


Which UX Research method or technique should I take? Assisting software startup professionals in making their choices

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Abstract User Experience (UX) is a field that aids in comprehending the impact of system usage on the user during the product development process. Software startups are entities that deal with cutting-edge products and experience significant growth, even in the face of unpredictability and potential market volatility. UX methods and techniques serve as tools for software start-up professionals to improve their products, establish connections with their customers, and maintain superior software quality. The goal of this paper is to present a thematic map filled with recommendations for the use of approaches, methods, techniques, and tools designed to assist software startup professionals in conducting research with users. We begin by conducting a gray literature review (GLR) on expert websites and blogs to uncover the approaches, methods, techniques, and tools most frequently referenced by industry professionals and their respective objectives. A thematic map was suggested, based on the thematic examination of the GLR findings. We created a web-based catalog named CatUX to facilitate the map's assessment. We evaluated the catalog's utilization by professionals from two angles: the use of the catalog and the catalog's acceptance. The findings indicated that the catalog helped the participants select the most suitable approach, method, technique, and tool for each given scenario.

Keywords: UX, UX Research, Software Startups, Software Development Professionals, Thematic Analysis

1 Introduction

User eXperience (UX) covers any form of interaction between users and services or products [Norman and Nielsen, 2016]. UX focuses on conceiving details about user interaction before user contact with the product; additionally, it deals with the efficiency of the product during its use and even after its use [Marti and Iacono, 2016]. UX research is the area that provides methods to support user data collection for both research and evaluation [Farrell, 2017]. Data collection can be carried out through methods and techniques with direct interaction with users. Interest in UX has been growing and gaining popularity in organizations such as startups [Nielsen, 2017].

Startups are companies characterized for operating in an environment that changes quickly in a dynamic market, and demands creativity and flexibility to find solutions that match with the business [Kuusinen *et al.*, 2019; Hokkanen and Väänänen-Vainio-Mattila, 2015]. Although there are startups that operate in different domains, software startups are organizations that manage the production of software or use software to drive their activities [Hokkanen and Väänänen-Vainio-Mattila, 2015]. Software startup professionals recognized the importance of UX Research practices in aiding in product conception or improvements [Saad *et al.*, 2021; Silveira *et al.*, 2021]. However, they often face challenges such as teams with little experience, limited human and financial resources, and pressure from customers and investors [Klotins, 2018; Sutton, 2000]. Therefore, software startup professionals often do not possess the required knowledge to choose and apply the UX strategies and procedures that are most suitable for their requirements [Hokkanen and

Väänänen-Vainio-Mattila, 2015].

The literature has discussed the advantages of adopting UX practices in software startups and provided some guidelines to mitigate the lack of these practices [Hokkanen and Leppänen, 2015; Guerino *et al.*, 2021]. However, these guidelines are more abstract and do not report recommendations for methods and their applications by software professionals. Offering a clear and direct explanation of how startup professionals can leverage UX Research methods could assist them in using UX Research as an advantage in the development of their products.

Taking into account the discussion above, this paper aims to investigate the approaches, methods, techniques, and tools that have been used in UX research practices. To support our investigation, we started by conducting a review of the gray literature (GLR) to uncover what UX professionals have been adopting in daily practice in the industry. The review of the gray literature (GL) has been considered a good source of practical knowledge available from blogs and websites [Garousi *et al.*, 2019; Zaina *et al.*, 2022]. From a thematic analysis, we proposed a mapping to show the appropriate methods, techniques, and tools for each UX Research purpose and their relationship. Taking into account the mapping, a catalog containing four themes and their respective recommendations was developed to guide professionals in selecting their UX research options. An evaluation of the catalog was carried out with software startup professionals. Specifically, we recognize that our mapping offers valuable input to software startup professionals because it has a consolidated and linked understanding of UX research methods and their purposes. We also consider that the application of GLR to

uncover knowledge is a noteworthy contribution, as it facilitates access to data directly associated with practice.

The rest of the paper is structured as follows: section 2 defines concepts related to UX, UX Research and startups. section 3 presents the gray literature review procedures. section 4 discusses the construction of themes and the consolidation of the catalog. section 5 and section 6 present the catalog evaluation and its results, respectively. section 7 discusses the main findings of our study and section 8 points out the limitations of the study. Finally, section 9 concludes with some final observations and future work.

2 Background

2.1 Fundamentals

User eXperience (UX) is recognized by different definitions. One of the most classical definitions is provided by Norman and Nielsen [2016] who see UX as a holistic conception: UX involves "all aspects of the end-user's interaction with the company, its services and products. The first requirement for an exemplary user experience is to meet the exact needs of the customer without fuss or bother. Next comes simplicity and elegance that produce products that are a joy to own, a joy to use. True user experience goes far beyond giving customers what they say they want, or providing checklist features".

Other work that focuses on UX in practice provides different aspects of UX. May [2012] mentions that UX practices support design products based on the context of use to meet user needs and promote their great experience. Concentrating on UX research, Varsaluoma and Sahar [2014] point out that its practices allow extracting a significant amount of useful information to foster ideas for new products. Furthermore, the application of UX research practices can aid to understand the users' behavior before, during and after the use a product or service [Biduski *et al.*, 2020; Marti and Iacono, 2016].

However, the incorporation of a User-Centered Design (UCD) cycle (Figure 1) is critical to maintaining a development that is centered around the user [Lowdermilk, 2013]. As depicted in Figure 1, UX Research is a component of the UCD cycle, emphasizing the exploration of user needs through the gathering of data and responses directly from the intended audience. There are numerous strategies and techniques available to collect data from users. However, the selection of an appropriate method or technique involves considering factors such as the availability of users and UX researchers, the timelines to perform the study, and the nature of the data to be collected (i.e., quantitative or qualitative) [Lacey and Luff, 2001].

As mentioned in the Introduction Section, software startups are companies that create innovative and high-tech products and operate with small teams usually with little technical experience [Klotins, 2018; Hokkanen *et al.*, 2015]. Typically, these companies face intense competition with other organizations to establish their products or services on the market. Such competition pushes software startups to rapid evolve in terms of business and products [Klotins, 2018; Gia-

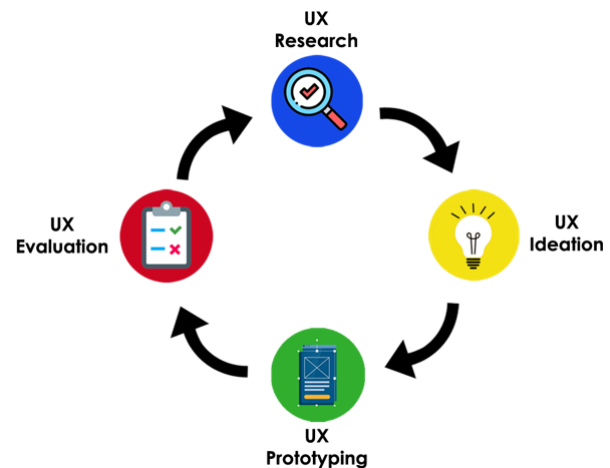


Figure 1. UCD cycle adapted from Norman [2018].

rdino *et al.*, 2016]. In a systematic mapping of the literature, Paternoster *et al.* [2014] suggest that software startups employ flexible and reactive methods that encourage customer feedback. According to the authors, this practice can help software startups make their decision about alternative software improvements [Paternoster *et al.*, 2014]. After, Klotins [2018] revisited the [Paternoster *et al.*, 2014]'s results giving suggestions more focused on software engineering practices.

2.2 Related Work

The literature has discussed the importance of UX practices for software startups. Unterkalmsteiner *et al.* [2016] points out that poorly planned and executed UX research can lead to severe consequences, particularly for small startups, given their inability to shoulder the financial burden of additional research. May [2012] points out that skipping the UX design stages to reduce expenses is equivalent to a software developer neglecting the quality assurance process.

Kuusinen *et al.* [2019]; Hokkanen and Väänänen-Vainio-Mattila [2015] and Hokkanen *et al.* [2015] conducted studies with software startups and the results revealed that professionals lack knowledge about UX methods and techniques that aim to improve and help the creation of software. According to the research of Hokkanen and Väänänen-Vainio-Mattila [2015], the startups developed their products based on assumptions about user expectations, that is, they did not engage with the users directly. In the Hokkanen and Väänänen-Vainio-Mattila [2015] and Hokkanen *et al.* [2015] surveys, feedback was collected from people close to startup professionals, such as friends, or based on experiences the startup had previously had.

On the other hand, Kuusinen *et al.* [2019] conducted a study with a startup that hired a professional to play the role of "UX Consultant"; however, the professional was a trainee with no experience in the UX area. In this paper, Kuusinen *et al.* [2019] described randomized experiments conducted with users through two design versions. Although the experiment was successful, the founders were unable to explain the lessons learned, which demonstrates the lack of awareness of the potential of using user feedback [Kuusinen *et al.*, 2019].

Some literature presents recommendations and patterns to

support the lack of UX professionals in the startup. Reporting a concrete solution for managing UX practices, Hokkanen and Leppänen [2015] describe three patterns to guide startups that have little or no time to employ efforts on getting expertise in UX. In one pattern, the authors suggest that the startups have a team specialized in user research methods to apply and collect such information [Hokkanen and Leppänen, 2015]. However, other authors point out the difficulties of startups on hire professionals dedicated to UX [Silveira *et al.*, 2021; Saad *et al.*, 2021]. Silveira *et al.* [2021], Guerino *et al.* [2021] and Saad *et al.* [2021] suggest training startup professionals in conducting research with users. The practice of training novice professionals is presented in some organizations as mentioned in Martinelli *et al.* [2022]; the authors reinforced that this training should be extended to more experienced professionals.

Süner-Pla-Cerdà [2021] discusses the application of remote methods for UX research stating that they can lead to savings in time and expenses, as well as facilitate the reach of more end-users. Darin *et al.* [2019] performed a systematic literature study using the snowball procedure with papers, conducted to investigate the characteristics of UX assessment instruments that have been proposed and used by the HCI community. The authors presented 116 instruments to help professionals make informed choices about which instruments can support the collection of user experience data, in line with their research objectives. However, the authors researched these instruments through papers while this work looked for methods and techniques in publications made by professionals at GL. Thus, our results provide a view of which instruments are most used in the industry.

The literature has shown that software startups have been concerned with conducting research with users. However, this research is carried out without direct contact with end-users in some startups [Kuusinen *et al.*, 2019; Hokkanen and Väänänen-Vainio-Mattila, 2015; Hokkanen *et al.*, 2015]. The lack of contact with the user can be seen as a contradiction, as UX practices employ approaches focused on understanding how people “feel” when using a certain technology [Hassenzahl, 2018]. Furthermore, even when software startups have the means to invest in UX, it often remains a secondary consideration Silveira *et al.* [2021]. This oversight in allocating resources for user experience research ultimately places a heavy burden on professionals who are expected to produce optimal outcomes with the limited tools at their disposal [Klotins, 2018].

Although the literature has provided some recommendations on UX practices for software startups, these usually do not include much information on which UX research methods and techniques can be adopted in certain situations. In addition, it would be beneficial for software startup professionals with and without experience in UX to find the knowledge on UX research concentrated in a place and linked to each other. This approach can also encourage startups to effectively introduce UX research in their practices.

Table 1. Q/A to proceed with a GLR.

| Questions (Based on Garousi <i>et al.</i> [2019]) | Our Answers |
|--|-------------|
| (1) Is the subject “complex” and not solvable by considering only the formal literature? | No |
| (2) Is there a lack of volume or quality of evidence, or a lack of consensus of outcome measurement in the formal literature? | Yes |
| (3) Is the contextual information important to the subject under study? | Yes |
| (4) Is it the goal to validate or corroborate scientific outcomes with practical experiences? | Yes |
| (5) Is it the goal to challenge assumptions or falsify results from practice using academic research or vice versa? | No |
| (6) Would a synthesis of insights and evidence from the industrial and academic community be useful to one or even both communities? | Yes |
| (7) Is there a large volume of practitioner sources indicating high practitioner interest in a topic? | Yes |

3 Gray Literature Review

Grey Literature (GL) encompasses all pieces of work that are disseminated without undergoing the process of peer review, such as blog posts and white papers [Library, 2022]. The method used to review GL, known as the Gray Literature Review (GLR), applies the same procedures employed in the systematic review of the literature Garousi *et al.* [2019]. Specifically, we utilized GLR in our study to reveal the information regarding UX research strategies (such as methods, techniques, tools) provided by UX experts. Our objective was to determine strategies and their application in real-world scenarios by UX practitioners. To conduct this review, we adopted the procedures recommended by Garousi *et al.* [2019].

To ensure that the GLR should be conducted, Garousi *et al.* [2019] proposes seven questions that can be seen in Table 1. For each question, the researcher answers “Yes” or “No”. If at least one question was assigned as “Yes”, the GLR is recommended. Table 1 shows five “Yes” responses to our study that gave us the confidence to proceed. In the next sections we described the details of planning, execution and results of our GLR.

3.1 Planning

First, research questions (RQ) were defined to address the objective of this review [Garousi *et al.*, 2019], which are:

- RQ1 - What are the approaches, methods, techniques and practices addressed by market professionals for UX Research?
- RQ2 - For what purpose are these approaches, methods, techniques and practices being used?

Table 2. Inclusion and Exclusion Criteria

| ID | Inclusion Criteria (IC) |
|------|---|
| IC01 | Articles reporting UX Research techniques in practice |
| IC02 | Articles from websites or blogs that have some professional information, even if they contain excerpts about UX Research concepts and foundations |
| ID | Exclusion Criteria (EC) |
| EC01 | Articles from academic literature |
| EC02 | Articles that do not address the target topic of this research |
| EC03 | Lack of availability to read or view content |

- RQ3 - What tools are used for which approaches, methods, techniques and practices?

We selected as search sources of GL websites and blogs focused on user experience (UX). In an initial exploratory search on Google, we could find many different sources. However, we opted to select the websites and blogs most accessed by UX experts. Publications with relevant and updated information on user experience contained contributions of experience of professionals who offer guidance, and reflections on the area were taken into consideration. As a result, we selected the sources: the website *Nielsen Norman Group (NN Group)*¹ - website founded by Don Norman and Jakob Nielsen where articles, research results, training courses and UX consultancy area are available; the blog *UX Collective*² which offers articles that according to the blog can help designers think more critically about their work in UX; and the blog *Brasil UX Design*³ which is the Brazilian version of the UX Collective - presents articles about UX in Portuguese. After selecting the sources, the inclusion criteria (IC) and exclusion criteria (EC) were defined following the guidelines of Garousi *et al.* [2019] (see Table 2).

In contrast to search engines for the academic literature, GL selection is carried out primarily using the search engines of GL sources (e.g. blogs and websites). As a result, a large number of results are typically displayed from a search. Garousi *et al.* [2019] propose the establishment of a limited effort criterion, that is, the identification of the top N results of the search engine to be considered in the searches. In our study, we consider exploring the results from January 1, 2018 to December 31, 2021. Our rationale was based on the fact that UX experts around the world adapted their UX research strategies during the COVID-19 pandemic period (2022-2023).

Therefore, we considered that a 4-year period (two years before and two years after the pandemic) would provide valuable results to our investigation. This period also allows us to understand which methods and techniques were applied in person and remotely. We prepared a set of strings that can be used from the search engines of the GL sources in case of difficulties introduced by the infinite scrolling in the browser. These strings are: UX + Research; UX Research + Types; UX Research + Planning; UX Research + Techniques;

UX Research + Methods; UX Research + Practices; UX Research + User; UX Research + Analytics; UX Research + Evaluate; UX Research + Task; and User Research + Planning.

3.2 Selection of Material

The process of selecting materials was conducted in this sequential manner: from December 2021 to January 2018. Nevertheless, we encountered some challenges in acquiring the articles in four-year batches. The only source that allowed us to navigate through four years of articles seamlessly was the NN Group. There were difficulties accessing older content from UX Collective and Brasil UX Design, as they had infinite scroll navigation. Some articles were not recovered from the Brasil UX Design blog (January to June 2018) and the UX Collective blog (January 2028 to November 2019), due to the large number of results. To mitigate this issue, we used the strings presented above individually from the search field into the blogs and websites. After doing this second approach for selecting the articles, we could conclude our data collection by covering the timespan previously defined.

In total, 579 articles were visited, of which 156 were approved and 423 were rejected. The primary causes for the dismissal of the articles were associated with EC02, i.e., “Articles that do not deal with the target topic of research”. Some reasons are: articles were about the UX career (job market, work ethics, salaries, portfolios, and job interviews); other UX areas (i.e., UX Write, UX Prototyping, UX Ideation, UX Work); focused on the area of design but not encompassing UX (UI, design of products, blueprint, color psychology, among others); and are recommendations of books suggestions or discussions of users’ behavioral issues. Taking into account the approved articles (N=156), 46, 53 and 57 were from the NN Group website, the UX Collective blog and the Brasil UX Design blog, respectively.

According to the recommendations of Garousi *et al.* [2019], a quality step was applied to refine the search and increase the rigor of GLR. In our study, we defined four questions for the quality step (see Table 3). To answer each question, each article in our sample was visited again and a rate of 0 to 1 was assigned; the final rate was the sum of rates for each question, i.e., each article could achieve a final rate of 4. Then, a minimum score was defined (N=0.5) and 111 articles were definitively approved which are reported in Appendix A.

3.3 Analysis

In the analysis phase, all the articles were fully read to answers to the 3 RQ (see section 3). To answer RQ1 (*What are the approaches, methods, techniques and practices addressed by market professionals for UX Research?*), a compilation of the approaches and strategies identified in the papers was made, along with the count of papers that referenced such findings. If the article cited a specific technique more than once, it was counted as only one citation. To answer RQ2 (*For what purpose are these approaches, methods,*

¹<https://www.nngroup.com/>

²<https://uxdesign.cc/>

³<https://brasil.uxdesign.cc/>

Table 3. Quality Criteria and Metrics

| Quality Criteria | Quality Issues (QC) | Metrics | | |
|---------------------------|---|--|--|------------------------------------|
| | | 1 | 0,5 | 0 |
| Authority of the Producer | QC1 - Does the author have expertise in the area? | Professional in the field, working in the industry | Postgraduate students and academics working in the field | Professionals from unrelated areas |
| Objectivity | QC2.1 - Are the objective descriptions clear and direct? | Yes, straight to the point | Yes, but with explanation of concepts | No |
| | QC2.2 - Is there a presence of click-bait or is the content of the work different from the title? | No | - | Yes |
| Methodology | QC3 - Does the author specify the approaches, methods, techniques or tools used? | Yes | - | No |

Table 4. Final list of articles approved

| Search Sources | Visited Links | Approved with Applied Criteria | Approved with Applied Quality |
|------------------|---------------|--------------------------------|-------------------------------|
| NN Group | 232 | 46 | 32 |
| UX Collective | 157 | 53 | 37 |
| Brasil UX Design | 190 | 57 | 42 |
| TOTAL | 579 | 156 | 111 |

techniques, and practices being used?), we examine the articles that report how a particular method or technique has been used. To answer RQ3 (*What are tools used for which approaches, methods, techniques and practices?*), a similar process was carried out to answer RQ1, but with a focus on tools. It is worth noticing that not all articles provided content to answer the three RQs.

3.4 Results of GLR

The results revealed that a variety of topics were covered in the articles; however, the focus changed from year to year. In 2018, the majority of articles were dedicated to elucidating the fundamentals of UX Research methods and techniques for novices in the field, but in 2019, articles featuring case studies with industry professionals became more prominent. The focus changed in 2020 and 2021, as the pandemic forced professionals to modify their routines. The number of articles on suggestions and guidance on UX Research methods, techniques and tools for experienced professionals has grown in the pandemic period, as well as articles on remote work in UX. In the next section, we discuss in details the results of each RQ.

3.4.1 RQ1 - What are the approaches, methods, techniques and practices addressed by market professionals for UX Research?

The results showed that the methods and techniques used for conducting UX research (i.e., research with users) are also commonly used for UX evaluation. Some articles did not detail the methods, just mentioning them as “quantitative” and “qualitative”. In total, 29 different approaches, methods and techniques were cited, of which interviews, usability testing, surveys, card sorting, and A/B testing were the most mentioned. On the other hand, affinity map, triangulation, RITE, design sprint and contextual investigation were less

mentioned in the articles. The complete results can be seen in Appendix B.

3.4.2 RQ2 - For what purpose are these approaches, methods, techniques and practices being used?

We selected the 15 approaches, methods and techniques most mentioned in the articles to be discussed in this section. For each one, we provide a short definition and the respective purpose of its application. We also make reference to all the articles that mention that approach, method, or technique by referring to the article ID (see the articles in Table 16).

Interview is a method used to uncover, understand, explore, make decisions and solve doubts considering user responses to questions; it can follow a structured, semi-structured or unstructured script [GL1, GL7, GL13, GL17, GL19, GL21, GL30, GL31, GL32, GL33, GL37, GL38, GL50, GL54, GL61, GL62, GL68, GL69, GL71, GL73, GL75, GL79, GL83, GL89, GL91, GL95, GL96, GL98, GL99, GL102, GL104, GL105, GL106, GL107, GL108]. Furthermore, *interviews* can be applied both face-to-face and remotely [GL10, GL29, GL60, GL67]. This method requires previous planning, such as creating a script with open and closed questions [GL16, GL48, GL55]. For interviews with users of different cultures or with little literacy in informatics, interpreters and native speakers are suggested [GL110]. The recruitment of users for interviews can be internal or external of organizations, i.e., inviting collaborators from the company or individuals from social networks, for instance [GL86]. Some experts opt to utilize interviews from previous projects as a time-saving measure, referring to a kind of research archive [GL88, GL56, GL90]. However, interviews may not be enough to collect data that generates sufficient insights; in cases like this, it is recommended to combine interviews with other methods [GL64].

Usability Test method helps UX professionals assess products with the aim of checking possible user interaction problems. This method allows us to measure the efficiency and effectiveness of products that can affect the design of a good experience [GL1, GL4, GL5, GL7, GL8, GL9, GL19, GL21, GL32, GL45, GL62, GL63, GL69, GL71, GL74, GL79, GL94, GL95, GL96, GL98, GL104, GL105, GL109]. They can be moderated or unmoderated [GL59]. The application methods are in person and remote [GL10, GL20]. The remote approach reduces application expenses and may offer

more convenience to participants. [GL57, GL59, GL60].

Survey supports professionals in collecting more quickly data on the behaviors, opinions, attitudes, preferences of potential customers [GL1, GL7, GL12, GL19, GL27, GL29, GL32, GL45, GL64, GL73, GL74, GL79, GL89, GL91, GL94, GL96, GL98, GL99, GL102, GL103, GL104]. This enables a connection to a significantly larger audience in a relatively short period of time [GL105, GL107]. It serves as a tool to validate or reject hypotheses and personas, while also supplementing the other information [GL36, GL14].

Card Sorting is a technique used to group patterns that make sense to users; it demonstrates the subject matter expertise of the intended audience to establish or confirm an information structure [GL1, GL4, GL19, GL21, GL32, GL45, GL70, GL73, GL74, GL79, GL96, GL99, GL102, GL104, GL105]. The technique can be applied to understand both the user and the product performance [GL91]. Its application can be performed both in person and remotely [GL10].

A/B Test technique allows to check the best option between two or more product versions; is based on monitoring performance ranging from applications and web pages to advertisements and emails [GL4, GL7, GL22, GL32, GL42, GL45, GL62, GL72, GL73, GL74, GL79, GL91, GL94, GL95, GL98, GL105, GL107]. Professionals have recommended its use considering its low cost of application and its nature to help the project team identify product issues; the *A/B Test* results can contribute to managing some company's business objective and also improve the user/client experience [GL85].

Diary Studies is a method to track and document users' experiences with products from the natural environment of users during a timespan [GL19, GL32, GL43, GL49, GL54, GL65, GL68, GL79, GL82, GL89, GL91, GL96, GL98, GL99, GL107]. The method requests that users make annotations and record details of their interactions (e.g. period of time, actions) as they use a system [GL107]. In person and remotely are acceptable as application of the method [GL10].

Questionnaire is a method to identify some quantitative data and question the user's pains, experiences and difficulties with the product [GL1, GL12, GL18, GL19, GL28, GL30, GL31, GL35, GL64, GL74, GL94]. It is a method that can be applied both in person and remotely [GL10]. Practitioners use it to validate or discard assumptions [GL41].

Focus Group technique focuses on discussions in small groups to encourage common understandings and learnings about user ideas, needs, attitudes and beliefs; it obtains data about the different perspectives of the participants [GL1, GL19, GL21, GL32, GL50, GL54, GL73, GL94, GL95, GL96, GL98, GL103, GL107].

Field Study is a method carried out in the user's environment observing behavior and daily activities, where the recruiter does not interfere and documents everything the user does [GL1, GL7, GL17, GL43, GL49, GL50, GL54, GL62, GL64, GL65, GL68, GL89, GL94].

Ethnography is a method by which user behavior is observed without interference from researchers [GL1, GL19, GL21, GL32, GL43, GL94, GL95, GL96, GL111]. It can be an effective method for learning the usefulness of product design or identifying that it introduces obstacles in the interaction [GL102].

Observation method can be applied to monitor users to understand aspects related to the process employed in their work and their pain points; from data collection, professionals can generate real insights for improving products [GL6, GL31, GL40, GL43, GL50, GL68, GL95, GL98, GL101].

CSD Matrix (Certainties, Suppositions, and Doubts) is a method that supports professionals in defining and organizing what they know, what they suppose to know, and their doubt, i.e., what they want to discover about products or projects; this method is frequently applied before employing other methods or techniques [GL11, GL12, GL29, GL32, GL37, GL38]. Professionals use it to map the current scenario and avoid unnecessary questions to users [GL12, GL32].

Participatory Design method allows revealing needs that can be hidden with direct participation of the audience; the collected data can guide professionals in discovering from which they should start the product conception [GL23, GL32, GL98]. The audience designs their experience in tangible artifacts, such as low-fidelity prototypes, that communicate their top priorities and the reasons behind them [GL94].

Tree Test technique guides participants to complete predefined tasks with the aim of evaluating the information architecture of the applications. The gathering of data aids experts in determining if the structure aligns with user anticipations [GL45, GL73, GL74, GL91].

Accessibility Test is a method to conduct studies with a specific group that requires accessibility (including visual, auditory, physical), distinguished by the instruments it employs [GL1, GL3, GL100].

3.4.3 RQ3 - What tools are used for which approaches, methods, techniques and practices?

Notebooks, pens, and post-it notes are mentioned for face-to-face activities in articles published in 2018 and 2019. Some authors recommend creating playful tools so that no-tech users can engage better in data collection [GL110]. The recommendations for free and remote tools increased in 2020 and 2021 as a consequence of social isolation and working from home.

Table 5 presents 55 tools identified in our GLR. In Table 6, we see the relationship between the 15 main approaches, methods, and techniques discussed in the last section with tools that can support their adoption. It is worth mentioning that some articles only report explanations of the approaches, methods, and techniques without reporting tools that could be used to apply them. Other articles did not have explanations, but rather tool recommendations for each method or technique [GL2, GL3, GL15, GL24, GL53, GL58, GL66, GL76, GL77, GL78, GL81, GL84, GL87, GL92, GL93, GL100, GL103].

4 Catalog Proposal

Taking into account the GLR results, we carried out a thematic analysis to group the main results. Thematic analysis method includes procedures to identify data patterns, group them, and thus create themes that describe the data in de-

Table 5. The 55 tools extracted from the GLR

| TOOLS | | | |
|----------------------------|-----------------------|------------------|--------------|
| App Verify | Google Optimize | NVDA | Trello |
| Notebook / Notepad | Google Sheets | OBS Studio | Typeform |
| Camera for video and audio | Voice recorder | Optimal Workshop | Useberry |
| Dragon Naturally Speaking | Instagram | Post-It | User Feel |
| Dropox | JAWS | Question PRO | User Testing |
| Dscout | Lookback | Reduct Video | User Zoom |
| Ethnio | Material Notes | Reframer | UX Tweak |
| Figma | Material Drawing | Sketch | UX Punk |
| Go To Meeting | Maze | Skype | Valida Tely |
| Google Slides | Microsoft Excel | Sprig | Voiceover |
| Google Drive | Microsoft Power Point | Survey Monkey | WhatsApp |
| Google Forms | Microsoft Sharepoint | Tally | Zoom |
| Google Jamboard | Miro | Telephone | Zoom Text |
| Google Meet | Notion | Testa Isso | - |

tail [Braun and Clarke, 2006]. Our objective was to map the relationship between methods, techniques, approaches, and tools with the aim of conducting UX research through themes. Considering the thematic analysis outcomes, we design a catalog to support software startup professionals in UX research practices. In the next sections, we discuss the mapping of the GLR results, the themes definition and the design of the catalog.

4.1 Mapping the Results

During GLR conduction, we noticed that some articles adopt the words *methods*, *techniques*, *approaches* and *tools* as terms interchangeably. The term “methods” was the most applied. Therefore, the initial step involved providing a clear definition of approaches, methods, techniques, tools, and strategies from the well-known literature on HCI (human-computer interaction), which gave us the following definitions.

Approaches are more abstract and general models that contain practices [Preece *et al.*, 2013]. Methods are processes that include a set of tools and techniques [Benyon, 2011]. Techniques are a particular way to deal with information about users and products [Preece *et al.*, 2013]. Tools are instruments that serve as a means to achieve a goal [MICHAELIS, 2024b]. Strategies are the planned use of resources available to achieve certain objectives [MICHAELIS, 2024a]. The following well-known literature supports us in outlining the definitions above: (i) Interaction Design: Beyond Human-Computer Interaction by Preece *et al.* [2013], (ii) Ergonomia e Usabilidade: Conhecimentos, Métodos e Aplicações (in English, Ergonomics and Usability: Knowledge, Methods, and Applications) of Cybis *et al.* [2015] and (iii) Interação Humano-Computador (in English, Human-Computer Interaction) of Barbosa *et al.* [2021]. This literature was recommended by HCI professionals [Grilo, 2022].

With the definitions in hand, we proceeded by classifying GLR results as approaches, methods, techniques, tools, and strategies. In some cases, the GL mentioned that a result was a “method”; however, we found that, in fact, it was categorized as a “technique” in the books. Some modifications

were required as the referenced books did not contain all the necessary results. Upon confirming the theoretical basis, a reclassification was undertaken. Affinity Map, for instance, was not found in the previously mentioned literature; therefore, we used another reference - (iv) UX Research com Sotaque Brasileiro (in English, UX Research with Brazilian Accent) by Henriques *et al.* [2022]. In that book, Affinity Map is mentioned as a tool. An additional modification was the elimination of two techniques (taxonomy and accessibility test) from the GLR sample. Taxonomy was omitted since it is a categorization, but the reference in which it is discussed does not detail the kind of categorization or elucidate it. Accessibility testing was also excluded due to the complexity of the subject and could be the focus of future work.

Following the implementation of the aforementioned changes, Table 7 presents the last version of the categorization of the results. To understand the requirements for using the tools, characteristics and criteria for using the items available in Table 7, we explored other details, such as: operational system (Windows, Linux, MACOS, Android, iOS or online), cost to use (paid or free), resources required (computers, smartphones, microphones) and online alternatives.

By examining the results of the GLR, it becomes clear that there are techniques that can facilitate the implementation of various methods. A re-evaluation of GLR articles was undertaken with the goal of identifying references to techniques and tools employed in the execution of the method. We proceeded by scrutinizing the GLR results to discover correlations between approaches, methods, strategies, and tools. The correlations were established as follows: When an article was accessed, references to a particular method were found. Then, all other articles cited that method were examined. From this, a search was started to find any signs of strategies and tools linked to this method. Figure 2 illustrated an example of correlations. In the example, we see that (i) to carry out testings with users adopting the cognitive path *method*, the interview *technique* is used; (ii) the observation and interview *techniques* support the ethnography conduction, that is, a *approach*; and (iii) Zoom is suggested as a *tool* to carry out usability testings, i.e., a *method*.

In the process of reviewing articles, it becomes evident that the authors select a topic and use it as a form of explanation, providing use recommendations or even presenting case studies. The topic of the article refers to some daily tasks run by UX professionals: interviewing users, seeking insights, and testing prototypes, among others. The articles also provide guidance and directions for novices entering the UX career by giving details on how to implement a method. From this, common traits related to methods and techniques were encoded to identify possible themes.

To carry out the coding, the focus of the use of that method or technique was identified. Common focuses were grouped, giving rise to possible themes. The coding can be seen in Table 8. Some articles outlined methods, techniques, approaches and tools, explaining the objective of applying them (see an example in Figure 3).

The potential to group similar themes was evident after an in-depth examination of the articles. Several articles highlight the necessity of setting a plan before working on user experience, while others underscore the importance of incen-

Table 6. The relationship between the tools extracted from GLR with the 15 main methods and techniques

| Methods and Techniques | Tools |
|------------------------|--|
| Interview | For recruitment: Ethnio, UX Tweak, Reframer. For remote audio and video interviews: Google Meet, GoToMeeting, Skype, Lookback e Zoom. Audio only: telephone. In person: notebooks and voice recorder. Transcription: Reduct Video. |
| Usability Testing | For remote: Google Meet, Skype, GoToMeeting, Zoom. To test: Figma, Sketch, Miro, Testa isso, User Feel, User Testing, Valida Tely, Lookback, Sprig, Optimal Workshop, Maze, Useberry, User Zoom, App Verify. To document: Google Drive, Dropbox, Sharepoint. |
| Survey | Google Forms, TypeForm, Survey Monkey, Question PRO, Tally. |
| Card Sorting | Miro, Google Slides, Power Point, Trello, UXPunk. |
| A/B Test | Google Optimize. |
| Diary Studies | WhatsApp, Instagram, Typeform, Notion, Dscout. |
| Questionnaire | Google Forms, TypeForm, Survey Monkey. |
| Focous Group | Do not cite. |
| Field study | Camera for recording and notebooks for reports. |
| Ethnography | Do not cite. |
| Observation | Camera for recording and notebooks for reports. |
| CSD Matrix | Post its, Jamboard, Spreadsheet (Excel or Google Sheets). |
| Participatory Design | Drawing material (paper, pencil and pen). |
| Tree Test | Do not cite. |
| Accessibility Test | Screen Reader: JAWS and NVDA (Windows), Voiceover (Mac and iOS), Talkback (Android). Shortcuts and Screen Orientations: JAWS and NVDA. Screen Magnification: ZoomText. Voice recognition: Dragon Naturally Speaking. Changing colors for color blind people: in the operating system itself. |

Table 7. Final Classification of GLR Results

| Final Categorization | |
|----------------------|--|
| Approach | Ethnography, Nielsen Heuristics, RITE |
| Method | Sentiment Analysis, Participatory Design, Design Sprint, Cognitive Path, Market Segmentation, A/B Testing, Tree Testing, Usability Testing |
| Technique | Brainstorm, Card Sorting, Desk Research, Diary Studies, Interview, Field Study, Focus Group, In-The-Moment Snippets, Contextual Investigation, Observation, Questionnaire, Survey, SUS |
| Tool | Affinity Map, CSD Matrix |
| Strategy | Triangulation |

Table 8. Coding Potential Themes

| Identification Code | Approach, Method, Technique, Tool |
|-----------------------|---|
| Users | Questionnaire, Survey, Participatory Design, Interview, Sentiment Analysis, Diary Studies, RITE, In-The-Moment Snippets, Card Sorting |
| User Group | Market Segmentation, Desk Research, Focus Group |
| User Location | Observation, Contextual Investigation, Ethnography, Field Study |
| Ideas and Planning | Brainstorm, Affinity Map, CSD Matrix, Design Sprint, Triangulation |
| Navigation and System | Nielsen Heuristics, Cognitive Pathway, Tree Test |
| Prototype | Usability Testing, SUS, A/B Testing |

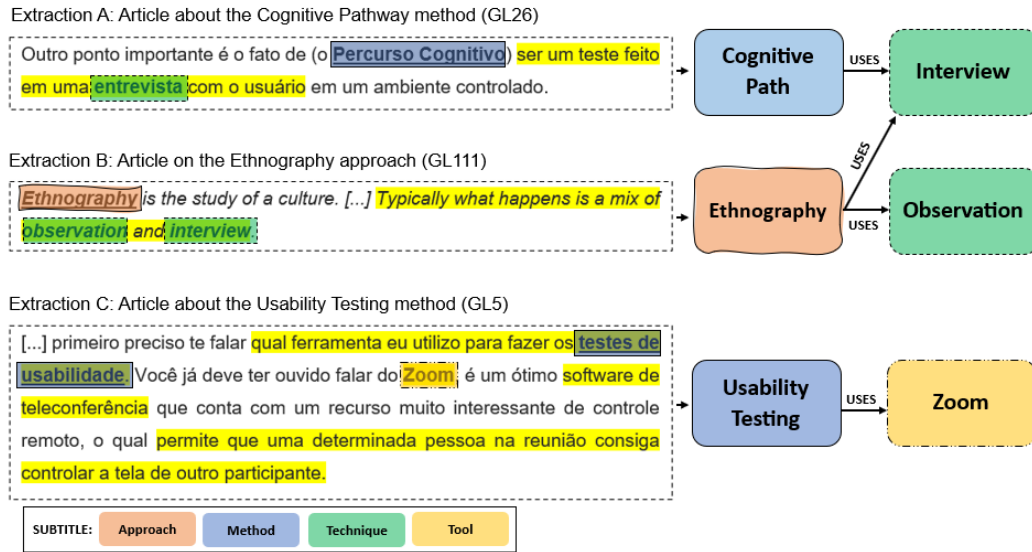


Figure 2. Example of procedures to connect approaches, methods, techniques and tools.

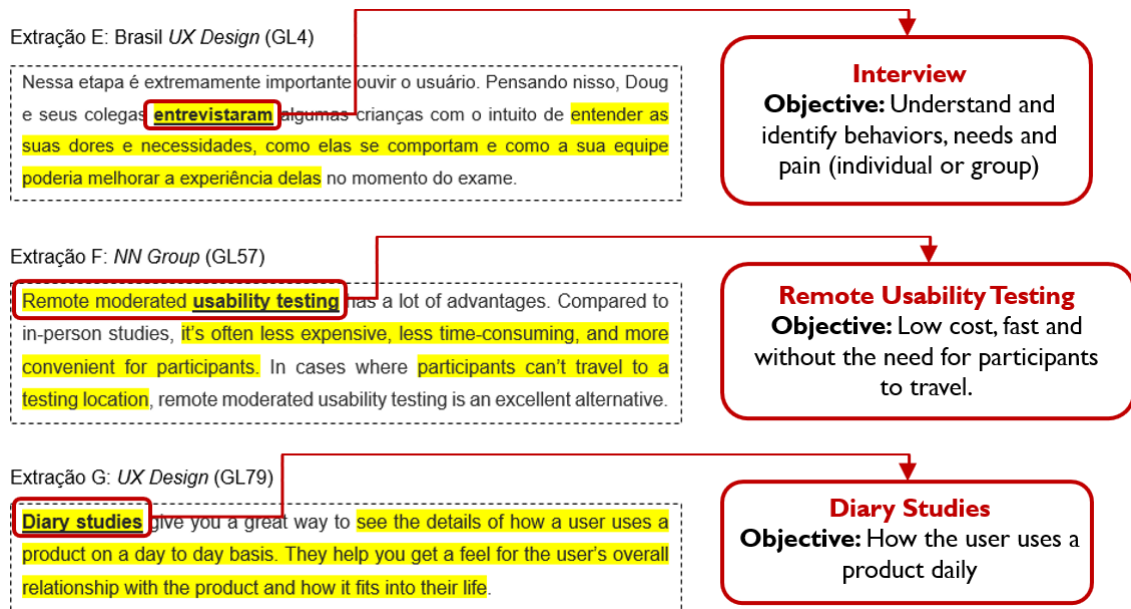


Figure 3. Examples of GLR extractions explaining the purpose of using the method or technique.

tives to obtain optimal insights. Most articles focused on user engagement, depending on the issue being addressed, the number of users, their location, and available resources. A substantial amount of articles mentioned handling existing products that require rethinking or prototypes that need evaluation before obtaining customer approval.

4.2 Defining Themes

We identified four themes that can be seen in yellow circles in Figure 4. Each theme covers a range of associated methods and techniques that align with its specific goals. We took into account the potential scenarios in which user research can be conducted. Each of these scenarios offers opportunities to gradually narrow down the search and consider possible situations to determine the most suitable approach, method, technique, and tool for that particular context. This fine-tuning considers potential situations that might arise, as discussed

in the articles that resulted from GLR. In the next sections, we give details of each theme.

4.2.1 Organize Ideas

The first theme is focused on users who have difficulty starting research and generating insights that can support software start-up professionals who have no experience with UX [Hokkanen and Väänänen-Vainio-Mattila, 2015; Kuusinen *et al.*, 2019]. Furthermore, UX research that is not well designed and applied can have negative consequences, especially for small startups that often lack resources [Unterkaalmssteiner *et al.*, 2016]. This theme proposes 3 starting points:

- *Generate possible solutions by gathering team ideas*: is appropriate for professionals who meet with professional colleagues and start working on the project together. At this stage, *Brainstorm* technique is a suitable option. Therefore, the team works with the information

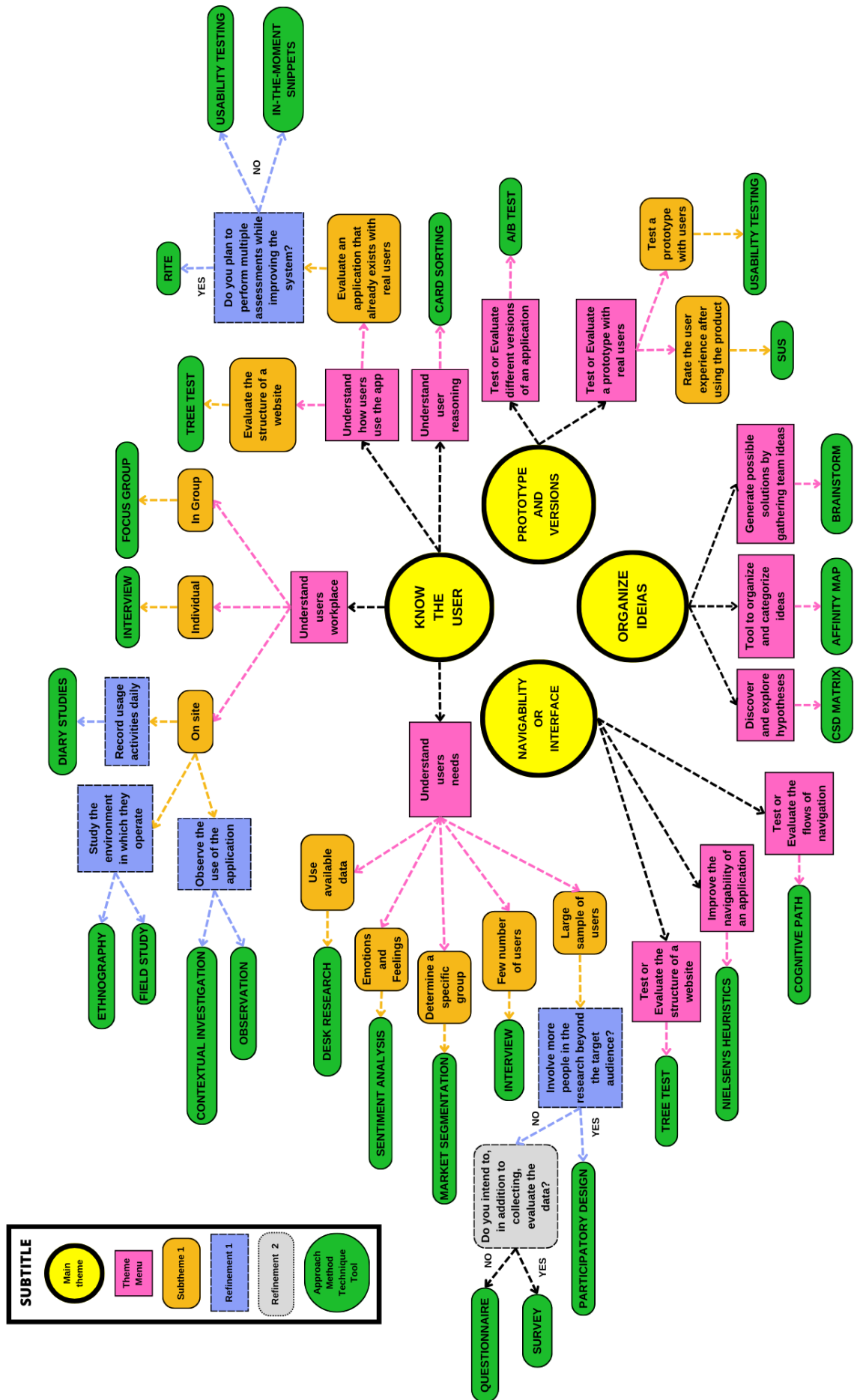


Figure 4. Thematic Map and flows for methods, techniques, approaches and tools.

provided by the client. In a group, the team brings together different points of view to generate ideas, solutions, and suggestions of how steps to follow;

- *Tool to organize and categorize ideas*: support professionals who cannot organize and define their priorities to obtain insights about users and products. *Affinity Map* tool is suggested to arrange the groups of ideas according to the reality of the project they are working on;
- *Discover and explore hypotheses*: aid professionals explore different views of the project before conducting UX research. *CSD Matrix* tool provides ways to pinpoint the certainties the professionals have about the project, the potential assumptions and guesses about the problem, and the doubts that need to be clarified.

4.2.2 Know the User

The second theme covers the central focus of UX research: users. Frequently, software startup professionals have little experience in methods and techniques to gather user data [Hokkanen and Väänänen-Vainio-Mattila, 2015; Kuusinen *et al.*, 2019; Hokkanen *et al.*, 2015]. The theme includes forms of collecting user data, understanding their needs, and details about users' workplace, their reasoning, and the way the user performs a task. Furthermore, it provides guidelines to the professional on which method and technique to use independently of the user sample size. It is possible to use information already collected for analysis or collect data from scratch. This theme proposes 4 starting points:

- *Understand users needs*: support in-depth understanding of the project audience; Questions can guide exploration: what to know about the user, how to deal with different sample sizes of users, and whether or not the target audience is defined. This theme contains sub-themes that support a refinement:
 - *Large sample of users*: the need for a large number of users introduces the question of the need to involve more individuals in UX research. In this case, the *Participatory Design* method is suggested because it helps professionals decide which features best satisfy the user's needs. To focus only on the target audience, *Questionnaire* technique is recommended to collect a large amount of data; *Survey* technique is suitable to add a more robust data evaluation;
 - *Few number of users*: in cases of a limited number of users to collect data (5-10 users), *Interview* technique is suggested. From a qualitative perspective, it allows to collect more in-depth users information if compared with surveys;
 - *Determine a specific group*: *Market Segmentation* method is suggested for understanding particular target audiences;
 - *Emotion and feelings*: to support the analysis of user mood in relation to a product *Sensitivity Analysis* method is suggested; it helps researchers discover, for example, whether the user found the experience positive or negative;

- *Use available data*: data previously collected in the project can be adopted when professionals are not available to leave the building. *Desk Research* technique is suitable for such cases.

- *Understand users workplace*: aid the understanding of the influence of external factors of the environment on the user experience with the product. This sub-theme has a refinement to obtain the results:
 - *Individual*: the data collection is focused on the individual perspective of each user. *Interview* technique is suggested;
 - *In group*: the data collection requests a large number of individuals who are part of the same environment. *Focus Group* technique is suggested to gather a significant amount of information and even promote a debate to obtain data from different perspectives;
 - *On site*: to collect data on the details of daily activities and to observe the use of the application in the environment where the user work or interact. The techniques *Observation* for a contextual work environment and *Contextual Investigation* for expert participants are suggested. However, if the focus is to study the environment in which users operate, we suggest the *Field Study* technique to obtain information on the natural environment. *Ethnography* approach provides a more comprehensive fieldwork. However, the *journal studies* technique is more appropriate in cases where recording of daily activities using the application is the focus.
- *Understand how users use the application*: direct participation of users is requested to improve or evaluate the application. This sub-theme has a refinement to obtain the results:
 - *Evaluate the structure of a website*: *Tree Test* method is suggested to check how easily users can find elements of a website;
 - *Evaluate an application that already exists with real users*: The form in which users use an application reveals what the needs are for improvements to the product. *RITE* approach is recommended to carry out several evaluations while improving the system. Otherwise, the *In-The-Moment Snippets* technique collects each movement the user makes while using the application; *Usability Test* supports general evaluations.
- *Understand user reasoning*: allow the user's mind and their rationale to be understood. For that case, *Card Sorting* technique is suggested.

4.2.3 Prototype and Versions

The third theme includes comparison and evaluations of products already conceived and medium- and high-fidelity prototypes independently of these resulting from previous research. This theme proposes 2 starting points:

- *Test or Evaluate a prototype with real users*: to test and evaluate products or prototypes. This sub-theme has a refinement to obtain the results:
 - *Test a prototype with users*: Usability Test method is suggested to assess user interaction with medium- or high-fidelity prototypes;
 - *Rate the user experience after using the product*: allow to extract data about users' interaction after they use the application; *SUS* technique is recommended.
- *Test or evaluate different versions of an application*: to select and compare which version of the application is the best option for the user. For this, the *A/B Test* method is recommended.

4.2.4 Navigability or Interface

The fourth theme addresses how to work with functional applications or websites. The paths followed by users help professionals to improve navigability, test and evaluate the site structure and navigation flows. This theme proposes 3 starting points:

- *Test or Evaluate the flows of navigation*: usability evaluation is the main focus to avoid user mistakes during navigation. *Cognitive Path* method is recommended;
- *Improve the navigability of an application*: the design of a good interface and navigability is the central point; *Nielsen's Heuristics* approach is recommended;
- *Test or evaluate the structure of a website*: as presented in Theme 2 (Know the user), the *Tree Test* method is recommended to check the ease of navigation of a website structure.

4.3 CatUX

Taking into account the thematic map and its elements, we developed a website as a catalog with recommendations, named CatUX: Cat- Catalog and UX- User Experience. First, low- and medium-fidelity prototypes were designed to define the navigation and menus. The four themes were associated with the main menu as starting points for navigation. From the menu, users can follow the other elements of the map (see Figure 4). The website was developed in HTML and CSS using the Brackets⁴ code editor. The images were retrieved from Freepik image⁵, a library free of charge. In Figure 5, we illustrate an example of the translation of the themes into the website. The website is available online⁶ (in Portuguese) and source codes are available from GitHub⁷.

5 Evaluation

The catalog was evaluated from two perspectives with the participation of software startup professionals. First, a usability test was performed to assess the use of the catalog in

practice. To conduct this evaluation, participants performed tasks in the catalog based on use scenarios that present hypothetical situations about UX research in software products. Based on the scenarios, participants should point out which approach, method, technique, or tool was the most appropriate. Think Aloud was used to collect qualitative data on user feedback. Think aloud is a protocol for collecting data from which users verbally express their thoughts during interaction with the product [Someren *et al.*, 1994]. In the second perspective, we evaluated the acceptance of the catalog from the perception of users by using the TAM (Technology Acceptance Model) method Davis [1989].

5.1 Planning

We defined the target participants in the study as UX professionals (i.e., UX Designers, UX Researchers, Product Designer, UX Trainee) and software developers (i.e., Analysts, Programmers, Front-End/Back-End/Full-Stack Developers, IT Trainee) who worked in software startups. To recruit participants, we developed a Google Forms questionnaire. The initial answers collected in the form (i.e., their positions, experience, startup details) helped us to then invite exclusively startup professionals.

A set of artifacts was built to collect data and guide the evaluation. The Informed Consent Form was prepared, which contains all the information about the research, objectives, and conditions of acceptance regarding the data collected. The study protocol was approved by the Ethics Committee: CAAE - 68524023.0.0000.5504. The four scenarios to drive participant tasks were also developed based on each theme presented previously (see the scenarios in Table 9). Each scenario encourages participants to choose a category and their respective flows that are associated with the themes of our mapping (Figure 4).

We developed in Google Forms a TAM version containing closed questions split into three categories: Ease of Use (EU), Perceived Usefulness (PU) and Future Use Intent (FUI) (see Table 10). The answers should be selected as Likert scale. There are also open questions (OQ) for participants to comment on the experience.

5.2 Execution

Participants were recruited on social media in two steps. In the first step, 29 professionals expressed interest in participating in the study. After prior analysis, we concluded that 11 volunteers meet the criteria (ie, they work in start-ups and have a position in the software development area) to participate in the evaluation. The evaluation was scheduled according to the availability of the participants and took place individually and remotely via Google Meet⁸.

These answers and questions asked at the beginning of the evaluation complemented the collection of participant profiles (demographic data).

As soon as data collection started, we presented the consent form and collected additional demographic data. After, we asked to participants to open an anonymous tab in their

⁴<https://brackets.io/>

⁵<https://br.freepik.com/>

⁶<https://catalogo-catux.com.br/>

⁷<https://github.com/pbluana11/catux>

⁸<https://meet.google.com/>

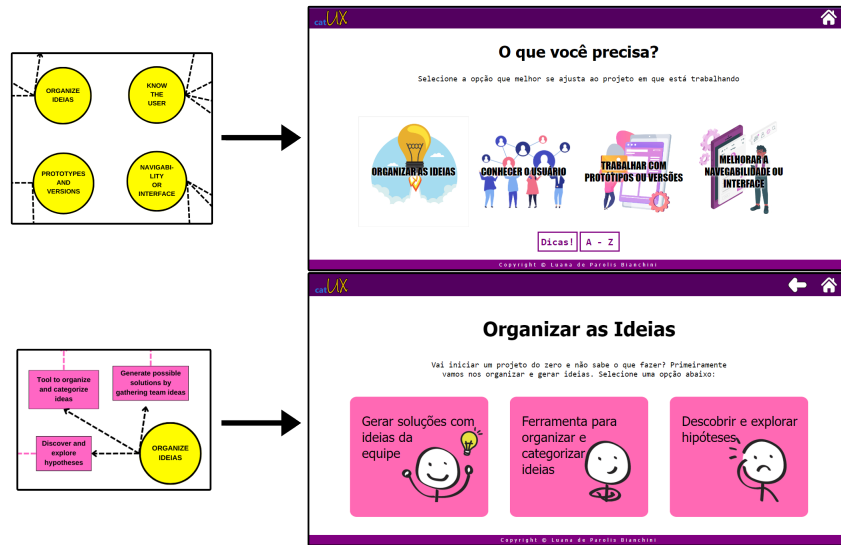


Figure 5. CatUX Website.

Table 9. Scenarios used in the evaluation

| Studies | Description of the scenarios | Goal |
|------------|---|--|
| Scenario 1 | The public transport company <i>Infinite line</i> would like to launch a specific application for people with disabilities and/or visual limitations to better guide this public about lines, schedules and waiting times. What type of application can we create for this target audience? | User chooses a classification from the Organize Ideas menu. |
| Scenario 2 | The city council of <i>Blue West</i> wants to launch an application so that the population can make appointments via cell phone, reducing the queues that form at <i>UBS (Basic Health Unit)</i> that end up hindering those who go to the health center for appointments. However, before developing, I would like to know the population's opinion on whether it is a good idea and what other services can be added to this application. How to get this feedback? | User chooses a classification from the Know the User menu. |
| Scenario 3 | The company <i>Let's Eat?</i> is a technology company that owns an app of the same name for ordering meals. It wants to launch a 2.0 version of the application, but believes that the change will be drastic as the product has a renewed layout and users are used to version 1.0. How to test whether the new version will work? | User chooses a classification from the Prototype and Versions menu. |
| Scenario 4 | The news website for the metropolitan region of <i>Blue West</i> , called <i>Cool News!</i> , has a lot of access on its home page. However, users do not access the site's news content much. On your social networks there are comments " <i>I didn't find the news</i> ", " <i>What a confusing website!</i> ". How to improve and increase access? | User chooses a classification from the Navigability or Interface menu. |

browser to avoid plugins or extensions disturb the data collection. We also asked them to share their computer screen so we could record their speeches. Then CatUX was presented and the URL address was notified to the participants.

The scenarios were then presented, and they were instructed to navigate into CatUX to find the approach, method, technique, or tool that the participant believed to be most appropriate to fulfill the scenario demands. During navigation, the participant used the thought-aloud protocol to share their thoughts and inform his choice during navigation. In the end, the 11 participants responded to the TAM form.

5.3 Analysis

The analysis was carried out to cover the two perspectives of the evaluation: *Analyze 1*: a qualitative analysis on the results of the catalog use and *Analyze 2*: a quantitative and qualitative analysis on the acceptance of the catalog. Analysis 1 followed the procedures presented in Figure 6. Analysis 2 explored the TAM answers and constructed graphs to illustrate the results. Qualitative feedback from participants

supports the presentation of the results.

In Analysis 1, we first transcribed all the data recorded. To organize and analyze the data, a spreadsheet was created⁹. Demographic data were then extracted. Subsequently, statements were extracted from participants' speeches per scenario. The objective was to identify positive points and barriers to using the catalog. Participants' comments were summarized in the spreadsheet. Some participants in certain scenarios did not express their opinions, either positive or negative, giving a more direct answer as to which option they would choose. In these cases, we inputted "-" into the spreadsheet. After fulfilling the spreadsheet, we checked the participants' choices to identify whether their choices met the scenarios' objectives. Finally, we examined the participants' speeches to find patterns that give evidence about positive points, barriers to use, suggestions, or justification for the chosen method or technique. The conclusions summarize the insights that users had about the catalog while using it. All of the above procedures were performed separately per participant and per scenario.

⁹CatUX Assessment Spreadsheet (available in Portuguese)

Table 10. TAM Questions

| Ease of Use Questions | | Questions about Perceived Usefulness | |
|-----------------------------|--|--------------------------------------|--|
| EU1 | My interaction with CatUX was clear and understandable | PU1 | Using CatUX improved my performance in finding a suitable approach, method, technique or tool for conducting user research |
| EU2 | Interacting with CatUX requires little mental effort | PU2 | Using CatUX allowed me to increase my productivity in finding a suitable approach, method, technique or tool for carrying out user research |
| EU3 | I find CatUX easy to use | PU3 | Using CatUX increased my effectiveness in finding a suitable approach, method, technique or tool for conducting user research |
| EU4 | I find it easy to use catUX to do what I want it to do, that is, find the most appropriate approach, method, technique or tool to carry out user research and guide myself on how to carry it out. | PU4 | I find CatUX useful for finding a suitable approach, method, technique or tool for conducting user research |
| Future Use Intent Questions | | Open Questions | |
| FUI1 | Assuming I have access to CatUX, I intend to use it | OQ1 | Comment on the usage difficulties you identified when trying CatUX |
| FUI2 | Assuming I have access to CatUX, I predict who would use it | OQ2 | Comment on your perspective on future use of CatUX |
| | | OQ3 | Provide some suggestions for improving CatUX. Mention existing points that can be improved or resources that you would like to find available in the tool. |

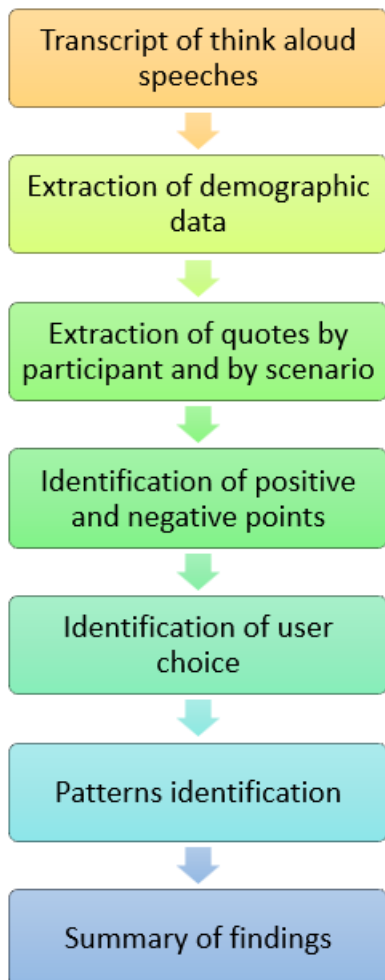


Figure 6. Method for Analysis 1

In Analysis 2, we separated the answers of closed questions and open questions for different analysis. For the answers to the closed questions, we built a graph and interpreted the results. The answers to the open questions were added to the spreadsheet and the interpretation of the opinions, criticisms, and suggestions of the participants was carried out.

6 Results of the Evaluation

The results will be presented in three parts: first, the summary of demographic data outlining the profile of the participants, followed by the results of the use of the themes, and finally the results of the acceptance of CatUX.

6.1 Participants' Profile

In total, 11 participants from four different cities from Brazil participated in the study. Of the total, 5 were UX professionals, 5 were IT professionals linked to software development, and 1 was a Trainee. None of the participants have worked in a complete in-person mode; 9 of them work remotely and 2 in a hybrid format. The profile of each participant can be seen in Table 11.

6.2 Scenario 1 Results - Organize Ideas

In Scenario 1, the situation involved possessing a concept for an application, but lacking the specific details to implement it, indicating the need for idea organization and generation. Thus, the goal is for the user to employ a method or instrument discussed in the first theme, 'Organize Ideas'. A summary of the various options, modifications, and alternative selections can be found in Table 12.

Table 11. Participants' Profile

| Participants | Age (years) | City | Professional Experience (years) | Office | Startup Experience (years) | In Person, Remote or Hybrid? |
|--------------|-------------|--------------|---------------------------------|------------------|----------------------------|------------------------------|
| P1 | 31 | Londrina/PR | 5 | UX Designer | 2.5 | Remote |
| P2 | 22 | Sorocaba/SP | 2 | Web Developer | 2 | Remote |
| P3 | 23 | Sorocaba/SP | 1 | Developer | 1 | Remote |
| P4 | 24 | Fortaleza/CE | 3 | UX Designer | 2 | Hybrid |
| P5 | 32 | Fortaleza/CE | 6 | Developer | 2 | Remote |
| P6 | 28 | São Paulo/SP | 5 | UX Researcher | 1 | Remote |
| P7 | 29 | Fortaleza/CE | 2.5 | UX Designer | 2.5 | Hybrid |
| P8 | 21 | Sorocaba/SP | 2 | Programmer | 0.6 | Remote |
| P9 | 21 | Sorocaba/SP | 1 | Trainee | 0.5 | Remote |
| P10 | 29 | Sorocaba/SP | 6 | Product Designer | 4 | Remote |
| P11 | 22 | Sorocaba/SP | 0.4 | Developer | 0.4 | Remote |
| MEDIA | 25.6 | - | 3.1 | - | 1.7 | - |

Table 12. Scenario 1 - Results

| Scenario 1 - Organize Ideas | |
|-----------------------------|---|
| Target Themes: | Brainstorm, Affinity Map e CSD Matrix |
| Allied Choices: | 3 - CSD Matrix (2), Affinity Map (1) |
| Different Choices: | 8 - Market Segmentation (3), Nielsen Heuristics (3), RITE (1), No reply (1) |

Given that the study was the initial interaction of the participants with CatUX, there were positive and negative comments about the home page and the main menu. P4 suggested that the home page could benefit from references to methods and techniques: *“I thought there was some information related to research methods below, but it’s really just a very... brief presentation and the location of the university.”*. There was also attention to “Dicas” (in English, Tips) and “A-Z” available in the main menu. P2 commented that “Tips” can help in choosing methods: *“Before clicking, I’ll click on the one that draws the least attention, which in this case are the tips, to see what I can do”*. P8 believes that “A-Z” is not helpful for those who are using the site for the first time: *“I think it’s everything that’s there just listed, instead of segmented into some topics. This one (A-Z menu) based on the name here, I think it will be more difficult”*.

Participant P5 commented that the generation of ideas is a basic step that would not require help from the catalog to organize thoughts. The participant mentioned that prefers to focus on the following stages of the process: *“I understood that it was information (pointing to the Organize Ideas menu)... which seems basic to me. I understand that I like surprises, but I believe I can skip them. Then I would go to get to know the user part”*. This could explain why most of the participants chose methods and techniques from the “Know the User” menu instead of “Organize Ideas”.

Participant P3 believes that the generation of ideas should be the first stage of the process: *“[...] I haven’t specified how I’m going to make this app yet [...]. So I’ll organize my ideas first.”*. P4 accessed the CSD Matrix page and commented that the explanation and step-by-step instructions are very clear and detailed: *“So, I think I found the method that... The tool, right? In which case I would use it first. Anyway, I found it very complete here. Here’s what it is, right? Cool.”*.

P1 suggested a change in spelling in the “Discover and Explore Hypotheses” option in the “Organize Ideas” menu: *“Explore assumptions. I don’t know if you’re thinking about*

Table 13. Scenario 2 - Results

| Scenario 2 - Know the User | |
|----------------------------|---|
| Target Themes: | Survey, Questionnaire, Participatory Design, Interview, Market Segmentation, Sentiment Analysis, Desk Research, Observation, Contextual Investigation, Ethnography, Field study, Diary Studies, Focus Group, Tree Test, RITE, Usability Testing, In-The-Moment Snippets, Card Sorting |
| Allied Choices: | 9 - Survey (6), Sentiment Analysis (2), Card Sorting (1) |
| Different Choices: | 2 - Affinity Map (1), Usability Testing (1)* |

*Although Usability Testing is present in the “Know the User” menu, the participant who chose this method accessed it through the “Prototype and Versions” menu.

improving here. Before we start the product, when we are in this exploratory phase, we have assumptions. Hypotheses are born after research.”

This initial feedback revealed that the catalog was easily accessed by participants who could find the appropriate methods and techniques. The explanations and instructions are clear and detailed according to the participants. The home page with explanation and information about CatUX is instructive upon first contact, but is not useful in helping those who use the tool. The “Organize Ideas” menu, despite being a fundamental step in the initial process, tends to be ignored because it is a basic step.

6.3 Scenario 2 Results - Know the User

The second scenario involved an application concept that was already equipped with goals and a defined audience and was in need of feedback. Consequently, the aim is for the user to employ a strategy, method, or technique outlined in the second theme, ‘Know the User’. The available theme options are summarized in Table 13. A participant opted for the Usability Test method; however, this selection was made via the “Prototype and Versions” menu, not the suggested “Know the User” menu. Despite the method being available in both menus, the fact that it was not accessed from the menu that aligned with the evaluation’s objective led to it being classified as a participant error.

Participant P5 expressed challenges for individuals utilizing the catalog for their second time and recommended that

the website should be more straightforward and purposeful for frequent users: *“There’s a little difficulty here (Home Page), okay? Let’s start with this step, which comes here (Main Menu). I believe I could access this information here directly on the home page. These four options (which are available in the Main Menu). Why do I say that? Because I am using this tool that helps me for the second time. But I feel like I’m using this for the first time. Let’s get started, got it?”*.

There was a question about the “Understand Users Needs” sub-menu and its options. P4 reported not understanding any meaning of the sub-menu option: *“I didn’t understand the relationship between the cards here [...] I didn’t understand the relationship because one has to do with the number of users and the other has to do with defining a specific group. So, I didn’t understand using data available to neither a few number of users nor large sample of users.”*.

In relation to the proposed scenario, the majority easily identified the menu to be accessed: P1 commented *“[...]Understanding how the user uses the application. That’s a good idea!”*, *“As they want the population’s opinion, it’s probably the get to Know the User tab.”* reported P11. On the page detailing a particular technique, there was praise for the array of choices available: *“I liked it. Generally, people know more about Google Forms, they end up going with it, but it’s also cool”*, *“There are the tools, it’s cool... I know them all, but [...] not everyone knows all these tools, I think it’s great!”* report P4 and P6 respectively.

In consideration of the explanation of the Survey technique, P6 pointed out alternatives for online and in-person application: *“Ah, look, formulate questions later and print. Yes, it’s interesting that we are in the digital universe, in the online universe, we forget that there is live too.”*. P4 believes that Survey could be better explained: *“But arriving here on the survey page, I didn’t feel like it helped me much in preparing the survey itself, which is the hardest part, right? So, like, I think it would be interesting to have some tips on how to prepare this survey. Ask... actually ask questions. How to prepare questions, what type of questions, tips on what to do, what to avoid doing.”*. Despite the criticisms directed at the Survey page, there is a section titled “Learn more with professionals!” that contains links that provide comprehensive guidance in formulating questions. However, P4 did not recognize or interact with these links.

The insights found are that CatUX has easy-to-understand content. The explanations of the methods and techniques are generally understandable, with in-person and online alternatives on how to carry them out. The materials suggested in each method or technique have a good variety of options and are compatible with those used in the industry. Specifically, the page dedicated to the survey technique was identified as basic and incomplete, which required more details on how to apply the technique.

6.4 Scenario 3 Results - Prototype and Versions

Scenario 3 involves a version 2.0 of an application, completely renewed which was ready to be launched; however, the client requests to test it to see if the new version will be

Table 14. Scenario 3 - Results

| Scenario 3 - Prototype and Versions | |
|-------------------------------------|--|
| Target Themes: | Usability Testing, SUS, A/B Test |
| Allied Choices: | 10 - A/B Test (5), Usability Testing (5) |
| Different Choices: | 1 - Cognitive Path (1) |

accepted by the audience. Hence, the aim is for the participants to apply a method or technique outlined in the third topic, ‘Prototype and Versions’. A summary of the accessible theme alternatives, configurations, and various selections can be found in Table 14.

In this third situation, it was observed that some users had committed the website to memory. P8 made a comment prior to navigating to the main menu: *“Now it seems that the option is to work with prototype or versions”*. P10 identified that in the “Test or Evaluate different versions of an application” sub-menu, it was A/B Testing even without having previously accessed it: *“Here is A/B Test [...] is A/B Test”*.

Several users came across fresh techniques and instruments through CatUX. P5 was surprised to land on the In-the-Moment Snippets page, however, after going through all the material, the participant understood: *“Hmmm I understand”*. P9 was not familiar with the Usability Testing method and upon reading the explanation expressed interest in using it: *“This kind of makes sense... it makes sense...”*. P4 and P6 were not aware of the Google Optimize tool. P4 commented: *“Cool, I didn’t know.[...] I didn’t know about Google Optimize, I really liked it.”*, *“[...] and Google Optimize, I didn’t know this human being, this little being here. Tool to carry out testing, it is connected to Google Analytics which is our help, that’s cool, I didn’t know about this tool, I’m happy.”* quoted P6. P2 agreed with the material suggestions in A/B Test: *“Yes, exactly. In Google Optimize, the metrics are already there, right? Like, comparison of click rate, region, session time, whatever.”*.

Participant P6 was the first to click on the links in the “Learn more from professionals!” section. After reading some articles, the participant commented that the section could increase his knowledge: *textit “Learn more is a place I would look at the articles here. I have knowledge, I have already applied A/B Test, but I like... Because it is something that has to be very well applied. So I needed to renew my knowledge.”*.

P4 found that the explanation of the A/B Test method lacked more up-to-date information: *“I was left here in doubt because, as far as I know, A/B Tests can be applied randomly, while the user uses the website or application, a certain user may fall into the new version and the evaluation can be done that way, so it does not involve recruiting participants. So, I think maybe this other option was missing, right?”*. P1 pointed out that CatUX menus can bias the choice of who uses the catalog: *“But here, I have to be very careful not to be biased [...] you have several cognitive biases or a biased question. It will guide you to an answer you want to hear.”*.

The discovered insights include the simplicity of remembering the catalog menus and identifying the techniques. CatUX enables professionals to self-update and acquire knowledge about novel methods and tools, comprehending

Table 15. Scenario 4 - Results

| Scenario 4 Results - Navigability or Interface | |
|--|--|
| Target Themes: | Nielsen Heuristics, Cognitive Path, Tree Test |
| Allied Choices: | 11 - Cognitive Path (6), Tree Test (4), Nielsen Heuristics (1) |
| Different Choices: | 0 |

their functionality immediately after reading. Nevertheless, a potential bias could exist in the menus, and there's an absence of detailed instructions on how to precisely implement A/B Test.

6.5 Scenario 4 Results - Navigability or Interface

In Scenario 4, users encountered challenges when trying to access news content on a website, leading to decreased accessibility and a surge of negative feedback on social media platforms. Consequently, the goal is for the user to implement a strategy or technique outlined in the fourth menu, titled 'Navigability or Interface'. A summary of the available menu options, settings, and errors can be found in Table 15.

Some participants mentioned that the explanation of methods with which they were not familiar was clear and detailed. P4 commented when reading Cognitive Path: *"But I really liked the step-by-step guide here, right, how to apply this method [...] I really liked the step-by-step guide here, it was very clear how to do. I've never done this method. And I think I could start with this step by step guide here."* Some users mentioned that they did not know some methods, as for instance, P7 when reading about Tree Test *"This one I didn't know"*. Some participants mentioned that CatUX helped them to remind methods and approaches: *"(reading Tree Test) Wow, refreshing my memory of tools, see?"* mentioned P5; P4 commented when reading about Nielsen Heuristics *"Look, I forgot about that, huh. It was not what I was thinking, but... Something that is, right?"*. Participant P3 reported when browsing the Nielsen heuristics page that this approach could be useful: *"If I knew... what I do there in the production internship... I was really interested in this heuristic by Nilsen"*.

P1 believes that the Card Sorting technique should be in the "Navigability or Interface" menu and not in "Know the User": *"I'm guessing, for me it fits the improvement, navigability and interface"*. P4 missed the "Heatmap" option, which is not in the catalog: *"As soon as I read the scenario, I already thought about Heatmap, right? Apply... Create a heat map on the website. Anyway, I don't know which application to use, which material to use, as well as how to... extract this information, but I thought about using the heat map. I was looking for this tool and I didn't find it."*

The findings indicate that CatUX aids in learning about new alternatives, is straightforward to comprehend, and contains educational material. The website's descriptions are enhanced by external links. The catalog assists professionals in recalling the application of various methods and techniques. Nevertheless, there is a future requirement to incorporate more tool choices and to distribute a technique more

suitably across the menus.

6.6 Catalog Acceptance Results: TAM

Catalog acceptance was evaluated from the TAM method Davis [1989] (see Table 10). A 4-point Likert scale (1 - completely disagree, 2 - partially disagree, 3 - partially agree, 4 - completely agree) was used to collect the participants' answers. The neutral point was not adopted to avoid decreasing the validity of the study and forcing participants to give their opinion [Johns, 2005].

In Figure 7, we see the TAM results. The results of ease of use (EU) revealed that most of the participants agree that CatUX is easy both to interact with and to find and guide the most appropriate approach, method, technique or tool. However, some of them believed that a greater experience with the catalog is necessary to be able to use it. The perceived usefulness (PU) results demonstrate that all participants agree that CatUX increases performance and effectiveness in finding the appropriate approach, method, technique or tool to work with UX. Most believe that the catalog increases work productivity and, in general, CatUX is useful for professionals working in user research. The third part of the TAM is to assess the future intended use of CatUX. The results indicate that there are disagreements regarding the future use of CatUX (FUI). From the 11 participants, 3 disagreed that they would use the catalog in the future. However, 8 participants stated that they would use CatUX if they had access. All participants agree that they know someone who would use the catalog. Generally, CatUX is well received as a search instrument for user research.

From the open questions, the participants commented on their difficulties when using CatUX, the prospects for future use, and suggestions for improving the catalog. Most did not encounter difficulties in using the catalog; however, some points were raised. P1 mentioned that the methods and techniques are versatile and can be applied in different scenarios. P2 and P4 expressed their belief that the process of navigating and accessing information is quite lengthy, leading to occasional disorientation. P7 commented on the difficulty of using the site at first contact, but that was overcome as the scenarios were presented: *"The layout was a little difficult. I couldn't immediately understand the site's proposal, and I didn't understand that it was a Questionnaire to be followed at first glance. But in the second flow, I found it much simpler because I better understood the purpose and function of the site."* P10 was the only participant to highlight issues in the navigation: *"As feedback I could say that the interface is cool, but the click issue was bad, because it is only where the texts are that it is clickable and sometimes I clicked on the image and nothing happened"*.

Following this, participants shared their views on the application of CatUX, specifically, their likelihood of using it in the future and the kinds of professionals who might find the catalog beneficial. All participants agreed that CatUX is a valuable resource that has potential applications in both academic and commercial settings. Most of them expressed their intent to utilize CatUX in their professional endeavors to expedite processes: *"It defines what type of method or tool to apply given each scenario, it is something that does"*

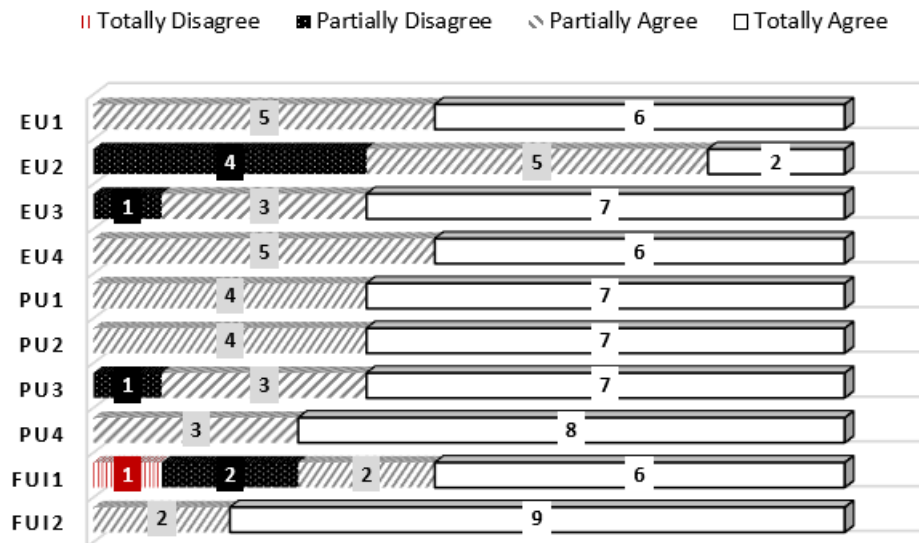


Figure 7. TAM Results

not yet exist (or at least I am not aware that exists) and that would make organizing a designer’s work MUCH easier, would make these choices much more objective, as in addition to narrowing things down, it gives full explanation of what it is, what materials and how to apply it.” quotes P4. P2 commented that the catalog can be used in startups: “I can imagine it being applied in startups to integrate UX Research projects in general. In my little market experience, I have already seen the damage that not having these concepts structured in the project can cause.”. Participant P7 mentioned that consulting CatUX brings speed and confidence: “I would certainly use it, as I felt that it is much easier to filter and search for methods using it than searching on Google, for example. Instead of me making a cognitive effort to remember the methods or the effort of looking for a page that gives me application details, CatUX already provides everything listed in a didactic, practical way, and with bibliographical references (which not only gives confidence, but it also sparks curiosity to find out more about the methods presented)”.

In conclusion, the participants provided recommendations to improve CatUX. Remarks were made about refining the site’s appearance (due to its simplicity, there is a need to give it a more contemporary look). Suggestions were also made to incorporate more visuals in the descriptions of methods and techniques, as the volume of text can sometimes be exhausting to read. P11 proposed that it would be beneficial to include real-world examples of how the application of a specific method altered the layout. P5 put forward the idea of allowing users to add to the catalog, create content, and facilitate interactions via comments. P3 recommended making comparisons: “A tool that could ‘compare’ two methodologies would be very interesting in the context of learning and identification of methodologies for the problem”. P1 suggests another way to present methods and techniques: “The UX tools could not be used in specific use scenarios, not being the best way, but leaving them according to their category: behavioral/ attitudinal (fitting into the different types

of both categories)”.

7 Discussion

The CatUX assessment implies that the catalog proposal is seen as beneficial and educational by professionals in software startups, aiding them in their engagement with UX Research through user research activities. Nonetheless, it is necessary to enhance the catalog.

In the initial assessment perspective (the use of the catalog), as the scenarios were implemented, the professionals’ familiarity with the catalog grew, leading to a decrease in the variety of choices. This could be viewed as simple memorization and navigation, conserving cognitive resources. The catalog provides professional guidance on approaches, methods, techniques, and tools in a direct way, as suggested in Kuusinen *et al.* [2019]; Hokkanen and Väänänen-Vainio-Mattila [2015] and Hokkanen *et al.* [2015]. Additionally, it improves understanding of new options and tools to perform user research, keeping professionals up-to-date, regardless of their level of experience. This represents a contribution to improving the knowledge of experts in the field of UX. The catalog can serve as a platform for professional development, as advocated by Saad *et al.* [2021] and Guerino *et al.* [2021]. However, we identified some barriers to its use. Although some methods and techniques are current, others require additional information and application details. There have been instances where the absence of certain contemporary methods and techniques was noted, indicating the need for regular content updates. Scenario 1, with its goal to ‘generate ideas’, offers the most diverse options. Some participants have noted that the idea generation phase is seen as a fundamental step and might be overlooked when using the catalog, as users tend to move on to the subsequent phase. It appears that CatUX offers a user-friendly navigation system that conserves cognitive resources.

In the second perspective evaluated (i.e., catalog acceptance), CatUX has received positive feedback and is en-

dorsed for use by professional peers. The necessity for modifications and updates was emphasized; in particular, enhancements in navigation and information flow were highlighted. The primary challenges identified include: the home page's lack of clarity regarding the site's purpose; the potential for users to become disoriented due to the volume of content; the lengthy navigation flow; and the exhaustive explanations of certain methods and techniques that make reading tiresome. Another aspect concerns approaches, methods, techniques, and tools, as professionals may employ different perspectives and strategies when implementing a specific method, influenced by their previous professional experiences. The primary recommendations from participants include: a more streamlined home page; a different navigation flow (categorized or tree-like, for instance); updated, comprehensive, detailed, and more visually engaging explanations (with the inclusion of images, for example); decision-making aids (references to methodology comparisons and practical examples were made); and the ability for professionals to contribute their own content. The assessment indicates that the catalog is suitable not only for professionals with minimal or no experience, but also for experienced professionals seeking advice or guidance in formulating their own strategies. Participants identified students, startups, software developers, designers, UXers and IT professionals as potential users of the catalog.

The findings also offer insight into the methods and techniques most frequently referenced. In the study by Darin *et al.* [2019], questionnaires/surveys were the instruments mentioned the most frequently, not due to their suitability but due to their simplicity in their creation and implementation. Our study progressed by exploring a great deal of material that contained the knowledge of professionals. Our GLR results revealed that interviews and usability tests are the most mentioned instruments. This leads to the understanding that industry professionals prefer to use methods and techniques that collect user data more deeply, mainly to capture details that may not be perceived from methods as surveys.

8 Limitations

There are some limitations in our study that should be considered for future work. This study identified a limitation in the constant requirement to update approaches, methods, techniques, and tools. These were derived from GLR, which conducted a review of articles on websites/blogs from 2018 to 2021. For subsequent evaluations, it is imperative to refresh the content to incorporate any new methods, techniques, or application methods that may have surfaced. Another issue is the catalog's inability to facilitate comparisons between methods and techniques, as they are presented individually. This restricts the user's choices based on their specific situation. The use of CatUX in software startup settings was not conducted in this study.

9 Conclusion and Future Work

The objective of this study was to develop a thematic map centered on four primary themes of UX research. Using this map as a foundation, we create a catalog filled with suggestions for the implementation of various approaches, methods, techniques, and tools related to UX research. The purpose of this catalog is to help professionals in software startups conduct user research to enhance the quality of their software products. The construction of the map was based on a thematic analysis of the findings of a gray literature review (GLR). This review allowed us to discover the most frequently cited UX research methods, techniques, and tools used by UX professionals, as well as the ways in which they were used in real-world scenarios. A website called CatUX was created to present the map in the form of a catalog. This website was evaluated by 11 specialists considering its usability and acceptance. The findings suggest that the catalog helps professionals, regardless of their level of experience, choose the appropriate approach, method, technique, or tool for their research. However, questions were raised regarding the navigation process, the exhaustive reading of descriptions, and the outdated nature of some practices.

This paper presents three main contributions. The first concerns the gray literature review (GLR) that revealed 29 UX research approaches, methods and techniques; 55 types of tools; feedback on how to apply them; and what types of results can be obtained. The second contribution is the thematic map, an artifact that represents the relationship between the elements uncovered in the GLR. The third contribution is the catalog and its evaluation. The catalog is made up of recommendations that have four main themes: Organizing Ideas, Know the Users, Prototype and Versions, Navigability or Interface. Through themes, the catalog allows software start-up professionals to explore the most suitable instrument for their research. The CatUX evaluation results revealed the potential of the catalog for use by software professionals.

For future work, it is advised to keep the catalog current to allow the integration of emerging UX Research practices and to ensure that existing approaches, methods, techniques, and tools are kept relevant. Additionally, it is suggested that CatUX evolves into a community-based project in the future.

Declarations

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Authors' Contributions

Luana de Parolis Bianchini: Conceptualization, Methodology, Software, Writing (original draft, review and editing), Investigation.

Luciana Zaina: Conceptualization, Methodology, Supervision, Writing (review and editing), Funding acquisition.

Competing interests

The authors declare that they have the following competing interests.

Availability of data and materials

The materials mentioned below are available in Portuguese (Brazil):

1. GLR1 Spreadsheet - Record of article URLs and applied inclusion and exclusion criteria. Available in: https://docs.google.com/spreadsheets/d/1zignDe_1-zT3wpzkjuriLUx6mdAntYqC8v1iZqa8AcA/edit?usp=sharing;
2. GLR2 Spreadsheet - Quality Step. Available in: https://docs.google.com/spreadsheets/d/1Av8PKDs8qq44QBsIo5CMwEr9YvLkUvo_IHR-37oa1SA/edit?usp=sharing;
3. GLR3 Spreadsheet - Analysis and Answering RQs. Available in: https://docs.google.com/spreadsheets/d/1tD860spu8s5_Gx6RagElh-rH4aMRYv1vebk6ULUnmQM/edit?usp=sharing;
4. CatUX1 Spreadsheet - Catalog Evaluation Analysis. Available in: <https://docs.google.com/spreadsheets/d/1RNa1Ct0SpTzf8MaCqSdK5zI4TwA9FEqtK7E6f7guDRE/edit?usp=sharing>.

References

- Ageieva, A. (2021). A survival guide to user interviews. Available in: Supplementary Material.
- Almaraz, V. (2021). Usando o obs studio para testes de usabilidade remotos. Available in: Supplementary Material.
- Almeida, M. (2019). Melhorando a eficiência do acompanhamento legislativo — um estudo de caso de ux. Available in: Supplementary Material.
- Amarante, M. (2021). 5 coisas que aprendi conduzindo testes de usabilidade remotos. Available in: Supplementary Material.
- Amorim, L. (2019). Entrevista motivacional é a ferramenta de ux research que você nunca ouviu falar sobre. Available in: Supplementary Material.
- Anderson, N. (2020). Which ux research methodology should you use? [chart included]. Available in: Supplementary Material.
- Araújo, B. S. (2019). Melhorando os cuidados com a saúde das crianças brasileiras — estudo de caso de ux. Available in: Supplementary Material.
- Banus, O. (2020a). Basic guide for ux research planning. Available in: Supplementary Material.
- Banus, O. (2020b). Basic guide for ux research planning. Available in: Supplementary Material.
- Banus, O. (2020c). A guide to top ux research methods. Available in: Supplementary Material.
- Barbosa, S. D. J., da Silva, B. S., Silveira, M. S., Gasparini, I., Darin, T., and Barbosa, G. D. J. (2021). *Interação Humano-Computador*. Editora Campus, 2th edition.
- Bastos, G. (2020). Pesquisa quantitativa ou qualitativa: Qual eu devo fazer? Available in: Supplementary Material.
- Batista, L. M. (2018). Como tornar a experiência da organização financeira pessoal e familiar mais rápida e prática? — ux case study. Available in: Supplementary Material.
- Benyon, D. (2011). *Interação Humano-Computador*. Editora Pearson.
- Bernstein, J. (2021). Doing rite wrong. Available in: Supplementary Material.
- Biduski, D., Bellei, E. A., Rodriguez, J. P. M., Zaina, L. A. M., and De Marchi, A. C. B. (2020). Assessing long-term user experience on a mobile health application through an in-app embedded conversation-based questionnaire. *Computers in Human Behavior*, 104:106169. DOI: <https://doi.org/10.1016/j.chb.2019.106169>.
- Bittner, M. (2020). The ultimate ux research cheat sheet. Available in: Supplementary Material.
- Bowers, M. (2020). Ux research methods and the path to user empathy. Available in: Supplementary Material.
- Bowman, J. (2021a). 17 tools that will streamline your ux research. Available in: Supplementary Material.
- Bowman, J. (2021b). The best ux research methods in a pinch. Available in: Supplementary Material.
- Bowman, J. (2021c). Fast and cheap ways to find ux research participants. Available in: Supplementary Material.
- Boylan, L. (2020). My ux research toolbox as a team of one. Available in: Supplementary Material.
- Bozzi, C. (2019). Melhorando a saúde dos brasileiros que precisam de ajuda psicológica ou psiquiátrica — estudo de caso de ux. Available in: Supplementary Material.
- Braum, M. (2019). Descobertas de um aplicativo de saúde — estudo de caso de ux. Available in: Supplementary Material.
- Braum, M. (2020). Guia: Como medir a usabilidade de produtos com system usability scale (sus). Available in: Supplementary Material.
- Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2):77–101. DOI: <https://doi.org/10.1191/1478088706qp063oa>.
- Brito, D. (2019). Worcoffee, um app para trabalhadores remotos — estudo de caso de ux. Available in: Supplementary Material.
- Budiu, R. (2021). Why 5 participants are okay in a qualitative study, but not in a quantitative one. Available in: Supplementary Material.
- Calheiros, R. (2020). Estourando a bolha: Um relato sobre uma pesquisa imersiva em cidades remotas do brasil. Available in: Supplementary Material.
- Camillo, R. (2019). Criando um solução de gestão financeira pessoal para o banco do brasil — estudo de caso de ux. Available in: Supplementary Material.
- Cavalcanti, V. (2020). A aplicação do ux research para melhoria no setor do turismo em período de covid-19. Avail-

- able in: Supplementary Material.
- Conrick, K. (2020). A breakdown of ux research types. Available in: Supplementary Material.
- Cybis, W., Betiol, A. H., and Faust, R. (2015). *Ergonomia e Usabilidade – Conhecimentos, Métodos e Aplicações*. Novatec, 3th edition.
- Dana, H. (2018). Ux case study: Dramafever. Available in: Supplementary Material.
- Darin, T., Coelho, B., and Borges, B. (2019). Which instrument should i use? supporting decision-making about the evaluation of user experience. In *Design, User Experience, and Usability. Practice and Case Studies: 8th International Conference, DUXU 2019, Held as Part of the 21st HCI International Conference, HCII 2019, Orlando, FL, USA, July 26–31, 2019, Proceedings, Part IV*, page 49–67. Springer-Verlag. DOI: https://doi.org/10.1007/978-3-030-23535-2_4.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3):319–340. DOI: <https://doi.org/10.2307/249008>.
- Dawud, M. (2021). Ux research e design thinking: o match perfeito. Available in: Supplementary Material.
- Dexter, S. (2021). Figma continues to skyrocket — 63 Available in: Supplementary Material.
- Dzekman, T. (2019). 4 methods for analysing user interviews. Available in: Supplementary Material.
- Fard, A. (2019). User research methods: how to choose the right one? Available in: Supplementary Material.
- Farrell, S. (2017). Ux research cheat sheet. Available in: <https://www.nngroup.com/articles/ux-research-cheat-sheet/>. Access on 10 January 2024.
- Fathallah, S. (2018). Researching family planning through proverbial hausa — a ux case study. Available in: Supplementary Material.
- Fátima, I. d. (2020). Resultados da pesquisa sobre os pesquisadores de ux no brasil. Available in: Supplementary Material.
- Fátima, I. d. (2021). Panorama ux research: Atividades e ferramentas – parte 3. Available in: Supplementary Material.
- Garousi, V., Felderer, M., and Mäntylä, M. V. (2019). Guidelines for including grey literature and conducting multivocal literature reviews in software engineering. *Information and Software Technology*, 106:101–121. DOI: <https://doi.org/10.1016/j.infsof.2018.09.006>.
- Giardino, C., Paternoster, N., Unterkalmsteiner, M., Gorschek, T., and Abrahamsson, P. (2016). Software development in startup companies: The greenfield startup model. *IEEE Transactions on Software Engineering*, 42(6):585–604. DOI: <https://doi.org/10.1109/TSE.2015.2509970>.
- Gibbons, S. (2020). Ux roadmaps: Definition and components. Available in: Supplementary Material.
- Grilo, A. (2022). Bibliografia brasileira sobre experiência do usuário - brasil ux design. Available in: <https://brasil.uxdesign.cc/bibliografia-brasileira-sobre-experi%C3%Aancia-do-usu%C3%A1rio-12d1f0776833>. Access on 10 January 2024.
- Guerino, G. C., Dias, N. S. B. C., Chanin, R., Prikladnicki, R., Balancieri, R., and Leal, G. C. L. (2021). User experience practices in early-stage software startups - an exploratory study. In Wang, X., Martini, A., Nguyen-Duc, A., and Stray, V., editors, *Software Business*, pages 122–136, Cham. Springer International Publishing. DOI: https://doi.org/10.1007/978-3-030-91983-2_10.
- Harley, A. (2018). Multivariate vs. a/b testing: Incremental vs. radical changes. Available in: Supplementary Material.
- Harper, C. (2018). Best practices for ethnographic research, lessons learned in the wild. Available in: Supplementary Material.
- Hassenzahl, M. (2018). *The Thing and I (Summer of '17 Remix)*, pages 17–31. Springer International Publishing, Cham. DOI: https://doi.org/10.1007/978-3-319-68213-6_2.
- Henriques, C., Pilar, D., and Ignácio, E. (2022). *UX Research com Sotaque Brasileiro*. Casa do Código, 1th edition.
- Ho, E. (2020). 5 things ux researchers can do differently: a reflection after uber’s layoffs. Available in: Supplementary Material.
- Hokkanen, L., Kuusinen, K., and Väänänen, K. (2015). Early product design in startups: Towards a ux strategy. In Abrahamsson, P., Corral, L., Oivo, M., and Russo, B., editors, *Product-Focused Software Process Improvement*, pages 217–224, Cham. Springer International Publishing. DOI: https://doi.org/10.1007/978-3-319-26844-6_16.
- Hokkanen, L. and Leppänen, M. (2015). Three patterns for user involvement in startups. In *Proceedings of the 20th European Conference on Pattern Languages of Programs*, pages 1–8. Association for Computing Machinery. DOI: <https://doi.org/10.1145/2855321.2855373>.
- Hokkanen, L. and Väänänen-Vainio-Mattila, K. (2015). Ux work in startups: Current practices and future needs. In Lassenius, C., Dingsøyr, T., and Paasivaara, M., editors, *Agile Processes in Software Engineering and Extreme Programming*, pages 81–92. Springer International Publishing. DOI: https://doi.org/10.1007/978-3-319-18612-2_7.
- Hott, K. (2020). Perfecting the art of the ux research report. Available in: Supplementary Material.
- Johns, R. (2005). One size doesn’t fit all: Selecting response scales for attitude items. *Journal of Elections, Public Opinion Parties*, 15:237–264. DOI: <https://doi.org/10.1080/13689880500178849>.
- Jones, S. (2020). Advanced ux lab techniques: Don’t just listen to users. Available in: Supplementary Material.
- Joyce, A. (2019). Formative vs. summative evaluations. Available in: Supplementary Material.
- Júnior, E. (2021). O que é e quais as funções do ux research? Available in: Supplementary Material.
- Kaley, A. (2021). Structuring intranet discovery design research. Available in: Supplementary Material.
- Kaplan, K. (2019a). How to conduct research for customer journey-mapping. Available in: Supplementary Material.
- Kaplan, K. (2019b). The science of silence: Intentional silence as a moderation technique. Available in: Supplementary Material.

- Kaplan, K. (2020). Remote ux work: Guidelines and resources. Available in: Supplementary Material.
- Kaplan, K. (2021). 10 usability heuristics applied to complex applications. Available in: Supplementary Material.
- Kato, M. (2019). Amaar: Criação de um website para uma ong de animais. Available in: Supplementary Material.
- Kawakami, G. (2021). Testes de usabilidade na pandemia. Available in: Supplementary Material.
- Klotins, E. (2018). Software start-ups through an empirical lens: are start-ups snowflakes? In *Workshop on Software-intensive Business*.
- Krause, R. (2019). Tracking research questions, assumptions, and facts in agile. Available in: Supplementary Material.
- Krause, R. (2021). Remote design work: Top challenges. Available in: Supplementary Material.
- Kuusinen, K., Sørensen, M., Frederiksen, N., Laugesen, N., and Juul, S. (2019). From startup to scaleup: An interview study of the development of user experience work in a data-intensive company. In Lárusdóttir, M., Winckler, M., Kuusinen, K., Palanque, P., and Bogdan, C., editors, *Human-Centered Software Engineering - 7th IFIP WG 13.2 International Working Conference, HCSE 2018, Revised Selected Papers*, pages 3–14. Springer. DOI: https://doi.org/10.1007/978-3-030-05909-5_1.
- Lacey, A. and Luff, D. (2001). *Qualitative data analysis*. Trent Focus Sheffield.
- Laubheimer, P. (2021). Data is more than numbers: Why qualitative data isn't just opinions. Available in: Supplementary Material.
- Leslie, C. (2021). O mercado de ux em um ano pandêmico: Atividades e ferramentas. Available in: Supplementary Material.
- Library, C. U. (2022). Science immersion: Power research: Finding gray literature. Available in: <https://guides.library.cornell.edu/c.php?g=611470&p=4277763>. Access on 10 January 2024.
- Lima, L. (2019). Usando o percurso cognitivo para avaliar uma interface. Available in: Supplementary Material.
- Lima, S. (2020a). Como criar bons questionários de pesquisa. Available in: Supplementary Material.
- Lima, S. (2020b). Como planejar uma pesquisa de ux em 8 passos simples. Available in: Supplementary Material.
- Lima, S. (2020c). Como tabular testes de usabilidade. Available in: Supplementary Material.
- Lima, S. (2020d). Covid-19 e ux research: como pesquisar em tempos de corona. Available in: Supplementary Material.
- Lima, S. (2020e). Personas: como criamos conexão com os clientes seguro auto youse. Available in: Supplementary Material.
- Liu, F. (2019). Iterative design of a survey question: A case study. Available in: Supplementary Material.
- Lowdermilk, T. (2013). *Design Centrado no Usuário: Um guia para o desenvolvimento de aplicativos amigáveis*. Novatec Editora.
- Machado, F. (2021). 3 dicas para conhecer seus usuários sem precisar entrevistá-los. Available in: Supplementary Material.
- Marti, P. and Iacono, I. (2016). Anticipated, momentary, episodic, remembered: the many facets of user experience. In *Conference on Computer Science and Intelligence Systems*, pages 1647–1655. DOI: <https://doi.org/10.15439/2016F302>.
- Martinelli, S., Lopes, L., and Zaina, L. (2022). Ux research in the software industry: An investigation of long-term ux practices. In *Proceedings of the 21st Brazilian Symposium on Human Factors in Computing Systems*, pages 1–13. Association for Computing Machinery. DOI: <https://doi.org/10.1145/3554364.3559126>.
- Matt, A. (2021). Ux research — o guia do investigador. Available in: Supplementary Material.
- Mattei, L. (2020). A ux research framework to speed up your design process. Available in: Supplementary Material.
- May, B. (2012). Applying lean startup: An experience report – lean lean ux by a ux veteran: Lessons learned in creating launching a complex consumer app. In *2012 Agile Conference*, pages 141–147. DOI: <https://doi.org/10.1109/Agile.2012.18>.
- MICHAELIS (2024a). Dicionário brasileiro da língua portuguesa: Definição de estratégia. Available in: <https://michaelis.uol.com.br/moderno-portugues/busca/portugues-brasileiro/estrat%C3%A9gia/>. Access on 10 January 2024.
- MICHAELIS (2024b). Dicionário brasileiro da língua portuguesa: Definição de ferramenta. Available in: <https://michaelis.uol.com.br/busca?r=0&f=0&t=0&palavra=ferramenta>. Access on 10 January 2024.
- Michelan, F. (2020). Do que os designers brasileiros se alimentam? Available in: Supplementary Material.
- Miyake, A. (2019). Pão de açúcar mais — estudo de caso de ux. Available in: Supplementary Material.
- Moran, K. (2018a). Quantitative user-research methodologies: An overview. Available in: Supplementary Material.
- Moran, K. (2018b). Quantitative ux research in practice. Available in: Supplementary Material.
- Moran, K. (2019a). Remote ux work: The nn/g case study. Available in: Supplementary Material.
- Moran, K. (2019b). Usability testing 101. Available in: Supplementary Material.
- Moran, K. (2021a). Collecting metrics during qualitative studies. Available in: Supplementary Material.
- Moran, K. (2021b). Context methods: Study guide. Available in: Supplementary Material.
- Moran, K. (2021c). Quantitative research: Study guide. Available in: Supplementary Material.
- Moran, K. and Pernice, K. (2020a). Remote moderated usability tests: How to do them. Available in: Supplementary Material.
- Moran, K. and Pernice, K. (2020b). Remote moderated usability tests: Why to do them. Available in: Supplementary Material.
- Moran, K. and Rosala, M. (2021). When to use context methods: Field and diary studies. Available in: Supplementary Material.
- Neto, W. D. (2019). Como solucionamos o fluxo de compra

- de hospitais usando o design sprint 2.0 — estudo de caso. Available in: Supplementary Material.
- Ngai, J. (2020). 13 helpful ux research tools. Available in: Supplementary Material.
- Nielsen, J. (2017). A 100-year view of user experience. Available in: <https://www.nngroup.com/articles/100-years-ux/>. Access on 10 January 2024.
- Norman, D. (2018). Principles of human-centered design. Available in: <https://www.nngroup.com/videos/principles-human-centered-design-don-norman/>. Access on 10 January 2024.
- Norman, D. and Nielsen, J. (2016). The definition of user experience (ux). Available in: <https://www.nngroup.com/articles/definition-user-experience/>. Access on 10 January 2024.
- Oliveira, M. d. (2019). Ajudando pessoas que utilizam o metrô pela primeira vez — estudo de caso de ux. Available in: Supplementary Material.
- Paternoster, N., Giardino, C., Unterkalmsteiner, M., Gorschek, T., and Abrahamsson, P. (2014). Software development in startup companies: A systematic mapping study. *Information and Software Technology*, 56(10):1200–1218. DOI: <https://doi.org/10.1016/j.infsof.2014.04.014>.
- Pernice, K. (2018). User interviews 101. Available in: Supplementary Material.
- Pernice, K. (2020). Research repositories for tracking ux research and growing your researchops. Available in: Supplementary Material.
- Philips, M. (2020). The complete guide to ux research methods. Available in: Supplementary Material.
- Preece, J., Sharp, H., and Rogers, Y. (2013). *Design de Interação: Além da Interação Humano-Computador*. Bookman, 3th edition.
- Prithyani, K. (2020). 65 ux methods and when to use them. Available in: Supplementary Material.
- Rahardjo, J. (2021). How research builds the designer. Available in: Supplementary Material.
- Ramos, A. L. P. (2019). Como melhorar a qualidade de vida de entregadores de bicicleta? — estudo de caso de ux. Available in: Supplementary Material.
- Reciputti, G. (2020). Dicas práticas sobre ux research: recrutamento. Available in: Supplementary Material.
- Ríos, A. (2019). Interviewing: more than a user research method. Available in: Supplementary Material.
- Rogers, A. (2021). How to share your ux research. Available in: Supplementary Material.
- Rogers, D. (2019). Qualitative and quantitative user research. Available in: Supplementary Material.
- Rosala, M. (2019). How to analyze qualitative data from ux research: Thematic analysis. Available in: Supplementary Material.
- Rosala, M. (2020a). The critical incident technique in ux. Available in: Supplementary Material.
- Rosala, M. (2020b). The discovery phase in ux projects. Available in: Supplementary Material.
- Rosala, M. (2020c). Rating scales in ux research: Likert or semantic differential? Available in: Supplementary Material.
- Material.
- Rosala, M. (2021). Writing an effective guide for a ux interview. Available in: Supplementary Material.
- Saad, J., Martinelli, S., Machado, L. S., de Souza, C. R., Alvaro, A., and Zaina, L. (2021). Ux work in software startups: A thematic analysis of the literature. *Information and Software Technology*, 140:106688. DOI: <https://doi.org/10.1016/j.infsof.2021.106688>.
- Sabino, A. (2020). Métodos criativos de user research para startups. Available in: Supplementary Material.
- Salvi, V. (2021). How can you make ux research insights visible, traceable, and fun? Available in: Supplementary Material.
- Samsyka, M. (2019). Understanding methods and tools in ux research. Available in: Supplementary Material.
- Sertório, W. (2020). Pesquisa qualitativa em tempos de quarentena. Available in: Supplementary Material.
- Shen, S. (2018). Best practices for on-video user testing. Available in: Supplementary Material.
- Sherwin, K. (2018). Card sorting: Uncover users' mental models for better information architecture. Available in: Supplementary Material.
- Silveira, S. A. M., Choma, J., Pereira, R., Guerra, E. M., and Zaina, L. A. M. (2021). Ux work in software startups: Challenges from the current state of practice. In Gregory, P., Lassenius, C., Wang, X., and Kruchten, P., editors, *Agile Processes in Software Engineering and Extreme Programming*, pages 19–35, Cham. Springer International Publishing. DOI: https://doi.org/10.1007/978-3-030-78098-2_2.
- Soares, E. (2020). Teste de usabilidade à distância (remoto). Available in: Supplementary Material.
- Someren, M., Barnard, Y., and Sandberg, J. (1994). *The Think Aloud Method - A Practical Guide to Modelling Cognitive Processes*. Academic Press.
- Süner-Pla-Cerdà, Sedefand Töre Yargın, G. Ş. H. D. S. (2021). Examining the impact of covid-19 pandemic on ux research practice through ux blogs. In Soares, M. M., Rosenzweig, E., and Marcus, A., editors, *Design, User Experience, and Usability: UX Research and Design*, pages 579–592. Springer International Publishing. DOI: https://doi.org/10.1007/978-3-030-78221-4_40.
- Sutton, S. (2000). The role of process in software start-up. *IEEE Software*, 17(4):33–39. DOI: <https://doi.org/10.1109/52.854066>.
- Teixeira, F. (2020). Os testes a/b enquanto válvulas de escape. Available in: Supplementary Material.
- Topps, R. (2020). Key considerations when planning a remote usability study for accessibility. Available in: Supplementary Material.
- Unterkalmsteiner, M., Abrahamsson, P., Wang, X., Nguyen-Duc, A., Shah, S., Bajwa, S. S., Baltes, G., Conboy, K., Cullina, E., Dennehy, D., Edison, H., Fernandez-Sanchez, C., Garbajosa, J., Gorschek, T., Klotins, E., Hokkanen, L., Kon, F., Lunesu, I., Marchesi, M., Morgan, L., Oivo, M., Selig, C., Seppänen, P., Sweetman, R., Tyrväinen, P., Ungerer, C., and Yagüe, A. (2016). Software startups - a research agenda. *e-Informatica Software Engineering Journal*, 10(1):89 – 123. DOI: <https://doi.org/10.5277/e>

Inf160105.

- Utesch, B. (2021). Ux research characteristics: An analysis of 100 open jobs. Available in: Supplementary Material.
- Varsaluoma, J. and Sahar, F. (2014). Usefulness of long-term user experience evaluation to product development: Practitioners' views from three case studies. In *Proceedings of the 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational*, page 79–88. Association for Computing Machinery. DOI: <https://doi.org/10.1145/2639189.2641218>.
- Wärnestål, P. (2021). How to design ai-powered services — lessons from the emergency room. Available in: Supplementary Material.
- Weber, M. (2019). Ux research: por onde começar uma pesquisa? Available in: Supplementary Material.
- Wenzel, M. (2020). How to select appropriate ux research methods. Available in: Supplementary Material.
- Whitenton, K. (2021). Triangulation: Get better research results by using multiple ux methods. Available in: Supplementary Material.
- Zaghi, R. (2019). Como usei os processos de ux para facilitar a matrícula de crianças nas creches públicas. Available in: Supplementary Material.
- Zaina, L. A., Fortes, R. P., Casadei, V., Nozaki, L. S., and Paiva, D. M. B. (2022). Preventing accessibility barriers: Guidelines for using user interface design patterns in mobile applications. *Journal of Systems and Software*, 186:111213. DOI: <https://doi.org/10.1016/j.jss.2021.111213>.
- Zukerman, B. (2021). Writer in tech? 7 reasons you should run a/b tests. Available in: Supplementary Material.

A Appendix - Final list of articles extracted from GL

See Table 16.

Table 16. Final list of articles extracted from GLR

| Id | Title | Available |
|------|---|-------------------|
| GL1 | Panorama UX Research: Atividades e ferramentas – parte 3 | Fátima [2021] |
| GL2 | O que é e quais as funções do UX Research? | Júnior [2021] |
| GL3 | O mercado de UX em um ano pandêmico: Atividades e ferramentas | Leslie [2021] |
| GL4 | UX Research e Design Thinking: o match perfeito | Dawud [2021] |
| GL5 | 5 coisas que aprendi conduzindo testes de usabilidade remotos | Amarante [2021] |
| GL6 | 3 dicas para conhecer seus usuários sem precisar entrevistá-los | Machado [2021] |
| GL7 | UX Research — O Guia do Investigador | Matt [2021] |
| GL8 | Usando o OBS Studio para testes de usabilidade remotos | Almaraz [2021] |
| GL9 | Testes de usabilidade na pandemia | Kawakami [2021] |
| GL10 | COVID-19 e UX Research: como pesquisar em tempos de Corona | Lima [2020d] |
| GL11 | Como planejar uma pesquisa de UX em 8 passos simples | Lima [2020b] |
| GL12 | Como criar bons questionários de pesquisa | Lima [2020a] |
| GL13 | Pesquisa qualitativa em tempos de quarentena | Sertório [2020] |
| GL14 | Personas: como criamos conexão com os clientes Seguro Auto Youse | Lima [2020e] |
| GL15 | Do que os Designers brasileiros se alimentam? | Michelan [2020] |
| GL16 | Dicas práticas sobre UX Research: recrutamento | Reciputti [2020] |
| GL17 | Estourando a bolha: Um relato sobre uma pesquisa imersiva em cidades remotas do Brasil | Calheiros [2020] |
| GL18 | A aplicação do UX Research para melhoria no setor do turismo em período de Covid-19 | Cavalcanti [2020] |
| GL19 | Resultados da pesquisa sobre os Pesquisadores de UX no Brasil | Fátima [2020] |
| GL20 | Teste de usabilidade à distância (remoto) | Soares [2020] |
| GL21 | Pesquisa quantitativa ou qualitativa: Qual eu devo fazer? | Bastos [2020] |
| GL22 | Os testes A/B enquanto válvulas de escape | Teixeira [2020] |
| GL23 | Métodos criativos de User Research para Startups | Sabino [2020] |
| GL24 | Como tabular testes de usabilidade | Lima [2020c] |
| GL25 | Guia: Como medir a usabilidade de produtos com System Usability Scale (SUS) | Braum [2020] |
| GL26 | Usando o Percurso Cognitivo para avaliar uma interface | Lima [2019] |
| GL27 | WorCoffee, um app para trabalhadores remotos | Brito [2019] |
| GL28 | Como usei os processos de UX para facilitar a matrícula de crianças nas creches públicas | Zaghi [2019] |
| GL29 | Ajudando pessoas que utilizam o metrô pela primeira vez | Oliveira [2019] |
| GL30 | Descobertas de um aplicativo de saúde — estudo de caso de UX | Braum [2019] |
| GL31 | Pão de Açúcar Mais — estudo de caso de UX | Miyake [2019] |
| GL32 | UX Research: por onde começar uma pesquisa? | Weber [2019] |
| GL33 | Entrevista motivacional é a ferramenta de UX Research que você nunca ouviu falar sobre | Amorim [2019] |
| GL34 | Criando um solução de gestão financeira pessoal para o Banco do Brasil | Camillo [2019] |
| GL35 | Melhorando os cuidados com a saúde das crianças brasileiras | Araújo [2019] |
| GL36 | Melhorando a saúde dos brasileiros que precisam de ajuda psicológica ou psiquiátrica | Bozzi [2019] |
| GL37 | Como melhorar a qualidade de vida de entregadores de bicicleta? | Ramos [2019] |
| GL38 | Amaar: Criação de um website para uma ONG de animais | Kato [2019] |
| GL39 | Como solucionamos o fluxo de compra de hospitais usando o Design Sprint 2.0 | Neto [2019] |
| GL40 | Melhorando a eficiência do acompanhamento legislativo | Almeida [2019] |
| GL41 | Como tornar a experiência da organização financeira pessoal e familiar mais rápida e prática? | Batista [2018] |
| GL42 | UX case study: DramaFever | Dana [2018] |
| GL43 | Context Methods: Study Guide | Moran [2021b] |
| GL44 | Triangulation: Get Better Research Results by Using Multiple UX Methods | Whitenton [2021] |
| GL45 | Quantitative Research: Study Guide | Moran [2021c] |

Continued on next page

Table 16 Final list of articles extracted from GLR – continued from previous page

| Id | Title | Available |
|-----------|---|---------------------------|
| GL46 | 10 Usability Heuristics Applied to Complex Applications | Kaplan [2021] |
| GL47 | Collecting Metrics During Qualitative Studies | Moran [2021a] |
| GL48 | Writing an Effective Guide for a UX Interview | Rosala [2021] |
| GL49 | When to Use Context Methods: Field and Diary Studies | Moran and Rosala [2021] |
| GL50 | Structuring Intranet Discovery & Design Research | Kaley [2021] |
| GL51 | Data Is More than Numbers: Why Qualitative Data Isn't Just Opinions | Laubheimer [2021] |
| GL52 | Why 5 Participants Are Okay in a Qualitative Study, but Not in a Quantitative One | Budiu [2021] |
| GL53 | Remote Design Work: Top Challenges | Krause [2021] |
| GL54 | The Discovery Phase in UX Projects | Rosala [2020b] |
| GL55 | UX Roadmaps: Definition and Components | Gibbons [2020] |
| GL56 | Research Repositories for Tracking UX Research and Growing Your ResearchOps | Pernice [2020] |
| GL57 | Remote Moderated Usability Tests: How to Do Them | Moran and Pernice [2020a] |
| GL58 | Rating Scales in UX Research: Likert or Semantic Differential? | Rosala [2020c] |
| GL59 | Remote Moderated Usability Tests: Why to Do Them | Moran and Pernice [2020b] |
| GL60 | Remote UX Work: Guidelines and Resources | Kaplan [2020] |
| GL61 | The Critical Incident Technique in UX | Rosala [2020a] |
| GL62 | Tracking Research Questions, Assumptions, and Facts in Agile | Krause [2019] |
| GL63 | Usability Testing 101 | Moran [2019b] |
| GL64 | Iterative Design of a Survey Question: A Case Study | Liu [2019] |
| GL65 | How to Analyze Qualitative Data from UX Research: Thematic Analysis | Rosala [2019] |
| GL66 | Formative vs. Summative Evaluations | Joyce [2019] |
| GL67 | Remote UX Work: The NN/g Case Study | Moran [2019a] |
| GL68 | How to Conduct Research for Customer Journey-Mapping | Kaplan [2019a] |
| GL69 | The Science of Silence: Intentional Silence as a Moderation Technique | Kaplan [2019b] |
| GL70 | Card Sorting: Uncover Users' Mental Models for Better Information Architecture | Sherwin [2018] |
| GL71 | User Interviews: How, When, and Why to Conduct Them | Pernice [2018] |
| GL72 | Multivariate vs. A/B Testing: Incremental vs. Radical Changes | Harley [2018] |
| GL73 | Quantitative UX Research in Practice | Moran [2018b] |
| GL74 | Quantitative User-Research Methodologies: An Overview | Moran [2018a] |
| GL75 | How to design AI-powered services — lessons from the emergency room | Wärnestål [2021] |
| GL76 | How can you make UX research insights visible, traceable, and fun? | Salvi [2021] |
| GL77 | How to share your UX research | Rogers [2021] |
| GL78 | 17 tools that will streamline your UX Research | Bowman [2021a] |
| GL79 | The best UX research methods in a pinch | Bowman [2021b] |
| GL80 | Doing RITE wrong | Bernstein [2021] |
| GL81 | Figma continues to skyrocket — 63% reported it was their primary UI tool | Dexter [2021] |
| GL82 | How research builds the designer | Rahardjo [2021] |
| GL83 | A survival guide to user interviews | Ageieva [2021] |
| GL84 | UX research characteristics: An analysis of 100 open jobs | Utesch [2021] |
| GL85 | Writer in Tech? 7 Reasons You Should Run A/B Tests | Zukerman [2021] |
| GL86 | Fast and cheap ways to find UX Research participants | Bowman [2021c] |
| GL87 | A UX Research framework to speed up your design process | Mattei [2020] |
| GL88 | 5 things UX Researchers can do differently: a reflection after Uber's layoffs | Ho [2020] |
| GL89 | The ultimate UX Research cheat sheet | Bittner [2020] |
| GL90 | Perfecting the art of the UX Research report | Hott [2020] |
| GL91 | Which UX Research methodology should you use? [chart included] | Anderson [2020] |

Continued on next page

Table 16 Final list of articles extracted from GLR – continued from previous page

| Id | Title | Available |
|-----------|---|------------------|
| GL92 | 13 helpful UX Research tools | Ngai [2020] |
| GL93 | My UX Research toolbox as a team of one | Boylan [2020] |
| GL94 | How to select appropriate UX Research methods | Wenzel [2020] |
| GL95 | A guide to top UX Research methods | Banus [2020c] |
| GL96 | 65 UX methods and when to use them | Prithyani [2020] |
| GL97 | A breakdown of UX research types | Conrick [2020] |
| GL98 | The basic rules of UX Research | Banus [2020a] |
| GL99 | Basic guide for UX Research planning | Banus [2020b] |
| GL100 | Key considerations when planning a remote usability study for accessibility | Topps [2020] |
| GL101 | Advanced UX lab techniques: Don't just listen to users | Jones [2020] |
| GL102 | UX research methods and the path to user empathy | Bowers [2020] |
| GL103 | The complete guide to UX research methods | Philips [2020] |
| GL104 | Understanding methods and tools in UX research | Samsyka [2019] |
| GL105 | User research methods: how to choose the right one? | Fard [2019] |
| GL106 | 4 methods for analysing user interviews | Dzekman [2019] |
| GL107 | Qualitative and quantitative user research | Rogers [2019] |
| GL108 | Interviewing: more than a user research method | Ríos [2019] |
| GL109 | Best practices for on-video user testing | Shen [2018] |
| GL110 | Researching family planning through proverbial Hausa — a UX case study | Fathallah [2018] |
| GL111 | Best practices for ethnographic research, lessons learned in the wild | Harper [2018] |
| | | End of Table |

B Appendix - Approaches, Methods and Techniques Extracted from GLR

See Table 17.

Table 17. Approaches, Methods and Techniques Extracted from GLR

| Methods or Techniques | Number of Citations | References |
|--------------------------|---------------------|--|
| Interview | 56 | GL1, GL3, GL6, GL7, GL10, GL13, GL14, GL16, GL17, GL19, GL21, GL29, GL30, GL31, GL32, GL33, GL37, GL38, GL48, GL50, GL54, GL60, GL62, GL64, GL67, GL68, GL69, GL51, GL52, GL71, GL73, GL47, GL75, GL78, GL79, GL83, GL86, GL88, GL89, GL91, GL92, GL93, GL94, GL95, GL96, GL98, GL99, GL97, GL102, GL103, GL104, GL105, GL106, GL107, GL108, GL110 |
| Usability Testing | 34 | GL1, GL3, GL4, GL5, GL7, GL8, GL9, GL10, GL19, GL20, GL21, GL24, GL32, GL45, GL57, GL59, GL60, GL62, GL63, GL69, GL71, GL74, GL76, GL78, GL79, GL94, GL95, GL96, GL98, GL100, GL103, GL104, GL105, GL109 |
| Survey | 29 | GL1, GL3, GL7, GL12, GL14, GL19, GL27, GL29, GL32, GL36, GL45, GL64, GL73, GL74, GL78, GL79, GL89, GL91, GL92, GL93, GL94, GL96, GL98, GL99, GL102, GL103, GL104, GL105, GL107 |
| Card Sorting | 19 | GL1, GL3, GL4, GL10, GL19, GL21, GL32, GL45, GL70, GL73, GL74, GL79, GL91, GL96, GL99, GL102, GL103, GL104, GL105 |
| A/B Testing | 19 | GL4, GL7, GL22, GL32, GL42, GL45, GL62, GL72, GL73, GL74, GL78, GL79, GL85, GL91, GL94, GL95, GL98, GL105, GL107 |
| Diary Studies | 18 | GL3, GL10, GL19, GL32, GL43, GL49, GL54, GL65, GL68, GL79, GL82, GL89, GL91, GL92, GL96, GL98, GL99, GL107 |
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