

Digital Citizen Rights: Accessibility of E-Government Websites in Italy

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Abstract. Nowadays, digital services pervade all our life. Accessible services can greatly empower the personal autonomy of people with disabilities. In Europe, accessible and usable interfaces for assuring a satisfying interaction with applications and services created by Public Administrations is a right for any citizen, regardless of any functioning or ability. In this paper, starting from experience of people with disabilities, the accessibility of Italian PA services has been investigated to evaluate progresses in a time range of six years. Results suggest that PA services have increased but no substantial improvement in terms of accessibility has been recorded. Simplified interaction and increased efficiency are still lacking, even if global user satisfaction seems to have slightly improved. However, the virtuous cycle of accessibility improvement is steadily in progress thanks to tools and resources made available by eGovernment agencies with the voluntary contribution of the Italian designer and development community, and this will hopefully lead to further improvements in the coming years.

Keywords: Human-Computer Interaction, Web Interfaces, Accessibility, People with Disabilities, e-Government.

1 Introduction

In most cases, the Internet is an opportunity for people with disabilities: accessible Public Administration (PA) online services can be performed autonomously, without the need for an accompanying person, greatly empowering personal autonomy. Autonomy is one of the most important conditions for people with disability and therefore it is very important to progressively increase the portfolio of available services. Investigating the main reasons why users who could access such services avoid using them could provide interesting information on barriers or problems to be solved.

This paper extends (Buzzi et al. 2023), a study on accessibility of e-Government services from the perspective of people with disability to assess if and how accessibility

improved over time. Specifically, a comparison between 2023 and 2017 has been introduced in (Buzzi et al. 2023) exploiting a questionnaire extended with additional questions and semi-structured interviews.

This paper extension provides a complete background ~~about~~on accessibility, the European and Italian directives and governance policies about Digital Citizen Rights. It also includes and discusses the complete details of the 2023 versus 2017 comparison, and finally discusses the study results with respect to official analyses performed by the Italian Government on its PA websites. Findings showed that PA services have increased but no substantial improvement in terms of accessibility has been recorded. Simplified interaction and increased efficiency are still lacking, even if global user satisfaction seems to have slightly improved.

The paper is organized in six sections. After discussing the background in Section 2, the related work is introduced in Section 3. The study and its results are then illustrated and discussed in Section 4. Next, Section 5 compares the current results with the 2017 study and assess the coherence of such results with official studies of the Italian Government. Finally, Section 6 outlines some concluding considerations and remarks.

2 Background

Users accessing online resources and sites may do so in different ways and devices, and thus may have different needs. For example, some people may use desktop computers, laptops, tablets or smartphones to access online information. In addition, there is a significant proportion of users who rely on assistive technologies to interact with digital content. These technologies, ranging from screen readers to special input devices, need to well interact with the user interface, i.e. web sites and pages. However, it is important that a user can easily interact with the interface, reach the contents and complete their task in a reasonable time and with as little effort as possible. It is usual to consider this for the ordinary user, while it is not kept in mind for the user with disabilities or who may have specific needs. This can then lead to interaction problems even for those web pages that are considered accessible. In the following few examples of possible interaction issues will be presented.

2.1 User Interaction and Assistive Technology

Users with disabilities may interact with web pages and services through assistive technologies exploiting also navigation techniques to interact in a simpler and more natural way, for instance users reading on a smartphone may need to zoom in, change the color of the text or background, or may need to interact in a simpler and more natural way. Furthermore, assistive technologies such as screen readers and magnifiers must interpret the content of the user interface in order to properly and appropriately deliver content to the user who cannot see or is partially sighted. For instance, the screen reader will have to announce when a link is a menu item, or which are the possible button choices the user can make, or which are the main areas or sections on a page. Let us also not forget those parts of the page that update very frequently and are very difficult,

and sometimes almost impossible, to capture via screen reader. These are just a few examples of possible user interactions, from which it emerges how important it is that the user interface is well designed and developed.

A screen reader is a software installed in the system able to interface between the user (blind/visually impaired) and the operating system and its applications. It interprets the contents of the interface (text, links, buttons, text boxes, drop-down menus, etc.) to announce to the user the type of content and object on which the focus is. For the detection of interface components to occur correctly, it is necessary that the developer has used and applied accessibility features, and thus has used the appropriate attributes and elements at the user interface level. For example, most screen readers, when accessing a web page, interpret the HTML code of the page, announcing the elements in the order in which they are written (entered) on the page. Therefore, the correct order of the contents and elements of a web page is very important to guarantee a correct sequence of the contents to be announced to the blind person.

A magnifier is an assistive technology used by partially sighted persons to better read the contents of the user interface by allowing the user to magnify the mouse pointer, increasing the font size or changing the background and foreground colours. If the system focus is not linked to the mouse pointer, this assistive technology does not work properly.

Another interaction issue may occur for a user interacting via keyboard. If every element of the interface has not been programmed to receive the system focus, only the mouse will have to be used to activate it. Thus, if a web page does not have any links or buttons programmed in a standard or accessible way granting focus, the user will not be able to interact via the Tab or Enter key. For a user who must interact via pointing systems, it is essential that the control elements of the interface are well separated, distinguishable and clickable. Also, if subtitles have not been provided in a video, or a script has not been associated with it, or if it does not provide an alternative form of speech and audio content to comprehension, the user who cannot hear will not be able to enjoy the content.

All these are just some examples of interaction with the web page by people who may have difficulties or use assistive technology to give an idea about the potential encountered problems.

2.2 Usability and Accessibility

It is important that a user can easily interact with the interface, can reach the contents and complete their task in a reasonable time and with as little effort as possible. That is why when designing and developing, we should not limit ~~this to refer~~ only to the basic concept of accessibility but ~~should try to~~ go beyond it by ~~worrying about how~~ considering how the user ~~actually~~ achieves the objective of navigating the website or service. It is usual to consider this for the ordinary user, while it is not ~~kept so in mind~~ for the user with disabilities or ~~who may have~~ specific needs. This can then lead to interaction problems even for those web pages that are considered accessible. If there are further accessibility problems, then it becomes even more complicated.

~~Often accessibility is concerned with defining the basic principles that enable the user and assistive technology to be able to interact with content, but risks neglecting the part of effectiveness, efficiency and user satisfaction, i.e. those characteristics that define so-called usability.~~ Usually, accessibility refers to the minimum requirements that allow everyone, regardless of ability, to access content, and more generally the user interface. However, there is no concern about how these contents are reachable and usable while they greatly impact on the user experience. ~~In other words,~~ There is a tendency to consider the concepts of accessibility and usability as separate, as if with usability were suitable only for non-disabled users. ~~Maybe it is for these reasons that often, even if the page or website is technically accessible, the user perceives barriers or difficulties in navigation.~~ Conversely, usability is a crucial aspect that must be considered when designing for making content technically accessible but also easy to use removing perceived barriers and difficulties in navigation.

Leporini et al. [Leporini and Paternò, 2004] proposed a combination of ~~the concept of~~ usability ~~with respect to those of~~ accessibility in the web, identifying the relationships between these two concepts, in particular considering usability criteria for accessible Web sites. ~~In other words,~~ the three properties ‘efficiency, effectiveness and satisfaction’ were ~~declined related with respect~~ to the concept of accessibility, and especially of interaction/navigation with the web interface. Many studies investigated the relationship between accessibility and usability for the web [Babu et al., 2010; Huber et al. 2008; Petrie & Kheir, 2007]. As a result, a number of criteria have been proposed in the literature to decline the concept of usability with respect to the accessibility of web pages for various types of users [Leporini and Paternò, 2008; Moreno et al., 2009].

2.3 Digital Citizen Rights

eGovernment services, such the Public Administration digital services addressed in this paper, represent a great opportunity to increase and simplify citizen relationship with governance structures. However, the European digital rights and principles [EU 2024] clearly indicate that such a transition from traditional to digital services must take into consideration some basic principles: one of these is *solidarity and inclusion*, which explicitly addresses the previously described usability and accessibility issues.

Specifically, in Italy such principles have been transposed in the Digital Citizenship Rights Guide [DL22/2005], which is now considered a mandatory guideline for the design of PA online services, and explicitly states that every citizen has the right to access online services in a simple, safe, and fast way.

Therefore, investigating such aspects of PA digital services, especially through the eyes of citizens with disabilities that mostly suffer from poorly designed applications and interfaces, is strictly required for the (mandatory) fulfillment of the European Declaration on Digital Rights and Principles as well as of National laws and guidelines.

Legislation is a way for inducing changes in society. The last few decades have been characterized by a legislative effort for improving accessibility of public services and digital products in Europe. In 2016, the EU Commission published the European Di-

directive (EU) 2016/2102 of the European Parliament and of the Council on the accessibility of websites and mobile applications of public sector bodies. Two years later the Commission Implementing Decision (EU) 2018/1523 established a model accessibility statement in accordance with Directive (EU) 2016/2102. Furthermore in 2018 the European Directive (EU) 2019/882 (Accessibility Act) was approved. Lastly, the Commission delegated ETSI to define a technical specification for accessible products and services: the EN 301 549 v.3.2.1 (Accessibility requirements for ICT products and services).

These directives have a significant impact fueling the internal market of accessible ICT products and removing barriers to their free circulation. Member States applied these directives at national level. They are applied not only to the Public Bodies but also to companies and legal entities offering services to the public through websites or mobile applications, with an average revenue in the last three years greater than 500 million euros.

2.4 The Italian context

Many websites of the Italian Public Administration are still not compliant with the minimum level of accessibility requirements [Gaggi et al., 2022]. Previous studies investigated the accessibility of PA services in Italy, mostly exploiting automatic tools for assessing the degree of accessibility of PA web sites [Barricelli et al, 2018, Valtolina and Fratus, 2022]. Unfortunately, the ability of automated test tools to identify problems is limited because they cannot detect all types of WCAG accessibility errors [Vigo et al., 2013]. A comparison of ten popular website accessibility tests in 2017 found 37% of problems (errors and warnings) at best and 17% at worst [Duran, 2017].

Considering the limits of automatic evaluation of web accessibility (due to their inability to check all aspects of accessibility automatically), our study investigates the current perceived accessibility level of e-Government services in Italy from the point of view of people with disabilities, who can highlight issues and problems not detected by automatic validators. A similar work was performed in 2017 investigating Italian public administration accessibility via an online survey answered by 68 people with disabilities accessing PA services in Italy [Buzzi et al., 2019]. Results from the sample highlighted the need to improve service accessibility and usability, and the request for increasing their number and set of functions. Our study thus follows the same methodology of Buzzi et al. [2019], investigating the accessibility of e-Government services in Italy in 2023 from the point of view of people with disabilities. Seventy-six users participated in an online survey, and the collected answers have been further refined through semi-structured interviews on a subset of participants. To make the results further comparable, the present study only extends the number of questions of the previous one to collect more data (adding three new questions related to usability and support) but keeps the original ones unchanged. Moreover, have a similar number of participants (68 vs. 76) and both recruited mainly blind and visually impaired (62% in the 2019 study and 85.5% in this study).

To better investigate and understand differences and similarities between the Italian situation in 2017 and 2023, in this section we briefly summarize main results in the 2017 study [Buzzi et al., 2019].

Regarding accessibility issues encountered by the 2017 sample, a first point concerns the participants' experience in accessing the online PA services. To better understand collected data, it is important to bear in mind that unskilled people having problems accessing online services often blame the failure on themselves – as unable to act correctly in a digital environment – instead of considering the cause as due to poor usability design.

Most users (88%) declared they have experienced some issues: 68% of participants had problems sometimes and 20% many times, as shown in Fig. 1.

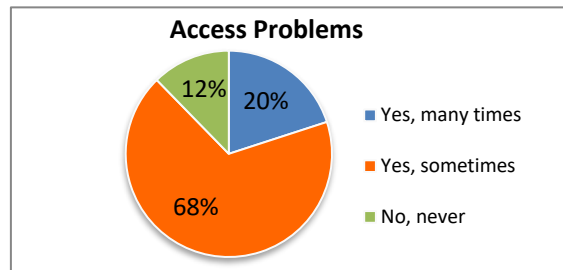


Fig. 1. Problems detected when accessing online PA Services

Concerning the ability to successfully completing the service, only 11% of the participants declared to always successfully complete a service while less than one third only often. More than half of the sample (i.e. 51%) instead was successful only sometimes, and two participants never. Three participants never tried to access online services, in fact for users with visual/hearing impairment it is very difficult to access online services, since they are unable to use the screen reader but can still exploit braille devices as assistive technology (Fig. 2).

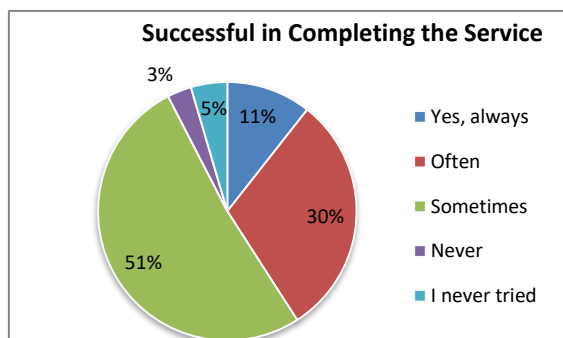


Fig. 2. Completing online PA Services

The interaction was evaluated as quite simple in most cases by 46% participants, and always simple by 9%, while big difficulties still are detected by 9% (always difficult) and 36% participants found it quite difficult (Fig. 3).

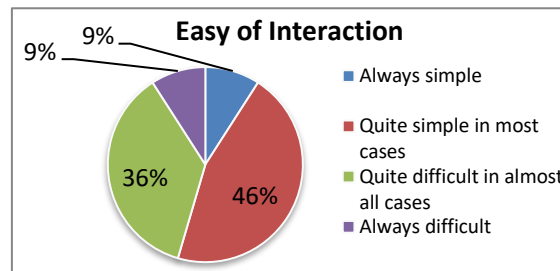


Fig. 3. Interaction in accessing online PA Services

Despite the very small sample, result indicated that the Italian PAs should improve their services to better guarantee web accessibility and usability for all. A very frequent issue encountered was related to the difficulty of finding the information or service the user was looking for. For this kind of issue, a more usable reorganization and presentation of web content could be beneficial to improving user orientation and usability overall.

After more than 6 years we have decided to investigate if and how the perception of accessibility of PA services by people with disability has changed over time.

3 Related Work

Technology may play a crucial role in promoting the participation and inclusion of people with disabilities in society [Ferri and Favalli, 2018]. Accessibility of websites and services is important for everyone, but it is crucial for people with disabilities, since their interaction may require more time and cognitive effort and may encounter more obstacles [Yesilada & Harper, 2019]. If not designed with accessibility in mind, the Internet may increase the marginalization of people with disability in society [Jaeger, 2022].

Although accessibility to any type of website is essential to allow full equity for people with disabilities, guaranteeing access to the services provided by Public Administration is especially delicate: if the eGovernment is not accessible, users with disabilities may suffer discrimination [Abascal, 2022]. Different kinds of barriers due to competences and skills, geographic position and resources, income, education, and special needs, create the so-called “digital divide” and without urgent countermeasures, in the future this gap could even increase [Seljan et al., 2020]. Several countries have published laws to favor and guarantee equal rights for all to access digital resources, web sites and services. These laws are mostly based on accessibility web standards defined by the World Wide Web Consortium (W3C), the Web Content Accessibility Guidelines (WCAG), which evolved for over 25 years to better incorporate usability into accessibility guidelines [W3C, 2023].

E-Government accessibility is a widely investigated topic, due to the importance to ensure equal opportunities for all citizens. Attention to accessibility seems also bound to the transparency of public administrations. Alcaraz-Quiles et al. investigated relations between transparency, accessibility, and usability of Spanish Regional Government websites, showing that the transparency of analyzed websites is inversely related to accessibility since without visibility retrieving information can require considerable time [Alcaraz-Quiles et al., 2018].

The assessment of the degree of accessibility of e-Government services has been a subject of investigation all over the world. Galvez and Youngblood [2016] analysed more than one hundred national and local e-government website sites in Rhode, using a combination of code inspection, heuristic evaluation, and automated analysis. Results suggest that best-practice templates may be helpful in improving usability, accessibility, and mobile readiness, while it is critical for designers to receive training and for governments to monitor Web sites compliance with standards.

Paul [2022] presented the evaluation of the accessibility of Indian e-government websites using a sample of 65 websites of various ministries based on the WCAG 2.1 standard, finding most e-government websites do not meet Level A conformance with WCAG 2.1.

Al-Sakran and Alsudairi [2021] investigated how well the Saudi mobile e-government websites comply with usability standards and accessibility guidelines recommended in the WCAG. Websites assessments were conducted using manual evaluation and complemented by different automated analysis tools. The findings revealed usability and accessibility problems that affect the performance of government websites. Several recommendations for improving the usability and accessibility of websites in Saudi Arabia were also suggested.

Agrawal et al. [2022] investigated the usability, accessibility, and mobile readiness of Indian government websites. The analysis covered 164 government websites delivering e-services. The evaluation of websites compliance with the WCAG 2.0 was done on various quality parameters using automatic online tools. The results indicate that many websites had low usability: most of the website does not follow WCAG 2.0 guidelines, while none was usable and fully accessible on mobile devices.

Siquiera et al. [2022] investigated whether public prosecutors' websites are following web accessibility guidelines. The authors evaluated the websites of each of the 27 states of Brazil using the WCAG 2.0. Results indicated that the websites violated between 16 and 33 different success criteria out of 61 criteria.

Referring to European countries, Kous et al. [2021] performed an accessibility evaluation (compliance with Standard EN 301549) of 189 Slovenian municipalities' websites using an automatic tool (Achecker). The results of the statistical analysis showed that the website home pages in 2018 (after the adoption of European Standard EN 301549) have significantly improved compared to 2017.

Inal et al. in 2022 analyzed the accessibility of 356 municipality websites in Norway using automatic tools. Results show that none of the municipality websites meet an acceptable level of compliance. The websites violate an average of 40 checkpoints, of which many are Level A criteria that represent the minimum level of satisfaction of checkpoints [Inal et al., 2022].

The situation in Romania in terms of web accessibility has been depicted by two key institutions in the field of administering social services and benefits in Romania – County Directorates of Social Work and Child Protection (DGASPC) as well as County Pensions Houses (CJP). The assessment grid was represented by the Web Content Accessibility Guidelines (WCAG) 2.1 requirements and techniques, mainly regarding Level A, minimum level of conformance. Results underlined significant discrepancies on implementing various accessibility characteristics among similar institutional bodies and the needs to take further steps on improved accessibility [Marin & Popa, 2023].

Recently, Lynn et al. [2023] examined the web accessibility of local authority websites in the Republic of Ireland specifically referring the Web Accessibility Directive, Results confirmed that most local government websites examined present significant accessibility issues.

Similar studies were performed also in Italy. Barricelli et al [2018] exploited automatic tools for assessing the degree of accessibility of PA web sites in Italy, showing that on more than 8000 websites of the Italian municipalities only ~~the~~ 1% fully conformed to the Italian legislation that required PA to implement a subset of the WCAG guidelines. This issue was confirmed by several successive studies. Buzzi et al. [2019] created an online survey answered by 68 people with disabilities accessing PA services in Italy. Results from the sample highlighted the need to improve service accessibility and usability, and the request for increasing their number and set of functions. Furthermore, Valtolina and Fratus [2022] investigated accessibility issues of local government websites in Italy proposing an evaluation strategy via two validators (AChecker and VaMolà) and analysing 7,713 homepages against WCAG 2.0 and Italian Law recommendations. Results confirmed a low degree of web accessibility of municipal websites.

However, most studies exploited only automated analysis tools (validators). A recent systematic literature review on automated tool utilization in web accessibility research from 2002 to 2021 showed an increasing trend in its use year by year [Macakoglu and Peker, 2022]. Considering the limits of automatic evaluation of web accessibility (due to their inability to check all aspects of accessibility automatically), our study investigates the current degree of accessibility of Italian PA services from the point of view of users with disabilities, who can highlight actual problems via an online survey further deepened through semi-structured interviews.

4 The Study

4.1 Methodology

Although recent years have shown an increasing attention at legislative, academic, and social levels, concerning accessibility of public services, many websites of the Italian Public Administration are still not compliant with the minimum level of accessibility requirements [Gaggi et al., 2022].

This study investigates the accessibility of digital services provided by Italian PAs for people with disabilities. To this aim, the study applies two methodologies for gathering participants' feedback: an online survey and semi-structured interviews.

The survey was administered via Google Forms, which supports screen readers and keyboard shortcuts offering a good degree of accessibility for screen reading users [Leporini et al., 2018]. The questions focus on interaction aspects such as effectiveness in successfully completing the service, ~~usability~~usability of the interface, overall user satisfaction.

To recruit survey participants, the main Italian organizations of people with disabilities (visual, motor, hearing, intellectual) were asked to distribute an invitation letter (with the survey link) to their associates. This assures the authors do not have any direct contact with participants.

On the other hand, the purpose of the semi-structured interviews was to better understand the main accessibility problems identified by the survey. Some participants accepted to participate. The interviews were designed to reveal the participants' personal narratives, leaving them free to express their opinions, considerations, and suggestions that could not emerge in closed questions. Interviews were conducted via a video conferencing tool (Google Meet) or by phone (preferred by visual impaired users) by two of the authors: one conducted the interview and the other one annotated answers, comments, and observations. After each interview, both authors checked and integrated the annotated answers.

4.2 Questions

The questionnaire used for the online survey is reported below. For each question, we report the descriptive text presented to the user and the set of possible single- or multiple-choice answers. In the paper, we will use the numbers listed here to refer to the single questions.

Section 1: Sample Characterization

Q1. Gender

Single choice: Male / Female / I don't want to specify.

Q2. Age

Single choice: 18-29 / 30-39 / 40-49 / 50-59 / 60-69 / ≥ 70 .

Q3. Occupation/Job

Single choice: Student / Employee / Professional / Unemployed / Retired.

Q4. Disability

Multiple choice: Visual / Motor / Hearing / Intellectual / Behavioural.

Q5. Internet usage – How often do you use the internet?

Single choice: Almost Never / Sometimes / Weekly / Daily.

Q6. Which online PA services do you access most frequently?

Multiple choice: Health / Municipality / Job/Pension / Tax / Justice / Official Documents / Finance/Economy / School & Education.

Section 2: Interaction with e-Government services

Q7. Access problems – Have you ever had problems accessing the PA's online services?

Single choice: Yes, often / Yes, sometimes / No, never.

Q8. Effectiveness of PA service interaction – Were you able to get what you wanted and to complete the requested services?

Single choice: Yes, always / Often / Sometimes / Never / I've never tried.

Q9. Ease of the interaction

Single choice: Always simple / Simple (in most cases) / Difficult (It was quite difficult in most cases) / Very difficult (No, it was difficult in all cases and sometimes I was unable to complete the service).

Q10. User satisfaction

Single choice: Very unsatisfied / Unsatisfied / Neutral / Satisfied / Very Satisfied.

Q11. Documentation and help – Rate documentation and help (manuals, interface messages, contacts, etc.)

Single choice: Totally dissatisfied / Dissatisfied / Neutral / Satisfied / Totally satisfied.

Q12. Errors – Were you able to manage it and move forward if you made mistakes? (clear messages and interaction mechanisms)

Single choice: I made mistakes and could not correct them / I made mistakes and could hardly correct them / I don't know / I made mistakes, but I could easily correct them.

Q13. User Interface customization – Could the interface be adapted to your needs? (e.g. increase font size, change contrast, increase line spacing)

Single choice: No, in general / Only in some sites / I don't know / Yes, generally / I have not tried.

Q14. Aspects to be improved urgently

Single choice: None, everything is fine / Response times / Ease of use / Increase the number of online services to avoid face-to-face services / Others.

Section 3: Authentication & citizen rights

Q15. Do you have SPID credentials?

Single choice: I don't know what they are / I know what SPID is, but I don't own it / I own it, but I don't use it / I own it and I use it.

Q16. Did you know that every citizen has the right to easily access all PA services?

Single choice: Yes / No.

Q17. Did you know that AgID (Agency for digital Italy) is the authority in charge of receiving reports on difficulties in accessing PA services?

Single choice: No, I didn't know / Yes, but I didn't report it / Yes, and I made some reports.

Q18. Each Administration must identify a Digital Public Advocate. Would you like to participate by sending them your personal suggestions?

Single choice: No, I'm not interested / No, I wouldn't be able / Yes, I would like to participate / I don't have time to do it.

On the other hand, the semi-structured interviews consisted in four questions about difficulties, effectiveness, efficiency, user satisfaction and possible improvements:

IQ1. What obstacles have you encountered in accessing PA Web sites?

IQ2. Were you able to do what you wanted, or did you need help?

IQ3. Was the interaction challenging, did it require effort and/or a lot of time?

IQ4. Were you satisfied or what would you like to improve?

4.3 Participants

A total of 76 participants filled out the online survey: 50 males and 26 females. Participants are aged between 18 and more than 70 years: 2 (2.6%) participants in the 18-29 range, 8 (10.5%) in the 30-39 range, 20 (26.3%) in the 40-49 range, 30 (39.5%) aged 50-59, 8 (10.5%) aged 60-69, and 8 (10.5%) participants were 70 or older as shown in Fig. 4.

All participants indicated their gender: 2/3 are males (50 out of 76) and 1/3 are female (25 out of 76).

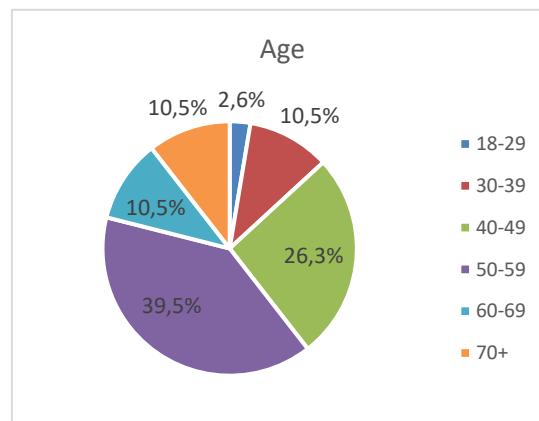


Fig. 4. Sample age

Regarding the type of disability, most participants are visually impaired (65 out of 76), followed by people with motor disability (8 out of 76) and three people having a mild cognitive impairment. Lastly, two hearing impaired people who communicate through the Italian sign language (signists) and one with a behavioral disability complete the sample. Note that some participants had multiple disabilities.

Among these participants, a total of 8 accepted to take part in the semi-structured interviews: 3 visually impaired (2 blind and one visually impaired that navigates via screen reader), 2 motor impaired, and 3 old persons with mild cognitive and motor impairment.

Clearly, the sample composition suffers from an imbalance in the representation of disability types, with 81.25% of the overall participants being individuals with visual disabilities. However, it should be taken into consideration that several studies have

shown that users with visual impairment, and more specifically blind users, encounter greater difficulties than users with other disabilities when interacting with websites. Visually impaired users searching the Web content took an average of 2.5 times longer than sighted users [Craven and Brophy, 2003]. An efficiency gap was also confirmed by [Ivory et al., 2004]: when blind people executed a search task, they took twice as long as sighted users to explore search results and three times as long to explore the corresponding web pages. Petrie et al. in 2004 performed an accessibility test of one hundred websites with users having visual, motor and perceptual disabilities. Results showed a mean task success rate of 76% which falls to 53% considering only the totally blind (the lowest score of all categories). Besides, regarding user satisfaction, blind users confirmed the lowest score of all the user categories [Petrie et al., 2004]. Overall, blind users interacting on the Web lose, on average, 30.4% of time due to frustrating situations, such as page layout causing confusing screen reader feedback, conflict between screen reader and application, poorly designed/unlabeled forms, no alternative text for pictures, misleading links, inaccessible PDFs, and screen reader crashes [Lazar et al., 2007]. For these reasons, we believe this study's sample including a high percentage of visually impaired users, who experience the greatest difficulties in web navigation, can offer interesting insights on the accessibility of PA services.

The distribution of participants by their occupation/job (Fig. 5) depicts that more than half of participants (~54%) are employees of a PA (Italian law requires PAs to recruit a percentage of people with disabilities). Twenty-three participants (30.3%) are retired, two participants are students (2.6%), five participants (6.6%) are practitioners and five unemployed people complete the sample.

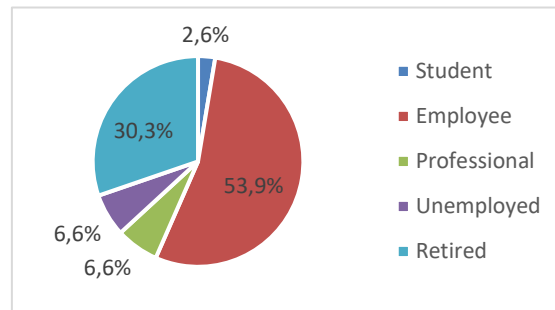


Fig. 5. Participant occupation/job

Finally, concerning the frequency of Internet use, most (68 out of 76) participants use the Internet daily, three weekly and two sometimes (Fig. 6). Three participants declared they use the Internet rarely. Two of them are 70+ aged and one 50+.

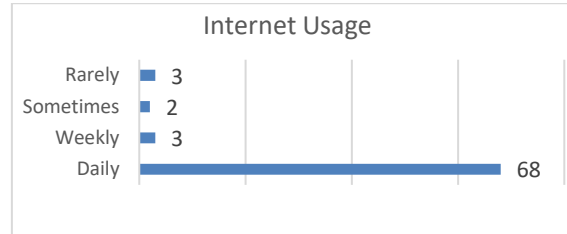


Fig. 6. Sample characterization: Participants' Internet use (Q5).

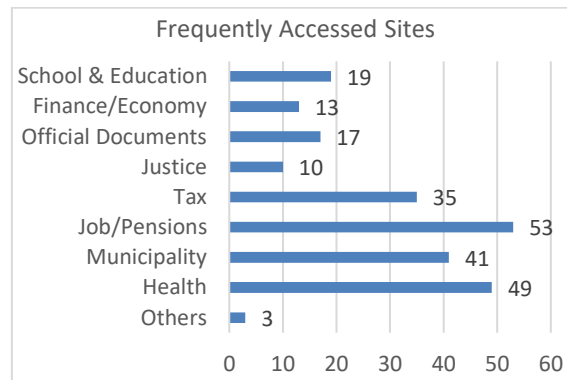


Fig. 7. Frequently accessed PA services (Q6).

Participants interact with several services of both local and central public administrations (Fig. 7). Most frequently accessed services are job or pension, Health, Local Administrations, and taxation.

4.4 Online Survey Results

Results are presented by analyzing the answers to sections 2 and 3 of the questionnaire.

Accessibility and Usability. Section 2 contains eight questions related to participants' usability experience when interacting with e-Government services. Answers to question Q7: "Have you had problems accessing the PA's online services?" offer indications on the access issues. It is remarkable that 89% of the sample reported access problems ('Sometimes' for 46 out of 76 users, and 'Often' for 22). Only 11% of the users (8 out of 76) never had an access problem (Fig. 8).

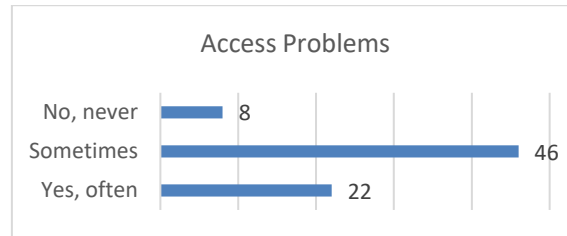


Fig. 8. Frequency of problems reported/encountered by participants when accessing e-Government services (Q7).

Regarding the effectiveness of interaction with PA services (Q8), more than half of the participants reported they were able to complete the requested services always (6 users, 8%) or often (37 users, 49.3%), while 27 users (36%) only sometimes and 3 never, as shown in Fig. 9.

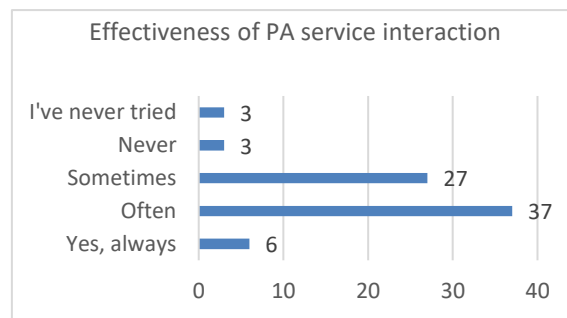


Fig. 9. Effectiveness of PA service interaction (Q8).

Considering how frequently the interaction with e-Government services was easy (Q9), most participants were positive: 4 users (5.3%) found it always simple and 37 users (48.7%) found it simple in most cases, but it is also relevant the percentage of participants that found it difficult in most cases (32.9%, 25 users) or very difficult in all cases (13.2%, 10 users), as shown in Fig. 10.

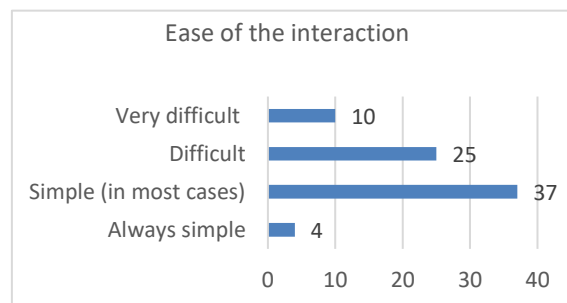


Fig. 10. Ease of the Interaction with PA services (Q9).

User satisfaction (Q10) reported a consistent number of participants (the majority) with a neutral position (27 users, 35.5%), as shown in Fig. 11. Positive rating is 30.3% (satisfied, 23 users) and 7.9% (very satisfied, 6 users), while negative rating is 15.8% unsatisfied (12 users) and 10.5% very unsatisfied (8 users).

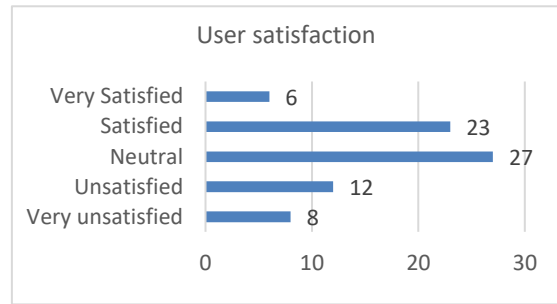


Fig. 11. User satisfaction about the Interaction with PA service (Q10).

For evaluating the PA website documentation and support (documentation and manuals, pop-up messages, etc.) a 5-item Likert scale (1 = *Totally dissatisfied*, to 5 = *Truly satisfied*) has been administered (Q11). Most users, 31 out 76, (i.e. 40.8%) chose the neutral option (*neither satisfied nor dissatisfied*), while the percentage of satisfied (22.4% *satisfied* and 7.9% *very satisfied*) is only slightly higher than the one of dissatisfied (19.7% *somewhat dissatisfied* and 9.2% *totally dissatisfied*), as shown in Fig. 12.

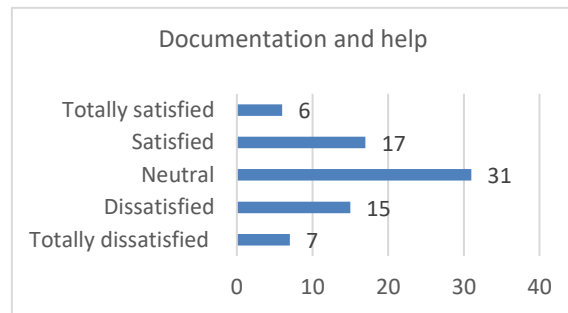


Fig. 12. User satisfaction about documentation and help (Q11).

Another question (Q12) was about errors: if you made mistakes, were you able to fix them easily (and were the error messages clear and helpful)?

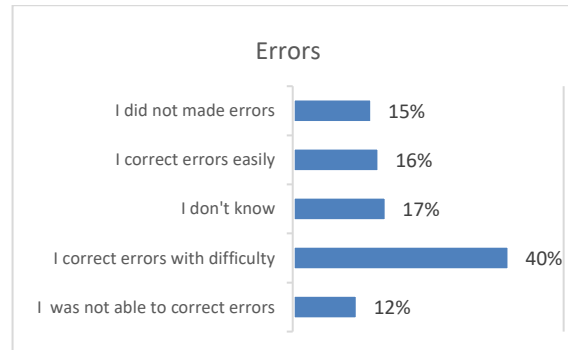


Fig. 13. Errors visibility and easy of recovery (Q12).

This question aims to understand if the recovery of errors is provided through clear messages and easy interaction mechanisms. Most users (40%, 30 users) reported that in case of errors they could hardly correct them, reaching half of the sample if we also consider the ones who said they could not correct errors (12%, 9 users). The neutral option (I don't know, 17.3%, 13 users), "I made mistakes, but I could easily correct them" (16%, 12 users) and "I don't made mistakes" (14.7%, 11 users) complete the answers (Fig. 13). Visibility of the error cause is a very important principle, and for people with disabilities this can imply to be perceptible with different sensorial channels.

Concerning the ability to customize or adapt the interface to the user's needs (Q13), one-fifth of the sample (20.3%) was *unable* to adapt the interface to their needs, 12.2 % were *able* in general, while 31.1% only *sometimes*. One-fifth of the participants (20.3%) did not try to modify the interface (Fig. 14).

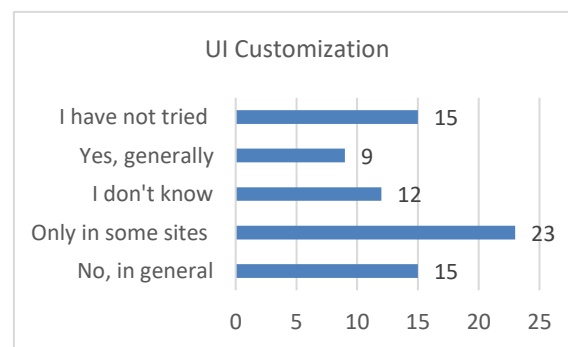


Fig. 14. Usability: interface customization (Q13)

Finally, concerning the aspects to be improved urgently (Q14), most of the users (45 out 76, i.e. 59.2%) suggested to make the UIs easier to use and simplify the interaction, while others suggested to add new online services (25%) and shortening the service response time (5.3%) as shown in Fig. 15. Some skilled users also suggested more specific improvements, e.g., better structuring of the content, use of logical templates to

make it easier to find what you are looking for, addition of instant chat for immediate assistance, subtitling and possibly translation in the sign language of videos.

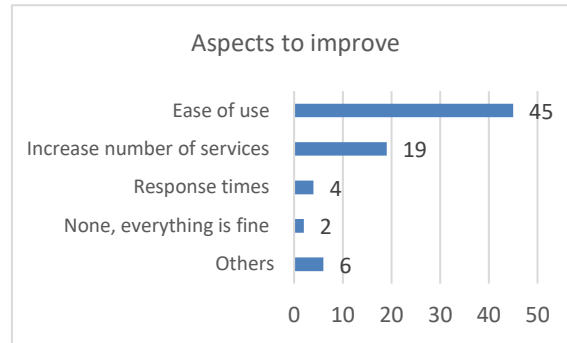


Fig. 15. Aspect to Improve (Q14)

Authentication and citizen rights. Section 3 of the questionnaire contains four questions concerning authentication and citizen rights. The first question (Q15) is about authentication via SPID (Public Digital Identity System). Overall, 63 participants (82.9%) use SPID for accessing PA services, 4 users (5.3%) have the authentication credentials but do not use them, 6 users (7.9%) know about the credentials but never requested them, and only 3 users (3.9%) still do not know anything about the SPID credentials, as shown in Fig. 16.

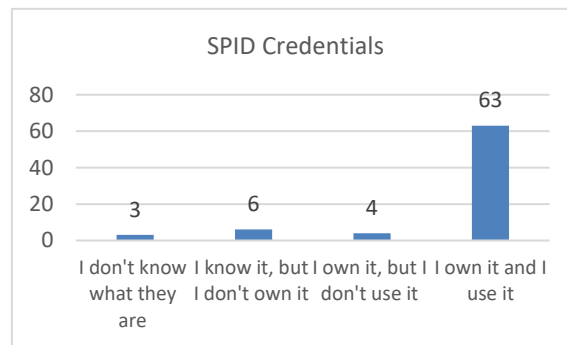


Fig. 16. Authentication: SPID credentials (Q15).

The other three questions are about citizen rights. Almost all participants (72, 94.7%) know their right to easily access all PA services (Q16), as shown in Fig. 17.

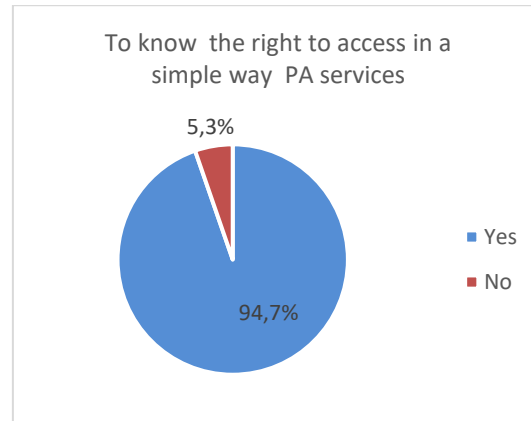


Fig. 17. Knowledge of citizen rights (Q16)

On the other hand, question Q17 investigates the awareness of users on the possibility of reporting accessibility problems to AgID (Agency for digital Italy), the authority in charge of monitoring and fueling the digitalization of the Italian PAs. Most of the participants (48.7%) are aware of this possibility but did not report any accessibility issues while 42.1% was not aware and only 9.2% sent some reports (Fig. 18).

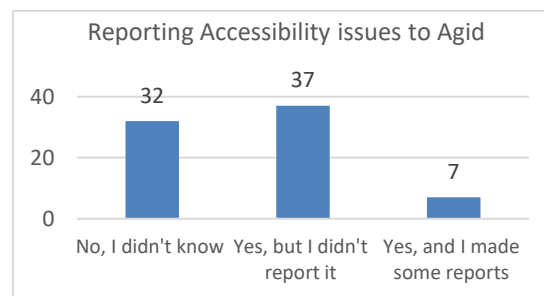


Fig. 18. Reporting Accessibility feedback to AgID (Q17).

Finally, question Q18 was about the knowledge of the role of the Public Advocate (*Ombudsman*) for the Digital Rights and the possibility to provide feedback for contributing to improve PA services. As shown in Fig. 19, most participants (47 out of 76, 61.8%) are interested in contributing, while 19 users (25%) do not consider themselves able to do it, one has no time, and 9 are not interested (11.8%).

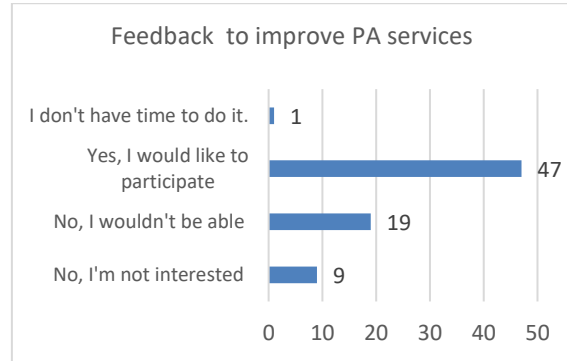


Fig. 19. Reporting Accessibility feedback to the Public Advocate (Q18).

4.5 Semi-structured Interviews Results

Tab. 1 summarizes the key findings from the participants' answers to the four interview questions (IQ1 – IQ4).

Table 1. Key findings from the interviews

Issues	Affected Tasks
Lack of clarity in the contents	<i>Exploring, searching</i>
Complex structure of the websites	<i>Exploring, searching</i>
Audio of the commercial advertisements overlaps the reading of the screen reader	<i>Listening the vocal synthesizer</i>
Documents created as an image (unreadable and unstructured)	<i>Reading a document</i>
Request to change the password frequently	<i>Access to website areas with authentication</i>
Tight and insufficient time for strong authentication	<i>Access to website areas with authentication</i>

A common obstacle encountered in accessing PA websites among all the users interviewed is the difficulty in finding what they are looking for, due to the lack of clarity in the contents and the complex structure of the websites. In particular, a totally blind user, who uses PA services daily, reported two major problems: the presence of advertisements on the sites that interfere with blind users' listening to the content, and the difficulty in using downloaded documents, as they are not readable by the screen reader being not in text format (e.g., PDF documents containing scans of paper documents).

Most notably, many of the interviewed users reported difficulties in accessing PA sites due to the SPID authentication or the need to periodically change their passwords, as required by the current national security guidelines. In some cases, participants were even unable to complete the service. Such users often require the assistance of family members or friends to accomplish these tasks.

An experienced blind user declared that the SPID authentication was accessible for him only through a specific provider. Indeed, such provider grants the user with 1 minute and 30 seconds to enter and confirm (SPID uses a two-factor authentication) the user credentials, as opposed to the 30 seconds granted by other providers.

5 Discussion

5.1 Current results

The survey and interviews results show that, although there is a high awareness about PA digital services and users with disabilities are usually able to benefit from them, indicators of user satisfaction, effectiveness and ease of use are generally still very low.

Indeed, while the increasing number of services offered through the PA websites is generally a positive aspect for all users, often this implies complex user interfaces that, if not suitably structured, are more difficult to understand and navigate via screen readers.

Moreover, the increased security and authentication constraints (as the multi-factor authentication mechanisms) introduced in the last years represent new accessibility barriers.

Clearly, both the current authentication processes and the user interfaces need further design simplification efforts to make users with disabilities able to successfully access the PA services, asking for urgent improvement of usability such as ease of use of the user interfaces that should be logically organized for easier navigation, offering more help and a simplified interaction (also for authentication purposes).

5.2 Comparison with previous study

Having determined that the PA digital services still suffer from severe accessibility issues in 2023, it is interesting to investigate if and how much such indicators changed in the last years.

The previous study contains data collected in 2017, so in the following, we write “2017” to indicate the results of [Buzzi et al, 2019] and “2023” for the results of the current study. Fig. 20 compares the disabilities of the survey participants.

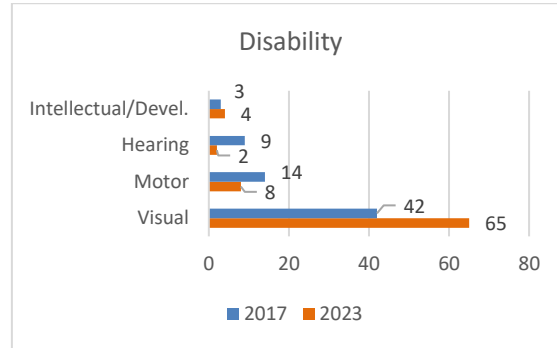


Fig. 20. Type of disability of participants: 2017 vs 2023 (bottom)

A main aspect concerns the participants' experience in accessing PA websites. Most users (89.4%) are still experiencing issues: 60.5% (vs 67.2% of 2017) of participants had problems sometimes and 28.9 % (vs 19.7% of 2017) often, as shown in Fig. 21.

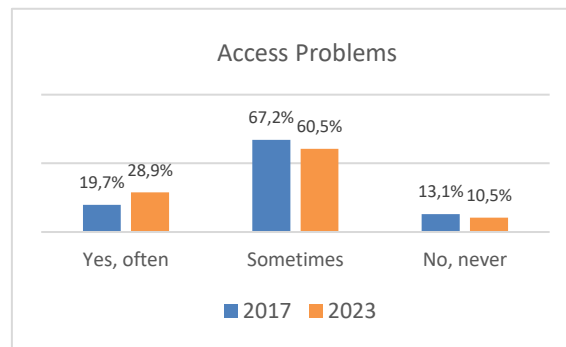


Fig. 21. Frequency of problems encountered when accessing online PA services: 2017 vs. 2023.

The situation seems to have become worse: the number of people who never experienced problems has decreased by 2.6% (10.5% in 2023 vs 13.1% in 2017) and the total number of people experiencing some issues has increased (89.4% of the sample in 2023 vs 86.9% in 2017). This could be caused by the new requirement of strong authentication for accessing the PA services, introduced by the European eIDAS Regulation on electronic Identification, Authentication and trusts services¹. Indeed, in Italy, access to PA services exploits digital identification through an Identity Service Provider (SPID) or via an Electronic Identity Card (CIE). As discovered in the interviews, strict temporal limits can obstacle the access by blind users interacting with such authentication mechanisms via a screen reader. Also regarding effectiveness, i.e. the ability to complete a service, the situation seems slightly worse than in 2017: only 8% of the participants (in 2023), compared to 10.6% (in 2017), has always achieved their goal, while the majority,

¹ <https://digital-strategy.ec.europa.eu/en/policies/eidas-regulation>

i.e., 49.3% (in 2023), compared 51.5% (in 2017), achieved it only often and 36% (in 2023) vs 30.3% (in 2017) only sometimes (Fig. 22).

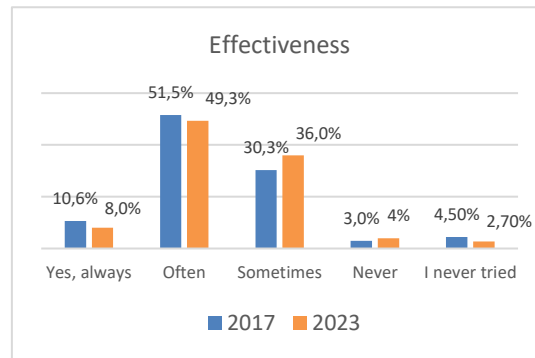


Fig. 22. Effectiveness of online PA Services: 2017 vs. 2023

The total number of participants experiencing effectiveness issues increased to 89.3% in 2023 vs 84.8% in 2017. However, we must consider that the small samples do not allow a generalization of such results.

A slight worsening was highlighted also regarding the ease of use in the interaction with online PA websites (Fig. 23).

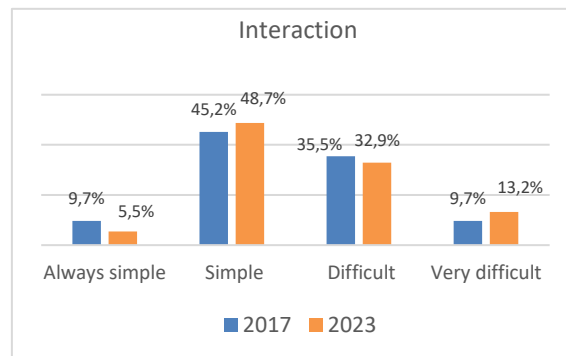


Fig. 23. Ease of interaction in accessing online PA Services: 2017 vs. 2023.

Participants who evaluated the interaction as simple decreased from 54.9% in 2017 (9.7% always simple + 45.2% simple) to 54.2% in 2023 (5.5% always simple + 48.7% simple). Furthermore, 46.1% of 2023 participants found the interaction quite difficult (32.9% difficult + 13.2% very difficult) compared to 45.2% in 2017 (35.5% difficult + 9.7% very difficult) of 2017.

Concerning the user satisfaction, Fig. 24 shows that most participants are still neutral (i.e., not completely satisfied), 30.3% (vs 26.5% in 2017) were satisfied and only 7.9% (vs 6.3% in 2017) very satisfied.

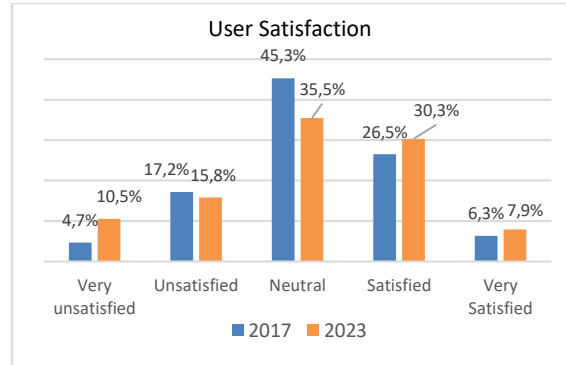


Fig. 24. User satisfaction in accessing PA website: 2017 vs. 2023.

However, since the total percentage of (vary) unsatisfied participants increased to 26.3% in 2023 vs 21.9% in 2017, the overall improvement is very little. Very often, inexperienced people having problems accessing online services believe that it is their fault, being unable to correctly interact with the interface, while the cause could be a poor usability design.

Overall, the collected users' feedback concerning the accessibility of PA websites, although on a small sample, seems to indicate a worsening, even if only slightly, compared to those of 2017, suggesting that, despite the regulation's intent, the problems seem not under resolution.

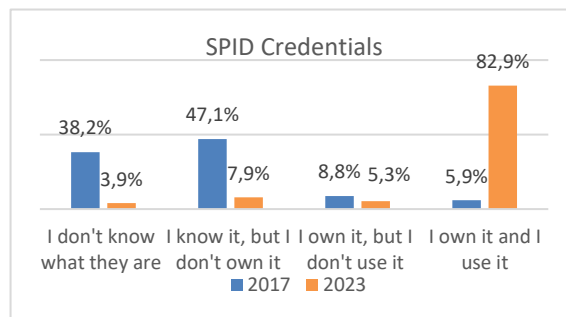


Fig. 25. SPID Credentials: 2017 vs 2023

Concerning the Authentication & citizen rights session, with respect to the result of the 2017 questionnaire, the situation improved: 82.9% of participants use SPID for accessing PA services (Fig. 25) with respect to only 5.9% in 2017, 5.3% have the authentication credentials but do not use them vs. 8.8% in 2017, 7.9% know about the credentials are but never requested them (vs 47.1 in 2017), and only 3.9% still do not know anything about the SPID credentials (vs 37.2 in 2017).

Analogously, most of participants (94.7% vs 89.7% in 2017) know their right to easily access all PA services (Fig. 26).

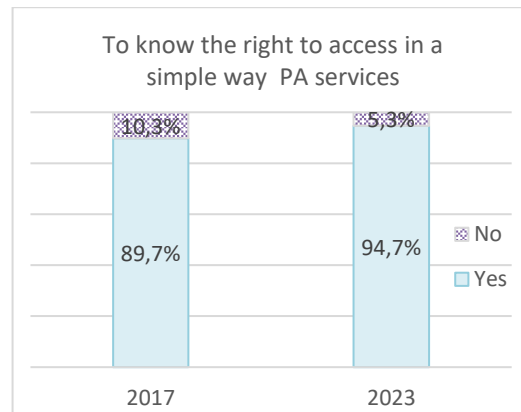


Fig. 26. Right to access PA services in a simple way: 2017 vs 2023

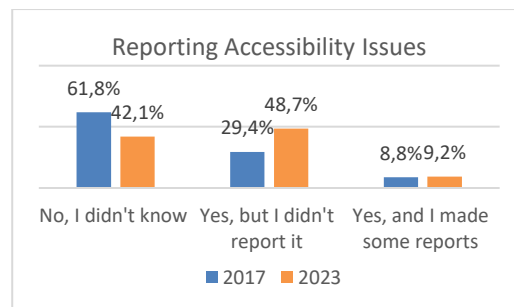


Fig. 27. Reporting accessibility issues: 2017 vs 2023

Concerning reports on accessibility issues of PA services to AGID (Fig. 27), awareness increased a lot. Most of the participants (48.7%) are aware of this possibility but did not report any accessibility issues (vs 29.4% in 2017) while 42.1% were not aware in comparison to 61.8% in 2017. However, few users exploit this possibility: only 9.2% in 2023 and 8.8 % in 2017.

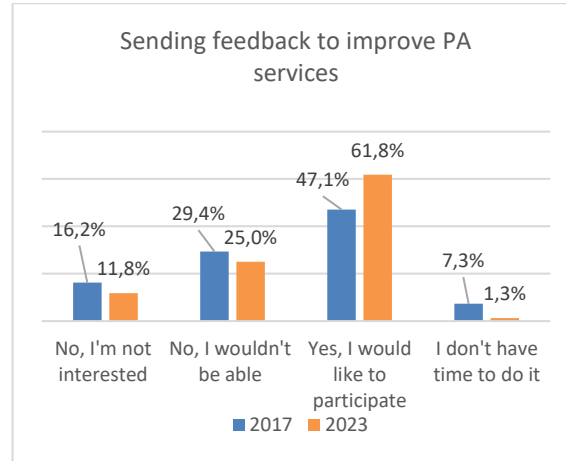


Fig. 28. Feedback: 2017 vs 2023

Last, most of the participants would contribute by sending feedback to the Public Advocate (Fig. 28): 61.8% vs 47.1% in 2017, while 25% do not consider themselves able to do it, respect 29.4% in 2017. The number of participants not interested or not having time slightly decreased to 11.8% vs 16.2% in 2017 the first, and to 1.3% vs 7.3% in 2017 the second one. This suggest that overall awareness and availability to participate are slightly increasing over time.

5.3 Comparison with official studies

To further validate the issues reported by the survey participants, and at the same time to check if the PA itself is aware of them, we compared our results with the Accessibility Monitoring reports published by the Agency for Digital Italy², which is indeed responsible for implementing the project "Inclusion of Citizens: Improvement of the Accessibility of Public Digital Services", part of the National Recovery and Resilience Plan (PNRR). Such project implements a completely automated evaluation process through the MAUVE++³ tool [Parvin et al. 2021], to perform a "detailed evaluation of the accessibility of public administration services". The work of Iannuzzi et al. [2023] describes the Mauve++ extension to allow Large Scale Automatic Web Accessibility Validation, thus providing the largest and most updated view of the accessibility situation of public websites in Italy. Results of the analysis of 2.7 million web pages highlighted that there are 14 success criteria with more than 1 million violations detected by their validation tool. Furthermore, the Accessibility Percentage metric, which provides info about the number of distinct elements successfully evaluated out of the total number of techniques for which the tool was able to make a successful or unsuccessful

² <https://accessibilita.agid.gov.it/>

³ <https://mauve.isti.cnr.it/>

evaluation, reported results among 71% and 81%, highlighting a considerable margin of improvement.

As discussed in the introduction, we feel that such kind of automatic analysis cannot capture many usability problems as well as several complex accessibility issues. However, it may be a useful complement to the data reported in this paper.

Indeed, the analysis results show very high failure percentages for WGAG criteria 2.4.7 (*Visible Focus*) and 1.4.1 (*Use of Color*), 40.7% and 25.5% respectively, which may negatively affect visually impaired users, together with *Minimum Contrast* (criterion 1.4.3, 13.7%) and *Non-text Content* (1.1.1, 5.2%). Overall, 50.46% of the detected problems were about *perception* (WCAG point 1, strictly related to accessibility problems, especially for visually impaired users) and 43.67% about *usability* (WCAG point 2). Moreover, the tool also detected high (above 20%) error rates in published PDF files with respect to WCAG criteria such as “*Page Titled*” or “*Info and Relationships*”, possibly connected with the “scanned PDF” problem raised by the participants to our survey.

Therefore, such results clearly support the main findings of both our surveys and interviews.

6 Conclusions

Recent years have shown an increasing attention ~~at-to~~ legislative, academic, and social levels, for accessibility of public services. However, many websites of the Public Administration are still not compliant with the minimum level of accessibility requirements [Gaggi et al., 2022].

In this study, the accessibility of PA services in Italy has been investigated. Although some improvements have been implemented, new difficulties have also been introduced such as the mandatory usage of ~~to the~~ digital identity for accessing services of the PAs and the time constraint in some implementation of the two-factor authentication mechanisms. These results are indeed coherent with the official studies performed by the Italian Government.

We could represent accessibility as a virtuous cycle including Steps and Tools, as showed in Fig. 29.

Accessibility as a virtuous cycle: Steps and Tools

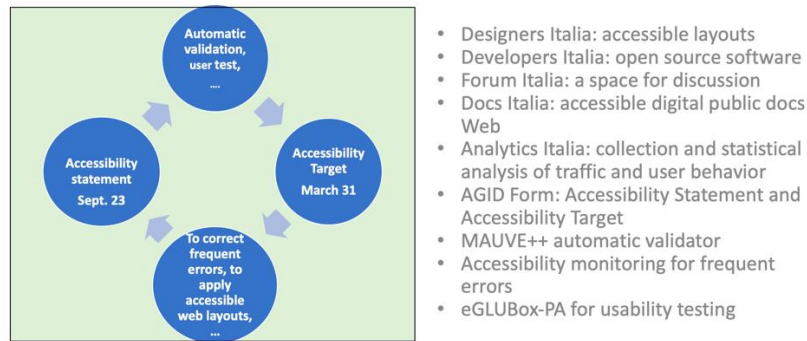


Fig. 29. Accessibility Improvements as a cyclic process

The Accessibility virtuous cycle includes four main steps:

- Monitoring & Evaluation
- Strategic Planning (accessibility Target)
- Implementing Accessibility Steps
- Assessing & Define (Accessibility Statement)

The path for reaching a full accessibility is long, and requires times and resources, due to the peculiarity of administrations and the complexity of the bureaucracy apparatus. This process drawn by the European legislation is incremental, guarantees to improve accessibility over time, according to the resources of each Public Administration.

In Italy, Agid with the Department for the Digital Transformation, and in cooperation with the Designers and Developers Community of Italy, has provided a set of tools and resources ~~for to~~ effectively support Public Administration in the Accessibility path, as shown in Fig. 29, and this will hopefully lead to further improvements in the coming years.

Each little accessibility enhancement is a small but important step toward the safeguard of human rights.

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