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Why Brazilian Organizations Invest in Accessibility? A Strategic Analysis of Motivations, Policies, Benefits and Barriers

Marcelo Medeiros Eler [**University of São Paulo** | ***marceloeler@usp.br***]
Luis André da Silveira [**Chicago Advisory Partners** | ***l.andre@alumni.usp.br***]
Isabel Francine Mendes [**National Institute of Telecommunications** | ***isabel.f@dtel.inatel.br***]
Giovanne Bertotti [**B3** | ***giovannebertotti@yahoo.com.br***]
Wajdi Alejedaani [**University of North Texas** | ***wajdi.j1@gmail.com***]

School of Arts, Sciences and Humanities, University of São Paulo, Rua Arlindo Bettio 1000, Ermelindo Matarazzo, São Paulo, SP, 03828-000, Brazil.

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Abstract Accessibility is a key requirement in any software system that requires user interaction since it is concerned with the development of products and services that can be used by a wide range of users, regardless of their physical or cognitive abilities. Many studies were conducted to understand the lack of accessibility observed in many digital products and concluded that the lack of knowledge and awareness, and the lack of management commitment and executive support were the main factors that hinder accessibility adoption in the software development process, suggesting that many organizations do not recognize the business importance of accessibility in digital markets. On the other hand, some organizations consistently invest in accessibility. In this manuscript, we present a study conducted with professionals involved in the decision-making processes of some of those organizations to uncover their strategic views on the development of accessible products, mainly regarding their motivations, policies, barriers, and benefits obtained from investing in accessibility. To accomplish our goals, we adopted an exploratory sequential mixed methods, starting with a qualitative study to explore the views of participants, followed by a quantitative study designed based on factors identified in the first study. In total 15 professionals participated in our qualitative study and 31 professionals participated in our quantitative study. Our findings suggest that in these organizations: i) accessibility demands are mostly generated by internal policies and cultures in tactical and strategic layers; ii) organizations are mostly driven by a mix of ethical, business, and regulatory factors, such as to promote digital inclusion, increase brand reputation and yet comply with current legislation; iii) policies to ensure accessibility adoption mostly include hiring people with disabilities, making accessibility validation mandatory with well-defined processes, and including accessibility in the definition of done (DoD) for all features; iv) perceived benefits are primarily associated with stronger brand reputation, better software quality and increased digital inclusion; v) the more critical barriers to accessibility adoption are linked to the lack of awareness and knowledge among stakeholders and the technical team, in addition to the lack of commitment across management levels and struggles with legacy systems.

Keywords: Accessibility, Business, Strategy, Software, Development

1 Introduction

The creation of accessible products and services is not a trivial task, as it requires the commitment of many stakeholders throughout the development process, including people in different management positions. It also requires the application and coordination of many specific processes, policies, training programs, and tools. Therefore, given the human and technical resources required, incorporating accessibility requirements in all activities of the development process highly depends on organizational investment, management support, and executive commitment.

Unfortunately, many studies conducted both in academia and in industrial settings have shown evidence of the general lack of accessibility in digital products (e.g. Mobile and Web Applications) [Eler *et al*., 2018; Yan and Ramachandran, 2019; Alshayban *et al*., 2020; Chen *et al*., 2022; WebAIM, 2024; Debevc *et al*., 2023], despite the existence of many resources (e.g. processes, tools, guidelines, standards, legislation) to promote the creation of accessible products. To understand this phenomenon, many researchers investigated whether accessibility is addressed in the development process of many organizations. Their findings suggest many barriers as the reasons organizations tend to develop inaccessible software, including lack of knowledge and proper training; lack of accessibility requirements; lack of resources (time, specialists, tools); lack of executive support; and lack of management commitment [Leite *et al*., 2021; Lazar *et al*., 2004; Freire *et al*., 2008; Antonelli *et al*., 2018; Pichiliani and Pizzolato, 2019; Bi *et al*., 2022; Alshayban *et al*., 2020; Putnam *et al*., 2023; Abdurahman and Kabanda, 2024].

The challenges mentioned above are closely related to organizational elements [Bi *et al*., 2022], which play a significant role in driving strategic goals and the long-term trajectory established by the organization for a product. Although there may be a perception that the responsibility for accessibility features falls on software developers and UX experts [Putnam *et al*., 2023], it is improbable that sufficient requirements and

resources will be allocated to develop accessible products unless organizational management considers accessibility a significant quality attribute and worthy of investments [Lazar *et al*., 2015; Brooks *et al*., 2023; Kline, 2020]. This might be the reason why participants frequently emphasize the insufficient support of executives and management as a primary obstacle in the development of accessible products [Nahon *et al*., 2012; Bi *et al*., 2022; Putnam *et al*., 2023, 2012].

The observed lack of executive support and management commitment towards accessibility suggests that many organizations may undervalue the role of accessibility as a quality attribute that can offer business benefits. In contrast, numerous successful organizations are continually allocating resources to provide their customers with accessible software, which might be an indication that they recognize the business value of developing accessible products.

In this context, we posed the following general research questions: Why organizations invest in the development of accessible software? With this research question, we intend to understand the strategic value of accessible design for some organizations. Understanding why some organizations invest in the design of accessible products can shed light on the business advantages of investing in accessibility. This knowledge can be a source of inspiration for other organizations, practitioners, and researchers. Specifically, our primary aim is to pinpoint factors linked to the creation of accessible software from a strategic standpoint, which includes exploring the sources of accessibility demands and requirements within organizations, key motivations for investing in accessible product delivery, policies and strategies implemented to achieve accessibility goals, business advantages perceived and measured post-investment in accessibility, and obstacles to adopting accessibility within the organization.

In the scope of this study, we focused on Brazilian organizations that have in-house software development teams and that notoriously have been investing in accessibility over the years. We focused on Brazilian organizations due to the context in which this research has been conducted and the choice for convenience sampling, which will be detailed in the methodology section (cf. Section 3. In addition, there have been many studies on how accessibility is addressed in the software development process in Brazilian organizations, mostly from a technical point of view [Ferreira *et al*., 2007; Antonelli *et al*., 2018; Pichiliani and Pizzolato, 2019; Leite *et al*., 2021], thus this research further contributes with a general view of how accessibility is approached in this specific context.

To accomplish our goals, we conducted two complementary studies in the context of a exploratory sequential mixed research method. The first study was a qualitative investigation based on interviews conducted with 15 professionals who occupy middle and senior management positions in organizations that notably integrate accessibility requirements in their development processes [da Silveira *et al*., 2024]. More specifically, we used a qualitative approach to identify factors associated with the development of accessible products and services, such as the layers of the organization that generate accessibility demands, the main motivations, barriers, policies, strategies, and perceived or measured benefits of investing in accessibility. The results of this study were previously published at the Brazilian Symposium on Human Factors in Computing Systems in 2024 [da Silveira *et al*., 2024].

The second investigation, which is the main focus of this manuscript, is a quantitative study in which we devised an online survey based on the results of our prior qualitative study. Accordingly, we applied this survey to professionals involved in accessibility-related decisions within organizational policies or development processes. Our main purpose with this second study was to further support our previous findings and quantitatively assess the factors identified in the first study, thus determining the factors that seem to be more relevant to participants. In total, we received 31 valid responses to our questionnaire. Our findings are consistent with the results of our previous investigation in the sense that few participants identified new factors, but we added quantitative information to identify the most prominent factors within each dimension explored in this study, indicating common views and trends across organizations when it comes to accessibility business values.

In summary, in organizations that invest in the development of accessible software, accessibility demands are more often initiated in the strategic and tactical layers, more specifically started by internal organizational policies or culture, specific client demands, or even due to accessibility legislation. In addition, organizations are motivated mainly by the desire to promote digital inclusion and increase brand reputation and user base, therefore acquiring competitive advantage and being compliant with accessibility legislation and organizational culture. Policies to ensure accessibility is adopted during the development process often include hiring people with disabilities, defining clear processes, and defining specific technical goals, such as requiring accessibility validation for all features and including accessibility in the Definition of Done (DoD). Monitoring user needs was also a prominent strategy mentioned by the participants. Most participants recognized many benefits obtained from their investment in accessibility, such as the promotion of digital inclusion, improved user satisfaction, and a larger user-based. Although some organizations have specific strategies and procedures to measure benefits, such as NPS surveys and tracking system usage with accessibility features enabled, almost half of the participants said that formal or informal measures are not adopted. Finally, the barriers most frequently recognized by participants were lack of awareness and knowledge among stakeholders, lack of commitment across management layers, lack of awareness in development teams, and lack of people with disabilities in the development teams.

This paper is organized as follows. Section 2 outlines the related work. Section 3 shows our study design. Section 4 presents the results of our investigation, while Section 5 provides some discussion. Finally, Section 6 outlines some concluding remarks and future directions.

2 Related work

The general lack of accessibility in digital products and services [Eler *et al*., 2018; Yan and Ramachandran, 2019; Alshayban *et al*., 2020; Chen *et al*., 2022; WebAIM, 2024;

Debevc *et al*., 2023] motivated many studies concentrated on understanding whether and how accessibility is incorporated in the development process of organizations. The majority of studies were based on online surveys aiming at uncovering accessibility awareness and knowledge among participants, their motivations and barriers to adopting accessibility, and the accessibility-related practices they execute during the software life cycle.

Most studies focused on professionals who are directly involved in the technical aspects of the development process, such as developers and designers [Lazar *et al*., 2004; Tangarife and Mont'alvao, 2006; Ferreira *et al*., 2007; Freire *et al*., 2008; Lopes *et al*., 2010; Farrelly, 2011; Yesilada *et al*., 2015; Antonelli *et al*., 2018; Crabb *et al*., 2019; Pichiliani and Pizzolato, 2019; Alshayban *et al*., 2020; Leite *et al*., 2021; Bi *et al*., 2022; Guissoni *et al*., 2022; Mendes *et al*., 2026]. Some researchers focused on professionals who make more holistic decisions concerning the development of web and mobile applications, such as UX, HCI, and accessibility professionals and experts [Putnam *et al*., 2012; Yesilada *et al*., 2012; Inal *et al*., 2019; Patel *et al*., 2020]. There is also a study involving non-professionals who design and develop online content [Nahon *et al*., 2012].

Even though many of those investigations included participants in management positions [Freire *et al*., 2008; Yesilada *et al*., 2012; Pichiliani and Pizzolato, 2019; Vollenwyder *et al*., 2019; Patel *et al*., 2020; Leite *et al*., 2021; Putnam *et al*., 2023; Abdurahman and Kabanda, 2024], they focused on accessibility awareness, knowledge, practical issues, and responsibilities within the development process.

In summary, most studies identified recurrent barriers to the full adoption of accessibility in the development process, such as lack of specific requirements, lack of knowledge and awareness, lack of education/training, limited resources (cost and time), lack of adequate tools, focus on different target public, lack of executive support and management responsibility. Furthermore, the participants noted that decisions regarding accessibility were beyond their control [Nahon *et al*., 2012; Putnam *et al*., 2012], and they lacked significant influence in encouraging the integration of accessibility measures within the process, which may explain why the lack of support from organizations or managers is a key barrier to the development of accessible products [Inal *et al*., 2019; Alshayban *et al*., 2020; Leite *et al*., 2021; Putnam *et al*., 2023].

In a context in which executive support is crucial for provisioning sufficient resources for the full adoption of accessibility in the development process, some studies have focused on professionals who make important decisions that influence the adoption of accessibility in the development process. For instance, Velleman *et al*. [2015] investigated public organizations to uncover factors that influence the creation of accessible websites. Their findings indicate that accessibility adoption is highly influenced by factors associated with innovation adoption and implementation (e.g., perceived advantage, compatibility with existing infrastructure, complexity, observability), with the design process (e.g., internal/external qualities, knowledge), and with the organizational infrastructure (e.g., responsibilities, stakeholders involvement, interdependence). Current legislation was also identified as an external factor, in addition to personal motivation.

In our previous work [da Silveira *et al*., 2024], we interviewed 15 professionals who play management roles in organizations in which they make essential decisions regarding accessibility adoption. Our findings show the importance of executive commitment in defining accessibility goals once they are backed by policies and processes to ensure their purposes are met. Differently from the work of [Velleman *et al*., 2015], in which participants have not mentioned relative advantage and observable benefits as influential in the decision to invest in accessibility, participants of our prior investigation highlighted that tangible benefits are key motivators, such as increased user satisfaction, expanded user base, and stronger branding; nevertheless, most participants emphasized that digital and social inclusion are also key drivers.

In this manuscript, we present a novel and complementary study conducted by means of an online survey with 31 participants who play management roles in organizations that invest in accessibility, significantly increasing the number of participants in our prior study, thus allowing for a more comprehensive understanding of the strategic perspective of organizations concerning their investments in the development of accessible software.

3 Study design

The main purpose of this study is to understand the reasons why organizations are investing in the development of accessible software from a business perspective, exploring how accessibility is approached across the tactical and strategic layers of private organizations that notoriously develop accessible software applications. Specifically, our main goal was to uncover the primary drivers behind their commitment to accessibility and the tangible benefits observed within the organization, along with strategies and barriers to achieve their accessibility goals. Accordingly, we framed our investigation around six research questions, which are presented as follows.

- RQ1 - Who prompts the need for the development of accessible software?
- RQ2 - What are the motivations that drive organizations to invest in developing accessible products and services?
- RQ3 - What measures do the organizations take to ensure that their products and services will be accessible?
- RQ4 - What are the perceived or measured benefits organizations have from investing in the development of accessible products and services?
- RQ5 - What are the organization strategies to measure the benefits of delivering accessible software?
- RQ6 - What are the main barriers organizations face to implement accessible software?

To achieve this goal, we adopted an exploratory sequential mixed methods, in which the study first begins with a qualitative research phase and explores the views of participants; next, the data are analyzed and the information is used to build an instrument for a follow-up quantitative phase [Creswell and Creswell, 2017; Creswell and Clark, 2017]. Mixed methods research in which both qualitative and quantitative strategies are employed tend to minimize limitations of both approaches,

which is suitable when one need to develop a better contextualized measurement instruments by first collecting and analyzing qualitative data and then administrating the instruments to a sample [Creswell and Creswell, 2017; Creswell and Clark, 2017].

Consequently, we conducted two studies: first, we conducted a qualitative study in which we interviewed professionals that occupy middle or high management positions in organizations that invest in the development of accessible products; next, we conducted a complementary study based on an online questionnaire to quantitatively assess the factors identified in the previous study thus supporting our previous findings. In this section, we firstly present the design of the qualitative study, a prior work that has already been published in the Brazilian Symposium on Human Factors in Computing Systems[da Silveira *et al*., 2024]; next, we present the detailed design of our quantitative study, the main focus of this manuscript.

3.1 First study: interviews

To answer our research questions from a qualitative perspective, we collected data from participants based on semi-structured interviews conducted with people who occupy managing and strategic positions in organizations that invest in accessibility. Accordingly, we defined some criteria for selecting participants: they must be employees of organizations that develop accessible products; and they must be involved in making tactical and strategic decisions in the software development process. Participants were thus selected based on a non-probabilistic method. We adopted the convenience sampling method by inviting employees of well-known national companies that invest in the development of accessible software.

In total, 15 professionals participate in our study, all from Brazilian organizations that have in-house software development teams.

The interviews were conducted remotely using the *Google Meet* tool and based using a semi-structured approach, in which demographic data and specific information regarding accessibility in the development process and as a business strategy were collected. We used open-ended questions to avoid introducing bias in the participant's answers. Appendix A shows the specific questions devised to answer our research questions. The questions of our interview script were inspired by the work of Freire *et al*. [2008], Velleman *et al*. [2015] and Leite *et al*. [2021].

3.2 Second study: online survey

The methodological procedures we adopted to ensure the quality and validity of our second study, which is the focus of this manuscript, is presented as follows, including the design of the online survey based on the results of the first study, the target audience, the recruiting process, the ethics procedures, and the data analysis.

3.2.1 Survey design

To reach the goals of our second study, we devised an online survey to collect data from people involved in the decision-making of the development of accessible products and services. In the exploratory sequential mixed methods, the qualitative findings inform the design of the quantitative study instruments. Consequently, the online questionnaire we used in this investigation was directly shaped by the interview script and the results of the first study (cf. Section 3.1), ensuring that the survey items reflected the themes, experiences, and perspectives shared by participants during the qualitative study [da Silveira *et al*., 2024]. This approach allowed for a structured and systematic translation of qualitative insights into measurable variables, maintaining alignment between the exploratory findings and the subsequent quantitative data collection.

At the beginning of the questionnaire, we included a question to check whether participants hold a management or leadership position in a company, sector, department, or team that requires the development of accessible digital content, products, or services, ensuring we would collect data only from professionals. Afterward, we introduced simple questions to collect basic demographic data, such as age, known disabilities, role in the organization, years of experience in that position, business domain, workforce, and type of product or service delivered by the organization.

Concerning the specific questions about the strategic role of accessibility in the organization, we followed our previous interview script to create closed-ended questions based on the factors identified in our prior study, yet ensuring participants had the option to include new information or to make comments if necessary. Accordingly, we included the following questions in our research instrument:

- What are the demands that motivate the development of accessible software in your organization?
- When the demand to develop accessible software comes from the organization itself, at which level of operation does this demand originate?
- Indicate which models, standards, or accessibility guidelines are used to develop digital content, products, or services.
- What are the main motivations for your organization to invest in the development of accessible software or digital services?
- What measures or policies has the organization implemented to ensure that the digital products and services developed take accessibility requirements into account?
- What benefits has the organization gained from investing in the development of accessible software?
- What mechanisms have the organization adopted to measure or estimate the return on investment in the development of accessible software?
- From a management perspective, what are the main barriers to incorporating digital accessibility into development processes?

The initial version of the questionnaire was assessed by two professionals with decision-making roles regarding the adoption of accessibility practices within their organizations.

Both participants completed the instrument and provided favorable evaluations, reporting that the questions were clearly formulated and the overall structure was easy to comprehend and respond to. This feedback supports the adequacy and clarity of the questionnaire for the target population. The complete survey with all options offered to participants to the open-ended questions is presented in the Appendix B.

3.2.2 Participant selection and recruitment

Our sampling strategy began by establishing clear criteria for participant selection. To qualify for the study, individuals needed to meet two key conditions. First, they had to be employed by an organization engaged in the development of accessible products. This implies that the organization must explicitly define accessibility requirements for its products and maintain specialized teams dedicated to accessibility development and/or evaluation. Second, participants were required to play a role in tactical and strategic decision-making within the software development process. This could involve decisions such as selecting development methodologies, allocating resources, setting hiring criteria, investing in team training and tools, and prioritizing project requirements, among other responsibilities.

Given these criteria, we employed a non-probabilistic sampling method, as not all members of the target population had an equal likelihood of being selected. Due to challenges in identifying the entire population of interest, we utilized convenience sampling. This approach involves intentionally selecting participants based on a predefined set of characteristics that aligned with our study's objectives, ensuring that the recruited individuals met the necessary criteria. To make sure we collected only information from our target audience, we included a validation question at the beginning of the questionnaire as mentioned in subsubsection 3.2.1.

In that sense, we employed three different strategies. The first strategy was to send direct invitations to people within the professional network of the co-authors of the paper who are known to meet the participant criteria we defined. This professional network mostly comprises other professionals that share similar interests and were met in specific courses, conferences or social media groups (e.g. Telegram group with accessibility experts). In that sense, most participants invited in this first strategy do not have a close relationship with the authors, thus avoiding potential bias. The second strategy was to use the LinkedIn network to recruit professionals whose job descriptions contain information about their positions in the organization and the accessibility aspects of software development. The third strategy was associated with snowball sampling, in which we asked recruited participants to invite new participants they knew to fit the profile to be part of our study. The combination of these three strategies allowed the selection of a more heterogeneous sample of participants.

3.2.3 Ethics procedures

This study was conducted in accordance with Resolution 674/2022 of the National Commission for Research Ethics (CONEP) and the guidelines of a local ethics committee. Our research project was approved under the process number CAAE 85125824.7.0000.5390. Following, we briefly describe the procedures we implemented to ensure compliance with all recommendations. Before answering the online questionnaire, participants were informed of the many aspects of the investigation: goals; possible risks and discomforts; benefits; privacy and anonymity assurances; and the contact information of the researchers. They were also informed that they could stop answering the questionnaire at any moment, and no question was mandatory. After providing participants with that information, they were asked to give their informed consent so we could use the information they provided in our investigation. No personal information was collected and used in this investigation to avoid the identification of the participants.

3.2.4 Data Analysis

The analysis of the open-ended questions from the online questionnaire was conducted using quantitative techniques to quantify key factors or variables mentioned by participants. The process involved two steps: data preparation and statistical analysis. In the data preparation step, valid responses were collected and organized into a structured dataset, and any irrelevant or incomplete responses were excluded to ensure data quality. In the analysis step, we employed basic descriptive statistics to outline our findings concerning the quantified factors and other variables of interest.

3.3 Demographics

In our qualitative study, we interviewed 15 participants who play a middle or high management role in 12 different private Brazilian organizations that invest in the development of accessible software and services. Table 1 summarizes some profile information about each participant. Most participants work in technology-related areas, while others are involved in product, design, accessibility, or quality. The majority (n=10) have over five years of experience in management roles and lead large teams, with most (n=9) managing over 20 people—and some overseeing more than 100 employees. Participants represent organizations from six sectors: Financial Services, Technology, Data, Payment Methods, Beauty and Cosmetics, and Agriculture and Construction, with the financial sector being the most represented (seven organizations and 10 participants).

In our quantitative study, 37 professionals responded to our questionnaire. However, a participant did not agree to the terms for consenting to the use of their responses, and five other participants mentioned that they do not occupy management positions. Hence, we received only 31 valid responses to our questionnaire. Participants from different contexts and backgrounds answered our questionnaire. The age distribution of the study participants shows that the majority fall within the 40 to 49 age range (n=16), followed by the 30 to 39 age group (n=11). Younger participants, aged 18 to 29, were fewer, with only 3 respondents, while the oldest age group, 60 to 69, was represented by just 1 participant.

Table 2 outlines some demographic data concerning the participants in our study. Notice that eight out of 31 participants have some disability, representing nearly 26% of

Table 1. Profile information about the 15 participants of the qualitative study (interviews). The columns represent the participant identifier, role in the organization, experience (in years) in managing positions, number of people they manage, organization identifier, organization's number of employees, and organization sector [da Silveira *et al*., 2024].

Part.	Role	Experience	Team size	Organization	Org. Employees	Sector
P1	Systems Manager	8	62	E1	90k	Finance
P2	Engineering Superintendent	8	350	E1	90k	Finance
P3	Systems Coordinator	10	24	E1	90k	Finance
P4	Engineering Manager	9	30	E1	90k	Finance
P5	Engineering Manager	9	50	E2	5k	Finance
P6	Quality Coordinator	1	18	E3	400	Technology
P7	Systems Manager	4	20	E4	3k	Finance/Data
P8	Engineering Manager	15	40	E5	8k	Finance
P9	Engineering Manager	15	120	E6	3k	Payment
P10	Accessibility Coordinator	2	3	E7	3k	Finance/Data
P11	Digital Business Manager	13	1	E8	82k	Agricultural/Construction
P12	Head of Products and Design	5	23	E9	5k	Technology
P13	Accessibility specialist	6	1	E10	12k	Beauty/Cosmetics
P14	Design Manager	3	13	E11	700	Finance
P15	UX Manager	4	11	E12	3k	Finance

the group: five have visual disabilities, one has an auditory disability, one has a physical disability, and one has ADHD. There are many different roles within the participants in our study, with the most frequent being Accessibility Specialist (n=8), Engineering Manager (n=5), and Technical Team Leader (n=4). Many other roles are associated with Design Manager (n=2), Chief Technology Officer (n=2), Product Manager (n=2), Chief Product Officer (n=1), Architecture Manager (n=1), Accessibility Designer n=(1), Chief Information Officer and Chief Operating Officer (n=1), System Manager (n=1), Developer Coordinator (n=1), Program Manager (n=1), and Head of Product (n=1).

The predominance of Accessibility Specialists, Engineering Managers, and Technical Team Leaders highlights roles that are often directly involved in implementing and ensuring compliance with accessibility standards. Although roles like CPO, CTO, CIO, COO, and Head of Product were less frequent, their participation indicates that people who make strategic decisions also contributed to this study.

Most of the participants have 3 to 5 years of experience (n=11), indicating a strong representation of mid-career professionals. A significant number also have 6 to 9 years (n=8) or 10+ years of experience (n=8), indicating that more experienced professionals responded to our questionnaire. Fewer participants have 1 to 2 years (n=2) or less than 1 year of experience (n=2). The most common team sizes managed by participants in this study were 6 to 10 people (n=8) and 11 to 20 people (n=8), showing that participants often oversee small to medium-sized teams. Fewer participants manage larger teams of 21 to 49 people (n=5), 50 to 99 people (n=2), or more than 100 people (n=2).

Most of the participants work in the Technology (n=13) and Finance/Banking sectors (n=12), while other sectors, such as Health & Wellness (n=2), Commerce (n=1), and Insurance (n=1), were represented by fewer participants. The vast majority of the participants work in large organizations with 100 or more employees (n=25). Smaller organizations, particularly those with 50 to 99 employees (n=4), 1 to 9 employees (n=1), or 10 to 49 employees (n=1), were significantly less represented.

4 Results

In this section, the results of both the qualitative (n=15) and the quantitative study (n=31) will be presented considering each research question (c.f. Section 3), followed by a discussion on Section 5. The findings from the qualitative research have been previously documented in an earlier publication [da Silveira *et al*., 2024]; therefore, they are presented here in a summarized form.

4.1 RQ1 - Origin of accessibility demands.

In our qualitative study, several participants noted that the demand for accessible software arises both from the organization itself and the customers or users. Some organizations proactively prioritize accessibility as a market requirement and conduct user studies and testing to guide design decisions. On the other hand, some organizations only adopted accessibility requirements after customer complaints or lawsuits that triggered internal changes and awareness campaigns. Most participants agreed that accessibility development is a two-way process, driven by both internal policies and active user participation through feedback channels like email, social media, app store reviews, and regulatory bodies.

When the need for the development of accessible software is prompted within the organizations, it can be driven by strategic, tactical, or operational levels of planning. In this study, most participants (n=11) reported that accessibility adoption originates at the strategic level, where specific policies guide the rest of the organization. Fewer participants pointed to the tactical level, where managers and innovation teams coordinate efforts to adapt products and embed accessibility into the development process and culture. At the operational level, some teams naturally integrate accessibility into their day-to-day work, treating it as a standard requirement. Two participants emphasized that accessibility stems from all three levels—strategic, tactical, and operational—demonstrating a comprehensive organizational commitment.

Considering the quantitative study, Figure 1 shows the responses of the participants regarding the origin of accessibility demands based on the factors identified in the qualitative

Table 2. This table shows some demographic data about the participants of this study, mostly related to their working profile. Column 1 shows an ID for each participant; Column 2 shows whether the participant has a disability; Column 3 shows the role in the organization; Column 4 shows the management layer; Column 5 shows the experience in years; Column 6 shows the team size the participant leads; Column 7 shows the organization sector; and Column 8 shows the organization size in number of employees

Part.	Disability	Role	Mgt layer	Experience	Team size	Sector	Org. size
P1	None	Accessibility Specialist	Strategic	6 to 9 years	11 to 20	Commerce	1 to 9
P2	Visual	Accessibility Specialist	Operational	3 to 5 years	6 to 10	Finance/Banking	>=100
P3	None	Accessibility Specialist	Strategic	3 to 5 years	11 to 20	Finance/Banking	>=100
P4	None	Architecture Manager	Strategic	>=10 years	11 to 20	Finance/Banking	>=100
P5	Visual	Accessibility Specialist	Strategic	1 to 2 years	1 to 5	Finance/Banking	>=100
P6	None	Developer Coordinator	Tactical	3 to 5 years	11 to 20	Finance/Banking	>=100
P7	None	Engineering Manager	Tactical	6 to 9 years	21 to 49	Finance/Banking	>=100
P8	None	Engineering Manager	None	6 to 9 years	21 to 49	Finance/Banking	>=100
P9	None	Engineering Manager	Tactical	>=10 years	21 to 49	Finance/Banking	>=100
P10	None	Technical Team Leader	Operational	6 to 9 years	1 to 5	Finance/Banking	>=100
P11	None	Technical Team Leader	Operational	< 1 year	1 to 5	Finance/Banking	10 to 49
P12	None	Technical Team Leader	Tactical	>=10 years	50 to 99	Finance/Banking	>=100
P13	Auditory	Engineering Manager	Tactical	6 to 9 years	50 to 99	Finance/Banking	>=100
P14	None	Engineering Manager	Tactical	3 to 5 years	11 to 20	Games & Entertainment	>=100
P15	Visual	Accessibility Specialist	Tactical	3 to 5 years	1 to 5	Health & Wellness	>=100
P16	None	Product Manager	Tactical	6 to 9 years	6 to 10	Health & Wellness	>=100
P17	None	CIO and COO	Strategic	>=10 years	> 100	Insurance	>=100
P18	None	CTO (Chief Technology Officer)	Tactical	>=10 years	11 to 20	Scientific Dissemination	>=100
P19	ADHD	Accessibility Designer	Operational	1 to 2 years	1 to 5	Technology	>=100
P20	Visual	Accessibility Specialist	Operational	3 to 5 years	6 to 10	Technology	>=100
P21	Visual	Accessibility Specialist	Strategic	3 to 5 years	6 to 10	Technology	>=100
P22	None	Accessibility Specialist	Operational	3 to 5 years	1 to 5	Technology	50 to 99
P23	None	CPO (Chief Product Officer)	Strategic	>=10 years	21 to 49	Technology	50 to 99
P24	None	CTO (Chief Technology Officer)	Strategic	>=10 years	> 100	Technology	>=100
P25	None	Design Manager	Strategic	3 to 5 years	6 to 10	Technology	50 to 99
P26	Physic	Program Manager	Tactical	3 to 5 years	6 to 10	Technology	>=100
P27	None	Design Manager	Tactical	6 to 9 years	6 to 10	Technology	>=100
P28	None	Head of Product	Strategic	6 to 9 years	21 to 49	Technology	>=100
P29	None	Product Manager	Tactical	< 1 year	11 to 20	Technology	>=100
P30	None	System Manager	Operational	>=10 years	11 to 20	Technology	50 to 99
P31	None	Technical Team Leader	Operational	3 to 5 years	6 to 10	Technology	>=100

study. Our findings revealed that such requests are usually initiated due to internal organizational policies or culture (n=25), followed by client demands (n=23). Accessibility legislation was mentioned by 20 respondents. Organizational values and purposes were mentioned in one response as an alternative option to those initially available in the closed-ended question, although it is closely related to the organizational culture indicated by many participants.

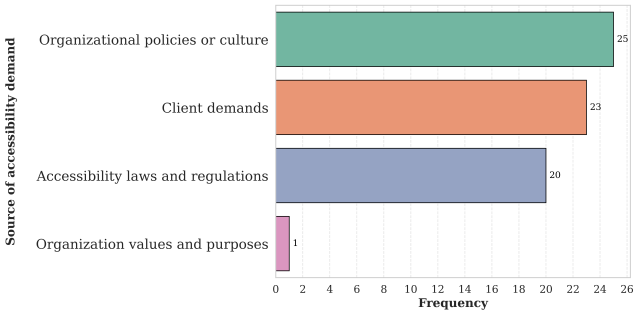

Figure 1. This chart illustrates the source of the demands for the development of accessible software .

When the demands to develop software come from their own organization, participants indicated which decision layer they come from. Figure 2 shows a summary of our findings. The strategic layer is the most common source (n=21), followed by the tactic layer (n=17) and the operational layer (n=13). This indicates that accessibility demands are most frequently driven by high-level decision makers, such as executives or senior management, who shape long-term goals and organizational priorities. In an open-ended question, one participant explained the differences when accessibility requirements come from different layers.

> *Operational: demands come through requests from the accessibility team to the squads.*
>
> *Tactical: It aligns with Key Results (KRs), which are business objectives aimed at improving inclusion and diversity within the company – it also aligns with digital accessibility standards and the company's culture.*
>
> *Strategic: It is driven by the use of innovations such as artificial intelligence. It also includes market research actively assessing the accessibility knowledge of teams, and creating metrics for decision-making.*

4.2 RQ2 - Motivations

In the qualitative study, most participants stated that their organizations aim to promote digital inclusion by ensuring users with disabilities are not excluded, while also recognizing that accessibility enhances compliance with national and international accessibility laws, which helps avoid lawsuits. Beyond legal concerns, participants highlighted motivations such as improving competitive edge, increasing brand reputation and expanding the user base. Many also emphasized

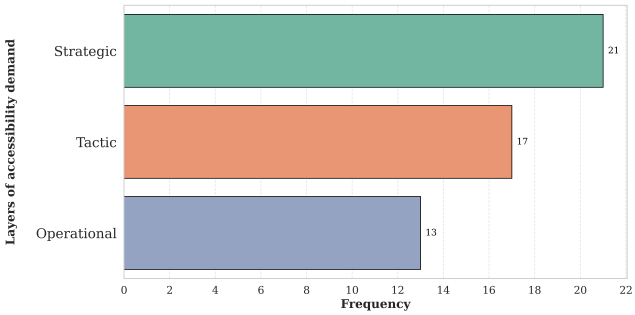

Figure 2. This chart illustrates the organization layers in which the demands for the development of accessible software come from.

that accessibility is embedded in their organizational culture, often seen as a non-negotiable aspect of development—sometimes rooted in past user demands or personal convictions. Additionally, participants noted that accessible products are associated with higher quality, leading to greater user satisfaction and productivity through cleaner design and more intuitive interactions.

Considering the quantitative study, Figure 3 shows the motivations that organizations have to invest in the development of accessible software and services. The motivations most frequently cited were to promote digital inclusion, increase brand reputation, and increase user base, each with 17 responses. These were closely followed by competitive advantage (n=16), compliance with accessibility legislation (n=15), and organizational culture (n=14). Other important motivations were moderately selected by the participants, such as improved user satisfaction (n=12), higher quality of the software (n=9), and increased productivity (n=9). Although less frequently, participants also indicated reasons, such as user-specific demands (n=7) and personal motivation (n=3). The least cited motivation was the product differentiation strategy, with a single response.

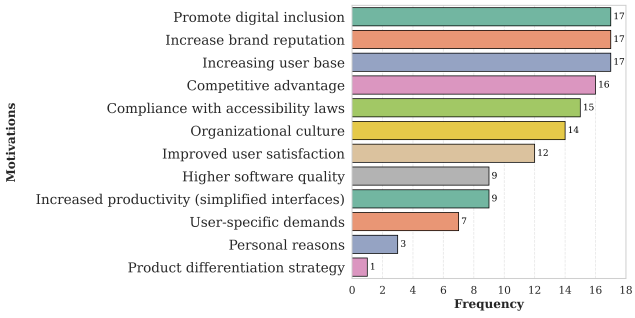

Figure 3. This chart illustrates the motivations organizations have to invest in the development of accessible software.

A respondent used an open question to further explain the importance of organizational culture and digital inclusion. According to this participant, "there are many developers with accessibility needs in the company, which ultimately contributes to a culture that encompasses these issues". This further highlights the importance of involving people with disabilities in the development and decision-making teams.

4.3 RQ3 - Policies

In the qualitative study, most participants reported that their departments have formal policies and governance processes to ensure product accessibility, along with monitoring mechanisms to assess compliance with accessibility standards. Only one participant stated their organization lacks such formal policies. The most frequently mentioned actions are: a) inclusion of accessibility requirements as a "Definition of Done" (DoD) criteria; b) accessibility teams need to validate development artifacts (e.g. requirements, user stories, prototypes); c) releasing product without accessibility team approval requires authorization from directors; d) investments in accessibility training; e) accessibility requirements included in contracts with third-party providers; f) accessibility culture building initiatives; g) well defined and mandatory accessibility testing process; and h) active monitoring of user needs.

Considering the quantitative study, Figure 4 illustrates policies adopted by organizations to ensure accessibility is implemented. The policies mentioned most frequently were the inclusion of people with disabilities in development teams, with 14 responses, followed by accessibility validation required for all functionalities, accessibility requirements included in the Definition of Done (DoD), and well-defined accessibility evaluation processes, each with 12 responses. The participants also mentioned interesting policies, such as active user monitoring (surveys, app reviews, social networks), with 10 responses, and investments in accessibility training, with eight responses. Some measures were less mentioned but still important to ensure the delivery of accessible products, such as the definition of accessibility checkpoints in intermediate artifacts (n=4), high-level management approval required for non-accessible features (n=5), and procurement policies favoring accessible products (n=4). A small number of respondents indicated that their organizations do not have policies (n=4) or that they are still developing policies in this context (n=1).

A participant of the study who indicated that no policy is adopted to ensure that accessibility is considered during the software development mentioned that their organization resorts to features of design systems that are intended to make the products more accessible. However, the same participant added a remark that this measure is not enough.

4.4 RQ4 - Benefits

In the qualitative study, participants highlighted several advantages their organizations gained through investments in accessible product development. The key benefits they reported are: a) user base growth; b) fewer complaints; c) improved user satisfaction; d) stronger brand reputation; e) cost reduction (reduced in-person services); f) improved software quality; g) market growth; and h) digital inclusion.

Considering the quantitative study, Figure 5 shows the benefits perceived or measured by organizations according to the participants of our study in return for their investments in the development of accessible software. The benefits indicated the most frequently were stronger brand reputation and better software quality (usability and user experience), each with 20 responses, followed by increased digital inclusion, with 19

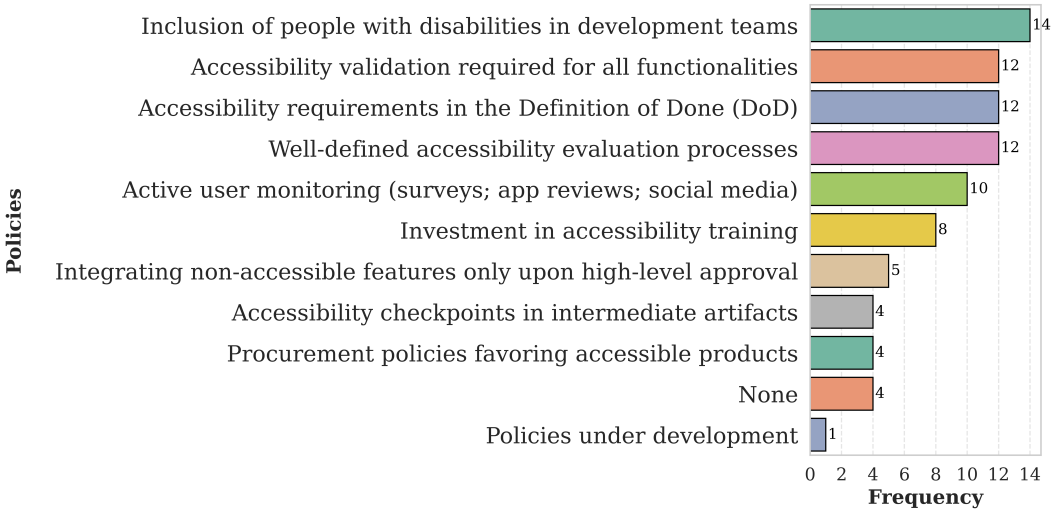

Figure 4. This chart illustrates the policies and measures organizations adopt to ensure that accessibility is considered during the development process.

responses, and improved user satisfaction, with 14 responses. The participants also mentioned other benefits, including a larger user base (n=12), market expansion due to international compliance (n=10), and fewer user complaints (n=10). The less frequently mentioned benefits were cost reduction (e.g., fewer in-person services), with 6 responses, and a possible impact on other organizations' accessibility culture with a single response. Three respondents said that no benefit is perceived or measured in their organization.

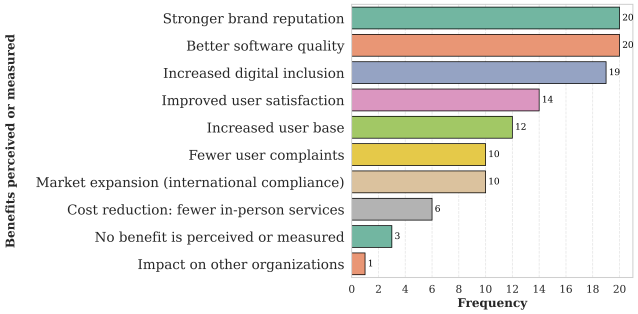

Figure 5. This chart illustrates the benefits perceived or measured by organizations in return for their investments in the development of accessible software.

4.5 RQ5 - Measurements strategies

In the qualitative study, most participants mentioned that their organizations recognize several advantages of investing in accessibility, but they lack a systematic and formal approach to measuring the benefits of developing accessible products. On the other hand, some participants described strategies their organizations use to assess these benefits, such as *Net Promoter Score (NPS)* surveys to gauge customer satisfaction, with participants looking for comments that highlight accessibility as a contributing factor. Additionally, some organizations employ *monitoring strategies* to track engagement in social media and app stores. Furthermore, some organizations monitor access to mobile applications from devices with accessibility features or assistive technologies enabled (e.g., screen readers), which provides an estimate of users with disabilities.

Considering the quantitative study, Figure 6 shows the procedures or strategies that organizations adopt to identify or measure the benefits they obtain by investing in the delivery of accessible software and services. The method most frequently cited was NPS (Net Promoter Score), with 17 responses indicating its popularity as a tool to measure and understand user satisfaction and loyalty. Many participants also pointed out that their organization adopts monitoring strategies to follow user comments on social media or official app stores (n=12). One common strategy across organizations is to track system access by devices with accessibility services enabled, a method that 12 participants mentioned. Only one participant responded that the organization uses private channels to collect user feedback and identify accessibility concerns. On the other hand, a significant number of respondents (n=11) reported that no measurement methods were adopted, suggesting a gap in evaluating the impact of accessibility initiatives.

Some participants made remarks about their responses to perceived benefits and strategies to measure them. One particular participant who indicated only the benefit of delivering a better software product commented that "the implementation of accessibility in the company's products is still in its early stages, so we only have few surveys and metrics available". Another participant said that" We are still in a very early phase of addressing the errors identified in the accessibility audit. A strategy for changing company culture has not yet been developed, nor have metrics been established". Although those companies have included accessibility as an important requirement in their development process, many of them are still in the process of building their culture and adapting their procedures.

4.6 RQ6 - Barriers

In the qualitative study, participants identified several barriers that hinder the full development of accessible software, even when the high level management employees are committed

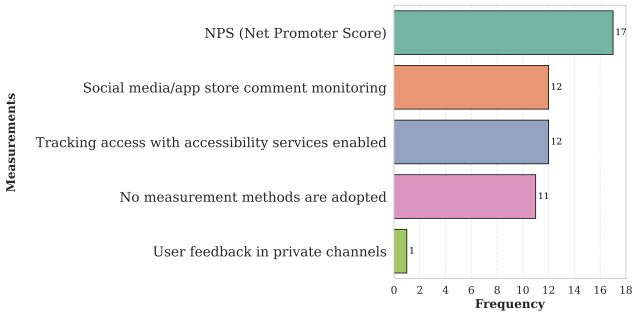

Figure 6. This chart illustrates the procedures and strategies adopted by organizations to measure the benefits obtained by investing in the development of accessible software..

to developing accessible software. The barriers identified in this study are: a) lack of accessibility awareness and knowledge among developers, testers, and stakeholders; b) lack of people with disabilities involved in the development process; c) lack of commitment and prioritization of accessibility requirements across different management levels; d) increased development costs; e) tight deadlines; f) lack of automated processes for accessibility testing; and g) legacy systems without accessibility.

Considering the quantitative study, Figure 7 presents the barriers identified by the participants that can hinder the full adoption of accessibility requirements in the development process. The barrier most frequently mentioned was the lack of awareness and knowledge among the system stakeholders, with 19 responses, followed by the lack of commitment and prioritization of accessibility requirements across the management levels, with 17 responses. Other significant barriers included difficulty with legacy systems and lack of awareness and knowledge among development teams, each with 15 responses. Furthermore, 11 respondents cited the low hiring of people with disabilities to be part of software development teams, while 8 respondents mentioned a lack of time and a lack of automated processes. Less common barriers were high costs, with four responses, and the lack of agreements between business and technical teams, with a single response.

5 Discussion

Considering our general research question concerning the reasons why organizations invest in the development of accessible software, our findings suggest that organizations make such investments due to a combination of business-driven motivations and ethical commitments to digital inclusion of people with disabilities. The business value of accessibility is supported by the fact that our findings also seem to suggest that the guidance and the investments for delivering accessible products and services originate mostly from both the tactical and the strategic layers of the organizations, backed by specific policies that ensure accessibility will be addressed since the earliest stages of the development process. Although most organizations do not systematically measure the benefits, participants reported clear business advantages of investing in the development of accessible products. However, even committed organizations face persistent barriers that can hinder meaningful progress. This study cautions against viewing accessibility as a checklist item limited to early development stages; instead, it must be seen as a core quality attribute as others (e.g. security), requiring coordinated effort across all levels of the organization.

Considering the specific research questions raised in both studies presented in this manuscript, the results obtained from the quantitative study further support the factors associated with the strategic elements of accessibility within organizations, as outlined in the qualitative study da Silveira *et al*. [2024]. The majority of participants considered the options available in each closed-ended question as sufficient to adequately express their perspectives on the matter. In fact, considering all responses, only one new factor was added in each specific question. Nevertheless, most of the emerging factors introduced by the participants are closely linked to the established factors. Following, we discuss some of our findings considering each dimension linked to the research questions, including a comparison with related work for some relevant aspects of our studies.

Accessibility demands. In addition to client demands, organizations that acknowledge the value of accessibility generally have internal policies, culture, and values that proactively establish accessibility requirements as a fundamental quality aspect of their projects. Although accessibility legislation plays an important role in this scenario, it may not be sufficient on its own to drive the adoption of accessibility in development processes. In many organizations, the accessibility culture built by hiring professionals with disabilities contributes to making the development of accessible products and services a key result.

The fact that most of the participants indicated that accessibility demands come from the strategic and tactic layers of the organizations highlights that accessibility is increasingly recognized as a priority at the highest levels of those organizations, aligning it with broader business goals and long-term visions. The relatively lower influence of operational layers suggests that the top-down approach facilitates the allocation of resources and the integration of accessibility into product and service roadmaps in some organizations. This is a different scenario found in studies with developers and designers that highlighted the lack of commitment of managers and the lack of executive support as one of the reasons accessibility is generally not implemented in many software products [Leite *et al*., 2021; Putnam *et al*., 2023].

Motivations. Our findings suggest that managers, coordinators, and directors are primarily driven by a combination of ethical, business, and regulatory factors. The strong emphasis on promoting digital inclusion and increasing brand reputation suggests a growing recognition of accessibility as a social responsibility and a way to enhance organizational reputation. This is strongly associated with motivating factors that emerge from an organizational culture in which people with disabilities are included in the management and development teams. However, organizations also appear to be motivated by competitive advantage and the acquisition of a larger user or client base, emphasizing the strategic business value of accessibility.

Compliance with laws remains a significant driver, though it does not seem to be the primary motivator, indicating that organizations are moving beyond legal obligations to em-

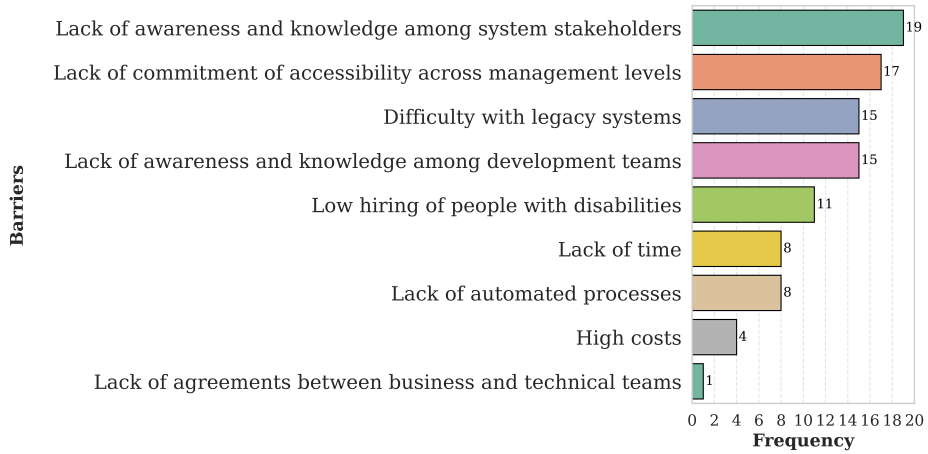

Figure 7. This chart illustrates the barriers organizations face, from a management point of view, to adopt accessibility in their development process.

brace accessibility as a core component of their operations. Although this is a positive evolution of organizations' view on accessibility, recent advances in accessibility legislation can change the landscape of motivations for many organizations, such as the publication of *ABNT NBR 17225 - Digital Accessibility for the Web*, which may be used as a reference for the Brazilian Law of Inclusion (LBI, n. 13.146/2015).

Furthermore, improving software quality and consequently increasing user satisfaction are not primary drivers, even though it is a common outcome when accessibility is considered. This further highlights strategic commitments with promoting digital inclusion regardless of the other motivations. The product differentiation strategy mentioned by one participant indicates an understanding of competitive advantage factors. In fact, according to Porter [2008], product differentiation is a common strategy to gain competitive advantage by building products with unique features or attributes that make them distinguishable from other products. In this context, offering products with accessibility features distinguishes them significantly, as most similar products may not incorporate such features.

Policies. Our results indicate that organizations adopt a combination of strategies that are associated with both proactive and structural approaches. The emphasis on including people with disabilities in development teams, the factor most indicated by the participants of this study, integrating accessibility into the definition of done (DoD), and the definition of clear accessibility evaluation activities and requirements reflect a commitment to incorporating accessibility into organizational workflows and decision-making processes. Such policies are complemented by important measures, although less frequently mentioned, such as the constant monitoring of user needs and requirements and providing professionals with adequate training.

It seems that most organizations understand that building a strong accessibility culture and well-defined processes are key to sustain other organizations' decisions toward the development of accessible products, such as defining guidelines to manage purchases or hiring third-party software that also favors accessibility.

The fact that only a small number of participants pointed out that their organizations lack accessibility policies in their development processes indicates that those organizations that emphasize accessibility recognize the importance of implementing top-down strategies. This ensures uniform adherence across the organization, regardless of individual development teams or project peculiarities. One particular participant indicated that the organization has no specific accessibility policy but also mentioned that the organization is currently formulating specific guidelines in this area.

Benefits. According to the responses of the participants, the benefits obtained with investments in the development of accessible software are in line with the motivations. The motivations mentioned most by the participants are to promote digital inclusion, increase brand reputation, and increase user base, while the most indicated benefits are stronger brand reputation, better software quality, and increased digital inclusion. These benefits align with both ethical and business objectives, demonstrating the dual value of accessibility and a growing recognition of accessibility as a driver of both social impact and business success. Although achieving better quality software was indicated by only nine participants as a motivation to invest in accessibility, they recognize that they produce not only software with better accessibility but also with better usability, which increases user satisfaction and leads to fewer user complaints, also benefits indicated by participants.

However, while participants indicated that achieving a larger client and user base was a primary motivator, this benefit was only observed by 12 participants. In addition, the lower frequency of perceived benefits such as cost reduction and market expansion suggests that some organizations may not yet fully recognize or measure the financial and strategic advantages of accessibility, indicating a potential gap in understanding or quantifying its economic value. Only three participants mentioned that no benefit was perceived.

A particular respondent added a new benefit that was not in the original list of options in the closed-ended question of our survey. This participant added a remark that one of the benefits they perceive is that their approach on adopting accessibility in the development process has impacts on other organizations' cultures and processes. In fact, many organizations that are leaders in technology investment and development play an important role in the software develop-

ment ecosystem, advocating for best practices and steering the market towards innovative approaches, including accessibility adoption.

An interesting result of this investigation is that, while only a few participants of our previous study said that their organization has a formal strategy to measure the impact of accessibility adoption, many participants in this new study indicated at least one method to collect this type of information. Many organizations rely on established methods to collect user feedback, such as NPS. However, some organizations invest in monitoring strategies to track users who access their systems with accessibility features enabled and to monitor social media conversations about their products. The widespread use of NPS and social media monitoring reflects a focus on user-centric metrics, which are valuable to understand the immediate impact of accessibility on user satisfaction and public perception.

A significant number of participants mentioned that their organization does not adopt any method to formally measure the benefits obtained from their investment in accessibility, suggesting that they might be missing an opportunity to quantify and communicate the value of accessibility initiatives. Furthermore, although many participants indicated that they use at least one strategy to minimally understand the impact of their investments in accessibility, given the many motivations that drive accessibility adoption and perceived benefits, we expected that participants would indicate many other methods. In that sense, our perception is similar to our perception in our previous study: a notable portion of organizations do not systematically measure these benefits at all. However, without a systematic evaluation, organizations can struggle to justify the continued investment in accessibility or identify areas for improvement. On the other hand, according to our previous study [da Silveira *et al*., 2024], organizations invest in accessibility based on our social responsibility and aim to provide their users and customers with better products and services, therefore measuring specific business advantages brought about by their strategy is not a priority for them.

Barriers. Our findings indicate that, even in organizations committed to the development of accessible products and services, accessibility adoption is not seamless. The main barriers pointed out by the participants to adopting accessibility requirements are rooted in organizational culture, awareness, and knowledge gaps, particularly between stakeholders and management. One particular participant mentioned a barrier that was not previously listed in the close-ended questions of our survey (cf. Appendix B): lack of agreements between the business and technical teams, suggesting that, for some projects, the business team pushes for accessible projects while the technical team lacks the appropriate knowledge and skills, while for others, the technical team is prepared to deliver accessible products, but some of them do not have explicit accessibility requirements, thus not allocating enough resources to incorporate all essential accessibility practices. In that sense, it seems that complete accessibility integration can only be possible if, in fact, policies and standards are defined by executive management layers as a key strategy for the organization.

Comparison with related work. Many studies have explored factors that influence the adoption and the implementation of accessibility requirements in the software development process, with a focus on designers and developers, and on the barriers that may hinder incorporating accessibility into digital products. One of the main contributions of this paper is to address motivations and policy-making strategies that drive organizations to invest in the development of accessible products. When it comes to existing literature, even studies that explore such factors, most participants are designers and developers, while in our study we focused on professionals that are involved in the decision-making process concerning accessibility in the organization. In that sense, following we discuss our findings considering the related work with respect to two dimensions of accessible development: motivations and benefits that drive organizations to invest in accessibility, and policies or strategies adopted to ensure that the accessibility goals are met.

Table 3 presents a comparative analysis of the motivations and benefits for adopting web accessibility, synthesizing findings from the current study alongside previous literature. It shows, for each identified factor, the number of related studies that have also reported it and the corresponding references. Overall, our findings provide an overview of which motivations are already well documented and where the current study contributes new or less explored perspectives.

Among the most commonly cited motivations, promoting digital inclusion stands out as the most recognized driver, appearing in seven studies. This indicates a strong and consistent emphasis on the ethical and social imperative of making digital products accessible to all users. Compliance with legislation is also highly cited, found in six studies, reflecting the influence of legal and regulatory frameworks in driving accessibility practices. Other relatively well-established factors include organizational culture (five studies), increasing the user base (four studies), and improving software or product quality (also four studies). These highlight that beyond ethical and legal imperatives, accessibility is often integrated into broader strategic and quality-oriented goals within organizations.

There are some less frequently mentioned motivations and benefits, which may be considered either novel or underexplored in the literature. Competitive or business advantage is cited in only one study in addition to ours, suggesting that the strategic positioning of accessibility has received limited attention. On the other hand, many other motivations and benefits identified by other studies are strongly related to competitive advantage, such as increasing user base and brand reputation, but in many cases researchers or participants of related studies does not explicitly mentioned this particular aspect of investing in accessibility. Other moderately rare motivations include increasing brand reputation and personal reasons, each mentioned in three studies, as well as user-specific demands and cost reduction, found in two studies each. Product differentiation was mentioned in a single study. These are somewhat recognized but not consistently reported across the literature. In addition, some important motivations and benefits, such as improved user satisfaction, increased productivity, and market expansion, are not mentioned in any of the related studies reviewed.

In addition to motivations and perceived benefits, strategies and policies to ensure accessibility goals are met are one of the

Table 3. Motivations and benefits identified in this study compared to related work. First column shows the factor, second column show the number of studies that identified the same factor, and third column shows the references of the related work.

Motivations and benefits	N	Related work
Promote digital inclusion	7	[Vollenwyder *et al*., 2019; Yesilada *et al*., 2012; Andrés *et al*., 2010; Velleman *et al*., 2015; Pichiliani and Pizzolato, 2019; Leitner *et al*., 2016; Leite *et al*., 2021]
Compliance with legislation	6	[Vollenwyder *et al*., 2019; Yesilada *et al*., 2012; Andrés *et al*., 2010; Velleman *et al*., 2015; Pichiliani and Pizzolato, 2019; Leite *et al*., 2021]
Organizational culture	5	[Vollenwyder *et al*., 2019; Andrés *et al*., 2010; Velleman *et al*., 2015; Pichiliani and Pizzolato, 2019; Leite *et al*., 2021]
Increasing user base	4	[Vollenwyder *et al*., 2019; Andrés *et al*., 2010; Pichiliani and Pizzolato, 2019; Leite *et al*., 2021]
Higher software/product quality	4	[Vollenwyder *et al*., 2019; Yesilada *et al*., 2012; Andrés *et al*., 2010; Leitner *et al*., 2016]
Increasing brand reputation	3	[Andrés *et al*., 2010; Leitner *et al*., 2016; Leite *et al*., 2021]
Personal reasons	3	[Pichiliani and Pizzolato, 2019; Leitner *et al*., 2016; Leite *et al*., 2021]
User-specific demands	2	[Vollenwyder *et al*., 2019; Andrés *et al*., 2010]
Cost reduction	2	[Andrés *et al*., 2010; Velleman *et al*., 2015]
Product differentiation	1	[Leitner *et al*., 2016]
Competitive/Business advantage	0	
Improved user satisfaction	0	
Increased productivity	0	
Market expansion	0	
Impact on other organizations	0	

Table 4. Policies and strategies identified in this study compared to related work. First column shows the factor, second column show the number of studies that identified the same factor, and third column shows the references of the related work.

Policies/Strategies	N	Related work
Management support and commitment	2	[Velleman *et al*., 2015; Parker and Velasco, 2022]
Investment in accessibility training	1	[Parker and Velasco, 2022]
Procurement policies	1	[Velleman *et al*., 2015]
Inclusion of people with disabilities	1	[Parker and Velasco, 2022]
Well-defined evaluation processes	1	[Parker and Velasco, 2022]
Requirements in the DoD	0	
Accessibility validation of all artifacts	0	
Active user monitoring (surveys, app reviews, social media)	0	
Management approval required for non accessible features	0	

main contribution of this paper, showing that the development of accessible products heavily depends on high level management commitment. Few studies address accessibility in the software development from this point of view as they mostly focus on technical practices such as the usage of frameworks, tools, techniques, and so forth. Therefore, we compare our findings with results obtained in related work that focus on organizational aspects rather than technical aspects. Table 4 presents a comparative overview of the policies and strategies identified in our study in relation to related work.

The first four rows correspond to factors already reported in earlier studies. For instance, management support and commitment have been highlighted in two previous works [Velleman *et al*., 2015; Parker and Velasco, 2022]. Similarly, investment in accessibility training, the inclusion of people with disabilities in the development process, and the presence of well-defined evaluation processes are each acknowledged in at least one prior study [Parker and Velasco, 2022]. Additionally, procurement policies that consider accessibility when outsourced software needs to e acquired were discussed in previous study[Velleman *et al*., 2015].

In contrast, four out of the strategies identified in our study were not reported in the related work reviewed, such as including accessibility requirements in the Definition of Done (DoD), conducting accessibility validation across all development artifacts, active user monitoring through surveys, app reviews, or social media, and requiring management approval for releasing features that are not accessible. These findings represent a contribution of this study and expand the current understanding of how accessibility can be promoted within the development processes with policies that comes from middle and upper management. One important observation is that some related studies mention the fact that accessibility requirements must be collected, but they do not mention, for instance, that they must be in the Definition of Done criteria. In addition, studies that mention the importance of collecting accessibility requirements do not refer to policies in which all derived artifacts must be validated by accessibility teams. Such measures are more strict policies than requirements elicitation tasks, which will ensure that accessibility requirements are in fact implemented and evaluated thorough the whole development process. One policy mentioned in both related studies [Velleman *et al*., 2015; Parker and Velasco, 2022] that was not identified in our study is the policy to clearly assign roles of who is responsible for achieving the accessibility goals of the organization in each step of the development process.

5.1 Limitations

This study has some limitations that should be considered when interpreting the results. First, the results based on a sample size of 31 participants for a quantitative analysis may not be generalizable. The relatively small number of respondents restricts the ability to perform more robust statistical analyses or identify trends, including cross analysis between factors and variables. Nevertheless, quantitative information from this study further confirmed the factors identified in the qualitative study. In addition, all participants are Brazilian and are based in Brazil, which means the results may reflect country-specific cultural, regulatory, and organizational contexts. Accessibility practices and priorities in Brazil may differ from those in other regions, limiting the applicability of the findings to a broader audience.

Second, the study relied on self-reported data from participants in both studies, which introduces the possibility of response bias. For instance, participants may have focused on specific factors that are more closely related to recent experiences, overlooking other important aspects. Furthermore, even though the survey design was based on our prior study, it may not have captured all relevant factors or nuances associated with the strategic views of accessibility in organizational contexts.

Finally, most participants come from the following contexts: specific sectors (e.g., Technology, Finance/Banking) and large organizations (100+ employees), which may not fully represent the diversity of professionals and organizations. This may limit the ability to generalize the findings to smaller organizations' sectors, which often face challenges such as limited resources or expertise, or have different operational scenarios, values, and priorities. Nevertheless, regardless of the characteristics of the organizations, the purpose of this study is to characterize the potential benefits investing in accessibility can bring to organizations.

6 Concluding remarks

This paper outlined the results of an investigation based on both qualitative and quantitative study conducted with professionals involved in the decision-making process on the adoption of accessibility in digital products and services within organizations. This study involved participants who completed an online survey that was devised based on factors associated with the strategic business view of accessibility. These factors were identified from 15 interviews conducted with managers, coordinators, directors, and accessibility experts from organizations committed to creating accessible products and services [da Silveira *et al*., 2024].

Our findings from both the qualitative and quantitative study are consistent as few participants suggested new factors when responding to our questionnaire, and most suggestions were strongly related to the already established factors. In that sense, this study was key to improving our understanding of the business value of accessibility in the sense that it adds both qualitative and quantitative information, highlighting the most relevant factors according to the perspectives of participants.

In summary, to answer our general question of why organizations invest in the development of accessible products, considering also the surrounding factors, our results show that organizations investing in accessible software are often driven by strategic or tactical layers decisions, initiated by internal policies or culture, and client demands. The main motivations that drive these organizations are to promote digital inclusion, improve brand reputation, and expand the user base for competitive advantage and compliance with accessibility legislation. Policies to integrate accessibility in the development process mostly involve hiring people with disabilities, defining clear processes and responsibilities, and setting accessibility requirements and validation as mandatory goals in the definition of done of the planned features.

The participants highlighted many benefits obtained from investments in accessibility, with an emphasis on a stronger brand reputation, better software quality, increased digital inclusion, and improved user satisfaction, all closely related to user-centric values. Most organizations use NPS surveys and monitoring strategies to formally measure the benefits of their investments in accessibility, suggesting a lack of more formal measures to track many other indicators associated with other benefits mentioned by users. Despite the clear business importance of accessibility, the participants mentioned some barriers to accessibility adoption, mostly related to lack of awareness, knowledge, commitment, and participation of people with disabilities in development teams.

In future projects, our intention is to execute in-depth case studies focusing on organizations that notably adopt accessibility in software development investments. These studies aim to provide a more detailed understanding of the complex challenges and nuances associated with accessibility efforts in diverse organizational settings. Furthermore, utilizing insights from these investigations, we plan to formulate best-practice guides designed for organizations seeking to integrate accessibility into their development workflows.

Declarations

Authors' Contributions

MME is the main contributor and lead author of this manuscript, responsible for conceptualization, methodology, data collection, result analysis, and discussion of the findings. LAS contributed to conceptualization, methodology, data collection, discussion of the results, and manuscript review. IFM contributed to conceptualization, data collection, discussion of the results, and manuscript review. GB contributed to data collection, discussion of the results, and manuscript review. WA contributed to conceptualization, discussion of the results, and manuscript review. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

The datasets generated and analyzed during the current study will be made available upon request.

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A Inverview script

The following questions should guide the semi-structured interviews with the participants in this study. Questions to collect demographic data are not presented.

1. Is the proposal to develop accessible software initiated by the organization, or is it driven by customer or user demands?
2. If it originates from the organization, does the need to develop accessible software stem from the more strategic, tactical, or operational layers of the organization?
3. If the organization adopts any accessibility standards or guidelines, can you mention which ones they are?
4. What are the main motivations for developing accessible software from the organization's perspective?
5. What are the development policies and governance adopted to ensure the delivery of accessible products?
6. What benefits have the organization obtained so far from investing in the development of accessible software?
7. Has developing accessible software indeed brought a competitive advantage to the organization?
8. Has developing accessible software indeed increased the number of users of your systems?
9. Can you identify other benefits of developing accessible software beyond those related to business values and competitive advantages?
10. Is there a formal strategy for measuring the return on investment in developing accessible software? If yes, what are they, and what have been the results?
11. What are the main barriers to developing accessible software from the organization's perspective?

B Online questionnaire

B.1 Initial validation

1. Informed Consent

[ ] Yes, I have read the Informed Consent Form and agree to participate in the research. *(Continue to Question 2)*
[ ] No, I do not wish to participate in the research. *(Skip to Section 4 - End)*

2. Target Audience Validation By selecting "YES" below, you confirm that you have read and understood all information provided in the Informed Consent Form and agree to participate in the research as described.

[ ] Yes *(Continue to Question 3)*
[ ] No *(Skip to Section 4 - End)*

B.2 Demographic Information

3. What is your age?

[ ] 18 to 29 years
[ ] 30 to 39 years
[ ] 40 to 49 years
[ ] 50 to 59 years
[ ] 60 to 69 years
[ ] 70 years or older

4. Do you have a disability?

[ ] Yes
[ ] No

5. If you have a disability, please specify: (Select all that apply)

[ ] Visual
[ ] Auditory
[ ] Physical
[ ] Motor
[ ] Mental/Intellectual
[ ] Other: _____

6. What is your job title or role in your organization? (Select one)

[ ] Technical Team Leader
[ ] Quality Leader
[ ] Accessibility Leader
[ ] Accessibility Specialist
[ ] Project Manager
[ ] Product Manager
[ ] Engineering Manager
[ ] Systems Manager
[ ] Architecture Manager
[ ] Design Manager
[ ] Testing Manager
[ ] Operations Manager
[ ] Usability/User Experience Manager
[ ] IT Superintendent
[ ] Engineering Superintendent
[ ] Systems Superintendent
[ ] Development Coordinator
[ ] Design Coordinator
[ ] Accessibility Coordinator
[ ] Director
[ ] CTO (Chief Technology Officer)
[ ] CEO (Chief Executive Officer)
[ ] CPO (Chief Product Officer)
[ ] VP of Engineering
[ ] VP of Product
[ ] Product Owner
[ ] Other: _____

7. At which management level do you operate?

[ ] Operational: Focused on day-to-day activities, ensuring tasks and processes are executed efficiently and on time.
[ ] Tactical: Responsible for implementing medium-term plans and objectives, connecting daily operations to strategic goals.
[ ] Strategic: Focused on long-term planning, defining goals and overall directions for the organization, ensuring market adaptability and sustainable growth.

8. How many years have you been in leadership or management roles (including past experiences)?

[ ] Less than 1 year
[ ] 1 to 2 years
[ ] 3 to 5 years
[ ] 6 to 9 years
[ ] 10 years or more

9. How many people do you manage, lead, or coordinate within your organization (including indirect reports)?

[ ] 1 to 5 people
[ ] 6 to 10 people
[ ] 11 to 20 people
[ ] 21 to 49 people
[ ] 50 to 99 people
[ ] More than 100 people

10. What is the industry sector of your organization? (Select one)

[ ] Agriculture & Livestock
[ ] Food & Beverage
[ ] Commerce
[ ] Communication & Marketing
[ ] Construction
[ ] Accounting
[ ] Education
[ ] Energy
[ ] Events
[ ] Finance/Banking
[ ] Games & Entertainment
[ ] Logistics
[ ] Environment
[ ] Health & Wellness
[ ] Technology
[ ] Textile
[ ] Other: _____

11. How many employees work in your organization?

[ ] 1 to 9
[ ] 10 to 49
[ ] 50 to 99
[ ] 100 or more

12. What types of digital products/services does your department develop or maintain? (Select all that apply)

[ ] Web applications/pages
[ ] Mobile applications (iOS, Android)
[ ] Desktop applications
[ ] Web-based customer service channels
[ ] Chatbot customer service channels
[ ] Multimedia content (audio, video, images, animations, etc.)
[ ] Other: _____

B.3 The strategic role of accessibility

13. What drives the development of accessible software in your organization? (Select all that apply)

[ ] Client demands
[ ] Internal organizational policies or culture
[ ] Accessibility laws and regulations
[ ] Other: _____

14. If accessibility is internally mandated, at which level does this demand originate? (Select all that apply)

[ ] Operational
[ ] Tactical
[ ] Strategic

15. [Optional] Any additional comments on your answers to the last two questions?

_____
_____
_____

16. Which accessibility guidelines or standards does your organization use? (Select all that apply)

[ ] None
[ ] WCAG - Web Content Accessibility Guidelines
[ ] eMAG - Brazilian Government Accessibility Model
[ ] NBR 17060:2022 (Brazilian Accessibility Standard for Mobile Apps)
[ ] Platform-specific guidelines (Android, iOS)
[ ] GAIA - Autism Accessibility Guide
[ ] EAA - European Accessibility Act
[ ] BBC Mobile Accessibility Guide
[ ] Section 508 (U.S. Rehabilitation Act)
[ ] Internally developed guidelines
[ ] Other: _____

17. What are the primary motivations for investing in accessible software development? (Select all that apply)

[ ] Promote digital inclusion
[ ] Compliance with national/international accessibility laws
[ ] Competitive advantage
[ ] Increasing brand reputation
[ ] Increasing user base
[ ] Organizational culture
[ ] User-specific demands
[ ] Personal reasons
[ ] Higher software quality
[ ] Improved user satisfaction
[ ] Increased productivity through simplified interfaces
[ ] Other: _____

18. [Optional] Additional comments on motivations for accessibility?

_____
_____
_____

19. What policies/measures does your organization adopt to ensure accessibility? (Select all that apply)

[ ] None
[ ] Accessibility requirements included in the Definition of Done (DoD)
[ ] Accessibility validation required for all functionalities
[ ] High level management approval required for integration of non-accessible features
[ ] Investment in accessibility training
[ ] Procurement policies favoring accessible products
[ ] Inclusion of people with disabilities in development teams
[ ] Well-defined accessibility evaluation processes
[ ] Accessibility checkpoints in intermediate artifacts
[ ] Active user monitoring (surveys, app reviews, social media)
[ ] Other: _____

20. [Optional] Additional comments on accessibility policies?

_____
_____
_____

21. What benefits has your organization observed from investing in accessibility? (Select all that apply)

[ ] None
[ ] Increased user base
[ ] Fewer user complaints
[ ] Improved user satisfaction
[ ] Stronger brand reputation
[ ] Cost reduction (e.g., fewer in-person services)
[ ] Better software quality
[ ] Market expansion (international compliance)
[ ] Increased digital inclusion
[ ] Other: _____

22. [Optional] Additional comments on accessibility benefits?

_____
_____
_____

23. How does your organization measure ROI on accessibility investments? (Select all that apply)

[ ] No measurement methods are adopted
[ ] NPS (Net Promoter Score)
[ ] Social media/app store comment monitoring
[ ] Tracking system access with accessibility services enabled
[ ] Other: _____

24. [Optional] Additional comments on measuring accessibility ROI?

_____
_____
_____

25. What are the main barriers to adopting accessibility in software development? (Select all that apply)

[ ] Lack of awareness and knowledge among development teams
[ ] Lack of awareness and knowledge among system stakeholders
[ ] Lack of commitment and prioritization of accessibility requirements across management levels
[ ] Low hiring of people with disabilities to be part of software development teams
[ ] High costs
[ ] Lack of time
[ ] Lack of automated processes
[ ] Difficulty with legacy systems

B.4 End of survey

Thank you for your valuable contribution to this study.