheduled mentoring by the participants and how it was the experience, with some mentors being frustrated with not having a scheduled session.

"Some teams already arrived with some more formed ideas and just needed an adjustment, some guidance. Others arrived very excited but without a path to follow and that was the moment for us to talk, calm down and explain that it was part of the process. But I didn't pick any team that was unmotivated. All the girls I had the opportunity to mentor were excited. Groups very connected and very happy with the experience they were having at the hackathon." (M4)

"I thought it might work fine. I just think that perhaps it should have been a little clearer for both the mentors and the teams what the purpose of these check-ins was, their importance and the importance of also marking other mentoring (on-demand), and what are each mentorship. For example, if it became clear to

> *everyone that design mentoring could also help in the process of ideation, research, and understanding the problem.*" (M3)

Individual characteristics: The code **Insecurity** voiced some of the worries as being a mentor, independently of having previous experience in this role.

> *"At the beginning, I was very insecure about being a mentor because you're going to be there, you're going to pass on what your group is going to follow. So I was like 'Do I have the knowledge to pass on to this group?"'* (M2)

> *"I go in a little suspicious. Am I competent enough? But then, when people start to ask, then we see that we can give this guidance. So, at the time of the mentoring, it was calm, but whenever I sign up I have that fear of 'Will I be able to help? Will they think I'm trash?'."* (M1)

Figure 18 – Summary of the main themes and codes from mentor's and participant's interviews

Participants interview's codes summary	
Motivations to participate	**Benefits of Hackathon focused on Women**
Networking	Apprenticeship
Curiosity	Reception
Gain experience	Representation
Apprenticeship	Comfort to talk about topics considered "taboo"
Career transition	Learning environment
Personal challenge	Cooperation
Award	Friendship bonds
Social themes	Safe Space
Apply concepts learned in project	Identification
Curiosity	**Obstacles during the event**
Make friendship	Absence of communication within the group
Creativity	No voice in the team
Hackathon format benefits	Erasure of work made during the hackathon
Product development	Competitiveness
Soft-Skills Development	Judgment within the team
Networking	Isolation of developers
New concepts during the event	Environment is not so safe
Knowledge Exchange	Hackathons viewed as competition
Meet people from other areas	**Event Format Feedbacks**
Collaboration beyond borders	Team formation
Collaboration between groups after the event	Feedback during pre-pitch
	Progress of other groups during pre-pitch
	Fear of having the idea stolen during pre-pitch
	Mentors
	Vision on the theme

Mentors interview's codes summary	
Motivations to be a mentor	**Benefits of Hackathon focused on Women**
Personal challenge	Comfort to talk about themes considered "taboo"
Sharing their knowledge	Safe Space
Having fun	**Individual characteristics**
Time Constraint	Insecurity
Helping the women community	**Event Format Feedbacks**
Hackathon format benefits	Vision on the theme
Product development	Workshop Participation
Soft-Skills Development	Check-in moment
Networking	Check-in pair
New concepts during the event	Pre-pitch moment
Knowledge Exchange	Feedback during pre-pitch
Meet people from other areas	On-demand mentoring
Collaboration beyond borders	
Collaboration between groups after the event	

Source: The author (2023)

5 DISCUSSION

In this chapter, we will summarize the results from the previous chapter, answering both **RQ1. How did the event design choices influence the participant's experience in a women-focused hackathon?** and **RQ2. How did the event design choices influence the mentor's experience in a women-focused hackathon?**. The similarities found between the participants are discussed in this chapter. The limitations of this dissertation will also be shared by the end of this chapter.

5.1 HOW THE DESIGN CHOICES WERE PERCEIVED BY THE PARTICIPANTS

5.1.1 Focus on Women

From the theme **Motivations to participate**, we were able to see similarities of previous motivations for joining a hackathon, but also newer ones, such as career transition, social theme, and personal challenge.

Although some participants felt comfortable during the event and discussed topics beyond the hackathon, including the code **Comfort to talk about topics considered "taboo"** like menstrual periods, having a women-majority event was not enough for a safe space.

The perception of the hackathon as a competition was present in the interviews. Although the participants put the motivation as "Becoming part of a community", the teams had little to no interaction with other groups and internal conflicts.

On a positive note, the code **Learning environment** emerged even if the team had conflicts, and this aligns with the motivation to "Learn new tools or skills" (Figure 9).

The social aspect of the theme was positive, being a motivation for some participants. However, it took a lot of work for some teams to develop a technical solution. Although none of the teams gave up during the hackathon, the solutions were similar.

5.1.2 Event Warm-up

The participants attended the workshops (above 50% attendance rate by the survey participants) and guided the technical aspects.

However, in the team formation aspect, some participants did not like searching for a team

in the event. The teams changed their hackathon experience mainly due to each member's importance on winning. The code **Isolation of developers** is another finding, where the members in non-technical roles can notice the absence of them in important discussions of the team and having the majority in discussions.

It was also interesting to see similar problems of hackathons of mixed teams, such as the codes **Judgment within the team**, **Enviroment is not so safe**, **No voice in the team**, and **Erasure of work made during the hackathon** (PAGANINI; GAMA, 2020). However, it is not clear the proportion of these problems in a women-focused hackathon compared to the ones in mixed teams.

The online environment could participate in the team's communication, and although the mentors and organization were available during the event, no reports of these cases were made.

5.1.3 Event Support Activities

Although the idea of the *pre-pitch moment* was made to stimulate the interaction of teams in the online environment, exposing the project to other people and receiving feedback, the participants fear sharing too much of their project, as stated in the code **Fear of having the idea stolen during pre-pitch**, with some groups not showing their current state of the project. The notion of **Hackathon viewed as competition** reinforced the fear of having their idea stolen.

The *mentors* was seen with great importance, not only in the technical aspects but as emotional support, as the participants (mostly developers) spent most hours of the night awake for the hackathon.

5.1.4 Teamwork in hackathons

While most people join the hackathon with the motivation to learn and become part of a community, some groups have trouble creating a healthy environment. From not having a voice to judgment within the team, the competitiveness of some participants made the hackathon experience difficult for some participants. This could be related to the hackathon prizes, with a previous experiment in the Science field showing women's competitiveness level increasing as the monetary prize increases as well (GUPTA; POULSEN; VILLEVAL, 2013). It broke some expectations from participants to have a less competitive environment because of the women

majority. The previous relations between participants played a role in the groups with conflicts, where they could make decisions as being a majority of a team. The **Isolation of developers** can be expected since they do other tasks. However, they must be present in the ideation process to understand the idea of the project. Besides the bad experience in their teams, the participants mentioned that they wanted to continue joining those events, with one already enrolled by the time of the interview. The teams with cooperation and reception had better interpersonal relations among the members, not necessarily less competitive, as the vision of the hackathon being a competition is present in different groups.

5.2 HOW THE DESIGN CHOICES WERE PERCEIVED BY THE MENTORS

5.2.1 Focus on Women

Having a **women-focused event** had different impacts on the mentors. It was one of the motivations for being a mentor of the hackathon and allowed them to be more comfortable during the event. However, this topic brought up misandry comments. One of the reasons to have a women-focused and not women-only is to allow the dialog between different genders and allies to the women in tech cause.

5.2.2 Event Warm-up

Although most mentors did not attend the **workshops**, they can be helpful for those going back to programming. One of the mentors also offered to give a talk on the hackathon theme if they were invited.

The **team-formation dynamic** ran smoothly, with mentors interacting and guiding the participants in the Discord room. Some of the mentors joined the games as well.

5.2.3 Event Support Activities

The **check-in moment** split the opinions of mentors. While some appreciated having time to meet the participants, some found it hard to break the time with the on-demand sessions. One of the mentors mentioned they got lost between the rooms in Discord, which have separate text and voice channels, and where to meet the participants. Some mentors

did not have mentoring sessions besides the check-in and pre-pitch moments, besides having availability, leading to frustration.

For the check-in moment and pre-pitch being done in pairs, mentors liked having a second opinion, especially if their pair had a different area of mentoring. However, knowing their pair before the hackathon or having a previous meeting could improve the experience. In this previous meeting, they would get to know their pair, exchange contacts, and which technical areas they could support.

During the **pre-pitch**, some groups did not prepare a presentation with slides, which was hard for mentors to follow and give feedback. Other groups had more straightforward presentations, which could be due to the fear of having their ideas stolen, which prevented the mentors from providing proper feedback. A mentor also mentioned that she could not voice their opinions about the group pitch due to an absence of time for each mentor to speak.

5.3 SIMILARITIES BETWEEN PARTICIPANTS AND MENTORS

5.3.1 Motivations to participate

The reasons for joining a hackathon were similar among the participants and mentors, as shown in the interview codes. These reasons include Networking, Having fun, and Learning. The main differences involve Sharing their knowledge, as the mentors have more experience in their area, and the Time Constraint since the availability needed from the mentors is lower than participants.

5.3.2 Information avaliability

Both mentors and participants had trouble finding information on Discord. The suggestions included centralizing the information, allowing users to join the Discord platform before the event, and previous knowledge about what was expected in the leading goals (check-in, pre-pitch, and delivery).

5.3.3 Low interaction between groups in pre-pitch

Both mentors and participants noticed the low interaction during the pre-pitch. During the interviews, there was only evidence of one group giving feedback to each other. Most participants were worried about having their idea stolen (some based on their previous hackathon experience). One mentor even asked herself if mentors needed to stimulate the participants and ask for more comments.

5.3.4 Competence-confidence gap

The competence-confidence gap (WANG; WANG; REDMILES, 2018) refers to the fear of being unable to complete a task, although one has the competence to do it, being more common in women. While in Figure 11, the most agreed prompt was "Did not feel that I have the technical skills to collaborate with the team", the hackathon offered a Learning Environment, having mentors to support the participants and giving previous workshops, and cooperation necessary for them to finish.

We also see this compete-confidence gap in the mentors, where most are perceived as role models (acknowledged by both the organization and participants) and can guide the teams. However, some of them felt insecure before starting the mentoring.

5.4 RECOMMENDATIONS FOR WOMEN-FOCUSED HACKATHON ORGANIZERS

As a hackathon organizer, some recommendations on how to start a women-focused hackathon will be presented in this section based on the Hack GRRRL experience, summarizing some of the points found in the previous chapter.

- Seek help with universities and women's tech groups; often, you can find volunteers to start a hackathon.
- Although having prizes can increase participation and interest in the hackathon, it can also generate some conflicts of interest. It is important to balance the prize's size to maintain the community-building aspect that participants want from a women-focused hackathon.

- Take care when choosing the hackathon theme so it is challenging enough to find solutions but does not discourage the participants.
- Make the code of conduct actionable: the organization needs to know how to handle the situations and conduct the event.
- Having a moment before the hackathon with the mentors allows them to network beyond the participants, especially when mentoring is done in pairs.
- The communication with both participants and mentors should be clear. Having documentation and allowing them to join the hackathon platform can support this goal.
- To avoid the isolation of developers, is it possible to reinforce brainstorming for the project idealization. The process requires all members to engage.
- Having women-only mentoring helps put talented individuals in the spotlight, allowing them to be role models and guide the teams.

5.5 LIMITATIONS

The work has cultural biases, as the participants came from the same country and were influenced by the events organized there. As part of qualitative research, the results are associated with the event and scenario of the study, with generalization not being possible. The interaction of Learning and Planning of Action Research was not made in this dissertation. Another limitation is not getting all the points of view from the groups, where only one person gave their point of view. From the classification of hackathons, Hack GRRRL was a focus-centric hackathon, so the results are not applied to the technological-focused ones. Further replication can be made to validate the results in other settings.

5.6 THREATS TO VALIDITY

5.6.1 External Validity

To mitigate the *Interaction of history and treatment*, since the hackathon happened in a short period, we surveyed in one week and the interviews in less than one month after

the hackathon. From the participant's side, they had not joined other hackathons during the interview process.

5.6.2 Internal Validity

Since we could not interview many survey participants due to nonmandatory participation, the research may have a *selection bias*. To mitigate that, the hackathon group of interviewees was collected and put in the master's dissertation.

Another threat is the author of the research being part of the hackathon community, taking part in these events in both online and co-located manner, which is part of the *Prolonged Engagement* with the studied topic. To minimize the bias, two people conducted the data analysis.

As the author was part of the organizing team, it may have influenced data collection (interviews with participants and mentors). To minimize these biases, the author avoided previous contact with the interviewee during the days between the end of the hackathon and the interview and asked for their sincerity during the recording.

The participation as an organizer may have also biased the analysis. To minimize the impact, the coding process of the participants was done in pairs with the advisor and showed both results to lower the chance of biases. The author also has previous experience in hackathons, which may have influenced the analysis of the study. Another limitation in the results is the translation from Portuguese to English, which may not capture the essence and full emotions of the original language.

5.6.3 Conclusion Validity

Since we only had one interaction of the research, the *Reliability of measures*, which means seeing the phenomenon twice the outcome should be the same, was not possible. The second iteration of the research will be done to improve the reliability of research findings.

6 CONCLUSIONS AND FUTURE WORK

In this qualitative research, we explored the influence of event design choices in a women-focused online hackathon on the participants and mentors, using a survey and interviews as data sources. Besides Networking and Learning, the motivations to join Hackathons included career transition, having a social theme for participants, and sharing their knowledge and time constraints for mentors. Having mostly women in the event is insufficient for a healthy environment with high competitiveness since we observed this aspect in one of the groups. However, they wanted to be part of a community and were still able to finish a project during the event.

6.1 IMPLICATIONS FOR HACKATHONS ORGANIZERS

As a contribution of this study, some pieces of advice can be taken for hackathons organizers. From the codes related to **Motivations to participate**, it is possible to see that participants have similar expectations between women-focused and mixed hackathons, with the exception of finding a community and career transition. It is important to provide a channel where they can continue communicating and find opportunities during and after the hackathon. However, for both participants and mentors, using a new platform, such as Discord, can bring attrition for those who are not familiar. A way to solve this could be to let people join the platform a week before the event.

Technical workshops before the hackathon can help the participants to prepare for the event marathon, especially those who never joined a hackathon, being attended by both participants and mentors, as seen in the code **Workshop Participation** and in the survey. Since Hack GRRRL has not had a specific language or project, workshops can prepare the developers on the technical side since they are expected to spend time choosing which problem to tackle.

The mentoring in pairs provided a way for mentors to network with other mentors (that usually have more experience in their area) instead of only having contact with the participants, and is perceived by the mentors in the codes **Networking** and **Meet people from other areas**. The code **Check-in pair** also gave feedback on having the mentor contact the other mentor before the event, being left as a piece of advice. Acknowledging your mentors (e.g., a slide with pictures in the closing ceremonies) is also vital since they share their times and

competencies.

It is also important to make sure that your mentors also align with the vision of the event. The case of misandry happened during the interviews, after the hackathon, so no action was taken. A more massive message of the event being *women-focused*, not *women-only*, and that everyone is welcome in the event may help in this case. Also, a Code of Conduct that has the levels of escalation and actions taken can improve how the organization handles these situations.

Lastly, having a women-focused theme allowed participants to reflect on their experiences, create meaningful conversations, and be more thoughtful about the topic, as seen in the codes related to **Benefits of Hackathon focused on Women**. Although in the next edition, the hackathon may bring an easier theme to have a technological solution, as seen in the code **Vision on the theme**, having a social direction for the participants is important.

6.2 FUTURE WORK

We will have a future edition for Hack GRRRL. We want to revisit the check-in process, making it more interactive with the teams, so they will not be so protective of their projects. Another design choice that will receive a new interaction is the team-formation dynamics since we want to match the exact motivations of hackathons while giving freedom to the participants. We also want to run another iteration with a hybrid event to investigate the influence of the design choices in a different environment than the online one and maintain the public across the country. Another future work is to run Hack GRRRL in different countries, where running in a different culture can impact the results.

It is also possible to investigate if participants with familiarity with other team members can impact team dynamics and projects in hackathons. Future work could include comparing the team dynamics between co-located, hybrid, and online events, focusing on the competitiveness level. Another possible work is investigating mentors in mixed-gender hackathons, seeing the benefits and motivations to participate. Another interesting point is to investigate the impact of being a mentor in hackathons on women's careers. A longitudinal study of women's participation in hackathons can also be made, making a longer approach to the influence of their careers and their permanence in the STEM area. Finally, it would be interesting to understand the isolation of developers (e.g., not taking part in ideation, leaving the team) in different hackathons scenarios.

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APPENDIX A – INTERVIEW SCRIPT

Warmup questions

Name

Age

State

What is your job today?

Are you graduated?

(If it was a mentor) How did you start to do mentorships in your area?

What are the positive aspects of these events from your point of view?

What is your goal in attending these events?

Do you have experience in hackathons?

If they have experience in hackathons

How many on co-located ones?

And in the online ones?

Why did you join your first hackathon?

What was the best experience that you had during a hackathon?

Do you remember negative experiences during a hackathon?

This situation could be avoided if you were from a different gender?

Did your goals to attend a hackathon change?

If they are inexperienced in hackathons

What prevented you from joining hackathons before Hack Grrrl?

About the event

Role at Hack Grrrl

How have you heard about the event?

What attracted you to attend a women-focused event?

Can you mention the goals of Hack Grrrl?

Did you attend the lives and workshops? They were useful during the event?

You were confident in your abilities during the hackathon? Do you think this helped you?

If they were a participant in the hackathon

If you had a man in your team, that confidence would have changed?

How many people are on your team?

Did you know your peers? How did you meet them?

Would you work again with your peers? And why?

How was the process to understand the theme of the hackathon and create the hackathon goals?

How were the roles assigned in the team?

Did someone from your team give up during the hackathon? (If so, how did the team manage?)

If you attended Hack Grrrl today, what would you do differently?

General questions

What do you think about the check-in process and the pre-pitch?

What would you change about Hack Grrrl?

And what would you not change about Hack Grrrl?

Hack Grrrl helped to achieve your original goal to attend a hackathon?

Do you pretend to attend (or be a mentor in) other hackathons? If so, online or co-hosted?

APPENDIX B – PARTICIPANT'S FORM

Individual measures

Gender

Age

- 18-25
- 26-35
- 36-45
- 46-55
- 56 or +

State

- AC
- AL
- AP
- AM
- BA
- CE
- DF
- ES
- GO
- MA
- MT
- MS
- MG

- PA
- PB
- PR
- PE
- PI
- RN
- RS
- RJ
- RO
- RR
- SC
- SP
- SE
- TO

Did you attend the first edition of Hack Grrrl in 2019?

- Yes
- No

Why did you participate in the hackathon?

- Having fun
- Making something cool/Working on an interesting project idea
- Dedicated time to get work done
- Learning new tools or skills
- Meeting new people

- Seeing what others are working on
- Sharing your experience and expertise
- Advancing my career
- Becoming part of a community
- Getting immediate feedback
- Joining friends that participate
- Getting through personal problems
- Felling needed
- Having a safe space to work

Do you identify with the general (mixed) hackathon community?

- I identify with other members of this community.
- I am like other members of this community.
- This community is an important reflection of who I am.
- I would like to continue working with this community.
- I dislike being a member of this community.
- I would rather belong to another community.

Feel free to justify your answer to the question before.
Why did you choose to take part in Hack Grrrl 2021?
Which role did you enrolled for Hack Grrrl 2021?

- Developer
- Designer
- Business
- Marketing

Developer measures (For those who selected Developer as their role)

How many years of programming experience do you have?

Referring back to your peers at this event, how do you estimate your experience in the role compared to others?

- Very inexperienced
- Inexperienced
- Comparable
- Experienced
- Very experienced

Work experience (For those who selected any other role except Developer as their role)

Referring back to your peers at this event, how do you estimate your experience in the role compared to others?

- Very inexperienced
- Inexperienced
- Comparable
- Experienced
- Very experienced

Experience in hackathons

Do you have attended hackathons before Hack Grrrl 2021? (Either presential or online)

- Yes
- No

No experience in hackathons (For those who had no previous experience)

Why you didn't join hackathons before?

- Fear of not collaborate with the team

- Didn't hear about hackathons before
- Didn't feel comfortable in man-dominated ambients
- Didn't feel comfortable to not sleep during the event
- Didn't feel that I have the technical skills to collaborate with the team
- Didn't feel comfortable to work with people that I don't know
- Didn't have interest
- The food of the event wasn't appropriate
- Didn't know people to enroll together
- The event focused only in developers
- Didn't have the necessary equipment
- The city that I live doesn't have co-hosted hackathons
- Felt that I wasn't part of the target audience

Feel free to share the details about the last question or another reason to not join

Experience on co-hosted hackathons

How many co-hosted hackathons do you attend before Hack Grrrl 2021?

- 0
- 1
- 2
- 3
- 4
- 5+

Experience on co-hosted hackathons

Please select the option that best describes how frequently (if at all) you have experienced that on previous co-hosted hackathons.

- Fear to not collaborate with the team
- The tasks were assigned mainly based on individual skills
- Didn't feel that I have the technical skills to collaborate with the team
- Didn't feel comfortable to work with people that I don't know
- Didn't feel comfortable in man dominate ambients
- I wasn't heard by my team
- The tasks were assigned mainly based on individual interest
- The mentors didn't talk directly to me - only to my peers
- I had trouble finding a team
- I was comfortable to reject a task assigned to me during the hackathon
- I heard jokes about myself
- Suffered harassment during the event
- People didn't take my technical skills seriously
- Somebody else spoke my idea and toke the credits

Feel free to share the details about the last question

How would you describe the work of your group on the last co-hosted hackathon that you attended? (From 1 to 5)

- Inefficient to Efficient
- Uncoordinated to Coordinated
- Unfair to Fair
- Confusing to Easy to Understand

Experience on co-hosted hackathons

How many co-hosted hackathons do you attend before Hack Grrrl 2021?

- 0

- 1
- 2
- 3
- 4
- 5+

Experience on online hackathons

Please select the option that best describes how frequently (if at all) you have experienced that on previous online hackathons.

- Fear to not collaborate with the team
- The tasks were assigned mainly based on individual skills
- Didn't feel that I have the technical skills to collaborate with the team
- Didn't feel comfortable to work with people that I don't know
- Didn't feel comfortable in man dominate ambients
- I wasn't heard by my team
- The tasks were assigned mainly based on individual interest
- The mentors didn't talk directly to me - only to my peers
- I had trouble finding a team
- I was comfortable to reject a task assigned to me during the hackathon
- I heard jokes about myself
- Suffered harassment during the event
- People didn't take my technical skills seriously
- Somebody else spoke my idea and toke the credits

Feel free to share the details about the last question

How would you describe the work of your group on the last online hackathon that you attended? (From 1 to 5)

- Inefficient to Efficient
- Uncoordinated to Coordinated
- Unfair to Fair
- Confusing to Easy to Understand

Group measures

How many people were there in your group?

How well do you know your group members?

- I know my group members well.
- I have collaborated with some of my group members before.
- I have been close to some of my group members before.
- I have socialized with some of my group members (outside of Hack Grrrl) before.

Was there a group leader? (A group leader is someone who provides guidance,instruction, direction and leadership to the group)

- Yes, I was the group leader.
- Yes, someone else was the group leader.
- No, there was no clear leader in the group.

Was there a project manager? (A project manager is someone who keeps track the group's progress and coordinates the actions of team members)

- Yes, I was the project manager.
- Yes, someone else was the project manager.
- No, there was no clear project manager in the group.

Was there a social-emotional leader? (A social-emotional leader is someone who alleviates the frustration, disappointments and hostilities which arise in the group)

- Yes, I was the social-emotional leader.
- Yes, someone else was the social-emotional leader.
- No, there was no clear social-emotional leader in the group.

How would you describe the work of your group? (From 1 to 5)

- Inefficient to Efficient
- Uncoordinated to Coordinated
- Unfair to Fair
- Confusing to Easy to Understand

How well you were aware about the goals of their group/project.

- I was uncertain of my duties and responsibilities in this group/project.
- I was unclear about the goals and objectives for my work in this group/project.
- I was unsure how my work relates to the overall objectives of my group/project.

Whether or not felt you could voice concerns or ideas during their group work.

- Everyone had a chance to express his/her opinion.
- The group members responded to the comments made by others.
- The group members participated very actively during the project.
- Overall, the participation of each member in the project was effective.

Whether you think that achieved what you wanted to achieve during the hackathon.

- I am satisfied with the work completed in my project.
- I am satisfied with the quality of my group's output.
- My ideal outcome coming into my project is achieved.

- My expectations towards my project were met.

Event Measures

Which of these did you attend or watch the record?

- Workshop: Uma introdução a React e GraphQL
- Workshop: Como construir conversas interativas?
- Workshop: Dicas para participar de uma Hackathon
- Team formation dynamics
- Fun night!
- Coffee breaks
- None of them

Do you plan to participate in similar events/hackathons in the future?

- Definitely not
- Probably not
- Might of might not
- Probably yes
- Definitely yes

In your opinion, what was good about the event?

How could the event be improved?

If you like to talk more about your hackathon experience and have a small interview - between 15 to 30 minutes, please share your email here.