Italian Developers and Accessibility: An Overview at the Dawn of the 2020s

Antonio Giovanni Schiavone

Commissione di Vigilanza sui Fondi Pensione, Piazza Augusto Imperatore 27, 00186 Rome, Italy
agschiavone77@gmail.com
ORCID: 0000-0003-2481-5389

Abstract

In the contemporary Information Society, digital accessibility plays a crucial role in fostering inclusivity and ensuring equitable access to information and services. Despite the passage of nearly two decades since the enactment of the Stanca Act, a substantial proportion of websites in Italy remain non-compliant with accessibility standards. This study explores the relationship between Italian developers and digital accessibility, emphasizing the ongoing relevance of this issue in the context of the legislation's 20-year legacy. Through a survey involving 300 developers, the findings reveal a limited understanding of accessibility principles. Developers expressing an interest in accessibility frequently encounter barriers, such as perceived resistance from clients or organizational leadership. Nonetheless, the survey also highlights a prevailing positive attitude, with participants expressing a strong willingness to enhance their expertise through free online resources and practical case studies. This study provides valuable insights into the perceptions and challenges faced by developers, underscoring the critical need for targeted educational initiatives to foster a cultural shift toward inclusive digital design practices.

Keywords: Web Accessibility; Exploratory Survey; Developers; Perception; Stanca Act

1. Introduction

For decades, the World Wide Web has been an indispensable tool, revolutionizing how individuals engage with business, education, government, and countless other services. Web technologies have facilitated the emergence of a vast ecosystem of platforms, accessible virtually anytime and anywhere, profoundly reshaping daily activities.

The transformative potential of digital technologies is particularly significant for individuals with disabilities. By leveraging digital platforms, these users can access unprecedented opportunities, overcoming barriers that might otherwise hinder their full participation in society. Acknowledging this potential, numerous nations have enacted legislation to ensure the accessibility of web applications, often covering both public and, in certain cases, private sectors [1].

In Italy, this commitment was formalized in 2004 with the introduction of Law 4/2004, commonly referred to as the “Stanca Act” [2]. Designed to improve access to information technologies for individuals with disabilities, the Act required all public administrations and certain private entities to ensure their websites and web applications adhered to accessibility standards. Initially, compliance was measured against proprietary guidelines; however, subsequent revisions aligned the Act with international standards, specifically WCAG 2.1 Level AA.

Despite being in force for nearly 20 years, the effectiveness of the Stanca Act remains a subject of concern. Numerous studies have consistently shown that websites of Italian public administrations frequently fail to achieve full accessibility and do not adhere to the mandated guidelines [3][4][5][6][7]. Accessibility issues have been widely documented across websites of universities, municipalities, and other institutions, revealing a persistent gap between legislative intent and practical implementation.

While these studies have successfully categorized and analyzed technical accessibility issues, they have not addressed the underlying causes or identified those responsible for this neglect of legal obligations. Understanding the motivations - or lack thereof - behind non-compliance is critical to advancing accessibility practices.

To bridge this gap, we directed our focus toward web developers: the professionals responsible for the technical design and implementation of web platforms. This investigation aims to explore the role developers play in achieving - or failing to achieve - web accessibility. It seeks to clarify their awareness, priorities, and the challenges they face in incorporating accessibility into their workflows. Questions surrounding the adequacy of their professional training, the obstacles encountered in daily practice, and their familiarity with accessibility evaluation tools and methodologies remain largely unanswered.

This study provides a detailed examination of accessibility awareness among Italian web developers. By analyzing their perceptions, practices, and challenges, we aim to uncover critical issues impeding progress and propose actionable solutions to strengthen the relationship between web development and accessibility.

2. Related Work

The exploration of accessibility perceptions among individuals involved in website development and management has been a recurring topic in research.

In 2004, Lazar et al. [8] conducted a comprehensive survey targeting webmasters, primarily in the United States, to understand why many websites lacked accessibility. The findings were notably optimistic: a significant proportion of participants reported familiarity with WCAG guidelines, prior experience developing accessible websites, and knowledge of accessibility evaluation tools. However, these results might represent an exceptionally favorable case, potentially influenced by sample selection bias.

Research on accessibility awareness has also been extensively conducted in Brazil. A foundational study by Tangarife et al. [9] in 2004 surveyed 68 participants, revealing that over 80% were unaware of accessibility laws in Brazil. While half of the respondents had heard of accessibility evaluation tools, only 18% had used them, and a mere 13% had developed an accessible website. Although this study offered an initial view of web accessibility in Brazil, its developer-focused representation was limited and drawn exclusively from the researchers' network.

Building on this, Freire et al. [10] conducted a larger survey with 613 participants in Brazil to compare accessibility perceptions across academia, industry, and government sectors. The study found significant gaps in awareness: 29.7% of industry respondents, 42.9% of government respondents, and 41.7% of academia participants had no knowledge of WCAG. Adoption of accessibility evaluation guidelines was similarly low, with only 15%, 9%, and 11% of respondents in industry, academia, and government, respectively, employing such methods. The study highlighted systemic deficiencies in accessibility training, particularly in academic and governmental contexts.

More recently, Antonelli et al. [11] surveyed Brazilian web development professionals, reporting that 13.9% had developed accessible websites, 34.4% had partially done so, and 51.7% had never addressed accessibility. Accessibility was not a client requirement for 51.5% of respondents, nor an organizational priority for 50%, underscoring key obstacles. Among those who considered accessibility, the most common focus was on visual impairments (86.2%), with far less attention given to neurological/cognitive disabilities (12.8%) and speech disabilities (5.1%).

Further investigations, such as the study by Pichiliani et al. [12] in 2019, targeted 105 Brazilian developers, identifying organizational barriers, challenges in understanding cognitive disabilities, and gaps in accessibility knowledge as key hindrances. This study reinforced the persistent lack of accessibility awareness, particularly concerning cognitive disabilities.

Outside of Brazil, Durdu et al. [13] examined accessibility perceptions among 108 participants from Turkish academia, industry, and government in 2020. The study highlighted that software professionals preferred inclusive definitions of accessibility, linking it to usability and user experience (UX). However, practical familiarity with accessibility standards and evaluation methods remained limited.

Similarly, Inal et al. [14] surveyed 167 UX professionals from Scandinavian countries (Denmark, Finland, Norway, and Sweden). Their findings indicated that while organizations acknowledged the importance of accessibility and

incorporated it into projects, dedicated time and familiarity with guidelines were insufficient, highlighting a gap between intent and execution.

Although several Italian studies have evaluated the technical accessibility of public-sector websites, to the best of our knowledge no prior work has explored Italian developers' perceptions of accessibility. We therefore position our survey as the first national inquiry targeting practitioners rather than artefacts, thereby complementing audit-oriented studies.

3. Experiment design and conduction

As outlined earlier, this research aims to conduct an exploratory study to uncover the reasons behind the persistent lack of web accessibility on Italian websites. To achieve this, we designed an online survey to gather insights into the awareness and practices of Italian web developers regarding accessibility and how they incorporate it into their projects.

The survey method is a widely used approach for collecting data on the characteristics, behaviors, or opinions of specific groups representative of a target population. Online surveys are well-suited for efficiently gathering a large volume of responses from geographically dispersed participants, making them ideal for this study.

The data collected through our survey provided valuable insights into the current profile of the web developer community in Italy, their relationship with accessibility, their knowledge levels, and the key obstacles hindering the effective integration of accessibility into their projects. These findings will inform the development of targeted strategies to address these challenges and support developers in creating more accessible digital applications.

To contextualize the survey results, it is important to clarify the scope of the term "Italian" as applied to the participants. Given our objective of exploring the relationship between developers and accessibility, we adopted an inclusive definition. This definition included developers of Italian nationality, regardless of whether they work in Italy or abroad, as well as foreign developers primarily working in Italy. This broader interpretation reflects the diverse composition of the developer community contributing to Italy's digital ecosystem.

3.1. Questionnaire design

In conventional surveys, data collection relies on a structured series of questions designed to explore specific facets of the target population's characteristics, behaviors, or perceptions. Questionnaires, a cornerstone of survey-based research methodologies, are crafted to present these queries in a standardized and consistent manner, ensuring the reliability and comparability of the responses.

For this study, we developed a questionnaire encompassing a broad range of topics related to web accessibility. The questions addressed key areas such as familiarity with accessibility guidelines, use of evaluation tools, awareness of national legislation, and the approaches developers use to acquire training and stay updated on accessibility developments. The design of the questionnaire balanced technical inquiries with broader considerations of accessibility's societal implications, ensuring a comprehensive examination of the subject.

Table 1. Inquiries pertaining to the demographic and professional details of the participants.

	Question	Prerequisite	Question type	Max Answers
Q1	What is your gender?	None	Closed	1
Q2	How old are you?	None	Open	1
Q3	What is your nationality?	None	Closed	1
Q4	Do you have any type of disability?	None	Closed	1
Q5	In which Italian Region do you live?	None	Closed	1
Q6	What is your educational background?	None	Open with suggestions	1

Q7	In which academic discipline does your Bachelor's degree fall?	University education in Q6	Open with suggestions	1
Q8	How many years have you been working as a developer?	None	Closed	1
Q9	What type of company/organization are you currently employed by?	None	Open with suggestions	1
Q10	How many employees does your company/organization have?	None	Closed	1
Q11	Specify the nature of your contract	None	Open with suggestions	1
Q12	What proportion of your working hours is dedicated to coding?	None	Closed	1
Q13	What type of developer are you?	None	Open with suggestions	1
Q14	What programming languages do you primarily use?	None	Open with suggestions	5
Q15	What CMS/LMS do you primarily use?	None	Open with suggestions	5
Q16	Any other technologies you commonly use?	None	Open with suggestions	Unlimited

Our questionnaire is organized into two distinct phases of inquiry. The first section consists of 16 questions designed to gather information about participants' demographic characteristics and professional backgrounds. Most of the questions in this phase follow a linear structure, with all participants answering each question except for Q7, which was specifically directed at respondents who, in the preceding question (Q6), indicated having attained a university-level education.

The questions in this section utilize various formats, including closed questions (e.g., Q1), entirely open-ended questions (e.g., Q2), and open-ended questions supplemented with suggested responses (e.g., Q12).

Table 1 summarizes the questions from this phase, detailing their formats and any conditional prerequisites.

The second section of the questionnaire focuses on the relationship between the interviewed developer and web accessibility. It explores their knowledge of national accessibility legislation, familiarity with key guidelines in the field, and use of common automated validation tools. This section also examines participants' previous experiences in developing accessible websites and the training methods they employ to stay updated on accessibility practices.

Unlike the linear structure of the first section, this part of the survey follows a decision-tree format, where the presentation of certain questions depends on responses to previous ones. For example, a negative response to question Q25 skips questions Q26 and Q27, while question Q19 serves as a decision point, directing participants either toward the sequence beginning with question Q20 or to the branch starting with question Q32.

As in the first section, the questions here vary in format, including closed questions (e.g., Q17), entirely open-ended questions (e.g., Q36), and open-ended questions accompanied by suggested responses (e.g., Q18).

Table 2 summarizes the questions of this section, outlining their formats and any conditional pathways.

Table 2. Inquiries pertaining to the relationship between developers and accessibility.

	Question	Prerequisite	Question type	Max Answers
Q17	Do you know the 'Stanca Act'?	None	Closed	1
Q18	Why didn't you apply the Stanca Act provisions?	Knowledge but limited or no application in Q17.	Open with suggestions	3
Q19	Have you ever heard about the topic of Accessibility?	None	Closed	1
Q20	How did you come across the accessibility topic?	Basic, good, or excellent knowledge in Q19.	Open with suggestions	1
Q21	How did you primarily delve into the accessibility topic?	Basic, good, or excellent knowledge in Q19.	Open with suggestions	3
Q22	Which accessibility guidelines/specifications are you familiar with?	Basic, good, or excellent knowledge in Q19.	Open with suggestions	Unlimited

Q23	Which assistive technologies are you familiar with?	Basic, good, or excellent knowledge in Q19.	Open with suggestions	Unlimited
Q24	In your view, which professional role bears the primary responsibility for the accessibility of software/web applications?	Basic, good, or excellent knowledge in Q19.	Open with suggestions	Unlimited
Q25	Have you ever developed accessible software/web application?	Basic, good, or excellent knowledge in Q19.	Closed	1
Q26	What disabilities have you primarily considered in the development?	Yes in Q25.	Open with suggestions	Unlimited
Q27	What are the major challenges in developing accessible products?	Yes in Q25.	Open with suggestions	5
Q28	Have you ever assessed the accessibility of software/web application?	Basic, good, or excellent knowledge in Q19.	Closed	1
Q29	What methodologies have you used to conduct the assessment?	Yes in Q28.	Open with suggestions	Unlimited
Q30	Which automated tools for assessing accessibility (Validators) are you acquainted with?	Yes in Q28.	Open with suggestions	Unlimited
Q31	How can we encourage developers to embrace the accessibility topic?	Basic, good, or excellent knowledge in Q19.	Open with suggestions	Unlimited
Q32	In your opinion, what does the term "accessibility" encompass in the field of computer science?	Limited or no knowledge in Q19.	Closed	1
Q33	Do you believe that in the near future you might become interested in the development of accessible products?	Limited or no knowledge in Q19.	Closed	1
Q34	What could motivate you to delve into the accessibility topic?	Yes in Q33.	Open with suggestions	5
Q35	Why aren't you interested in the topic of accessibility?	No in Q33.	Open with suggestions	5
Q36	Feel free to share any additional thoughts you have on the topic of accessibility	None	Open	1

3.2. Procedure

The survey was conducted between May and July 2020, i.e., in the interval between the first and second COVID-19 waves in Italy. Recruitment followed a targeted convenience strategy, supplemented by limited peer forwarding.

Invitations were disseminated through three channels:

- Brief announcements at conferences devoted to accessibility;
- Direct e-mails to individuals who had previously joined accessibility initiatives led by the authors;
- Posts in Italian-language Facebook groups dedicated to specific programming languages and frameworks (PHP, JavaScript, Java, Python, Angular, Laravel, and others).

The last channel proved the most effective in generating responses: participation rose sharply immediately after invitations were posted in these Facebook groups, and an estimated 85% of all submissions came from members of one or more of these communities.

No probabilistic sampling frame was available, so participation was entirely self-selected. Using recent market analyses that estimate 300 000–320 000 professional developers in Italy[15], a sample of 300 yields a 95% confidence margin of error of ± 5.4% to ± 6.9% for simple proportion estimates (computed with $p = 0.5$). While the approach enabled rapid, pandemic-safe data collection and captured diversity in gender, region, company size and seniority (see Q2, Q5, Q8, Q9), it may also have biased certain answers—for example Q1 on prior exposure to accessibility—toward interests prevalent in the Facebook groups. Results should therefore be interpreted with due caution regarding statistical generalizability.

To minimize potential biases related to accessibility and to encourage participation from individuals less familiar with the subject, the survey was presented as a broad investigation into the landscape of web developers in Italy, deliberately omitting any explicit mention of accessibility. While this approach successfully avoided priming effects, it also influenced responses to the final question (Q36), as explored in later sections.

4. Survey results

Upon completing the data collection phase, we successfully gathered a total of 300 responses. For certain questions, particularly open-ended ones and those inviting suggestions, a process of normalization and response consolidation was applied. This approach streamlined the aggregation of results, making them more manageable and conducive to meaningful analysis.

The substantial volume of data collected adds considerable depth and value to the insights derived from this survey, enabling a robust exploration of the research questions.

4.1. Demographic data (Q1-Q8)

As illustrated in Figure 1, most participants identified as male (95%), with only 14 women (4.6%) responding to the survey. Additionally, one participant chose not to disclose their gender.

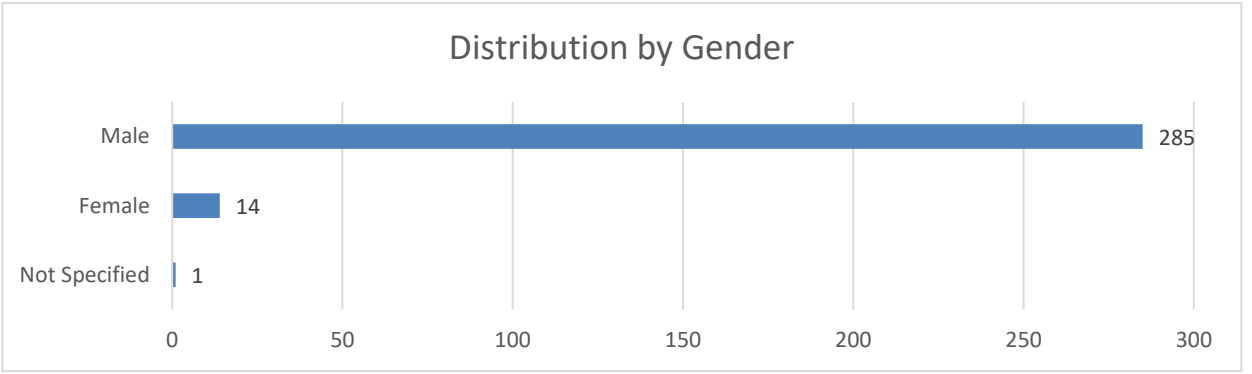

Figure 1: Distribution by Gender

This pronounced gender imbalance may, as speculated earlier, reflect a tendency among female developers to engage less frequently with social media platforms as venues for discussing or participating in conversations about technology and professional topics. Given that a significant portion of responses was sourced from members of Facebook groups, this factor likely influenced the demographic composition of the sample.

The survey participants range in age from 16 to 63 years, with an average age of 37.5 years (variance: 81.9; standard deviation: 9.05). Figure 2 illustrates the age distribution of respondents, organized into 5-year intervals. The largest group falls within the 25–29 age range, while approximately 75% of participants are between the ages of 20 and 44.

As with the gender distribution, the age demographics may also have been influenced by the high level of participation from Facebook group members, whose engagement likely shaped the overall profile of the surveyed population.

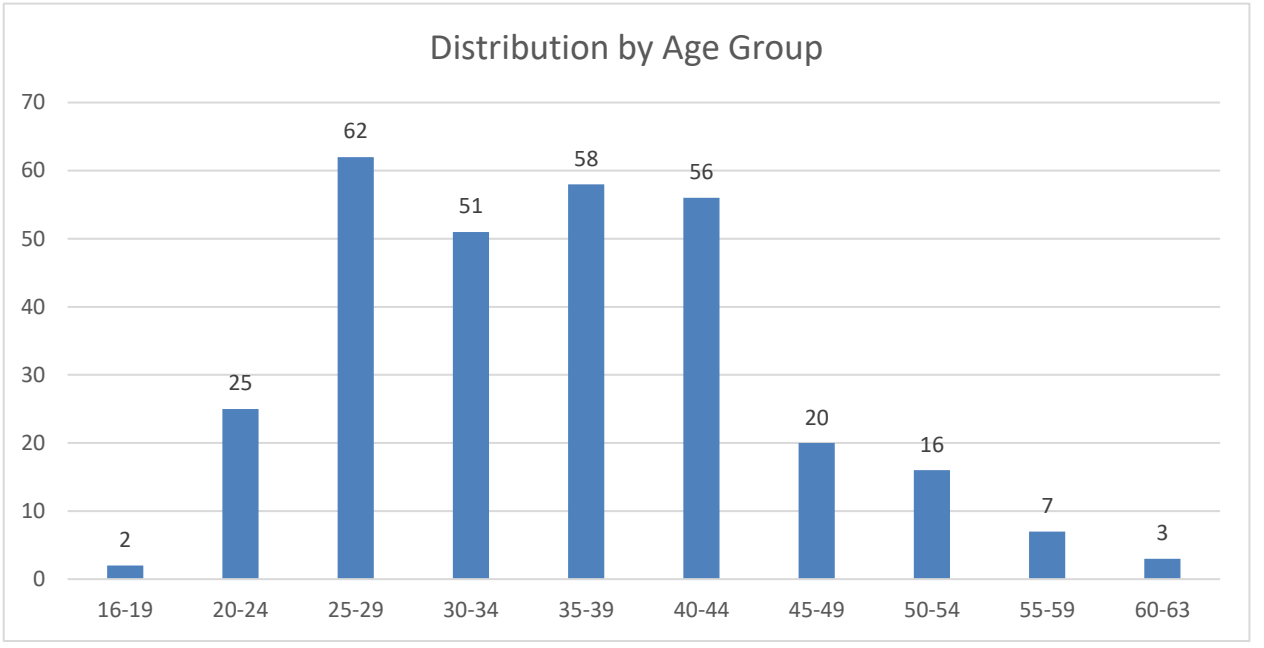

Figure 2: Distribution by Age Group

Regarding participants' nationality, the overwhelming majority are Italian, as anticipated. As depicted in Figure 3, only two participants reported being nationals of a European country other than Italy, while one participant opted not to answer this question.

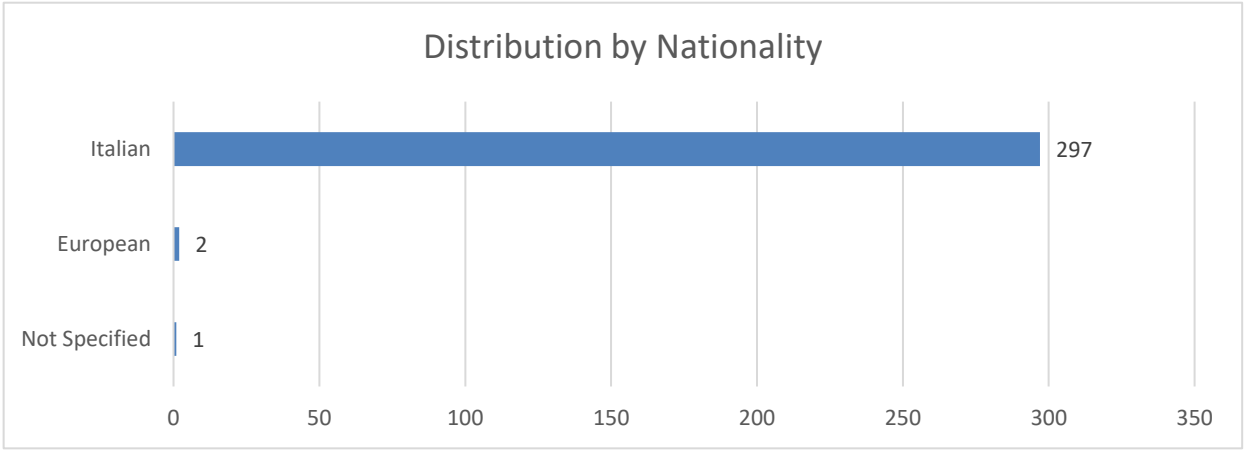

Figure 3: Distribution by Nationality

As illustrated in Figure 4, 16 survey participants reported experiencing some form of disability. Of these, 7 indicated visual impairments, 3 reported hearing impairments, 2 cited disabilities affecting intellectual or comprehension abilities, and 4 mentioned disabilities outside these categories.

Among the remaining 284 participants, 281 stated that they do not have any disabilities, while 3 chose not to respond to this question.

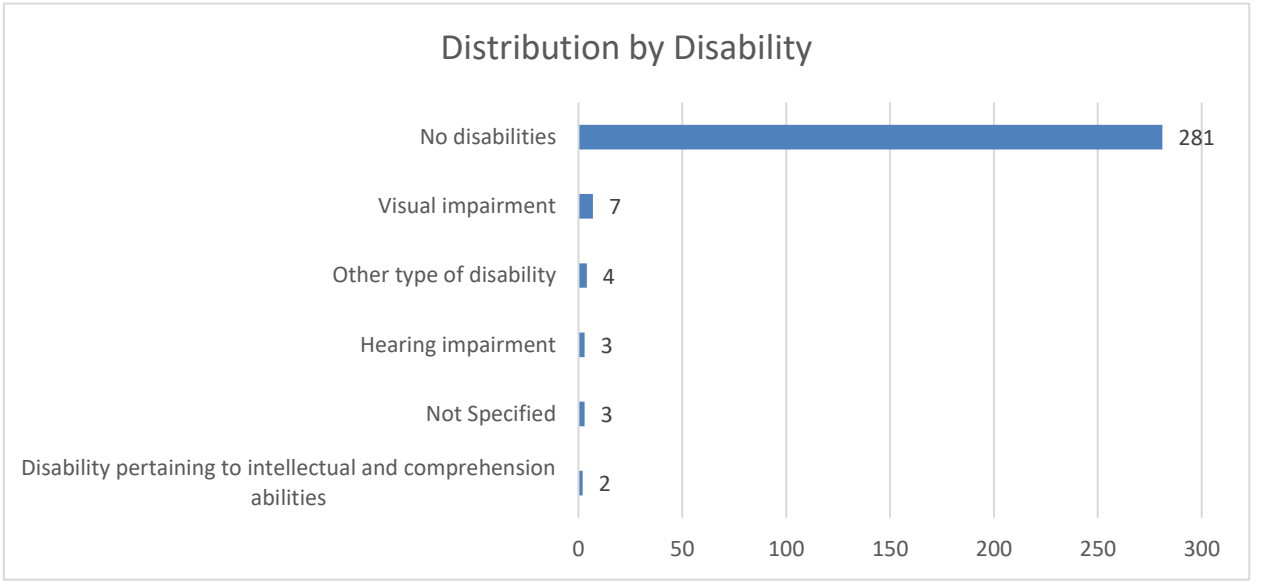

Figure 4: Distribution by Disability

Administratively, Italy is divided into 20 regions, which form the second level of the Nomenclature of Territorial Units for Statistics (NUTS) classification system [16]. Each region has its own capital city. These 20 regions are further grouped into five macro-regions, corresponding to the first NUTS administrative level, as detailed in Table 3.

Table 3. Macro-Regions in Italy

Macro-Region	Regions (in alphabetical order)
North-West	Aosta Valley, Liguria, Lombardy, Piedmont
North-East	Emilia-Romagna, Friuli-Venezia Giulia, Trentino-South Tyrol, Veneto
Center	Lazio, Marche, Tuscany, Umbria
South	Abruzzo, Apulia, Basilicata, Calabria, Campania, Molise
Islands	Sardinia, Sicily

The survey reached participants from 17 of Italy's 20 regions, as well as 10 Italians residing abroad, representing approximately 3.3% of the total sample.

Notably, the largest concentration of respondents (59 participants, or about 19.6% of the sample) resides in Lombardy, a region renowned as Italy's economic powerhouse. Lazio follows with 43 participants (14.3%), and Veneto ranks third with 27 participants (9%).

Conversely, the least represented regions in the survey are Umbria and Trentino-South Tyrol, with 4 participants each (approximately 1.3%). Additionally, Aosta Valley, Basilicata, and Molise are not represented in the statistical sample.

When analyzed by Macro-Regions, the North-West emerges as the most represented area, with 83 participants (27.6% of the sample), followed closely by the Center, which accounts for 81 participants (27%). The least represented Macro-Region is the Islands, with 21 participants (approximately 7%).

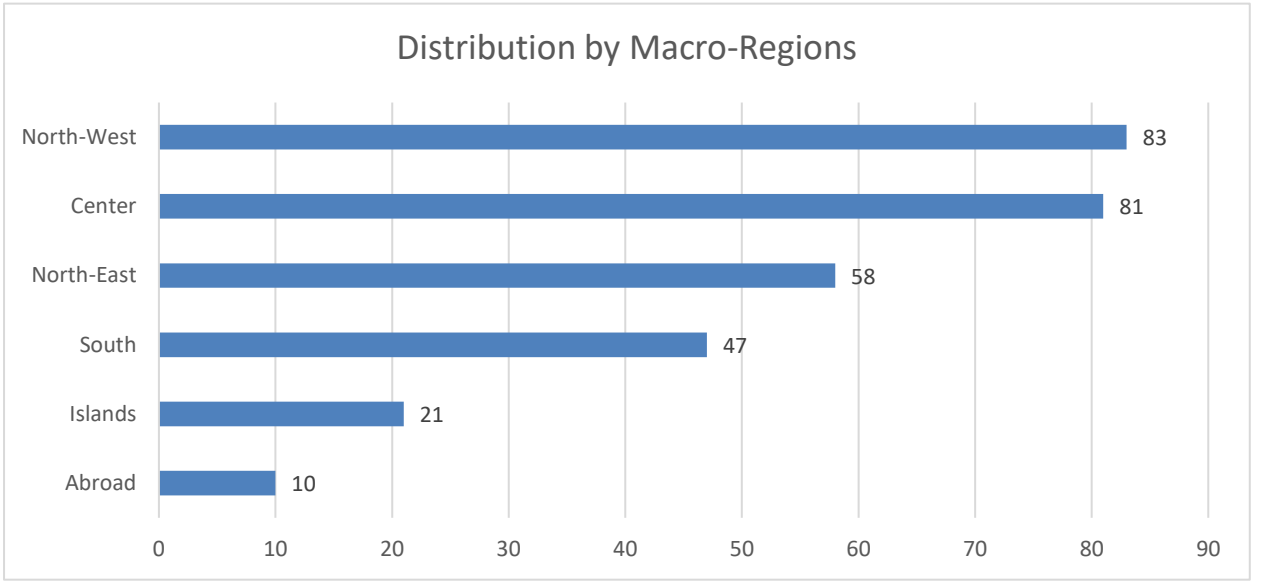

Figure 5: Distribution by Macro-Regions

Figures 5 and 6 provide visual representations of the participant distribution by Macro-Regions and Regions, respectively, offering a detailed overview of geographic engagement in the survey.

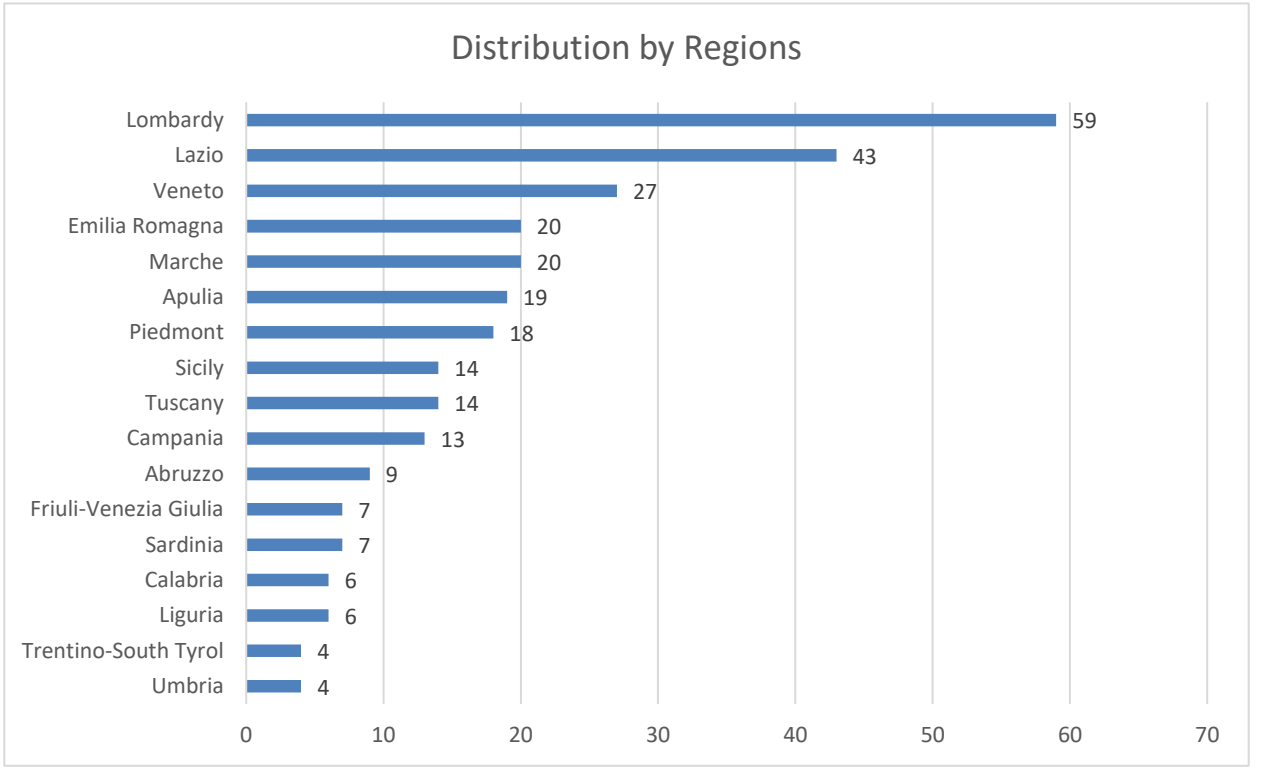

Figure 6: Distribution by Regions

Regarding the educational background of survey participants, approximately 47.3% completed their education with a high school diploma, while 51% hold a university degree at either the bachelor's or master's level. Among those with higher education, 7 participants (about 2.3%) have obtained a postgraduate master's degree, and 2 participants (roughly 0.6%) hold a Ph.D. Additionally, 5 participants (1.6% of the sample) reported middle school as their highest level of education. The distribution of educational qualifications is illustrated in Figure 7.

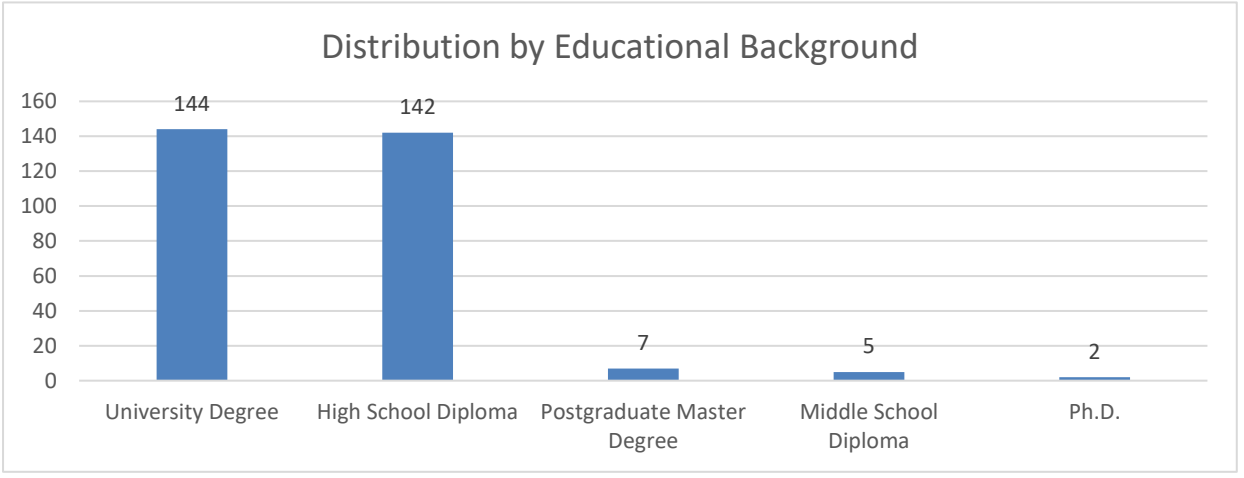

Figure 7: Distribution by Educational Background

Focusing on participants with a university-level education or higher, we further analyzed the types of degrees they hold. As shown in Figure 8, a substantial majority of these graduates - 114 individuals, representing approximately 75% of the sample - hold degrees in Computer Science or Computer Engineering. Interestingly, the second-largest group consists of graduates from fields notably unrelated to ICT, such as Law, Economics, or Business, totaling 11 individuals (around 7% of the graduates).

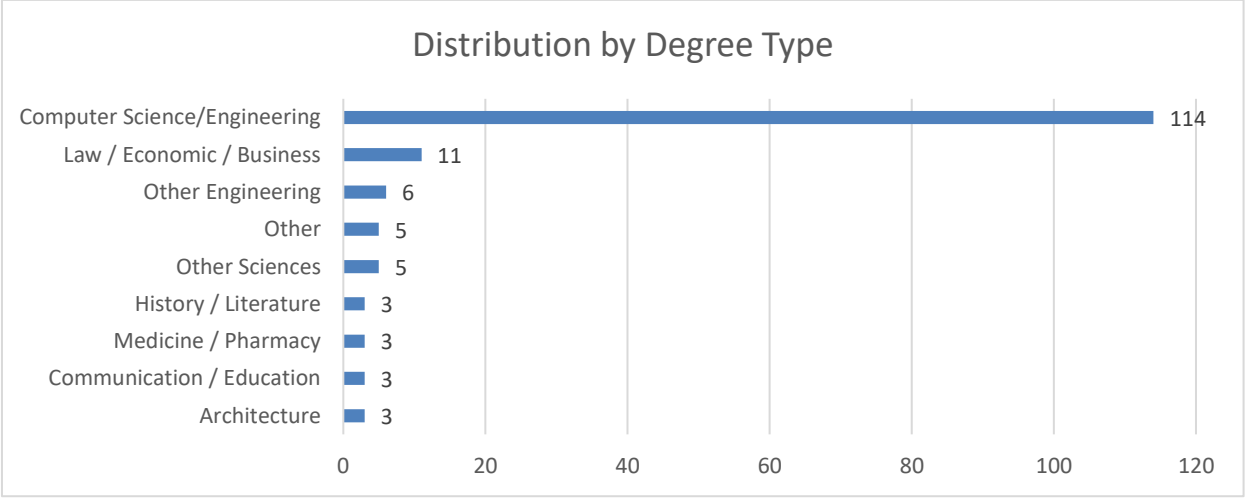

Figure 8: Distribution by Degree Type

By combining the data from Q7 and Q8, it is evident that only a minority of the total participants (38%) hold a degree in Computer Science or Computer Engineering. This observation is particularly relevant and will be highlighted

in the discussion evaluating the influence of university-level initiatives aimed at enhancing developers' awareness of accessibility issues.

4.2. Professional data (Q9-Q16)

The distribution of professional experience among participants follows a Gaussian curve, with the largest group consisting of 84 individuals (approximately 27.6%) possessing 10 to 20 years of experience. In contrast, only 20 participants (about 6.6%) reported having less than one year of work experience. The detailed distribution is presented in Figure 9.

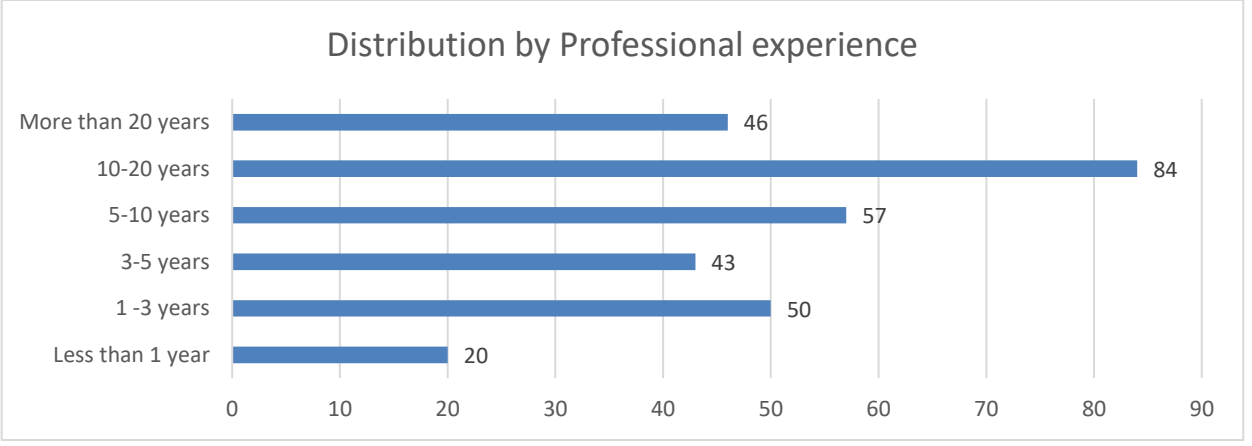

Figure 9: Distribution by Professional Experience

The majority of participants, 172 individuals (approximately 57%), reported working in private companies, while nearly a quarter of the sample - 72 participants (24%) - identified as freelancers.

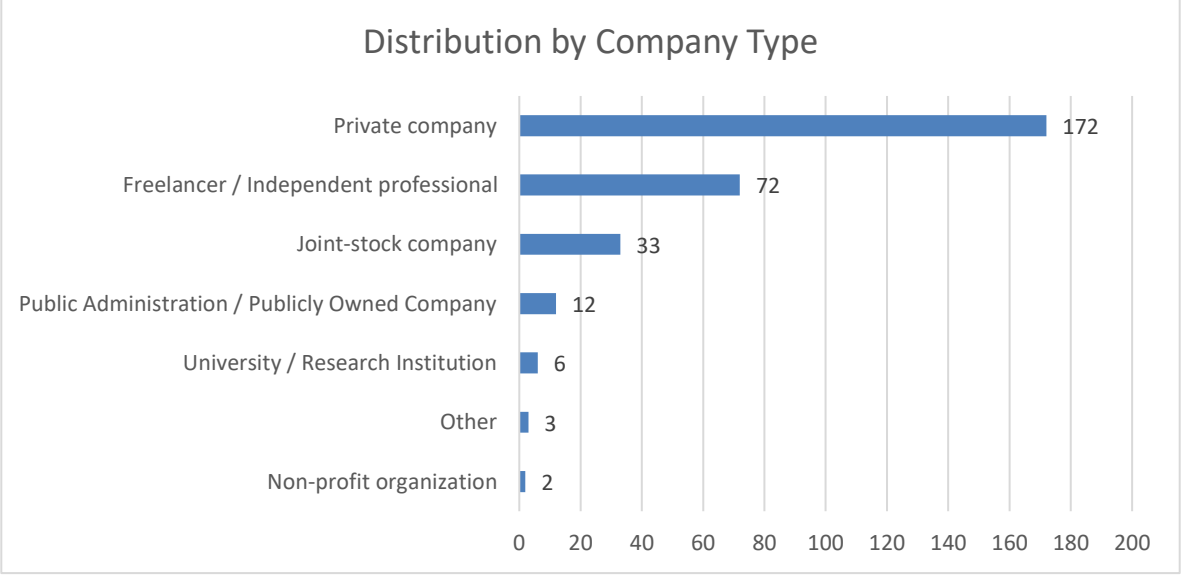

Figure 10: Distribution by Professional Experience

Notably, only a small proportion of respondents are employed in public administration (12 developers, 4%) or engaged in scientific research (6 individuals, 2%). The distribution of employment sectors is illustrated in Figure 10.

As illustrated in Figure 11, approximately 40% of surveyed developers are either self-employed or work in small-sized companies. In contrast, only 56 participants (around 18%) are employed in large or very large companies, defined as organizations with more than 500 employees. This finding will be revisited later in the discussion, particularly in the context of the opportunities for incorporating accessibility training within corporate education programs.

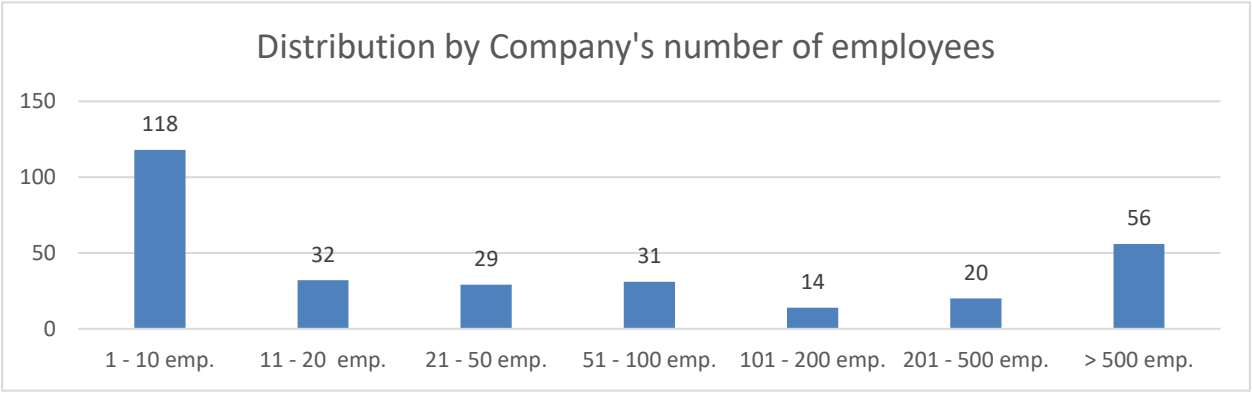

Figure 11: Distribution by Company's number of employees

The data from the previous question can be meaningfully juxtaposed with the information regarding the types of employment contracts, as illustrated in Figure 12. While the majority of respondents (176 individuals, approximately 59%) reported holding permanent employment contracts, a notable segment - 81 participants (approximately 27%) - identified themselves as consultants or freelancers. The latter group, combined with business owners (8 individuals, about 2.6%), represents a significant proportion of those working independently or in small-sized companies.

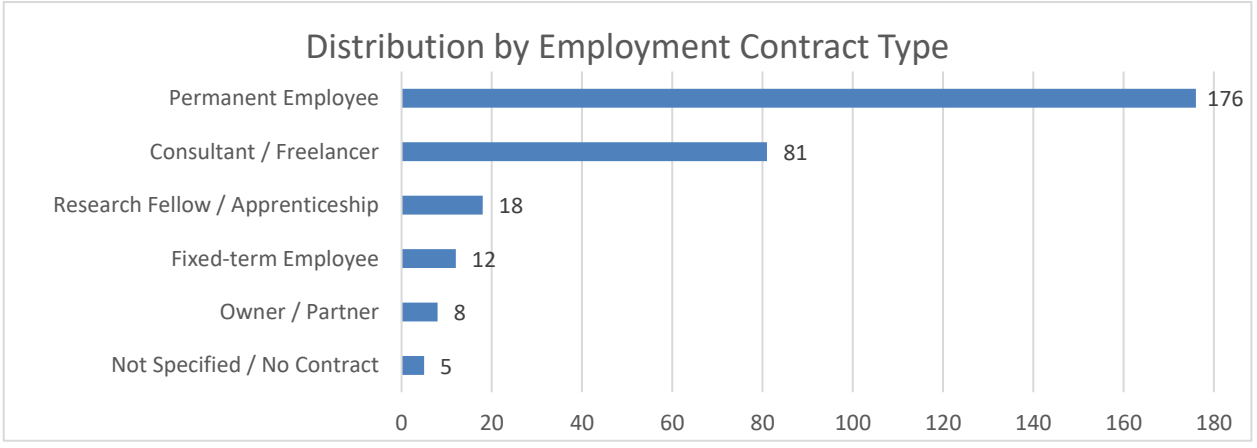

Figure 12: Distribution by Employment Contract Type

As anticipated, given the composition of our statistical sample, the majority of participants - 192 individuals (64%) - indicate that programming constitutes their primary or exclusive professional activity, occupying more than 60% of their working time. This distribution is illustrated in Figure 13.

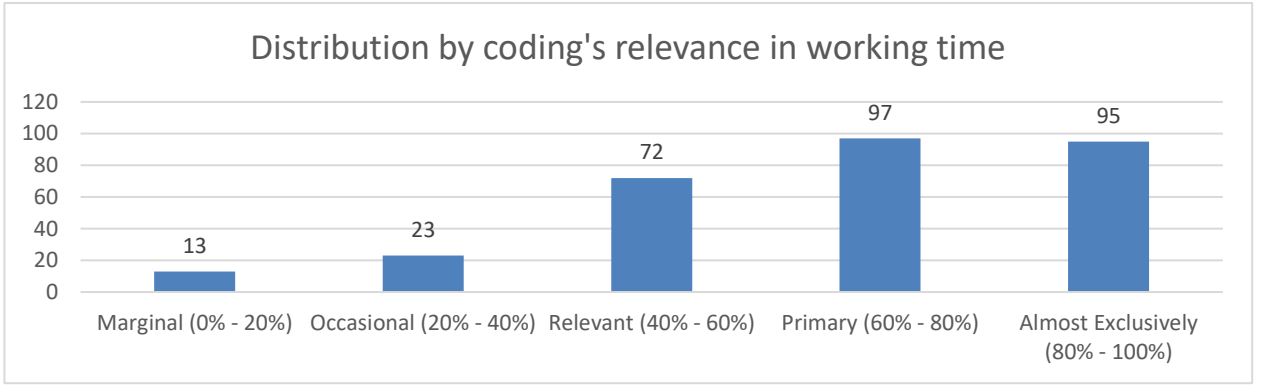

Figure 13: Distribution by coding's relevance in working time

Participants were also asked to identify the type of developer role with which they most closely associate. As shown in Figure 14, the majority of respondents - 167 individuals (approximately 55.6%) - identify as Full Stack Web Developers, professionals proficient in both the front-end and back-end aspects of web development. This is followed by UI/UX Experts and Frontend Developers, who make up 34 participants (about 11.3%), and Backend Developers, with 32 participants (around 10.6%). The least represented role is that of DevOps, selected by only 3 participants (1%).

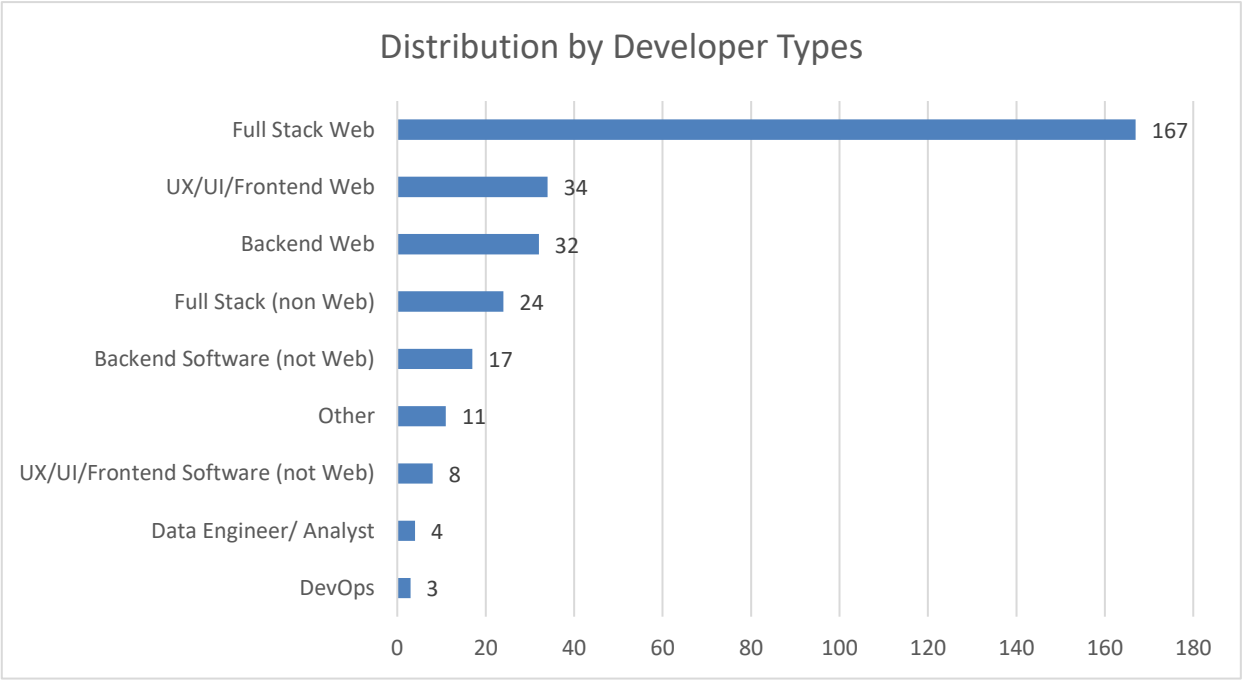

Figure 14: Distribution by Developer Types

It is noteworthy that, despite our efforts to broaden the survey's reach across various developer types by promoting the initiative through Facebook groups related to a wide range of programming languages and frameworks, the majority of participants (233 developers, approximately 77.6%) are engaged in web development. This significant proportion will be taken into account when analyzing the implications for accessibility, particularly in relation to adherence to the WCAG guidelines. Data are shown in Figure 15.

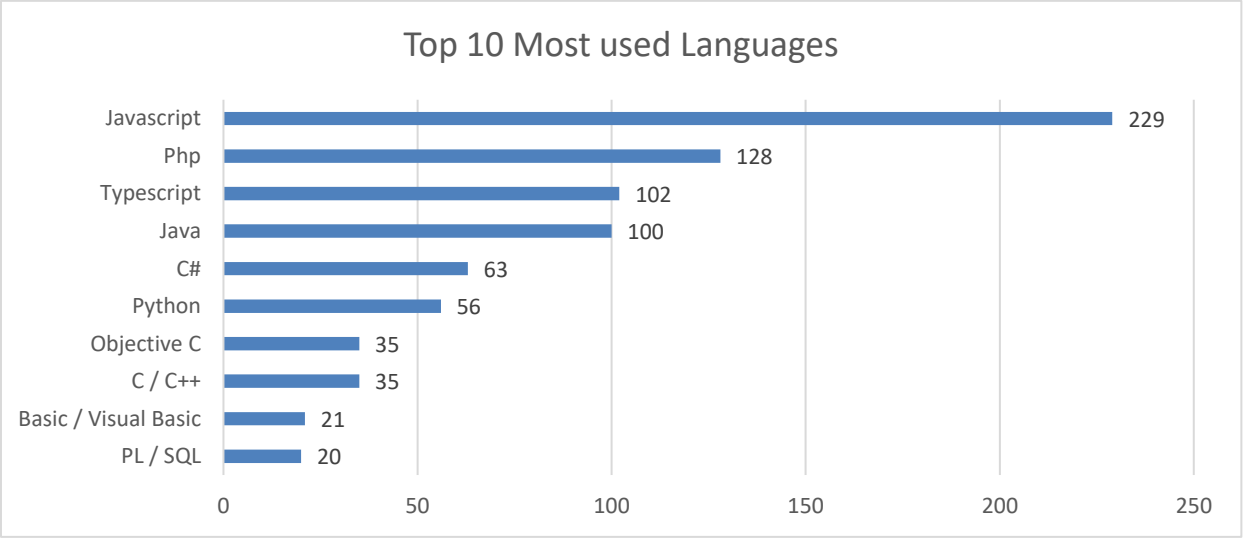

Figure 15: Top 10 Most used Languages

This information is further supported by data regarding the programming languages participants primarily use in their work. JavaScript is the most common language, used by 229 respondents (76.3%), whereas 128 developers (42.6%) report using PHP and 102 (34.0%) favor TypeScript. Thus, the three most commonly used languages among survey participants are predominantly employed in web application development.

We also asked participants about their use of Content Management Systems (CMS) or Learning Management Systems (LMS) and to specify the platforms they utilize.

Finally, we asked survey participants to list additional information technologies, such as libraries, frameworks, databases, application servers, and non-programming languages, that are commonly used in their daily work, excluding the programming languages and CMS/LMS platforms mentioned in previous questions.

As anticipated, and consistent with the responses to earlier questions, the majority of the top 10 most frequently mentioned technologies, shown in Figure 17, are directly related to the development of websites and web applications.

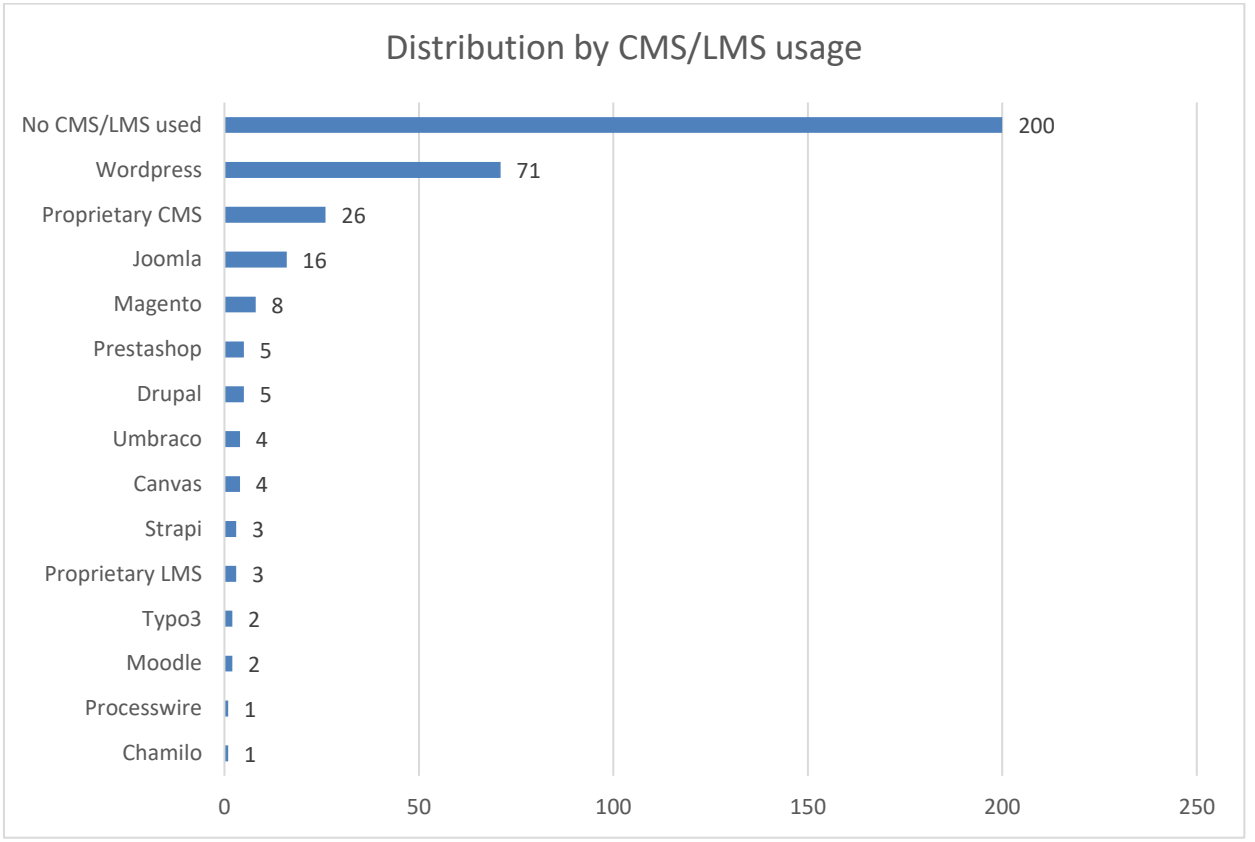

Figure 16: Distribution by CMS/LMS usage

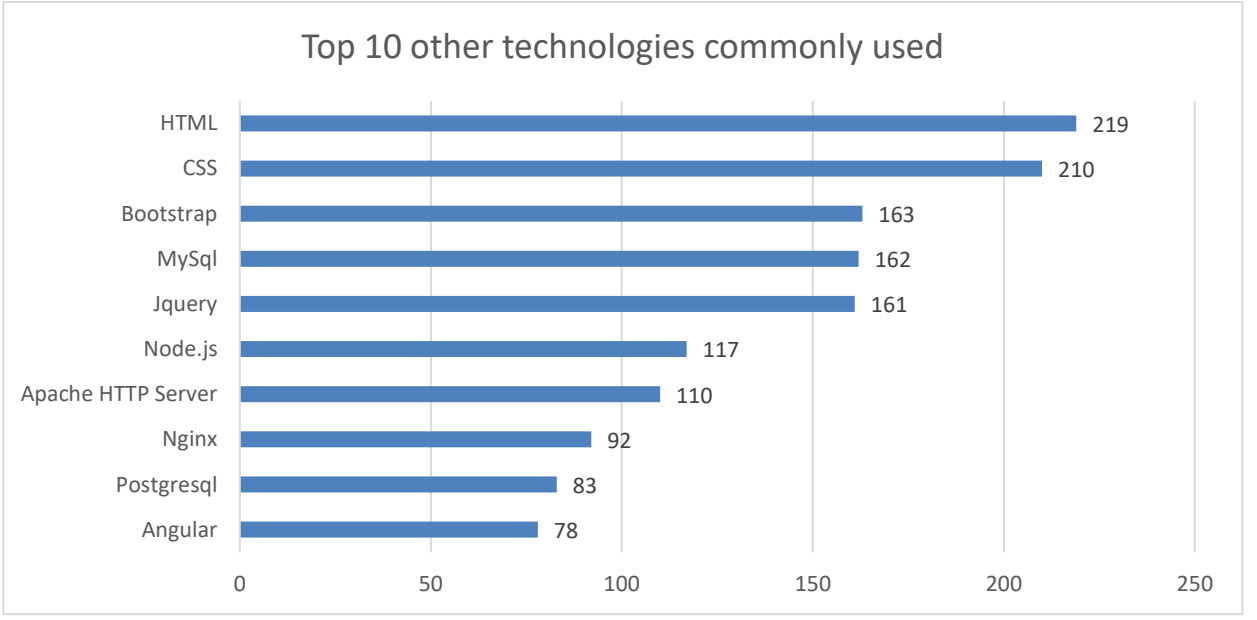

Figure 17: Top 10 Other technologies commonly used

4.3. Characterization of our prototypical participant

Based on the feedback obtained in our survey, it is now feasible to define a characterization of our typical participant:

- An Italian male living in Italy, particularly in one of the Northwest or Central regions, aged between 25 and 45, not disabled, with approximately 10 years of professional experience and not necessarily holding a university degree in ICT - although they may possess qualifications in other disciplines such as economics or law**;**
- Engaged in permanent employment with a small private company or freelance/company owner, with a substantial focus on coding in their daily tasks;
- Specializing in web development as Full Stack Developer, with a preference for not using CMS/LMS or opting for one developed internally within their company.

4.4. General questions about accessibility (Q17-Q19)

As discussed, the second section of our survey was dedicated to examining the relationship between developers and web accessibility. Our objective was to assess their familiarity with this topic, the strategies they employ to address accessibility requirements, and the underlying reasons for any lack of engagement or indifference toward this critical issue. To this end, we designed a series of questions that gradually moved from general considerations to more in-depth analyses.

The first question in this section explored participants' awareness of the Stanca Act. This legislation, currently enforced in Italy, defines and regulates the obligations of public administrations, as well as certain private entities, to ensure the accessibility of their websites and web applications. The findings are illustrated in Figure 18.

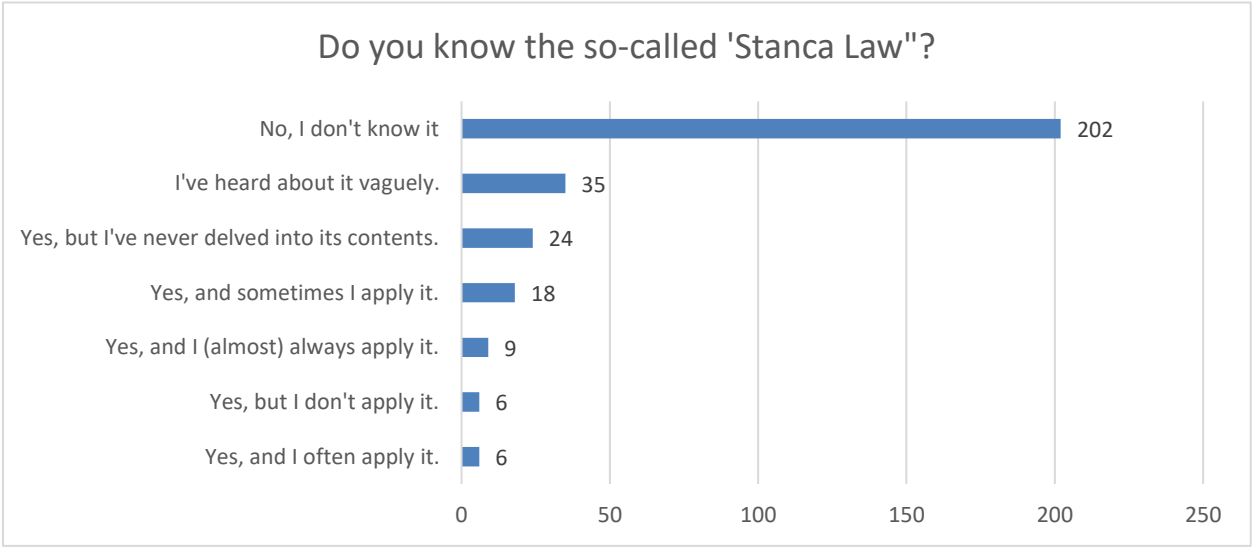

Figure 18: Knowledge of Stanca Act

Surprisingly, over two-thirds of the surveyed developers (202 participants, approximately 67%) reported being unfamiliar with the Stanca Act. An additional 35 developers (around 12%) indicated only a vague awareness of the legislation.

Conversely, 63 individuals (21%) acknowledged being acquainted with the law. However, among this group, only 33 participants (11%) reported applying its provisions in their work, albeit with varying degrees of frequency.

Of the remaining respondents, 24 developers (8%) admitted to never having reviewed the content of the Stanca Act, while 6 participants (2%) stated they were aware of the legislation but deliberately chose not to implement its guidelines.

To delve deeper into the issue of non-compliance among those familiar with the Stanca Act but applying it sporadically or not at all (24 participants, 8%), we explored the underlying reasons for their stance. Participants were invited to select from predefined options or provide their own explanations, with a maximum of three responses permitted. The results are presented in Figure 19.

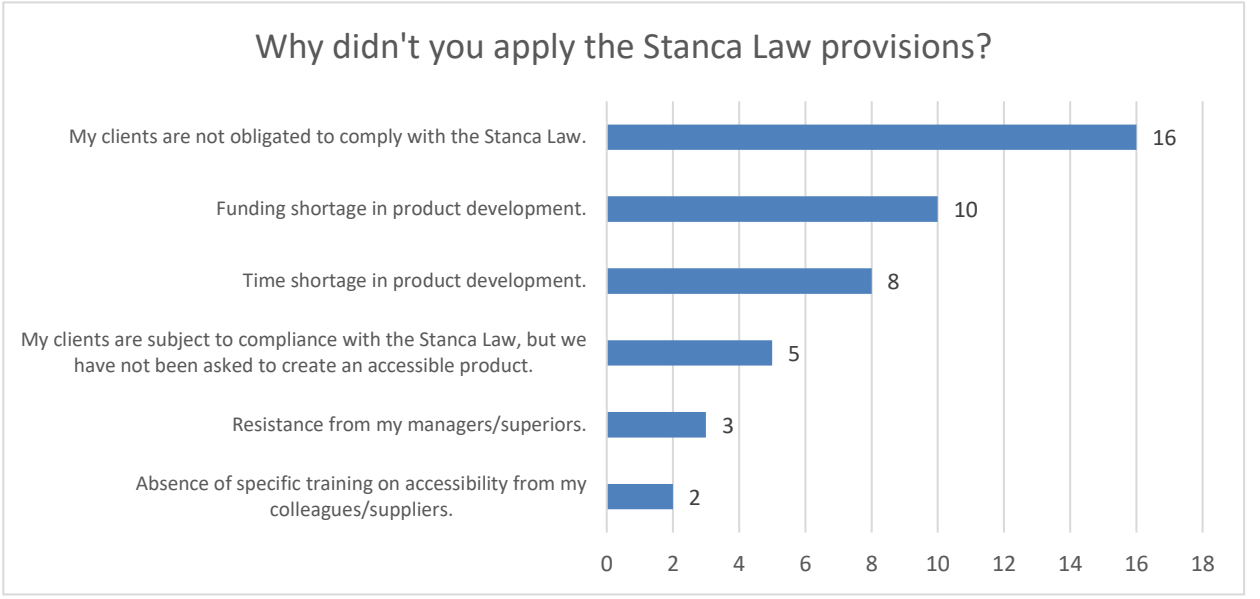

Figure 19: Factors behind non-adherence to the obligations of the Stanca Act

The most frequently cited reason for non-compliance (mentioned 16 times) is that the developers' clients did not belong to the category of entities obligated to adhere to the provisions of the Stanca Act. However, it is worth noting that this does not inherently preclude the possibility of creating accessible software solutions.

Following this, funding constraints and time limitations during product development were also highlighted, with 10 and 8 mentions, respectively.

Interestingly, 5 out of the 24 developers in this subset (approximately 20%) reported that, even when their clients were subject to the obligations of the Stanca Act, they were not explicitly instructed to develop accessible products.

When reviewing the entire participant pool, we explored their familiarity with the concept of accessibility within the field of computer science.

As illustrated in Figure 20, participants demonstrated a notably higher level of awareness compared to their familiarity with the Stanca Act. Specifically, only 71 developers (approximately 27%) indicated they had no knowledge of accessibility, while 86 participants (around 29%) admitted to having only a very vague understanding of the subject.

This left 143 participants who claimed at least a basic understanding of accessibility. However, it is worth noting that only one participant (0.3%) identified themselves as an expert in this field.

As outlined in Table 2, this question served as a pivotal point for dividing participants into two distinct groups. The first group (Group A) included individuals with some degree of familiarity with accessibility, even at a basic level (143 participants, approximately 48%). The second group (Group B) comprised those with no familiarity or only vague awareness of accessibility (157 participants, approximately 52%).

Participants in Group A were asked a series of targeted questions (Q20–Q31) designed to explore their exposure to accessibility concepts. These questions examined the channels through which they acquire information, their

familiarity with accessibility-related technologies, and whether and how they apply these technologies in their professional work.

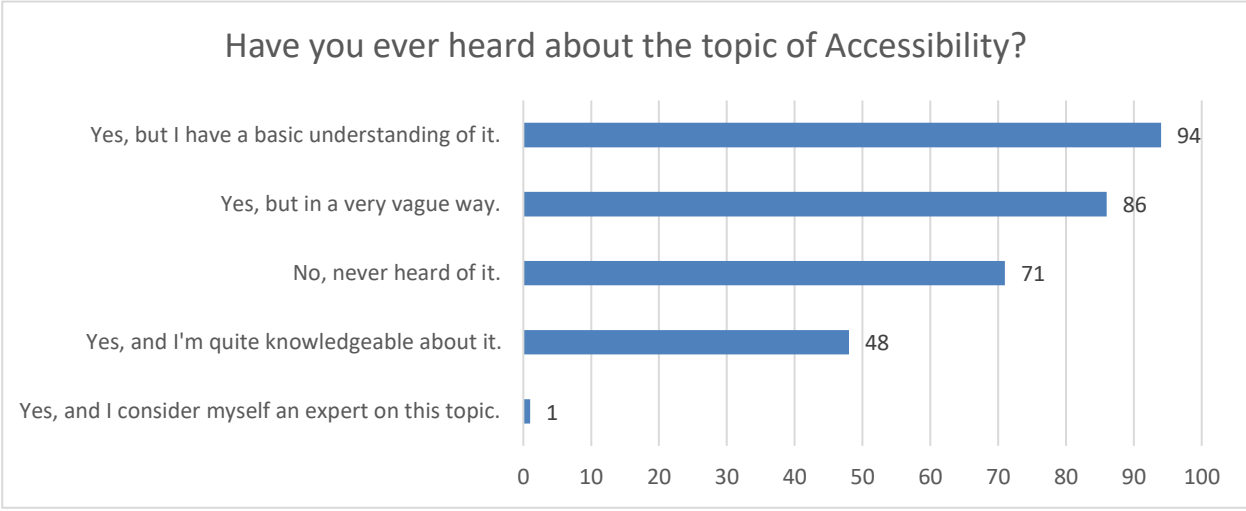

Figure 20: Levels of accessibility knowledge.

Conversely, Group B participants responded to questions (Q32–Q35) aimed at uncovering the motivations and biases that may have deterred them from engaging with accessibility. The survey also sought to identify potential factors that might encourage these developers to integrate accessibility into their projects.

The analysis of responses from these two distinct groups will be discussed in detail in Sections 4.5 and 4.6.

4.5. Targeting participants with a basic, moderate or good knowledge of accessibility (Q20-Q31)

The first question posed to Group A members aimed to identify how they initially encountered the concept of accessibility.

As illustrated in Figure 21, most participants (37 developers, approximately 26%) reported that their first exposure to accessibility stemmed from work-related experiences. Additionally, 30 participants (around 21%) credited online sources, such as social media, blogs, or news websites, as their primary introduction to this topic.

University courses and conferences had a relatively modest influence, with 18 participants (approximately 13%) and 14 participants (around 10%), respectively, identifying these avenues as their first point of contact with accessibility.

Notably, online courses, books, legislative documents, and scientific papers contributed minimally to initial awareness, with each category garnering responses from only 3% to 4% of participants.

After identifying participants' initial exposure to accessibility, we sought to explore whether they pursued further study of the topic and, if so, through which avenues. Respondents were allowed to select up to three channels for additional exploration. The results are depicted in Figure 22.

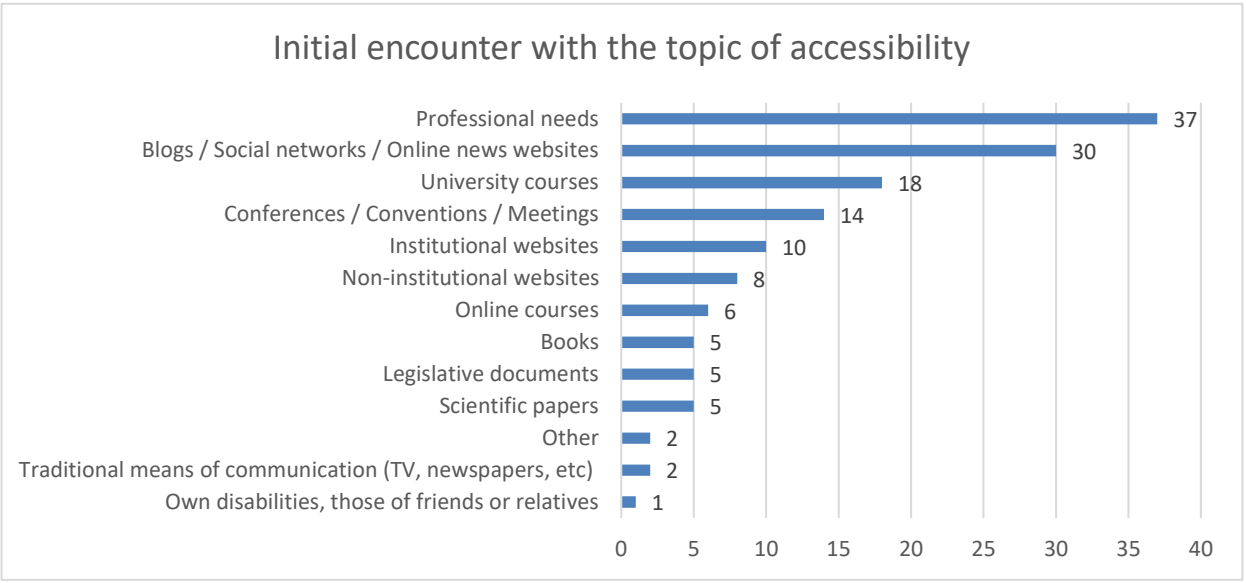

Figure 21: Initial encounter with the topic of accessibility

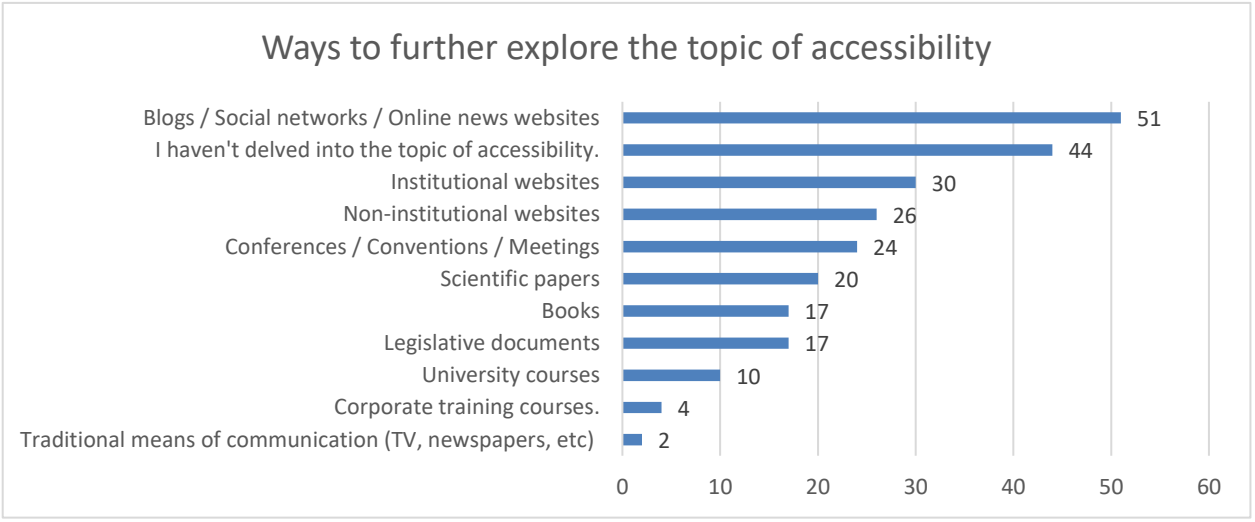

Figure 22: Ways to further explore the topic of accessibility

A key insight from the responses is that approximately 31% of participants (44 individuals) did not pursue any further investigation after their initial encounter with accessibility. By cross-referencing data from earlier questions, it became evident that the vast majority of these individuals (40 out of 44) had previously indicated possessing only a basic understanding of accessibility.

Among those who chose to delve deeper, the most frequently cited resources for further study were online sources such as blogs and social networks (51 mentions). Institutional websites were also prominent (30 mentions), followed by non-institutional websites (26 mentions).

Scientific papers (20 mentions) and conferences (24 mentions) emerged as noteworthy avenues for in-depth exploration, showing a marked increase compared to their role in participants' initial exposure to accessibility.

To further gauge participants' familiarity with accessibility standards, we asked Group A members to specify any guidelines they recognized, with the option to list up to three. Figure 23 presents the results.

Interestingly, nearly 40% of participants within this subset admitted to being unfamiliar with any accessibility guidelines. Among those who did report knowledge, the most widely recognized standards were the Web Content Accessibility Guidelines (WCAG), with notable mentions for versions 2.1[17] (41 mentions), 2.0[18] (30 mentions), and 1.0[19] (22 mentions).

Other frequently cited guidelines included those associated with the initial enactment of the Stanca Act (39 mentions), the Accessible Rich Internet Applications (WAI-ARIA) [20] standards (38 mentions), and the User Agent Accessibility Guidelines (UAAG) [21], mentioned by 15 participants.

Conversely, the Authoring Tools Accessibility Guidelines (ATAG) [22] and the U.S. Section 508 accessibility standards [23] were relatively less familiar, with only five mentions each.

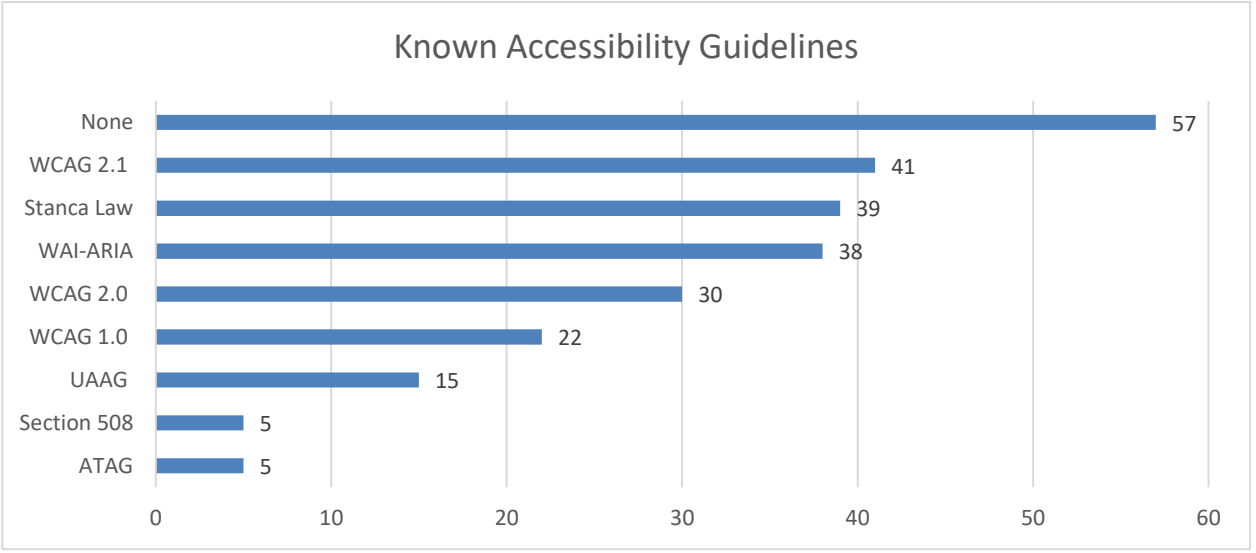

Figure 23: Popularity of Accessibility Guidelines

We also examined developers' familiarity with assistive technologies (Figure 24). On average, these technologies appear to be relatively well-known: only 30 participants reported being entirely unfamiliar with any assistive technologies.

Among the most recognized tools are screen readers and text-based web browsers, cited by 79 and 76 participants, respectively. Text-to-speech systems and screen magnifiers also exhibit significant recognition, with 68 and 63 mentions, respectively.

Conversely, familiarity with tools associated with Braille writing is noticeably lower: only 25 participants mentioned Braille keyboards, and a mere 10 participants identified Braille printers/embossers. Similarly, systems enabling disabled users to interact with a computer using eye-tracking technology remain relatively obscure, acknowledged by just 15 respondents.

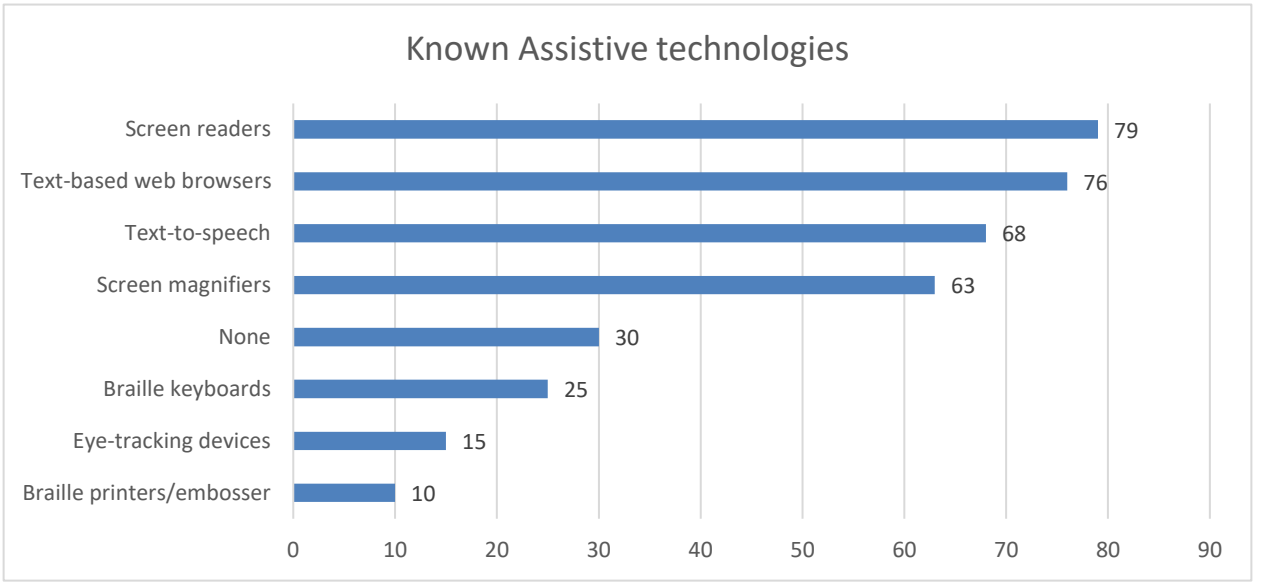

Figure 24: Popularity of Assistive technologies

Following the evaluation of participants' understanding of accessibility guidelines and assistive technologies, we delved into perceptions regarding the primary responsibility for ensuring the accessibility of a software product within a typical development team. The findings are illustrated in Figure 25.

Surprisingly, only 31 respondents (roughly 22%) identified developers as the primary stakeholders responsible for ensuring the accessibility of software products. In contrast, approximately half of the participants (71 respondents) attributed this responsibility to UI/UX designers. This suggests a prevalent perception that accessibility is more closely associated with the user experience and interface design than with the core functionalities of the product.

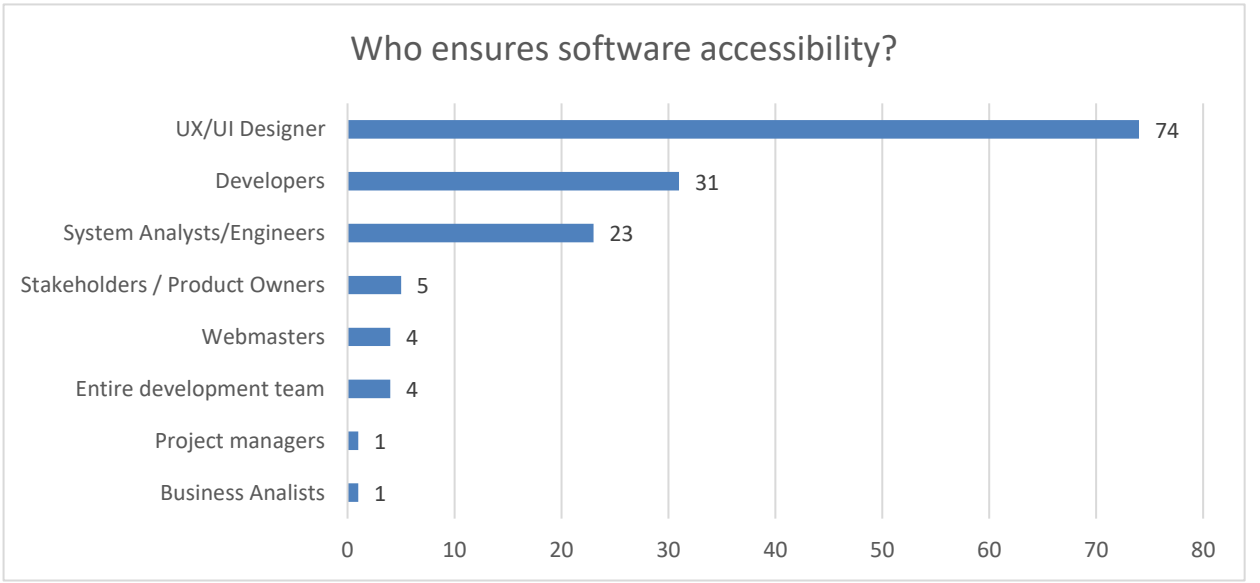

Figure 25: Accessibility responsibility among professionals

Figure 26 highlights the professional experience of Group A members regarding accessibility. Only 43% (61 participants) reported having created accessible products at least once during their careers.

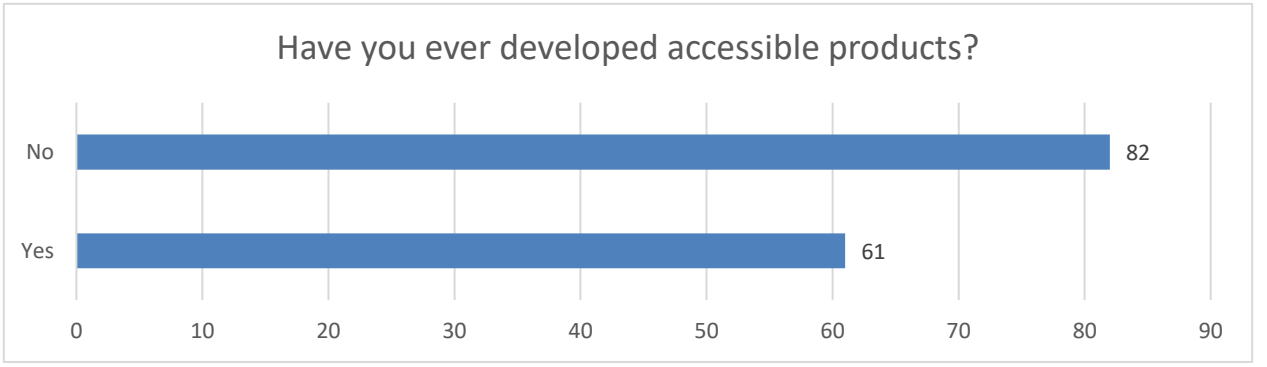

Figure 26: Experience in developing accessible products.

Among those with experience in accessible development, an overwhelming majority (approximately 90%) indicated a primary focus on addressing visual impairments in their accessible product designs, as depicted in Figure 27.

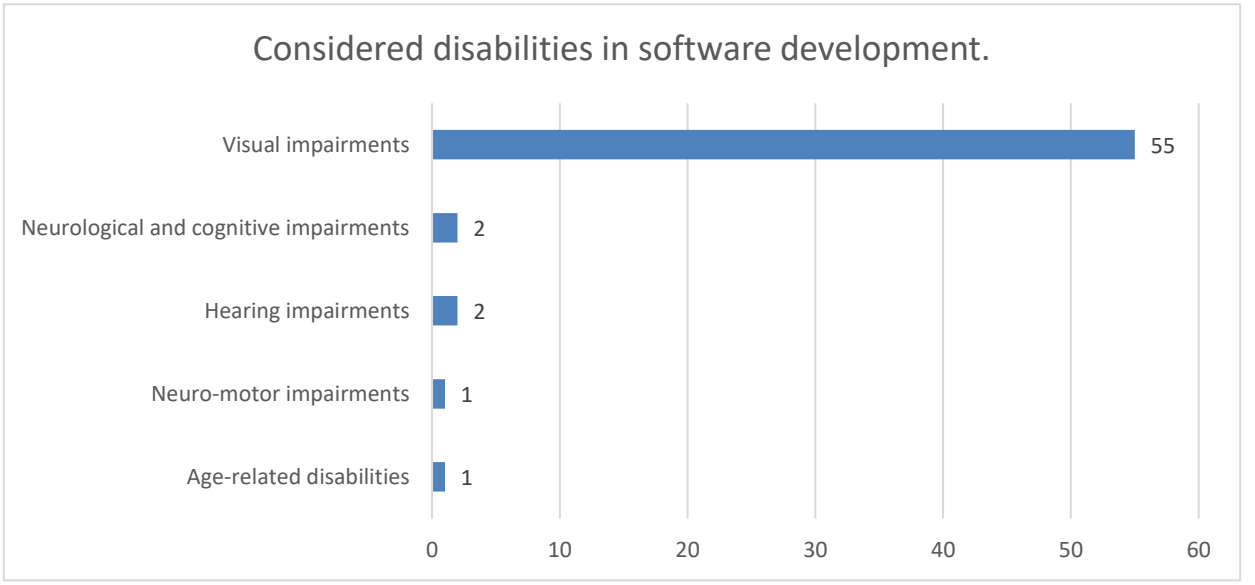

Figure 27: Considered disabilities in software development

To gain a deeper understanding of their experiences, participants who had developed accessible products were asked to identify up to five key challenges encountered during this process.

The results are summarized in Figure 28.

The most frequently cited obstacle, noted by 72% of developers (44 respondents), was a lack of interest from their clients in prioritizing accessibility within their projects. Additionally, 29 developers (around 48%) expressed concerns about insufficient training on the subject.

Other prominent challenges included a lack of adequate funding (24 respondents, approximately 39%), limited support or interest from managers and superiors (21 respondents, about 34%), and the high costs associated with tools for developing or verifying the accessibility of software (20 participants, around 33%).

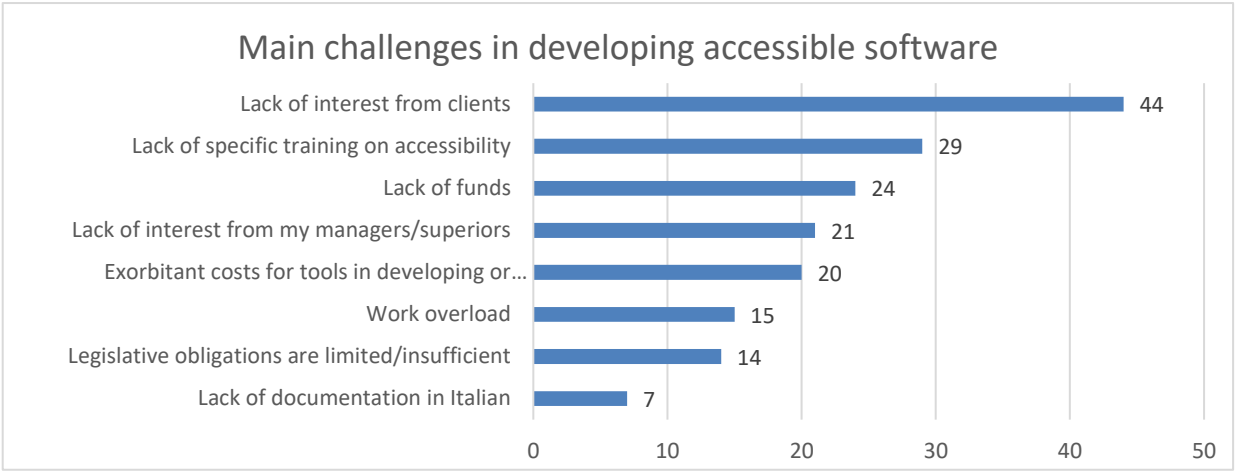

Figure 28: Main challenges in developing accessible software

Returning to broader Group A, we also explored whether participants had ever conducted an accessibility assessment for any product, whether developed by themselves or others. Figure 29 illustrates that only 54 developers, roughly 38% of the group, confirmed having performed such evaluations.

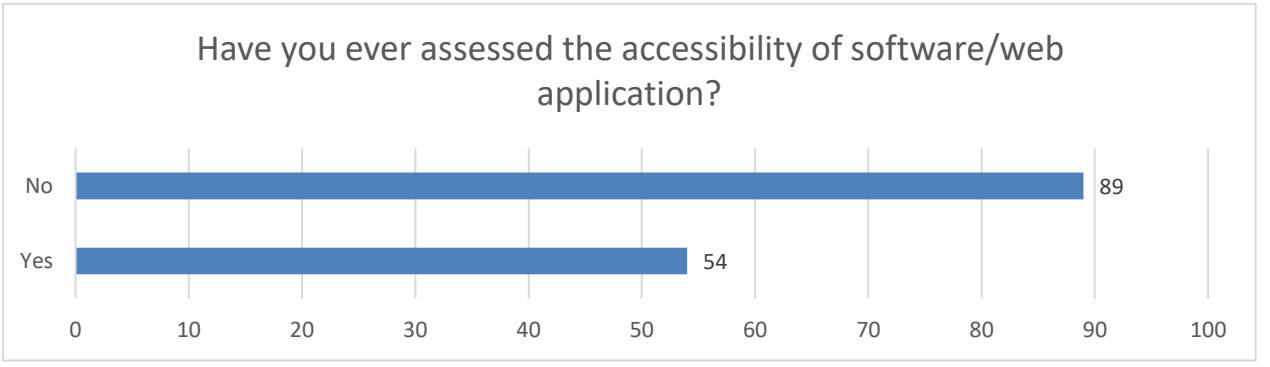

Figure 29: Developers who have conducted an accessibility assessment

For respondents who confirmed conducting accessibility assessments, we further explored the specific evaluation methodologies they employed (refer to Figure 30).

The most used method, reported by 32 participants, involved manual inspection and verification to ensure adherence to one or more accessibility guidelines.

Other frequently utilized techniques included validation through Accessibility Validators - automated tools designed to assess accessibility- cited by 25 respondents, and validation through testing with one or more assistive technologies, mentioned by 22 participants.

Interestingly, testing with disabled users or elderly users was rarely employed, with only 12 and 5 mentions, respectively, underscoring a significant underutilization of direct user testing in accessibility validation.

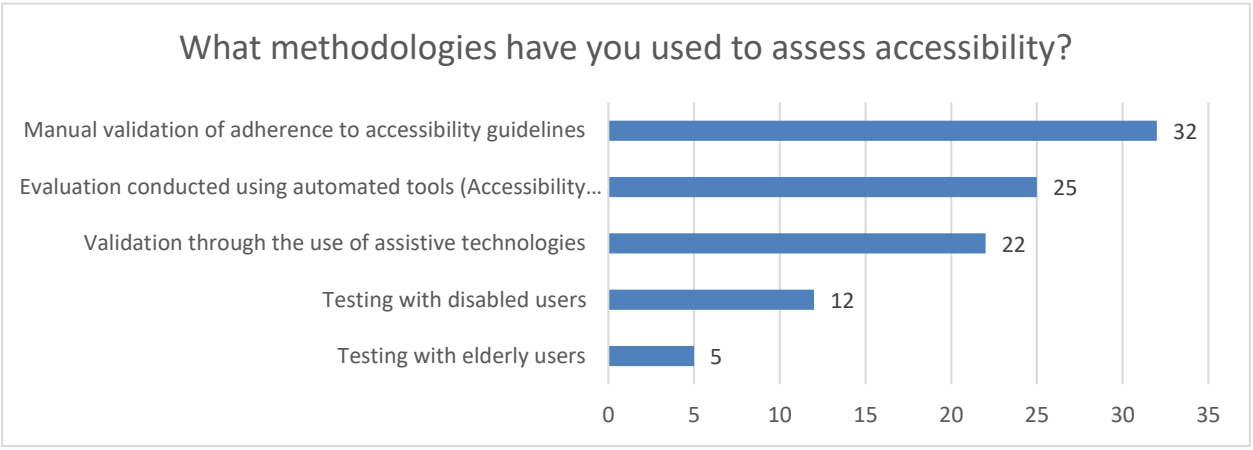

Figure 30: Most common methodologies for accessibility assessment

Additionally, we asked Group A members to identify any specific accessibility validators they were familiar with. The responses, summarized in Figure 31, revealed that a notable 27 developers stated they were unfamiliar with any accessibility validators, reflecting a substantial knowledge gap in this area. The most widely recognized accessibility validator is A-Checker [24] (mentioned by 15 participants), followed by MAUVE [25], Total Validator [26], and WAVE [27], each of which was cited 12 times.

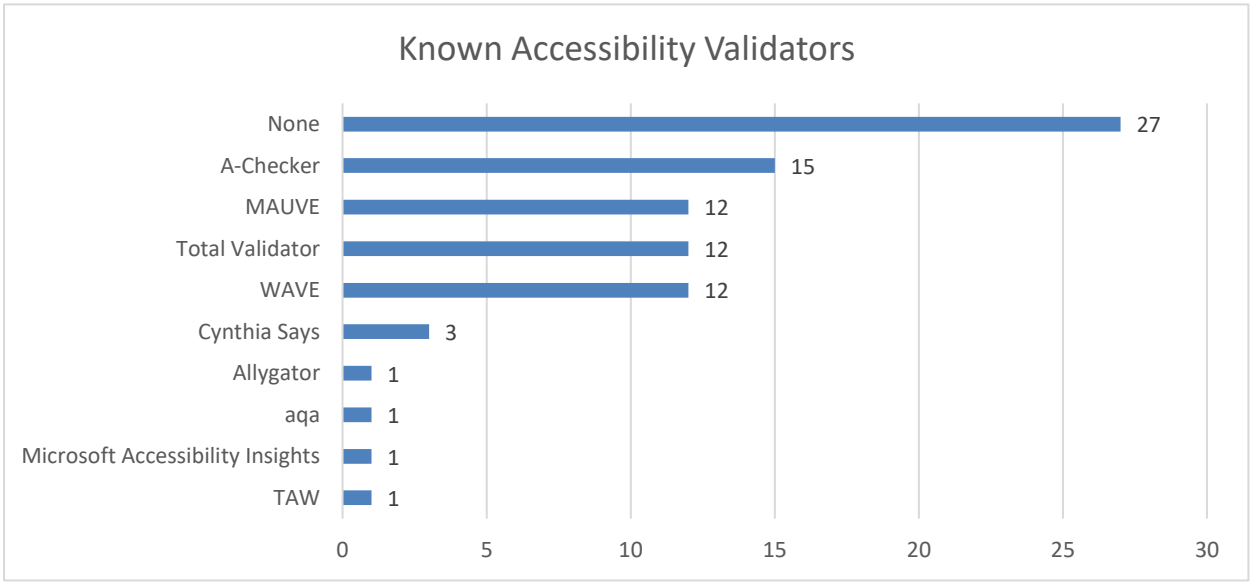

Figure 31: Most well-known Accessibility Validators

Finally, Group A members were asked to propose up to five activities to promote accessibility among developers. The responses are summarized in Figure 32.

The most frequently suggested initiative, mentioned 79 times, involves offering economic incentives or tax breaks to encourage and support the development of accessible products.

Following closely, two proposals garnered 63 mentions each: the need to amplify and enhance technical examples of accessible product development, and the creation of more automated tools to aid developers in crafting accessible products effectively.

These insights underscore the participants' preference for tangible support, practical resources, and financial motivation as key strategies to foster greater engagement with accessibility in the developer community.

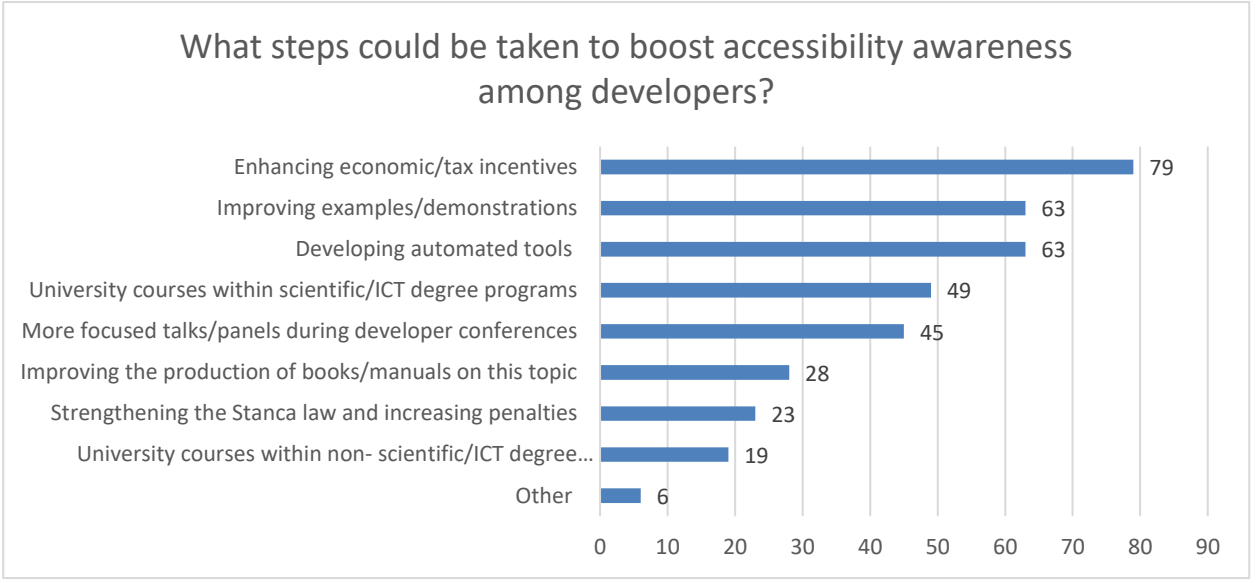

Figure 32: Suggestions for enhancing awareness regarding accessibility

Other notable recommendations from Group A members include the expansion of specialized courses on accessibility within scientific and/or ICT degree programs mentioned 49 times, and advocating for a higher frequency of talks focused on accessibility at developer conferences, which received 45 mentions.

4.6. Targeting participants with vague or no knowledge of accessibility (Q32-Q35)

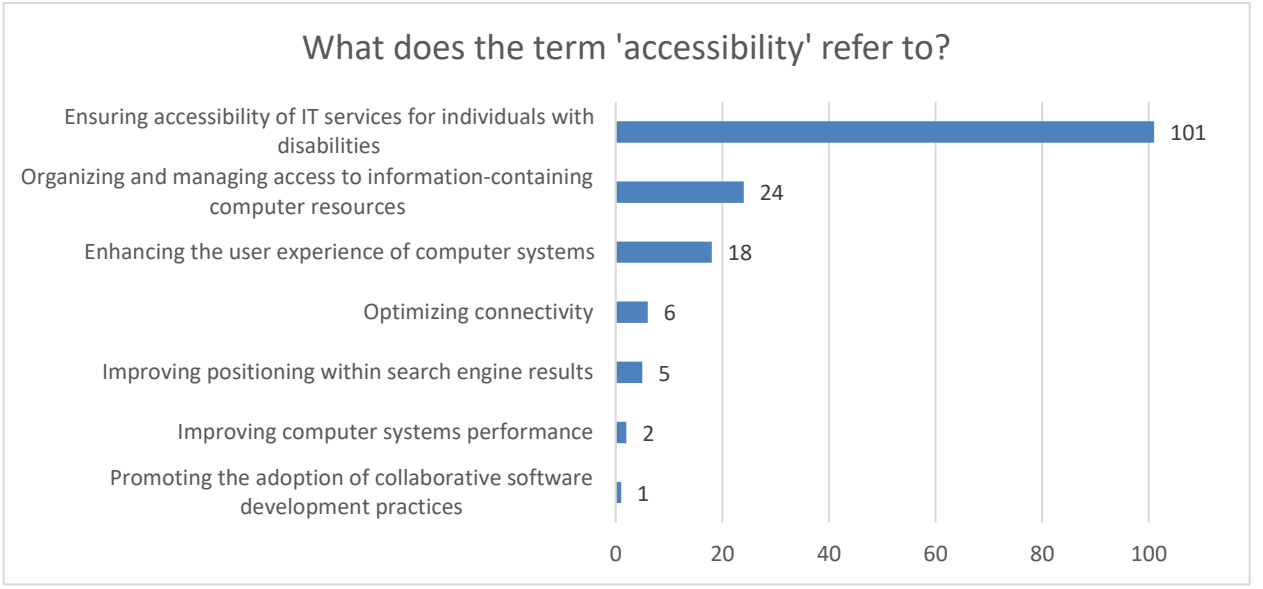

Figure 33: Distribution of accessibility definitions

The initial inquiry for Group B participants sought to determine their understanding of the term 'accessibility' without external assistance, such as search engines or dictionaries. Participants were presented with several predefined definitions, as shown in Figure 33.

Approximately 64% of the group (101 developers) correctly identified a definition aligned with the Stanca Act. However, 24 developers (roughly 15%) mistakenly equated accessibility with access management, and 18 participants (around 9%) selected a definition more closely tied to usability rather than accessibility.

Following the clarification of the correct definition of accessibility, participants were asked about their interest in developing accessible software, applications, and websites in the future.

As depicted in Figure 34, the results were promising. In fact, the majority (102 developers, approximately 65%) expressed a strong willingness to acquire the necessary knowledge and skills to create products with enhanced accessibility features.

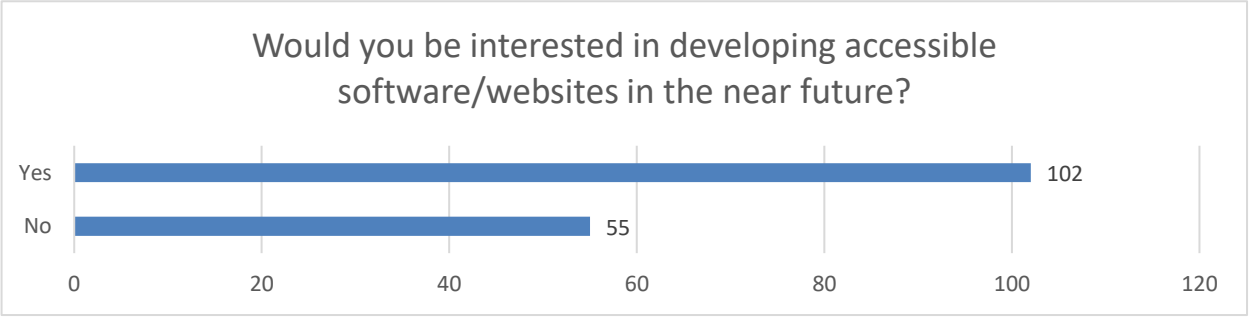

Figure 34: Distribution of interest in accessibility by Group B members

To further investigate the potential for foster engagement with accessibility among Group B members, we asked those expressing interest in the topic to identify factors that might inspire them to explore it further. The results, as displayed in Figure 35, highlight several key motives.

Ethical considerations emerged as the most influential factor, cited by 66 developers, meanwhile Other significant drivers included the accessibility of advanced validation tools (43 mentions), the prospect of career advancement through skills acquired in this domain (40 mentions) and the increasing availability of free online courses dedicated to accessibility (37 mentions).

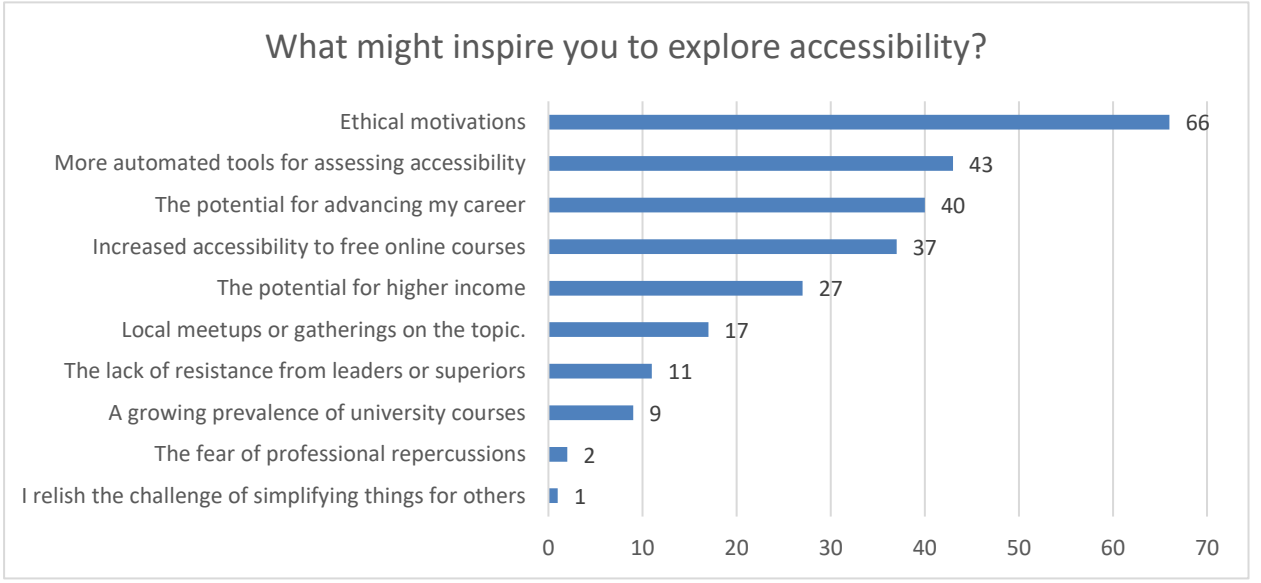

Figure 35: Motivations prompting Group B members to delve into accessibility.

Conversely, for those in Group B who displayed a lack of interest in accessibility, we sought to understand the underlying factors contributing to this stance. As depicted in Figure 36, the predominant concern, voiced by 18 developers, was the fear that the technical expertise gained in this area might not align with their superiors' priorities, potentially undermining the value of their efforts.

Other frequently mentioned reasons included the perception of limited career utility in accessibility (17 mentions) and a belief that focusing on accessibility would not significantly help in attracting a larger client base (16 mentions).

These findings underscore the dual challenges of overcoming misconceptions about the professional value of accessibility and addressing workplace cultural resistance to its adoption. At the same time, they reveal an encouraging openness to ethical and practical incentives that could motivate developers to embrace accessibility in their work.

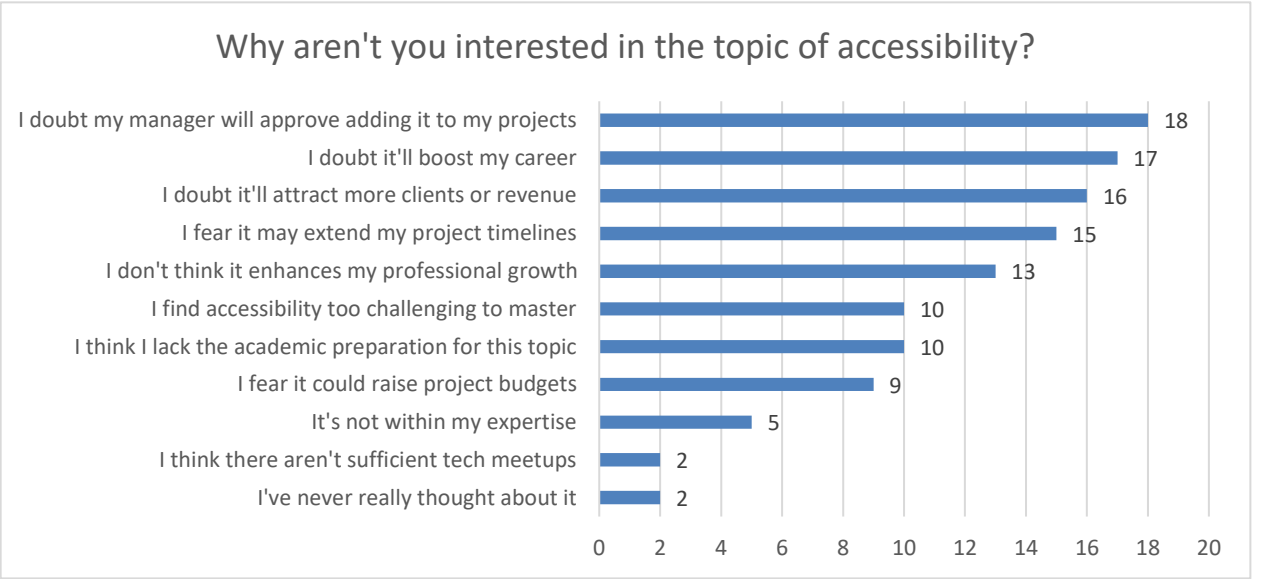

Figure 36: Reasons for Group B's waning interest in accessibility.

4.7. Final comments

At the conclusion of the survey, all participants, spanning both Group A and Group B, were invited to share additional thoughts on the topic of accessibility or the survey itself. Unfortunately, only 18 developers, representing just 6% of the total participants, chose to provide feedback.

Many of these responses (13 developers) offered positive remarks:

- Several participants praised the initiative behind the questionnaire;
- Others underscored the importance of raising public awareness about accessibility issues;
- A few pointed out the challenges they face in advocating for accessibility within their organizations or during client engagements;
- Some admitted that they had previously overlooked the topic but found the survey inspiring and expressed intentions to explore accessibility further.

In contrast, 5 participants provided critical feedback, with opinions varying widely:

- Two respondents dismissed accessibility as lacking market demand, which they viewed as validating their disinterest;
- One developer characterized accessibility as a subject confined to academic or research settings, describing it as impractical in real-world application;
- Another participant criticized the survey for failing to explicitly mention its focus on accessibility, suggesting they felt misled;
- The final respondent expressed a reluctance to promote accessibility among their clients, arguing that the responsibility for advancing this issue rests with the government rather than individual developers or private enterprises.

This mixed feedback highlights the diverse perspectives within the developer community, ranging from enthusiasm and newfound interest to skepticism and criticism. It underscores the importance of addressing misconceptions and fostering dialogue to promote accessibility as both a professional and societal imperative.

5. Discussion

The survey responses illuminate the multifaceted relationship between Italian developers and digital accessibility, exposing both structural barriers and actionable leverage points. Although successive guideline releases - WCAG 2.0 (2008), WCAG 2.1 (2018), WCAG 2.2 (2023) - and the harmonized European standard EN 301 549 have progressively embedded testable success criteria into mainstream frameworks, only 9% of respondents were aware of WCAG 2.2. This technological lag frames many of the challenges reported in the questionnaire.

Our ancillary analyses qualify these findings further. Demographic factors contributed little explanatory power: gender showed no association with self-reported accessibility knowledge ($\chi^2(4, N = 300) = 3.05$, $p = .55$, $V = .07$), and age exhibited only a small, non-significant difference (M_{aware} = 37.8 years vs M_{unaware} = 36.2 years, $t(183) = 1.47$, $p = .14$, $d = 0.17$). Prior accessibility training, by contrast, emerged as the most salient predictor of practice: developers who had completed at least one course were almost four times more likely to have delivered an accessible product (OR = 4.2, 95% CI [2.1, 8.3], Wald $\chi^2 = 18.1$, $p < .001$), whereas company size and seniority were non-significant. Consistent with this pattern, developers familiar with at least one accessibility guideline were far more likely to have released an accessible product (43% vs 0%, $\chi^2(1, N = 300) = 81.45$, $p < .001$, $V = .52$), and familiarity with Italy's accessibility law (Legge 4/2004) showed a similarly strong link to practice—59% of legally aware participants had shipped an accessible artefact versus just 10% of those unaware of the legislation ($\chi^2(1, N = 300) = 69.61$, $p < .001$, $V = .48$). These patterns mirror surveys from Brazil (≈ 20% adoption) and Turkey (< 15% guideline awareness), reinforcing the view that training—rather than organizational scale—is the decisive enabler of inclusive development. Taken together, the evidence indicates that economic incentives and legal mandates will remain insufficient unless paired with systematic capacity-building initiatives. Nearly half of our respondents assigned primary responsibility for accessibility to UI/UX specialists alone (Q24), a siloed mind-set consistent with the limited uptake of automated testing tools (Q30) and further underscoring the need for cross-functional training.

Challenges in developing accessible software, as highlighted by Group A (Q27), align closely with the reasons for disinterest identified by Group B (Q35). Both groups point to difficulties in advocating accessibility to clients, because of limited perceived economic return, and to superiors, for whom the theme is not considered career-enhancing. Consequently, Group B's interest in accessibility is largely driven by ethical considerations (Q34) rather than professional demands.

A recurrent theme is the perception of insufficient training opportunities; notably, respondents who had already produced an accessible artefact flagged "lack of training" far more often than novices (48% vs 11%, $\chi^2(1, N = 300) = 120.40$, $p < .001$, $V = .63$), suggesting that experience heightens awareness of skill gaps. Participants consistently call for practical examples, online courses and automated tools (Q31, Q34). This shortage is reflected in limited engagement: only about 20% have developed accessible products (Q25), and these efforts focus mainly on visual impairments (Q26). Similarly, accessibility assessments remain uncommon and largely manual (Q28, Q29).

Academic initiatives alone may have limited reach, as most developers lack formal ICT education and rely on self-directed online learning (Q20, Q22, Q34). Disseminating accessibility knowledge through these preferred channels may therefore be more effective.

Further inconsistencies emerge in self-reported familiarity. While many claim basic knowledge (Q20), limited awareness of guidelines, assistive technologies and practical experience (Q22, Q23, Q25) suggests over-estimation. Adjusting for these discrepancies, the share of developers with substantive knowledge likely lies between 31% and 38%, indicating a more critical situation than surface figures imply.

Indeed, every respondent who had ever evaluated accessibility reported knowing at least one automatic validator, whereas none of those unaware of validators had performed such checks ($\chi^2(1, N = 300) = 293.26$, $p < .001$, $V = 1.00$); developers who conducted evaluations were also six times more likely to have shipped an accessible product (63% vs 11%, $\chi^2(1, N = 300) = 70.70$, $p < .001$, $V = .49$), underscoring the practical payoff of embedding audits into the workflow. Although many respondents perceive automated tools as costly, most leading solutions are free or freemium (Q30), contradicting this assumption and highlighting an information gap.

Finally, the employment landscape, dominated by small private firms and freelancers, often lacks the resources and planning needed for staff training, further hindering the integration of accessibility into everyday practice.

While our convenience sample inevitably limits the study's generalizability, the convergence with international data lends external validity.

6. Conclusions and future work

Drawing on responses from 300 Italian software professionals, this study offers the first nation-wide snapshot of how developers perceive and practice digital accessibility. The results expose a stubborn "awareness–action gap": although nearly three-quarters of participants have heard of the topic, only one in five can identify the Stanca Act - even though that law has been on the books for more than twenty years - and a similarly small fraction have ever released an accessible artefact. Quantitative tests sharpen this picture, showing that prior training - not company size or seniority - multiplies the odds of delivering an inclusive product by a factor of four, while a widespread tendency to off-load responsibility onto the UI/UX team helps to explain why automated validators remain under-used and fixes are largely confined to visual impairments.

These findings imply that legal compliance alone will not shift practice unless it is buttressed by incentives that enlarge both skills and tooling. Policymakers could, for example, pair certified accessibility audits with tax credits or reduced social-security contributions; public agencies might underwrite brief, hands-on micro-MOOCs that weave WCAG 2.2 exercises into the up-skilling pathways already favored by freelancers and small firms; and targeted grants to the open-source validator ecosystem would lower the real, and perceived, cost of routine checks. In companies, accessibility could be normalized through cross-functional checkpoints that require joint sign-off from developers, designers and project managers at each sprint review, keeping the issue visible throughout the life-cycle.

The work is not without limitations: our convenience sample and reliance on self-reported measures necessarily limit generalizability, and future studies should triangulate survey claims with repository mining and objective accessibility scores. Longitudinal field experiments that track the impact of structured training and fiscal levers, together with comparative surveys across EU member states in the run-up to WCAG 3.0, would provide the next decisive tests. In short, Italy already has a solid legal floor; only sustained investment in people and tools can raise the ceiling of genuinely inclusive design in its digital economy.

Declarations

Conflict of Interest: The author declares that he has no conflicts of interest.
Funding Declaration: This research did not receive financial support.
Human Ethics and Consent to Participate declarations: not applicable.

References

[1] Paternò, F., Schiavone, A.G. The role of tool support in public policies and accessibility. Interactions, 2015, 22.3: 60-63

[2] Stanca Act: https://www.normattiva.it/atto/caricaDettaglioAtto?atto.dataPubblicazioneGazzetta=2004-01-17&atto.codiceRedazionale=004G0015

[3] Gambino, O., Pirrone, R., Giorgio, F. D. Accessibility of the Italian institutional web pages: a survey on the compliance of the Italian public administration web pages to the Stanca Act and its 22 technical requirements for web accessibility. Universal Access in the Information Society, 2016, 15, 305-312.

[4] Barricelli, B. R., Sciarelli, P., Valtolina, S., Rizzi, A. Web accessibility legislation in Italy: a survey 10 years after the Stanca Act. Universal Access in the Information Society, 2018, 17, 211-222.

[5] Valtolina, S., Fratus, D. Local government websites accessibility: Evaluation and finding from Italy. Digital Government: Research and Practice, 2022, 3(3), 1-16.

[6] Schiavone, A. G. Is Moodle accessible? An analysis through experiences in scientific literature and a case study. Proceedings of International Symposium on the Future of Education in Information Science, 2018, pp. 165–174.

[7] Barricelli, B. R., Casiraghi, E., Dattolo, A., Rizzi, A. 15 years of Stanca act: are Italian public universities websites accessible? Universal Access in the Information Society, 2021, 20, 185-200.

[8] Lazar, J., Dudley-Sponaugle, A., Greenidge, K. D. Improving web accessibility: a study of webmaster perceptions. Computers in human behavior, 20(2), 269-288.

[9] Tangarife, T., Mont'Alvão, C. O que os desenvolvedores brasileiros sabem sobre acessibilidade Web e inclusão digital? Proceedings of the 6th Congresso Internacional de Ergonomia e Usabilidade, Design de Interfaces e Interação, 2006

[10] Freire, A. P., Russo C. M., Pontin Fortes, R. The perception of accessibility in Web development by academy, industry and government: a survey of the Brazilian scenario. New Review of Hypermedia and Multimedia. 14, 2 (2008), 149-175. http://dx.doi.org/10.1080/13614560802624241

[11] Antonelli, H. L., Rodrigues, S. S., Watanabe, W. M., de Mattos Fortes, R. P. A survey on accessibility awareness of Brazilian web developers. In Proceedings of the 8th international conference on software development and technologies for enhancing accessibility and fighting info-exclusion, 2018, pp. 71-79.

[12] Pichiliani, T. C. P. B., Pizzolato, E. B. A survey on the awareness of Brazilian web development community about cognitive accessibility. In Proceedings of the 18th Brazilian Symposium on Human Factors in Computing Systems, 2019. pp. 1-11.

[13] Durdu, P. O., Yerlikaya, Z. The perception of website accessibility: A survey of Turkish software professionals. AJIT-e: Academic Journal of Information Technology, 2020 11(41), 42-71.

[14] Inal, Y., Guribye, F., Rajanen, D., Rajanen, M., Rost, M. Perspectives and practices of digital accessibility: A survey of user experience professionals in nordic countries. In Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society, 2020, pp. 1-11.

[15] Distantjob.com - "How Many Software Developers Are There in The World?: https://distantjob.com/blog/how-many-developers-are-in-the-world

[16] Eurostat - Nomenclature of territorial units for statistics (NUTS): https://ec.europa.eu/eurostat/web/nuts/background

[17] W3C – Web Content Accessibility Guidelines (WCAG) 2.1: https://www.w3.org/TR/WCAG21/

[18] W3C – Web Content Accessibility Guidelines (WCAG) 2.0: https://www.w3.org/TR/WCAG20/

[19] W3C – Web Content Accessibility Guidelines (WCAG) 1.0: https://www.w3.org/TR/WCAG10/

[20] W3C – Accessible Rich Internet Applications (WAI-ARIA): https://www.w3.org/TR/wai-aria-1.2/

[21] W3C – User Agent Accessibility Guidelines (UAAG): https://www.w3.org/TR/UAAG20/

[22] W3C – Authoring Tool Accessibility Guidelines (ATAG): https://www.w3.org/TR/ATAG20/

[23] U.S. Section 508 Official Website: https://www.section508.gov/

[24] Gay, G., Li, CQ.: AChecker: Open, Interactive, Customizable, Web Accessibility Checking. In: International Cross-Disciplinary Conference on Web Accessibility—W4A 2010, pp. 1–2 (2010)

[25] Schiavone, A. G., Paternò, F. (2015). An extensible environment for guideline-based accessibility evaluation of dynamic Web applications. Universal access in the information society, 14(1), 111-132.

[26] TotalValidator: https://www.totalvalidator.com/

[27] WAVE - Web Accessibility Evaluation Tools: https://wave.webaim.org/