# User Studies without End-users? Analysis of the Proxy-users Involvement in the Development of Digital Products

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***Abstract. Introduction****: Users participation is crucial for the creation of digital products that address their real needs. In some of these cases, the only available option to ensure that some form of user perspective is considered during the product development is count on proxy-users.* ***Objective:*** *This paper examines how research studies involving proxy-users are conducted in the development of digital products.* ***Methodology****: A dual methodological approach was employed: firstly, a tertiary study was conducted from a previous systematic literature review with 164 studies, and secondly, a survey with 69 professionals involved in the development of digital products.* ***Results:*** *The results of the tertiary study indicate that while proxy-user research employs common HCI methods, aspects such as methodological rigor, justification for excluding end users, and proxy-users' familiarity with the target audience are often unclear. The survey revealed diverse information sources on the users needs and contexts mentioned by respondents, and the reasons for not involving end users. To summarize the research findings, this study presents a set of 10 recommendations for industry professionals and researchers when involving proxy-users in their studies.*
***Keywords*** *User centered-design, Proxy-users, User studies, HCI Methods.*

## 1. Context and Research Problem

User involvement during system development is a core principle of User-Centered Design (UCD). According to Norman and Draper, UCD entails incorporating user needs into the design process to ensure the system serves the user rather than merely being an aesthetically pleasing piece of programming [Norman e Draper 1986].

As noted by [Barbosa et al. 2021], involving end users in system development enhances usability by providing access to user interpretations and feedback on design outcomes. However, despite efforts to engage users, in some cases, including them in the design and development process is not feasible. Various barriers may hinder their involvement, including limited budgets [Lievesley e Yee 2007], geographical constraints [Novak e Lundberg 2015, Matin et al. 2023], ethical concerns [Sofian et al. 2021], restricted access due to corporate policies [Moreno de Oliveira et al. 2022, Silva et al. 2024], and challenges related to users with disabilities or communication difficulties [Boyd-Graber et al. 2006]. Thus, to address the lack of direct user involvement in system development, researchers have

involved proxy-users, who serve as intermediaries by providing insights into the needs and expectations of primary users.

[Salminen et al. 2022, Ritter et al. 2014, Lazar et al. 2017] define proxy-users as the study participants who are not the actual primary users but play the role of intermediary people. These authors note that the involvement of proxy-users in system development may, in some cases, compromise study validity, as their perspectives may not fully align with those of real users.

This study aims to investigate the research practices involving proxy-users by examining at which stages of the design process they are engaged, the data collection techniques employed, the types of data gathered, the rationale for involving proxies instead of end users, and the ways in which these representatives contribute to product development. Based on this motivation, the study poses the following research question (RQ): *How is research with proxy-users conducted in Information Technology (IT) product development according to both academic literature and industry practice?*

To answer this question, the study employs a dual approach: 1) a tertiary study from an update literature review on user studies and 2) an online survey targeting professionals in the information technology sector. As a results, the literature review showed that most user studies involved users in discovery and evaluation phases, using common HCI techniques to collect data on usability, experience, and performance. However, few addressed the use of non-representative samples. The survey with 69 professionals highlighted key information sources in product development and the reasons for not involving end users, emphasizing the role of proxy users in research and validation. As an outcome of the entire research process, a set of ten recommendations was developed and presented in the form of instructional cards. These cards aim to synthesize the knowledge produced throughout the study and serve as a tool to support the planning and methodological definition of projects that involve, or may involve, proxy users within research contexts.

This paper is the result of an undergraduate thesis, conclued in 2024, from the Digital Design program at the Federal University of Ceará, Quixadá campus. This work is divided into the following sections: Section 1 presents the introduction; Section 2 provides background information with related works; Section 3 explains the methodology; Section 4 describes the methodology used in this paper; Section 5 presents recommendations that emerged from the research process; and finally, Section 6 discusses the findings and presents the conclusions of this research.

## 2. Background and Related Works

### 2.1. User-Centered Design

According to [Norman e Deiró 2006], User-Centered Design (UCD) is a philosophy focused on understanding user needs and interests to develop comprehensible and usable products. In industry, it is often used in conjunction with other product development processes. The literature presents various works using UCD as both a philosophy and an approach to involving end users in product development [Bull et al. 2024, Coleti et al. 2024b, Gomes 2022, Coleti et al. 2024a].

[Gould e Lewis 1985] highlight that most design and HCI processes are user-

centered, meaning they seek to involve users throughout their stages, such as Double Diamond, Design Thinking, and Simple Design. A design process helps structure the activities of HCI and design professionals by defining a set of actions. Some studies illustrate how design processes following a user-centered and design thinking approach contribute to software development, requirement elicitation, and user involvement [Silva et al. 2024, Oliveira et al. 2022, Lobão et al. 2023, Kryvoruchca et al. 2020].

[Lazar et al. 2017] state that the only way to support claims about the importance of users and UCD is through solid and rigorous research. Some common HCI and design techniques for gathering user data and conducting a rigorous ressearch include questionnaires, interviews, focus groups, natural observation, and usage diaries [Barbosa et al. 2021]. [Salinas et al. 2020] found that prototyping, usability evaluation, stakeholder identification, interviews, and focus groups are the most used techniques in UCD-driven redesigns. [Junior et al. 2023] developed a set of cards to help students and professionals apply UCD techniques, while [Abich et al. 2020] introduced a gamified framework to support user-centered software development.

Implementing a user-centered approach in design processes is a way to amplify user needs [Rogers et al. 2013]. Understanding their needs, contexts, and motivations requires HCI, UCD, and design techniques that capture relevant user information. In this work, understanding UCD concepts helped frame the reflections and discussions on research findings.

### 2.2. User Studies

User studies examine user behavior, needs, motivations, and pain points related to a product or service. For [Salminen et al. 2022], a user study is a systematic evaluation involving individuals interacting with IT, which may include entire systems, software applications, or components of information systems to assess performance or user reactions to a tested product. The authors explain that user studies can take various forms, such as A/B testing, user research, and usability evaluations [Salminen et al. 2022].

User studies can be segmented or generic [Salminen et al. 2022]. Segmented user studies are focused on a defined user group for a specific technology (e.g. an educational app aimed at children). Generic user studies are designed for a broad audience without a predefined user group (e.g. a generic search service)

Besides segmentation, user studies can focus on specific IT domains. [Salminen et al. 2022] define an IT domain as a specialized field of knowledge, providing a classification of domains through open coding. Understanding the definition of user studies helped us conduct the systematic literature review conducted in this study. The SLR was conducted to find articles that described user studies with a technology. In addition to understanding the user studies, understanding whether the technology/product evaluated or described was generic or segmented, based on the type of target audience, was essential for us to be able to analyze whether the articles involved real users or proxy users.

### 2.3. Types of Users

According to [Barbosa et al. 2021], before doing a user study, it is necessary to define who the users are and whether they are reliable and relevant to the research.

[Nielsen 1994] highlights that there are three dimensions that differentiate users from each other, in terms of experience with digital products: 1) knowledge about computers; 2) experience in using the system and 3) understanding of the task. Similarly, [Benyon 2011] and [Ritter et al. 2014] emphasize that users vary in their physical, behavioral, social, and cognitive characteristics.

[Barbosa et al. 2021], along with [Eason 1989], [Wyatt 2003], and [Lazar et al. 2017], categorize users based on their relationship with the product: primary users, secondary users, tertiary users, non-users, stakeholders, and proxy users.

User studies, whether focused on segmented or generic technologies, should involve the target audience for which the technology is designed. These individuals are considered the actual users of the technology in question, meaning they are the primary users of the product under development. When the user study is segmented, it supposes to have a defined target audience, but includes participants who do not belong to that audience or who act as intermediaries representing the real users during the research process, these participants are referred to as proxy users.

For [Eason 1989], mapping different user types and characteristics is useful for reminding designers that users have varying needs. Additionally, this mapping supports the design process by helping determine which users to prioritize. In this study, defining user types, their characteristics, and differences was crucial in establishing the criteria for conducting the research.

### 2.4. Proxy-Users

In a user study of a specific digital product, proxy-users are not supposed to use this product, but are often close people to end users and may be included in the design process in order to provide insights about the real users. According to [Lazar et al. 2017], proxy-users are individuals who are not the actual users of a product, but who somehow represent end users. Most commonly, they are family members, therapists, or individuals closely associated with end users.

For [Ritter et al. 2014], proxy users are defined as intermediaries between digital product developers and end users. Hence, some research studies involving proxy-users present them as intermediaries of end users [Boyd-Graber et al. 2006, Sjölinder et al. 2017, Sofian et al. 2021]. However, [Ritter et al. 2014] argues that involving proxy users to define usability requirements poses a significant risk, as the system may fail to meet the real expectations of end users, since proxy users do not share the same mental models and needs as the actual users.

In a study analyzing 725 user research cases, [Salminen et al. 2022] found that 547 (75.4%) involved real users, while 178 (24.6%) employed proxy users. Although it is not the majority of studies, the presence of proxy users in user studies is still significant. [Lazar et al. 2017] highlight that involving proxy users to speak on behalf of end users or test technologies is a common practice, particularly when representing users with disabilities. For example, in some studies that evaluated assistive technologies designed for people with disabilities, the participants were not actual users but individuals out of the target audience simulating a disability [Almeida et al. 2024, da Silva et al. 2021, Soares et al. 2021, de Oliveira et al. 2020].

[Ferreira et al. 2021] discuss the importance of involving end users instead of proxy-users in the research to understand the requirements. [Teixeira et al. 2021] conducted the entire design process with proxy users. In feedback meetings, developers commented on the importance of involving real users, to avoid rework. In the same way, authors such as [Oliveira et al. 2022], [Savolainen 2021] [de Sousa Silva et al. 2024] present industry cases where engaging end users was not feasible. Instead, they involved individuals with knowledge on the end users and the challenges they faced throughout the product development process.

## 3. Methodology

The methodology used in this study consisted of three stages: 1. Tertiary Study built upon the existing Systematic Literature Review (SLR) conducted by [Salminen et al. 2022]. This stage involved two steps: firstly, we updated the review by incorporating studies from 2022 and 2023 in the RSL base; secondly, we conducted the tertiary study itself on research methodologies involving proxy-users. 2. Survey with Industry Professionals, aimed at understanding how research is conducted with proxy-user in the professional and industry context. 3. Data Analysis, combining both quantitative and qualitative approaches to interpret findings from the previous stages and development of a set of recommendations for industry professionals and researchers when involving proxy-users in their studies.

### 3.1. Literature Update and Tertiary Study Analysis

To conduct the tertiary study, we based ourselves in the 725 articles previously identified by [Salminen et al. 2022] in their previous study. However, before delving into the works listed by the research, we extended the scope of the SLR identified studies. In the SLR, the authors compiled 725 works published between 2013 and 2021, of which 178 included proxy-users in their research sample. These 178 articles listed by [Salminen et al. 2022] were used for in-depth analysis of proxy-user research practices. To enhance the comprehensiveness of the review, the same inclusion and exclusion criteria, as well as search string used by the authors, were applied to update the literature for the years 2022 and 2023[1]. The criteria can be found in Figure 1.

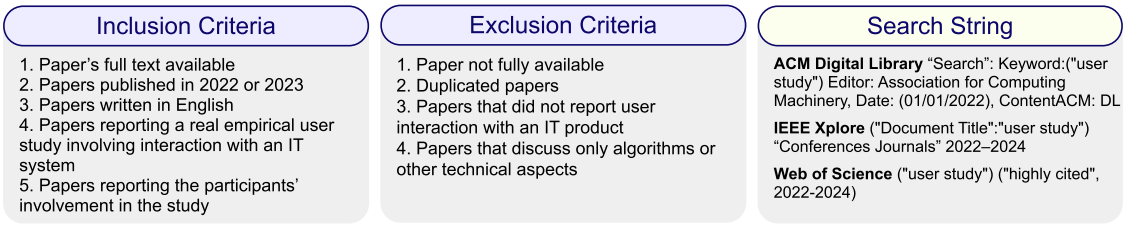


**Figure 1. Exclusion and Inclusion Criteria and Search String (based on [Salminen et al. 2022]).**

The entire update of the SLR adhered to the principles established by [Keele et al. 2007]. Consequently, the systematic review was conducted by two

[1]The research for this thesis was conducted from January to June 2024. However, only studies from 2022 to 2023 were selected for analysis, as they reflect the most recent contributions available before the start of the research.

researchers to minimize biases in selecting articles for inclusion in the tertiary study. The general steps of the systematic review were as follows: 1) Identification of additional research works in the same bases (ACM Digital Library, IEEE Xplore, and Web of Science); 2) Reading of papers' abstracts and titles to determine if they reported user studies, excluding those that did not qualify as such; 3) Subsequently, the accepted papers were analyzed in greater depth to extract data regarding the involvement of proxy users, sample characteristics, and the respective areas of technology addressed in these articles. Figure 2 illustrates this process. Following the Figure 2 analysis, 174 user studies from 2022 and 2023 were included, of which 26 involved proxy-users. Since this article was interested in understanding research with proxy-users, articles that did not involve proxy-users in their research were not considered for detailed analysis. The 26 new articles that involved proxy-users were considered for detailed analysis along with the 178 articles already listed by [Salminen et al. 2022].

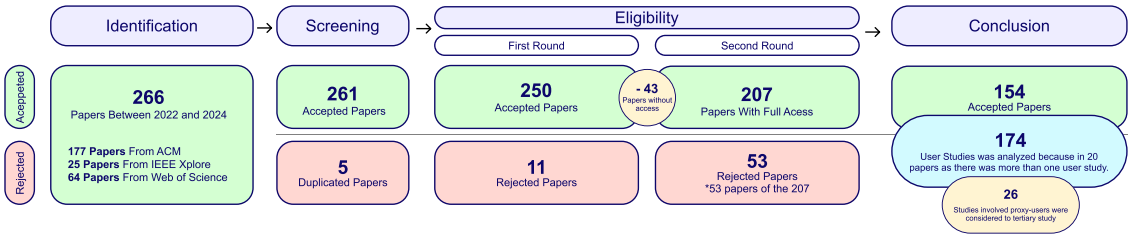


**Figure 2. Process of Conducting the update to Salminen et al.'s SLR [Salminen et al. 2022]**

Some research sub-questions were formulated to help address the overarching research question outlined in this paper. The research sub-questions were essential to the literature review process as they guided the entire process of reading the paper. The sub-questions were:

- (SQ1) What are the objectives of user studies that involve proxy-user?
- (SQ2) At which stages of the design process are proxy-user involved?
- (SQ3) What data gathering techniques are employed in these user studies?
- (SQ4) What types of data are collected from the proxy-user?
- (SQ5) What precautions are taken regarding these proxy-user throughout the study?
- (SQ6) Do the studies discuss proxy-user employment and consider future research with actual users to validate hypotheses?
- (SQ7) What are the study reasons for involving proxy-user?
- (SQ8) What is the proximity level of proxy-users to the end users?

To support data extraction during the tertiary study, for each paper, we put in the a *Google Sheets* file the following information: title; library; year; authors; the context in which the proxy-user were employed; whether the study described the proximity level between proxy-users and end users; the objective of the user study; a description of the design process stage in which proxy-users were involved; the research techniques employed with proxy-users; a list of which data was collected during the study; precautions taken with the proxy-user; whether the studies recognized the involvement of proxy-user; and finally, observations, intended to provide additional information that could be useful during the analysis.

The most of the collected information was explicit in the papers, meaning it was detailed and described throughout the text. Therefore, with the exception of the fields designated for describing the design process and observations, it was unnecessary to make inferences about the extracted data. Regarding the field for describing the design process, many of the analyzed works did not present the design process explicitly; thus, inferences were made about the moments when participants were involved.

### 3.2. Survey with Industry Profissionals

The survey had as target audience professionals from various fields within information technology (e.g. Computer Science, Software Engineering, Computer Engineering, Digital Design, Digital Media and Systems, Systems Analysis and Development, Information Systems, among others) and within design (e.g. Design, Product Design, Digital Design, etc.). The target audience also encompassed professionals roles such as developers, testers, UX designers, UI designers, UX researchers, Product Designers, Product Owners, and team leaders involved in tech product development.

With the target audience established, a data collection instrument was created using *Google Forms*. The online questionnaire was designed with multiple-choice questions and open-ended questions to gather a diverse range of responses and was structured into the following sections: 1) Consent for participation, which aimed to explain the study and clarify ethical considerations. In this section, the Informed Consent Form was presented, adhering to the ethical guidelines for involving users in research as outlined in Resolution No. 466/2012 of the Brazilian National Health Council. The form also included the study's Certificate of Presentation of Ethical Appreciation number from the Research Ethics Board (CAAE Nº 79714624.7.0000.5054); 2) A section dedicated to gather data on the professional situation of the respondents; 3) A section focused on collecting data about the company where the respondent work; and finally, 4) A section regarding the design processes applied in the respondent' work routines and the sources of information used in product development to understand users and create products.

Before disseminating the questionnaire, a pilot test was conducted with three people with characteristics compatible with the target audience, specifically professionals in the fields of technology and design. The pilot test aim at identify potential issues with the questions and assess participants' understanding of the research questions. The participants suggested several changes to the descriptions of the survey items and highlighted areas that were unclear. Following the pilot test, the necessary adjustments were made to the questionnaire. The survey was distributed through various channels, including social networks (Instagram, Facebook, Telegram, and X (Twitter), LinkedIn, email distribution lists, and relevant professional groups to the target audience.

### 3.3. Ethical Considerations

In this study, all procedures were meticulously designed and executed to uphold the highest ethical standards. Prior to data collection, the research protocol, including the survey instrument and participant recruitment methods, received comprehensive approval from the institutional Research Ethics Board (CAAE No. 79714624.7.0000.5054). Participant autonomy and informed consent were paramount. All potential participants in the industry survey were presented with a clear and comprehensive Informed Consent Form. This form detailed the study's objectives, the nature of their participation, potential

risks and benefits, and assurances of anonymity and confidentiality of their responses. Participants were explicitly informed of their right to withdraw from the study at any time without penalty. Data collected was handled with strict adherence to privacy regulations, ensuring that individual responses could not be linked back to specific participants.

## 4. Results

### 4.1. Tertiary Study: Literature Analysis

When integrating the 174[2] user studies from the SLR update conducted in this work which included the years (2022-2023) with those 725 identified by [Salminen et al. 2022], the authors of SLR which included the years (2013-2021), we have a total of 899 user studies conducted between 2013 and 2023, then covering a span of ten years. Among the 899 studies, 516 focused on segmented technologies, while 583 addressed generic technologies[3]. In 695 studies (77.3%), real users were involved, and in 204 studies (22.7%), proxy-users were included. Hence, for this article, the 204 studies (178 identified by [Salminen et al. 2022] and 26 identified by this research) involving proxy-users were considered for the tertiary study, as they were essential for addressing the research question.

**Regarding the types of proxy-users involved in the 204 studies**, we found: students (142; 69%), crowd-workers (45; 22%), unknown (10; %5), and researchers (8; 4%). [Salminen et al. 2022] used 19 IT fields to classify the user studies. **The three IT domains that employed proxy-users the most were:** Virtual and Augmented Reality (37; 18%); Information Processing and Retrieval (30; 14.7%); and Digital Analysis and Visualization (18; 8.8%).

The 204 articles resulting from the SLR updated that involved proxy-users should be considered to answer our main research question. However, due to access restrictions, 40 articles from [Salminen et al. 2022] SLR was not included in the further analysis. Thus, 164 user studies (138 from 2013-2021 plus 26 from 2022-2023) were considered for this tertiary study[4] related to research involving proxy-users.

**When analyzing the objective of these 164 articles, we have a diversity of goals**. The most frequent ones were:

- To evaluate aspects related to usability and user experience of technologies proposed in the works (e.g. [Badam et al. 2014, Balata et al. 2014, Kelly et al. 2015, Birmingham et al. 2020]). These authors aimed to assess user perceptions, how users interact with these technologies, and how these technologies can support users' daily routines.
- To compare the technology presented in the user study with existing technologies to determine whether the new one improves or not the proposed scenario (e.g. [Gossen et al. 2014, Henley e Fleming 2014]).

[2]Spreadsheet link with data from the literature review update process: https://docs.google.com/spreadsheets/d/1lqVnJsGXezbFHx-6H0KnJajr6afQ9GFgqfGmphU9uV4/edit?gid=0#gid=0

[3]The same classifications defined by the author [Salminen et al. 2022] and other parameters mentioned in the background section were used in SLR updated.

[4]Spreadsheet link with data on the process of updating the in-depth articles and tertiary study https://docs.google.com/spreadsheets/d/1nLhAfcXdkWGxdvv4R1tqBiHMVRmrZaS2EiMKJDdkSrY/edit?gid=0gid=0

- To investigate whether the technology proposed in the user study supports users in some way within the specific context of the study (e.g. [Tamine e Soulier 2015, Melenhorst et al. 2015]).
- To present the technology to proxy-users and collecting opinions and feedback (e.g. [Kairam e Heer 2016, Frison et al. 2017]).

This demonstrates that, in the literature analyzed in this study, the lack of involvement of real users is not limited to a specific type of research objective. Rather, proxy-users are engaged across various research contexts.

Most of the studies analyzed involved proxy-users primarily during the **Evaluation Phase** (129 studies; 78.6%). Their use during validation and assessment of technologies and products presents a certain risk, as validation is not being conducted with end-users. The opinions, behaviors, and mental models of proxy-users may differ significantly from those of actual users, potentially compromising the reliability of the findings. The second most frequent phase in which proxy-users appear is **Discovery** (81 studies; 49.4%). This indicates that proxy-users are often used as primary sources of information about user needs, which also introduces a significant risk to the research. The discovery phase is intended for requirements elicitation, and the absence of real users at this stage may result in design solutions and requirements that are misaligned with actual user needs. The remaining phases in which proxy-users were involved are **Ideation** (3; 1.8%), e **Definition** (2; 1.2%). To answer this question, when the authors did not explicity mention the moment in which the user study involved the proxy-user, an inference was made to decide when it happened.

Some articles were classified into more than one stage (that's why the percentage above sums more than 100), as proxy-user were involved in multiple stages of the design process. For example, one study [Gonçalves et al. 2015] assessed how children responded to different interfaces designed to support creative writing, by involving proxy-users in the Evaluation and Discovery stages. The authors developed the application and then conducted the evaluation to understand children's interactions and discover their needs for the product.

The 164 studies analyzed mostly employed research methods commonly used in the HCI field and collected a variety of data from proxy-users. The most frequently used research method was **questionnaire** (118 studies; 72%). In the analyzed studies, questionnaires were widely used to collect quantitative data from proxy-users, particularly related to demographic data, domain experience, personality, and general information. Another widely employed method was **observation** (89 studies; 54%), along with the use of **log data** (63 studies; 38%). Both were commonly applied in the context of usability and user experience testing involving proxy-users. These methods primarily collected data such as task time, success rate, errors, performance, and user experience (UX). Some other methods also stood out in the analysis was **Interview** (26; 15.8%), **Thinking Aloud** and **Card Sorting** (3 each; 1.8%), **Personas**, **Use Scenario**, **Interaction Design**, **Electrodermal**, **Cultural Probe**, and **Unidentified** (1 each; 0.6%).

In general, the user studies collected a variety of data from proxy-users. Hence, we tried to classify these data in a non-exhaustive and intuitive manner, according to the following categories:

- **Understanding the User**: Opinion (60), Demographic Data (50), Domain

Experience (33), Personality (2), General Information (2);
- **Performance**: Task Time (45), Success Rate (12), Errors (11), Performance (10), Task Difficulty (3);
- **Usability Aspects**: User Experience (UX) (21), Accuracy (16), General Usability (12), Usefulness (5), and Ease of Use (5);
- **Behavior**: General User Behavior (10), Eye Movements (6), Gestures (3), Head Movement, Steps, Facial Expressions, and Body Movement (each with 1 study);
- **Subjective Data**: Preferences (15), Cognitive Effort (15), Perception (9), Well-being (5), Judgment (4), Thoughts, Confidence, and Feelings (3 each), Expectations and Productivity (2 each);
- **Other Types of Data**: Interaction (34), Log Data (10), Notes (5), Heart Rate (4), Dizziness (4), and Design Suggestions (2).

The data collected in the of the analyzed studies involving proxy-users were diverse and widely recognized within the HCI field. In HCI and UX research, collected data serve multiple purposes, from gaining a deeper understanding of the user group being studied to evaluating user interaction and experience with the technologies and products analyzed in the studies. While some data types are widely used, others are more specific, such as heart rate (4) and dizziness (4). Some data require specific technologies for their collection, including eye movements (6), log data (10), head movement, steps, facial expressions, and body movement (each with 1 study).

It is important to question the validity of these data, considering that they were obtained from proxy-users rather than actual end-users. Collecting information about opinions, behaviors, needs, and perceptions of usability and user experience from participants who do not represent the intended target audience can seriously compromise the validity of the research. Within the research process, this practice may lead to distorted interpretations, resulting in design decisions that require multiple iterations and rework, as the insights obtained during discovery and evaluation phases may not reflect the real expectations and needs of the actual users.

Some of the data collected were obtained using formal structured research instruments. The five most commonly used instruments were: **NASA-TLX** (Task Load Index) (9), **System Usability Scale** (SUS) (8), **AttrakDiff** (4), **Simulator Sickness Questionnaire** (SSQ) (4), and **User Experience Questionnaire** (UEQ) (3). Once again, these instruments were designed and validated to be used in contexts involving real users, highlighting the methodological fragility when applied without acknowledging the representational gap of proxy-users.

In the 164 studies analyzed, we sought to understand what kinds of care were taken by researchers when involving a non-representative user sample, the proxy-users. By **care**, we refer to the methodological procedures or actions adopted by researchers to clarify the research context to participants or to ensure that the data collected would not be improperly generalized, given that it was not the end-users themselves providing feedback on the solution.

The majority of the analyzed studies **did not mention any methodological care taken when involving proxy-users** (145 studies; 83.3%). This scenario highlights a significant gap in transparency and scientific responsibility. The authors of these studies could contribute meaningfully to open and reproducible science by explicitly

stating the precautions taken, or even acknowledging the lack thereof, when conducting research with proxy-users. Making these aspects visible would help other researchers better understand how to adapt methods, conduct studies under constraints, and mitigate limitations when the involvement of real users is not feasible. Also, such documentation could provide valuable insights into alternative methodological strategies in similar contexts.

After all, methodological constraints are inherent to the research process, whether due to time, access, budget, or institutional factors—as previously discussed in the introduction of this paper. However, recognizing, critically reflecting on, and documenting these limitations is essential for the collective advancement of the Human-Computer Interaction field, promoting greater rigor, ethics, and accountability in scientific practice.

On the other hand, some studies bring caution during the research process with proxy-users: **some works creates a usage scenario around the technology their authors wish to test in a more general way, so that participants can imagine themselves in that scenario and perform the tasks** (7; 4.0%); **In the case of crowd-workers employment, the authors analyze the participants' history and creates algorithms to ensure the quality of interaction and responses** (4; 2.2%); **During recruitment, the authors highlight the interests that proxy-user is supposed to have in order to participate** (2; 1.1%). In addition, there was one study for each strategy described as follows: The participants uses blindfold covering the eyes to simulate user blindness; The authors analyze more than one data source seeking for differences; The authors develop a list of proxy-user quality criteria; During recruitment, the authors highlight the proxy-user expected knowledge; The authors involve people who know about the context and user; The authors involve specialists in the area of the study.

For examples, [Tamine e Soulier 2015] used scenarios to help proxy-users immerge inside the tasks. In [Badam et al. 2016], a more generic scenario and script were created so that inexperienced participants could test the technology. Finally, one study focused on accessibility [Balata et al. 2015] involved a proxy-user simulating a person with a disability in order to evaluate an application that helps people with visual impairments aim at the right place when taking a photo.

In general, **the works does not discuss about the proxy-users involved in the research or ideas for future research with real users** (111; 67.6%). Recognizing the limitations of the sample is essential for promoting open science and supporting researchers in the academic community who will consume, reproduce, or use the work as a reference. In the analysis, **some studies recognize that involving proxy-users are not ideal for the research, and consider future research with a broader users sample or users with demographic data and profiles closer to the end users** (53; 32.3%). For example [Amati et al. 2014] recognizes that by involving students in the research, the results may not reflect the actual behavior and needs of real users, limiting generalization. In contrast, [Church et al. 2015] state that in future research they will seek larger samples and real usage contexts, similarly to [Brazier e Harvey 2017], which also intend to test the technologies in real contexts and with real users.

As for the reasons for the involvement of proxy-users, **most authors do not**

**mention reasons for involving proxy-user in the study (154; 93.9%)**. This scenario is concerning, as the user samples involved are not representative of the target audience. Although the involvement of proxy-users may be acceptable in certain contexts, explicitly stating the reasons for their use adds an important layer of depth to the study by clarifying the real motivations behind the absence of end-users in the evaluation of the technologies. These reasons can inform critical reflections within academic communities and serve as relevant discussion points for HCI professionals seeking to develop frameworks or methods that consider user perspectives without necessarily involving them directly. Moreover, in cases where proxy-user involvement is necessary, such justifications can support the creation of frameworks that are better suited to this specific research scenario. Furthermore, when justifications are presented, they tend to be: **The reason is the study's own objective** (4; 2.4%); **Convenience for the researchers and those involved in the work** (4; 2.4%); **and due to the pandemic** (1; 0.6%).

Finally, in the analysis of the studies, we sought to investigate whether the proxy-users involved had any degree of closeness to the actual users, whether through friendship, kinship, or, more broadly, caregiving relationships. As discussed by [Lazar et al. 2017], in some contexts proxy-users may indeed have an in-depth understanding of the end users, their routines, and needs. However, none of the 164 studies analyzed explicitly mentioned any level of proximity, kinship, or connection between the proxy-users and the actual users involved. This omission undermines the transparency of the studies and hinders the assessment of the validity of the data obtained, especially in research relying on faithful representation of specific user experiences and contexts.

The in-depth analysis of 164 studies revealed that proxy-users are generally involved in the evaluation and discovery stages. The techniques used to collect data are common and well-known in the field of HCI, such as Surveys, Observations, Logs, and Interviews. The data collected during the studies are focused on measuring performance, usability, and user experience. Some formal collection instruments are often used, such as SUS and NASA-TLX. Among the 164 studies, few highlight the reasons for involving proxy-users instead of end users, and even fewer present what was done during the study to ensure that the data collected from proxy-users "attempts" to truly represent the end users. Few works recognize the involvement of proxy-users as a problem, a threat to validity, or a limitation, as the data obtained from users deputies may diverge from the opinions and needs of real users. Finally, no study reports the level of proximity/knowledge of the proxy-user regarding the end user. Thus, the data presented in this tertiary study provide insights on the involvement of this type of user in scientific research. More broadly, considering that the analysis was conducted within the context of academic literature, it is important to emphasize that limitations and specific contexts of each study should be accompanied by a critical reflection on the type of users involved and the methods employed. This transparency is essential to ensure scientific validity, promote reproducibility, and enable other researchers to understand the boundaries and adaptations made in the methodological approaches.

### 4.2. Survey: Industry Perspective

The online survey was available for responses for one month and was disseminated on social media, online groups, and e-mail lists that targeted professionals in the fields of Design and Information Technology. The questionnaire received 69 valid responses. Due

to the diversity of responses and contexts, the data will be presented in a summarized form, highlighting the majority of the results.

In general, the profile of the participants who responded to this survey are: employed in **Full-Time Work** (45; 5.2%), Students (10; 14.5%), and Freelancers (8; 11.6%).

Focusing in the professional activity areas, the respondents worked with: **Design** (UX, UI, Product, Research, Writer) (45; 65.2%); **Development** (Front-end, Back-end, Full-Stack) (21; 30.4%); Product (Product Owner, Product Manager) (10; 14.5%); Communication (Marketing, Social Media) (9; 13%); and Requirements (Requirements Analyst) (7; 10.1%). Regarding the respondents' experience level: 24 (34.8%) are Mid-level; 21 (30.4%) are Junior; 16 (23.2%) are Senior; 4 (5.8%) are Interns; 3 (4.3%) are Specialists; and 1 (1.4%) is Trainee.

Regarding the workplace, a large portion of the participants work for **Development / IT Companies** (27; 39.1%); 27 (39.1%) works for private companies focused on one or more products; 14 (20.3%) for startups; 8 (11.6%) for independent innovation or research institutes; and 7 (10.1%) for universities. Five (7.2%) participants reported being unemployed. Still on the workplace, 28 (40.6%) participants work in Large Institutions (with 500 or more employees); 15 (21.7%) work in Medium Institutions (100 to 499 employees); 11 (15.9%) work in Small Institutions (20 to 99 employees); and 7 (10.1%) work in Micro-enterprises (up to 19 employees). Six (8.7%) participants reported being unemployed at the moment, and 2 (2.9%) participants did not know how to respond.

The profiles of the research participants were quite diverse, coming from various fields of activity, with some in full-time jobs and others identifying as students. However, most of them are from the areas of UX, UI, Product and Development. Given this number and profile of professionals, it is expected that they will have knowledge about the importance of user involvement in the product research and development process, especially professionals in the area linked to the product. The respondents are generally more experienced, with the majority considering themselves mid-level and junior. The participants work in private software development companies and startups, mostly in large and medium-sized institutions.

In the survey, participants responded about the design processes used by the companies and teams they work with. The results indicated that most processes are agile and user-centered, such as: **SCRUM** (52; 75.4%); **User-Centered Design** (31; 44.9%); **Design Thinking** (29; 42%); Double Diamond (26; 37.7%); Agile Design (11; 15.9%); and Lean UX (8; 11.6%).

Concerning user research and research sources, when initially asked about their level of involvement in the research processes, 22 (31.9%) respondents indicated that they have a considerable level of participation in the user research process, followed by a V**ery high level of participation** (14; 20.3%); **then High level** (13; 18.8%); a Very low level of participation (12; 17.4%), and finally, Low level (8; 11.6%).

The data presented indicate that company processes demonstrate or should demonstrate, an awareness of the importance of considering user needs during the discovery and evaluation stages. Considering that the most commonly used processes in organizations are User-Centered Design, SCRUM, Agile Design, and Lean UX, all

of which share an emphasis on iterative cycles focused on requirements elicitation and user-centered decision-making, this alignment is expected. Furthermore, the survey respondents themselves reported a high level of involvement in user research activities, reinforcing the understanding of the need to conduct research with the actual target audience.

The survey addressed the sources of information involved at the time of research. Figure 3 shows the frequencies (high, medium, low, and never) of used research sources by the survey participants.

According to Figure 3, the five sources of information with the greatest numbers of high frequency of use are: **People involved in the product development (Product Managers, Product Owners) (53; 76.8%)**; **The users themselves (40; 57.9%)**; **Expert individuals who know about the users/customers (32; 46.3%)**; Support team members (30; 43.4%); and Complaints records in company channels (Support Tickets and Calls) (26; 37.6%).

The categories People involved in the Product Development, **Support Team Members**, **Customer Experience Team Members**, **Experts on Users**, **Family/friends of the users** and **People who have no direct connection with the user** may be considered representatives of the users (proxy-users) and, based on the responses, are generally involved in the product development process.

According to Figure 3, the primary source of information reported by survey respondents consists of individuals directly involved in product development, such as Product Managers and Product Owners (76.8%). This source is complemented by others, including audience experts (46.3%) and support team members (43.4%).

Although these people have experience with the product, the business, and the technology, and may understand user pain points, they do not directly experience the technology as end users do. While they can provide valuable complementary information, if they assume a central role in the discovery process by providing insights into user routines, challenges, and needs, they may distort the actual understanding of user experiences and requirements. This is particularly concerning when these voices are prioritized over those of the users themselves.

Still in relation to Figure 3, the five sources of information that have the greatest numbers of low frequency of use are: **Social media** (29; 42%); **Press articles** (26; 37.6%); Public/Open places (25; 36.2%); People who have no direct connection with the users (24; 34.7%); and Family/friends of the users/customers and Books and scientific articles with 22 (31.8%) responses each. Finally, according to Figure 3, the five sources of information that have the greatest numbers of never used: Family/friends of the users/customers (38; 55%); Public/Open places (36; 52.1%); People who have no direct connection with the users (33; 47.8%); Press articles (26; 37.6%); and Social media (23; 33.3%).

When analyzing the responses regarding the stages at which information sources are employed in the product development process, they are mostly **involved during the Discovery about the problem phase** (42; 60.9%) and the **Defining the problem phase** (36; 52.2%). These findings prompt a reflection on whether the right users are being involved at a crucial stage of the HCI process, that of understanding the user's actual pain

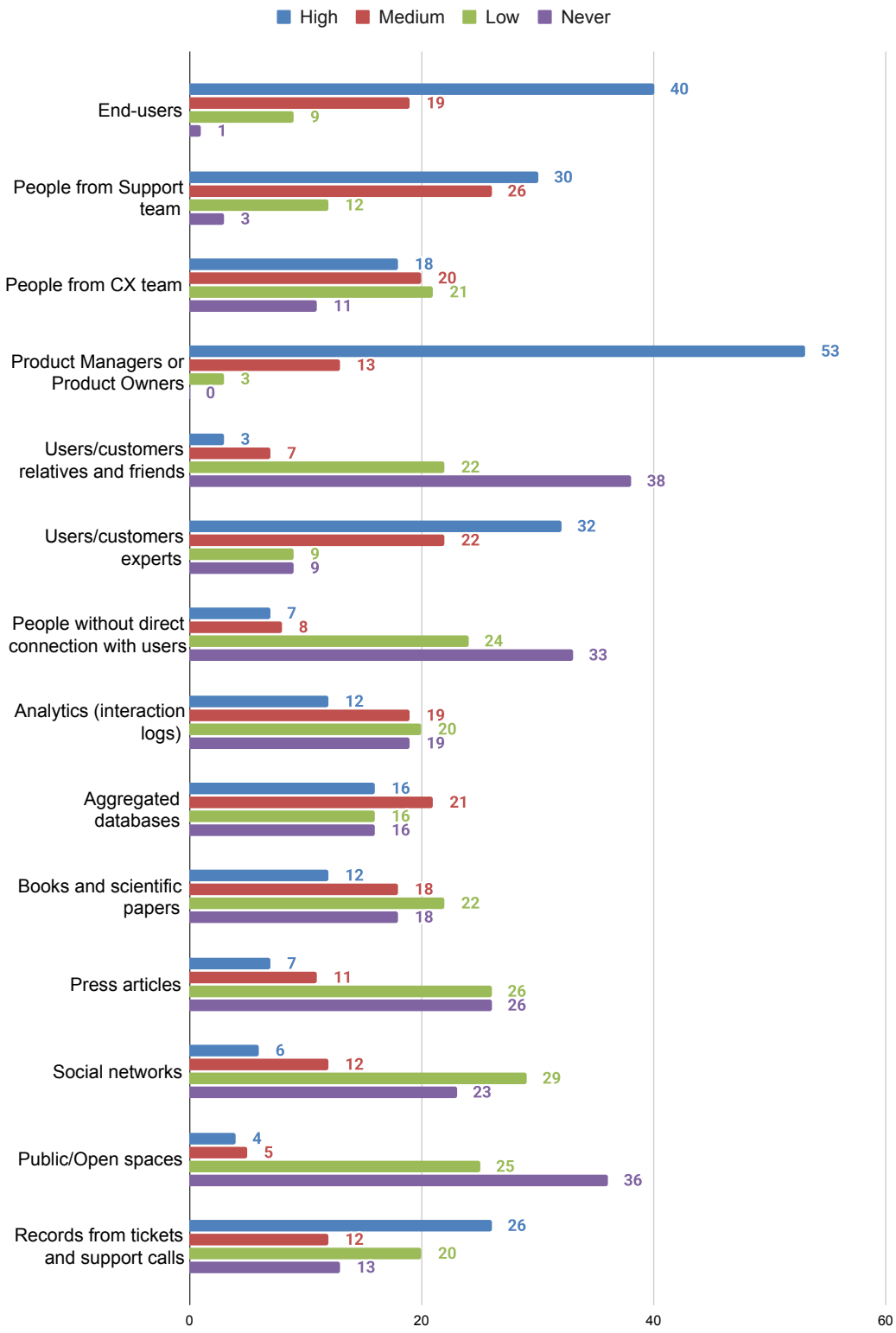


**Figure 3. Information Sources involved in the product development**

points. As shown in Figure 3, other information sources tend to take precedence over the end users, even though a significant number of respondents reported that they do consult the end users. In the other hand, sources are employed in: Ideation to model the solution (34; 49.3%); Development (prototyping/implementation) (31; 44.9%); During all stages of the work process (28; 40.6%); Post-development (testing/ delivery) (26; 37.7%); After the solution launch (12; 17.4%); and "I don't know" (1; 1.4%).

Respondents also brought up the reasons for not involving real users in the product development process that led to the majority of respondents indicated Users/customers are/were always involved (30; 43.4%). However, the other reasons listed show a more complex reality, **such as there was not enough time to recruit users** (21; 30.4%); **The team did not have permission to access and recruit users** (16; 23.2%); **The institution had a small team to recruit users** (16; 23.2%); **The company saw no reason to recruit users** (16; 23.2%); **The institution did not have financial resources to recruit users** (7; 10.1%); The institution faced challenges related to distance/travel to recruit users (6; 8.7%); The institution had concerns about ethical issues when recruiting users (5; 7.2%). The data may indicate that involving real users in the digital product development process is not always feasible due to time constraints, nor is it always seen as a priority or a viable option. Although most respondents previously indicated that they use user-centered and agile processes, which are expected to include real user involvement, in practice, other factors tend to take precedence over the ideal philosophy and practices of these methods.

When asked on are involved, participants responded for the most part **they are involved individuals are encouraged to give their opinion on the product/service** (39; 56.5%); **The involved individuals describe the user experience (Feelings, Hedonic aspects, Emotions)** (19; 27.5%). These context can reveal a great risk that professionals and companies run, they bring experiences from a third perspective, that of the proxy-user, which in turn can have several biases, stereotypes and dissonance between what the user's real need is and what the proxy-user imagines it to be.

Futhermore, the involved individuals participate in tests/evaluations in place of the users (20; 29%). The data reveals another significant issue in industry practice: individuals who are not part of the target audience are involved in the evaluation and feedback processes for technologies they will never use. The product evaluation process is well-established in the literature by some authors like [Barbosa et al. 2021] and [Lazar et al. 2017]. However, spending time, money, and resources evaluating technologies and validating products from a business perspective with users who lack real context of the actual user pain points poses a risk to the business. It creates a false sense that the right thing is being done.

In the other hand: The involved individuals are encouraged to talk about the users/customers' needs/pains (38; 55.1%); The involved individuals describe how the users/ customers intend to interact with the product (24; 34.8%); The involved individuals are encouraged to describe the users/customers' demographic data (10; 14.5%); The involved individuals describe the users/customers' behaviors (20; 29%); and The involved individuals are encouraged to provide the users/customers' context of use (26; 37.7%). Seven (10.1%) participants responded that proxy-users were not involved.

In summary, the survey results highlight that there is almost always and

generally a relationship and proximity between the involved proxy-user and the end user. Furthermore, it is emphasized that when involved, proxy-users are encouraged to give their opinion about the product/service, describe the end user experience, or participate in tests and evaluations in place of the end user.

The survey revealed that respondents are considerably involved in user research, using popular data collection techniques such as interviews and usability testing, both with end users and with proxy-users. Regarding how proxy-user contribute, the majority provide opinions about the product/service to be developed and describe the needs and expectations they know about the end users.

Although proxy-users are more involved than end users, the survey showed that, in the respondents' work routine, most followed processes focused on agile development and user-centered approaches. However, even when using user-centered design processes, end users are not always involved. The main reasons include lack of time, limited resources, and even the company not seeing the importance to involve end users. The results highlight a possible contradiction between the adoption of user-centered processes and techniques, while user involvement is seen as a secondary priority, with proxy-users being more involved.

## 5. Discussion

Proxy-users are not the ideal people to be involved in the product development process. However, when necessary, they can serve as an alternative and useful source of information about the end user. The findings from both the tertiary study and the industry survey reveal a significant disconnection between theory and practice. In the established literature, authors such as [Norman e Draper 1986], [Lazar et al. 2017], and [Barbosa et al. 2021] acknowledge that research has its limitations and that proxy-users can be employed in user studies, but always with caution and critical reflection on their limitations. However, the analysis of the reviewed studies shows that although proxy-users are widely used, their involvement is rarely problematized or properly contextualized.

In professional settings, even though there is strong adoption of user-centered methodologies such as Design Thinking, Lean UX, and agile practices, the analysis of the most frequently used information sources during discovery and evaluation processes reveals that, in practice, most decisions are based on inputs from proxy-users, such as product managers, support teams, and internal specialists.

The involvement of proxy-users in the product development process can bring divergent data regarding what end users expect or need. There is little value in investing time in planning and executing research methods to gather user opinions, using advanced technologies such as log tracking and eye movement analysis, or employing structured forms to collect data on usability, user experience, and performance, if the right sample of users is not involved. In the academic literature, it is essential that user sample data be clearly presented. Furthermore, researchers should disclose the limitations related to user research. This practice supports the reproducibility of studies and contributes to advancing the state of the art in the field. In industry, due to time constraints, this practice is often normalized, even though it can pose significant risks to product development.

Nevertheless, when conducting a study that involves proxy-users, it is essential

to recognize that they are not fully representative of the target audience for which the technology is intended. Their insights, while useful, are filtered through their own roles, assumptions, and distance from the lived experiences of real users. Without critical reflection and methodological care, relying on proxy-users may lead to design decisions that do not truly address user needs, undermining the core principles of user-centered design.

### 5.1. Recommendations on proxy-users studies

As a way to systematize the knowledge and findings from the **systematic literature review (SLR)**, **survey**, and **bibliographic study**, a set of **10 Recommendations Cards** and **6 Information Cards** was proposed to serve a tool to support planning and defining methods in projects that involve or may involve proxy-users. To summarize these recommendations and information, a card format was adopted as a means of synthesizing the results of this research and presenting the reflections in a more actionable and accessible manner.

These cards are intended for industry professionals who work with user research, as well as for researchers who need to involve or choose to involve proxy users in the course of their studies. While professionals and researchers alike are generally expected to define appropriate samples and understand the issues related to inadequate user sampling, both the literature and field studies with practitioners indicate a high prevalence of proxy-users in user research and evaluation.

The cards are designed to serve as a tool for critical reflection, particularly during research planning, method selection, and participant recruitment. By raising questions about the presence or absence of real users in studies, the cards aim to provoke a critical review of methodological decisions, encouraging greater awareness of the potential impacts and limitations associated with the use of proxy users. The proposed cards acknowledge that, in practice, the involvement of real users is not always feasible, and that the use of proxy-users or alternative methods is common but carries methodological limitations and risks. Through an actionable format, they encourage researchers and professionals to reflect on these decisions, aligning the recommendations with the real complexities of research and digital product development. Thus, the cards make practical dilemmas explicit, fostering a more reflective, ethical, and rigorous approach to user studies.

The structure of the cards is illustrated in Figure 4. The **Recommendation Cards** are composed of: a) A recommendation title; b) A context section that complements the title and presents key reflections; and c) A practical example derived from the SLR, bibliographic review, and survey with professionals. The **Information Cards**, on the other hand, consist of: a) A title that summarizes the information; b) A concise explanation of the concept; and c) A bibliographic reference. The information cards provide definitions of terms related to the different types of users who may be involved in the development of digital products.

All recommendation cards contents can be seen in Table 1. To enhance content clarity and considering the article format, the table was chosen to present the content. The cards in their original format can be consulted at [5]. The recommendations elucidate

[5]https://drive.google.com/drive/u/0/folders/12IVqKtbM9N85Bf9llYYi7QQSPtIl05yr

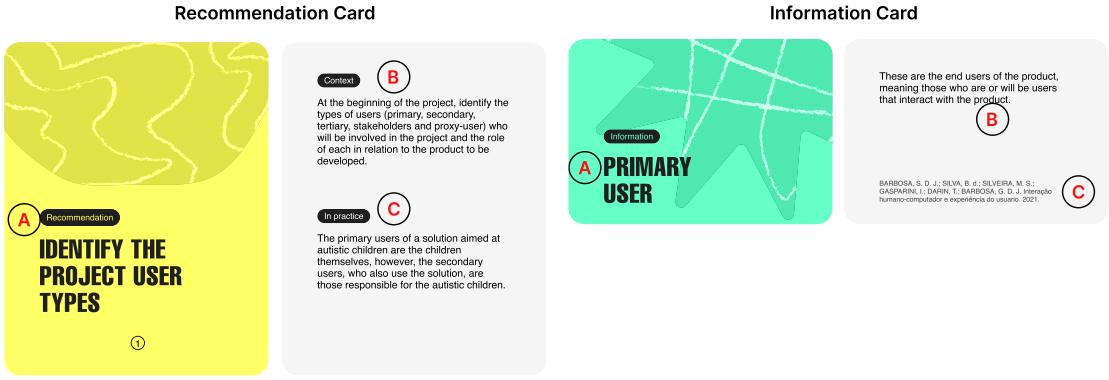


**Figure 4. Structure of the Recommendation Cards and Information Cards**

issues that can be considered good practices for involving proxy users. They serve as a tool to support research planning, method definition, and participant involvement in contexts where direct access to end users is limited or unfeasible.

As for the information cards, the main idea is that they serve as a quick reference for terms that the recommendations may present. Thus, they provide definitions and examples of types of users: primary, secondary, tertiary, proxy users, stakeholders, and non-users, to foster a better understanding of the different user types and to help map them in the product development process. All information cards can be accessed at [6].

It is hoped that the recommendations outlined in this work support the reflection on the involvement of proxy-users, on how to recruit them, as well as define data collection techniques and choose the right user representatives to produce useful information about the product being developed or tested. Furthermore, the information presented may encourage professionals involved in the product development process and user research to insist on to involve the end users of the product being developed. This study as a whole can assist design and IT professionals and researchers, in sharing and arguing about the importance of involving real users in the research process, with the aim of producing information that genuinely represents the end user of the product.

There is no user-centered process, no sophisticated method, and no validated structured form that can ensure sound decision-making when the sample of users involved does not reflect the actual target audience. In certain contexts, the use of proxy-users may be acceptable, but it must be approached with caution. When proxy-users are employed, professionals should clearly justify the absence of real users, explicitly state the limitations, and, when possible, share the challenges faced in involving proxy-users. It is also important to describe the measures taken to reduce bias in the data sample, including strategies used to ensure that proxy-users spoke on behalf of the real users, focusing on their experiences and needs, rather than their own perspectives.

## 6. Final Remarks

The conception of new research methods in HCI is a fundamental challenge for the decade [Silva Junior et al. 2024], requiring an understanding of the current state to identify gaps and potentialities. This research stands out by: (1) Problematizing the participation of

[6]https://drive.google.com/drive/u/0/folders/12IVqKtbM9N85Bf9llYYi7QQSPtIl05yr

## Table 1. Recommendations Cards

| Nº | Title | Context | In Practice | Origin |
|---|---|---|---|---|
| 1 | **Identify the Project User Types** | At the beginning of the project, identify the types of users (primary, secondary, tertiary, stakeholders and proxy-user) who will be involved in the project and the role of each in relation to the product to be developed. | The primary users of a solution aimed at autistic children are the children themselves, however, the secondary users, who also use the solution, are those responsible for the autistic children. | Bibliographic research |
| 2 | **Learn how to access each type of user** | At the beginning of the project, learn the access methods and limitations for each type of user involved in the project. Later, this mapping will help you define the most appropriate research methods to avoid bad surprises. | Due to the tight project schedule and limited access to the product's end users, access to end users will be possible only during the evaluation stage. | Bibliographic research |
| 3 | **Discover the Stakeholder's knowledge** | Map the stakeholders' knowledge about end-user needs, usage context, and expectations regarding the solution. A stakeholder with the right knowledge about the end-user can help in situations of limited access to end users. | A product owner who knows the users' expectations, a business manager who knows the customers' financial issues, and an implementation analyst who knows the customer's most urgent needs may all be involved in the product development process. | Bibliographic research |
| 4 | **Identify Alternatives to Know the User** | When it is not possible to get to know the end user of the product directly through questionnaires, interviews or evaluations, identify other alternatives to learn on the users without necessarily involving them. | In a project, some alternatives may be the company's complaints channels, open calls to the support team, comments on social networks and app stores, interaction logs, press articles and scientific papers, and involvement of other people such as the support team, people who are experts on the user, people involved in product development. | Survey |
| 5 | **Evaluate information from proxy-users** | Evaluate the information that proxy-users may provide during product development. This assessment can help involve proxy-users who bring different perspectives about the end user of the solution. | A software developer on the project may have context about the solution and can provide more technical insight into the product. A support analyst may have knowledge about the users' wills and needs and can provide insight into the pain points that users have most. | Survey |
| 6 | **Evaluate the level of proximity of the proxy-user** | Understanding the level of proximity between proxy-users and end users allows selecting reliable proxy-users, who bring end user context information that is closer to reality. | A mother of a child with communication limitations can inform the child's needs and routine. Alson, involving a specialist in the field can provide more general information about the child and his or her condition. | Survey |
| 7 | **Develop scripts that highlight the end user** | Develop scripts for data gathering that make it clear that the proxy-user is acting as a spokesperson for the solution user and that the solution is not aimed at the proxy-user but rather at the end user. | A proxy-user is involved in an evaluation of a system prototype, even though he is not the end user. He highlighted points that may become problematic for end users, according to what he knows about the end users. | Bibliographic research |
| 8 | **Create scenarios considering the proxy-user** | Present usage scenarios, when requiring a proxy-user to interact with the solution, aligned with the proxy-user knowledge of the end user, so that the proxy-user can provide feedback on how the end user will interact with the solution. | A proxy-user is evaluating a tool for traders. Although they are not the end user, he is familiar with some usage scenarios and have more expertise to provide feedback aligned to the end users' needs. | RSL |
| 9 | **Discover the proxy-user's Knowledge** | In a survey, it can be useful to create initial questions to measure the knowledge of the responding proxy-users about the end-user context. | The proxy-user will be involved in an evaluation of a prototype of the solution. To better understand the proxy-user's knowledge, create forms that measure some of this knowledge about the solution and the end user. | RSL |
| 10 | **Code to detect false clicks** | When using crowdworkers tools and/or involving proxy-user in evaluation scenarios without the supervision of researchers, it may be useful to create algorithms to detect non-standard clicks and responses, in order to ensure a acceptable level of quality. | The proxy-user will be involved in an evaluation of a prototype, but the evaluation will take place through crowdworker platforms. To avoid false responses, create algorithms that certify and validate clicks and responses within the standards. | RSL |

proxy-users in research; (2) Identifying gaps in market and academic practices, which frequently rely on proxy-user data in contrast to UCD theory; (3) Recommending best practices based on the results obtained.

The study demonstrates and reinforces the importance of considering the end-user as the primary source of research, discussing the lack of prioritization of research with real users in many companies due to time constraints, resources, and perceived importance. This urges the HCI community to advocate for greater integration and valuation of research with authentic users, advancing the state of the art.

The originality of this work lies in its in-depth focus on the proxy-user. Although HCI literature acknowledges their existence and the relevance of UCD, this study investigates how research with proxy-users is conducted specifically in digital product development. It not only defines them but also analyzes the design process stages in which they are involved, the data collection techniques used, the types of data collected, and the reasons for their involvement. Furthermore, it presents a critical analysis of academic transparency, pointing out that most analyzed studies do not mention the methodological precautions taken when involving proxy-users, nor discuss sample limitations or reasons for not including end-users. The study also discusses the dichotomy between theory and practice in the industry, revealing a contradiction between the stated adherence to user-centered methodologies (such as SCRUM, UCD, Design Thinking) and the actual prioritization of information from proxy-users (such as product managers and support teams) to the detriment of end-users.

These findings highlight the challenge of sociocultural aspects in HCI [Neris et al. 2024], as the underrepresentation of real users can perpetuate the underrepresentation of already vulnerable groups, both in science and industry. Understanding the limits, applications, and methods employed with proxy-users, resulting from this research, can assist future studies in establishing efficient protocols and methods for participant protection, in addition to making results more representative, without compromising the interests of those being represented.

Methodologically, the study employs a dual approach: a tertiary study based on a updated systematic literature review and a survey with industry professionals. This combination provides a comprehensive view of the problem, comparing academic theory with industrial practice, and was approved by the Research Ethics Committee.

As future work, in the short term, it is proposed to evaluate the effectiveness of the recommendations from this study, investigate the involvement of proxy-users in research in Brazil, and deepen the survey of justifications and methodological precautions in HCI studies. In the medium term, it is suggested to deepen the investigation into proxy-users in accessibility research, create and validate a measurement instrument to assess the usefulness of a proxy-user in projects, and directly compare usability/UX results obtained with proxy-users versus real end-users. In the long term, it is indicated to develop specific methodological frameworks and data collection methods for scenarios where direct end-user involvement is unfeasible but the use of proxy-users is necessary, and to conduct longitudinal studies to correlate the degree and form of proxy-user involvement during product development with the long-term success of these products in the market.

Blackbox, DeepSeek and ChatGPT were used to translate the texts into English.

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