LONG PAPER

Web accessibility in Turkey: awareness, understanding and practices of user experience professionals

Yavuz Inal[1] · Kerem Rızvanoğlu[2] · Yeliz Yesilada[3]

Abstract

Ensuring web accessibility for all is not an easy task and requires the awareness, understanding and practices of people with different roles. User experience professionals (UXPs) play an important role in ensuring web accessibility for all. However, in Turkey, there is no research concerning the status of the awareness, understanding and common practices of UXPs. The overall goal of the present work was to offer an assessment of the current situation in Turkey to suggest areas of improvement and changes to advance web accessibility practices. To meet this goal, we conducted an online survey. The results of this survey show that UXPs believe they have enough training and education in web accessibility; however, they are not familiar with web accessibility standards and assistive technologies used by people with disabilities. They do not work with people with disabilities in their studies on usability, and they do not consider web accessibility in their projects. Our findings also show that UXPs have a top-down approach to web accessibility and they think that it is the responsibility of project managers to make web applications accessible. In brief, the study showed that UXPs in Turkey need to be better educated and trained on web accessibility, and organizations need to realize that both top-down and bottom-up approaches are required to ensure accessibility of the web for all.

Keywords Web accessibility · User experience · Usability · User experience professionals

1 Introduction

Today, across the world, websites are mainly used as public faces by all private companies, public institutions, and even individuals to introduce and advertise products and services, and provide information. Over the years, there has been a major change from conventional text-based web pages to complex web applications and sites in all aspects including e-commerce and education [21]. Web users with disabilities use assistive technologies to access web sites; however, most of the time they face many difficulties as the sites are not designed with assistive technologies in mind and therefore they have web accessibility problems [16, 21]. According to

the Web Accessibility Initiative (WAI) of the World Wide Web Consortium, "Web accessibility means that people with disabilities can use the web. More specifically, web accessibility means that people with disabilities can perceive, understand, navigate and interact with the web and that they can contribute to the web" [23].

There have been many studies in existing literature addressing web accessibility and the roles of different groups toward achieving it [16, 21]. It has been shown that there are many and different reasons for not achieving web accessibility (see Sect. 2). The limited knowledge and awareness and lack of training of people who are responsible for web accessibility such as developers and content creators can cause difficulties in making websites accessible [3]. Particularly, when web accessibility is not supported by government legislation and policies, there is even less tendency to consider it during web design projects [16]. People with different responsibilities should be made aware of and well informed about how to ensure web accessibility. They need to be aware of guidelines and standards that have been developed by accessibility consortia and organizations [4] and to properly follow them. In brief, ensuring web accessibility

✉ Yavuz Inal
yavuz.inal@atilim.edu.tr

1   Department of Information Systems Engineering, Faculty of Engineering, Atilim University, Ankara, Turkey

2   Faculty of Communication, Galatasaray University, Istanbul, Turkey

3   Middle East Technical University, Northern Cyprus Campus, Kalkanlı, 99738 Güzelyurt, Mersin 10, Turkey

involves an ecosystem that requires an in-depth understanding, awareness and practices of people with different roles, particularly so of user experience professionals (UXPs) that are primarily responsible for ensuring accessibility in many website development projects.

Although, in recent years, there has been an increasing interest in and extensive research on web accessibility [2, 10, 11, 31], none of the studies in the literature focuses on UXPs' awareness, understanding and common practices concerning web accessibility in Turkey. Our goal is to understand the status of web accessibility awareness in Turkey and propose solutions that can improve it. In particular, we focus on UXPs as they play an important role in large organizations in providing access to all. To achieve this goal, we conducted an online survey with UXPs in Turkey. Our study is unique as no such study has been conducted before and it makes a major contribution to research on UXPs by providing an insight into the awareness, knowhow and practices of UXPs in Turkey. In summary, with regard to awareness, this survey shows that UXPs believe they have enough training and education in web accessibility; however, they are not familiar with web accessibility standards and assistive technologies used by people with disabilities. Regarding their practices, they do not work with people with disabilities in their studies on usability and they do not consider web accessibility in their projects. When looking at their understanding, our findings show that UXPs have a top-down approach to web accessibility and think that it is the responsibility of project managers to make web applications accessible. This paper discusses the results in detail and suggests steps to be taken to improve web accessibility in Turkey. In brief, this study showed that UXPs in Turkey need to be better educated and trained on web accessibility, and organizations need to realize that both top-down and bottom-up approaches are required to ensure the accessibility of web for all.

The rest of this paper is organized as follows: Sect. 2 provides a review of the relevant research. Section 3 describes the methodology used in the study. Section 4 presents the findings of the research followed by Sect. 5 that discusses these results, their impacts and what needs to be done. Finally, the paper is concluded with suggestions based on the results and recommendations for future research, in Sect. 6.

2 Related work

The design and implementation of online applications and web pages demand the interdisciplinary efforts of professionals from diverse backgrounds. Web accessibility is a growing field of interest among these professionals and the relevant literature which focus on the UX professionals'

perception and understanding of accessibility is growing incrementally as well.

Lazar et al. [16] are among the first researchers who worked on this issue. They conducted a survey with 175 webmasters to investigate their level of knowledge and the reasons for their actions related to web accessibility. Most of the participants reported that they valued the concept of web accessibility. However, the authors cited the main barriers of web accessibility as the lack of time, training, managerial support and client support as well as inadequacy of software tools, and the confusing nature of accessibility guidelines [16]. The authors concluded that only governmental websites tended to be accessible due to regulations.

The enabled group [5] conducted a similar online survey with a total of 269 participants from the Health on the Net project. The study revealed that the participants needed significant training on web accessibility. Only 13% of the participants had already received training on accessibility, mainly from the Internet, school, university and friends. However, a significant percentage of the participants (74%) reported that they needed training on accessibility, specifically on web accessibility guidelines, usability and accessibility evaluation.

In 2006 and 2007, two studies were undertaken on web accessibility in Brazil. Tangarife and Mont'alvao [22] conducted a survey with 68 Brazilian developers to investigate their perception of accessibility. The participants reported that the two main barriers to incorporating accessibility into their work were budget limitations and lack of experts. These were followed by lack of time and managers' low accessibility awareness. The second study, by Ferreira et al. [6], used different methodologies in different phases of the research. The first phase aimed to determine whether governmental websites complied with the Decree/Law 5, 296/2004. The second phase of the study involved the accessibility evaluation of web pages from the federal, state and municipality websites. In the final phase, an online questionnaire was completed by officials responsible for each of the 87 organizations who participated in the study. The findings showed that the greatest challenges to implement accessibility were low priority of accessibility projects, lack of experts, and the large amount of information to be adapted [6].

These two studies presented valuable findings on the perception and adoption of accessibility in organizations in Brazil. However, both studies had certain shortcomings; they mostly focused on government organizations and did not perform any statistical tests [7]. Taking these limitations into account, Freire et al. [7] conducted a further survey in Brazil with subjects from diverse backgrounds including professionals from academia, industry and government who took part in web development projects in Brazil. The findings obtained from 613 valid responses demonstrated that only 19.9% of the participants considered accessibility

as a critical part of their digital projects. They stated that accessibility was rarely considered at project planning stages mainly due to the lack of training in the area and lack of knowledge concerning the Brazilian accessibility law.

Lopes et al. [17] conducted an extensive study on the perception of accessibility of more than 400 professionals representing the diverse stakeholders in the accessibility ecosystem including developers, service providers, public bodies, accessibility evaluation experts, elderly and people with disabilities. Their findings were consistent with those from the previous literature in that the participants did not fully understand or did not effectively use web accessibility guidelines. The authors also confirmed the significant need for accessibility evaluation tools to easily assess the accessibility of web, mobile and desktop interfaces.

To address the misperceptions concerning web accessibility even among accessibility professionals, Yesilada et al. [29] conducted an online survey and analyzed the responses of web accessibility specialists regarding several pre-defined definitions of accessibility. They found that misconceptions about accessibility, language and terminology could cause tension between different groups. In this context, the participants mostly preferred to use a realistic and concise language to define accessibility. The findings showed that it was mostly social aspects that shape our perspectives of accessibility. Rather than the definitions proposed by individual experts, the participants mostly accepted the definitions provided by standards and regulatory bodies. The results also showed that presenting empirical evidence for the benefits of accessibility was more effective in encouraging the adoption of accessibility compared to forcing the implementation of such practices.

In 2013, Yesilada et al. [30] carried their 2012 study a step further to examine the communities' understanding of the relationship between accessibility and other subdomains of human–computer interaction (HCI), and to assess how the community perceived accessibility. To this end, the authors asked more than 300 people who had an interest in accessibility to respond to a survey of 33 questions which explored the relationship between key concepts such as accessibility, user experience (UX) and usability, inclusion and exclusion, and finally, evaluation. The respondents considered accessibility and usability to be highly related and believed that accessibility was applicable to everyone, not only people with disabilities. The respondents strongly agreed that accessibility must be grounded on user-centered practices and that accessibility evaluation was more than just inspecting source codes. However, there was no consensus on whether training in "Web Content Accessibility Guidelines" was necessary to assess accessibility.

As mentioned above, there is only a limited number of studies focusing on the perception and understanding of UXPs on web accessibility. Putnam et al. [19] conducted a survey on how UX and HCI professionals perceived accessibility and integrated it into their work. Most of the participants stated that accessibility was important or very important for their work. However, when the participants' considerations regarding accessibility were explored through an open-ended question, it was found that their scope was limited. The findings also showed that the aspects of empathy and professional experience were associated with how accessibility considerations reported. Many respondents expressed that they did not have any control over the decisions regarding accessibility. Putnam et al. [19] believed that their findings had implications for academic programs in HCI and UX as to how well-organized programs can prepare students to consider and advocate for inclusive design.

In a recent study, Aizpurua et al. [1] investigated the relationship between UX attributes and web accessibility through the perceived accessibility reported by 11 participants and conformance testing to guidelines. The results of this study showed that most UX attributes were significantly correlated with perceived web accessibility and perceived accessibility is related to hedonic and pragmatic qualities. In this context, the researchers recommended to use concepts that belong to these UX attributes and in ethnography, contextual enquiry, focus groups or interview studies. The researchers also found significant relationships between three hedonic quality-stimulation attribute pairs (typical–original, conservative–innovative and lame–exciting) and accessibility indicators derived from conformance of web sites to WCAG 2.0 guidelines.

In Turkey, web accessibility is still in its infancy [9, 13, 20]. There is no research demonstrating the awareness, understanding and common practices of UXPs in Turkey. Therefore, the overall objective of this survey was to provide an insight into the current situation in Turkey to determine the areas that need improvement and offer suggestions to advance web accessibility practices. This is also crucial for supporting the disability community in this era of information technology.

In brief, several specialized studies on UXPs have been published around the world; however, there is no study specific to UXPs in Turkey. Therefore, in this study, we examined the common practices, awareness and understanding of UXPs in Turkey to provide guidelines and recommendations to improve web accessibility practices.

3 Method

The survey was implemented using an online survey tool[1] over a period of 4 months between February and May, 2016. The survey[2] was distributed through local UX mailing lists,

---

[1] SurveyGizmo, https://app.surveygizmo.com/.

[2] http://www.surveygizmo.com/s3/2566469/Erisilebilirlik.

such as those of User Experience Professionals Association (UXPA), the Turkish Chamber of Computer Engineers, Informatics Without Borders Association, and personal contacts. In total, 269 people accessed the survey, of whom 113 completed it. The survey was in Turkish, which ensured that only Turkish-speaking people can access it, distributed to the local lists so that only people living in Turkey can access it and the origin of country of the participants could be tracked by the online survey tool.

3.1 Questionnaire

The survey mainly focused on the awareness and understanding, and common practices of UXPs in Turkey. Therefore, it was organized into three sections: an information sheet, items under four main categories, and a closing section. The information sheet explained the goals of the study and the rights of the participants, and in the closing section, the UXPs were asked whether they would like to be considered for participation in a follow-up study. The core part of the survey contained questions under the following four categories:

- *Demographics* consisted of questions to collect demographic information about the participants such as age, gender, education, experience and workplace information;
- *Understanding and awareness* contained questions to determine the participants' educational level, knowledge, and understanding of web accessibility definitions and standards, understanding and awareness of assistive technologies, and awareness of and interest in supporting web accessibility;
- *Common practices* is comprised of questions that aimed to identify the common web accessibility practices in Turkey, whether web accessibility was considered in projects, common activities and techniques used to support web accessibility and the participants' reasons for not integrating web accessibility into their projects;
- *Statements* contained 33 web accessibility statements, which the participants were asked to rate using a five-point Likert scale (strongly agree to strongly disagree). These statements aimed to provide information about the relationship between accessibility and usability, accessibility for all versus for people with disabilities, web accessibility versus UX, inclusion versus exclusion, marketing, legislation, standardization, user-centered design, context and web accessibility evaluation. These statements were taken from the study by Yesilada et al. [30], and the aim was to examine the responses in the Turkish context.

3.2 Research questions

This survey was designed to address two groups of research questions. These questions listed below were not directly asked in the survey though they were rather used as a way to organize the questions asked in the survey, as explained in the previous section.

3.2.1 Understanding and awareness

1. *Web accessibility training and education*: Do UXPs in Turkey have sufficient accessibility training or education?
2. *Web accessibility standards and definitions*: Which standard definition of web accessibility is preferred by UXPs in Turkey? How familiar are UXPs with accessibility standards?
3. *Understanding user needs*: Do UXPs know how disabled users access the web? Are they familiar with assistive technologies used by people with disabilities?
4. *Motivation of web accessibility*: What is the primary interest of UXPs in Turkey and their organizations in web accessibility?

3.2.2 Common practices

1. *Web accessibility as part of the projects*: Do UXPs in Turkey consider web accessibility in their projects?
2. *Difficulties in ensuring web accessibility*: What are the difficulties faced by UXPs in Turkey in integrating accessibility into their work?
3. *Web accessibility evaluation techniques*: Do UXPs consult/involve people with disabilities in their projects? Which accessibility evaluation methods are used by UXPs in Turkey?
4. *Why not*: What are UXPs' reasons for not considering web accessibility in their projects?

4 Results

Table 1 summarizes the demographic profile of the respondents. Of the 113 UXPs that participated in the study, 70 (62%) were male, 38 (34%) were female, and the remaining 5 (3%) did not state their gender. The mean age of the participants was 31.17 years (SD = 7.67). Only three participants reported that they had a disability. Concerning the educational levels of the participants, 48 were university graduates, 46 had a Master's degree, 14 had a Ph.D., 4 were high school graduates, and 1 had an associate degree. A high percentage of the participants (26%, $n = 29$) had a Bachelor's or postgraduate degree in computer science or information systems with the remainder

Table 1 Demographic profile of UXPs

		Frequency (*n*)	Percentage (%)
Gender	Male	70	62
	Female	38	34
	Missing	5	3
Education level	High school degree	4	4
	Associate degree	1	1
	Bachelor degree	48	42
	Master degree	46	41
	Ph.D. degree	14	12
Graduation field	Computer science/information systems	29	26
	Media and communication	18	16
	Engineering	18	16
	Administration and management	12	11
	Fine arts	7	6
	Other	29	26
Organization type	Private sector	76	67
	Academic institution	28	25
	Public institution	8	7
	Public–private partnership	1	1
Organization business sectors	Informatics	37	33
	Education	31	27
	Banking and finance	21	19
	Telecommunication	10	9
	E-commerce	6	5
Organization size	Large scale	70	62
	Medium scale	14	12
	Small scale	26	23

having qualifications in the areas of media and communication (16%, $n = 18$), engineering (e.g., electronic, automation and industry) (16%, $n = 18$), administration and management (11%, $n = 12$) and fine arts (6%, $n = 7$).

Most the participants ($n = 76$) worked in the private sector, 28 were employed in academic institutions, 8 in public institutions, and 1 worked in a public–private partnership, with the prominent areas of activity being informatics (33%, $n = 37$), education (27%, $n = 31$), banking and finance (19%, $n = 21$), telecommunication (9%, $n = 10$) and e-commerce (5%, $n = 6$). More than half of these institutions (62%, $n = 70$) were large-scale, followed by small- (23%, $n = 26$) and medium-scale (12%, $n = 14$) organizations.

Concerning their workplace positions, more than half of the participants worked as domain experts (50%, $n = 56$). In addition, there were project managers or team leaders in medium/low-level positions (25%, $n = 28$) and managers at high levels (11%, $n = 12$). The job titles of the participants differed including a wide variety of UX-specific titles such as usability/UX designer, expert, strategist, manager, researcher, analyst, engineer and consultant.

The average of the total length of the participants' work experience was 9.2 years (SD = 7.22) with experience in the usability/UX area being 3.8 years (SD = 4.48) and the average time in the current position being 4 years (SD = 4.21). Twenty percent of the participants ($n = 23$) had no experience regarding software projects, 22% ($n = 25$) had 1–3 years, 12% ($n = 13$) had 4–6 years, 5% ($n = 6$) had 7–10 years, and 41% (46) had more than 10 years of project experience (Fig. 1).

4.1 Understanding and awareness

In the following, we present the results of each research question as described in Sect. 3.2.1.

4.1.1 Web accessibility training and education

Twenty-nine percent of the UXPs ($n = 33$) reported that they had not received any training in web accessibility. Of the remaining participants, 32 (28%) and 24 (21%) had attended classes on web accessibility during their postgraduate and university education, respectively, 20 (18%) participated

Fig. 1 UXPs' previous experiences (years) regarding software projects (frequencies)
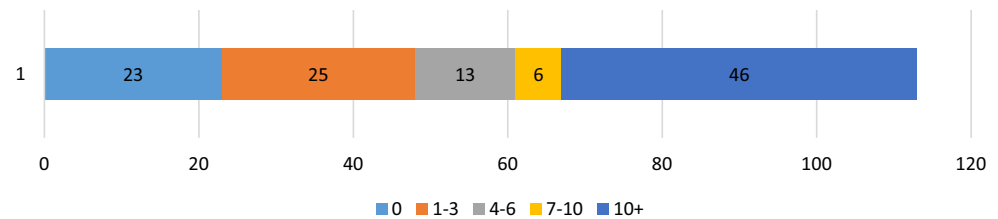
Table 2 Which definition is the most important?

	Frequency (n)	Percentage (%)
The usability of a product, service, environment or facility by people with the widest range of capabilities [14]	52	46
Web accessibility means that people with disabilities can use the Web. More specifically, web accessibility means that people with disabilities can perceive, understand, navigate and interact with the Web and that they can contribute to the Web [23]	26	23
The quality of being able to be reached or entered [18]	17	15
The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use [15]	16	14
A person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service [15]	2	2

in training programs organized by their workplace, and 18 (16%) had engaged in online courses. Only 8 participants (7%) had a certificate, and 25 (22%) had undertaken project work or postgraduate studies in this area.

Most of the participants that received in-service training in web accessibility (90%, $n = 18$), almost all the participants that took online courses (94%, $n = 15$) and all the participants that had a certificate on web accessibility (100%, $n = 8$) worked in the private sector. With regard to their principal work areas, they are mainly informatics, banking and finance, and telecommunication. Similarly, more than half of the participants that reported to have undertaken project work or postgraduate studies in the web accessibility area (60%, $n = 15$) worked in the private sector although this group contained only 1 person who had undertaken postgraduate studies in this area.

4.1.2 Web accessibility standards and definitions

When asked to rate the definitions of web accessibility, most participants (46%, $n = 52$) chose the definition "The usability of a product, service, environment or facility by people with the widest range of capabilities" [14]. Twenty-six participants (23%) considered that "Web accessibility means that people with disabilities can use the Web. More specifically, web accessibility means that people with disabilities can perceive, understand, navigate and interact with the Web and that they can contribute to the Web" [23]. Seventeen participants (15%) defined web accessibility as "The quality of being able to be reached or entered" [18] and 16 (14%) as "The extent to which a product can be used by specified

users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" [15]. Only two participants thought that web accessibility refers to "A person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service" [15] (Table 2).

In this study, the knowledge and awareness of UXPs concerning web accessibility was also elicited. A high number of participants stated that they had little or no knowledge regarding standards and guidelines on web accessibility. Forty-eight participants (43%) reported to have no knowledge of the Web Content Accessibility Guidelines (WCAG), whereas only three participants had a good level of knowledge. The situation was similar for the remaining guidelines and standards. For example, 66 (58%) and 62 participants (55%) did not have any knowledge regarding the Authoring Tool Accessibility Guidelines (ATAG) and User Agent Accessibility Guidelines (UAAG), respectively. Similarly, ISO 9241-171:2008 Guidance on Software Accessibility and ISO 9241-210:2010 Human-Centered Design for Interactive Systems were not familiar to 65 participants (58%) and 58 participants (51%), respectively (Table 3).

Regarding the effect of the participants' previous training in web accessibility on their knowledge of international guidelines and standards in this area, it was found that the participants who had undertaken postgraduate studies were more familiar with these guidelines and standards. However, those participants who had a web accessibility certificate or who enrolled in university courses or participated in online or in-service training on web accessibility were found to have a lower level of knowledge in this area. Of the UXPs

Table 3 Participants' level of knowledge regarding guidelines and standards on web accessibility (0: no knowledge, 5: expert level)

Guidelines or standards	0	1	2	3	4	5
Web Content Accessibility Guidelines (WCAG)	48 (42%)	24 (21%)	7 (6%)	20 (18%)	11 (10%)	3 (3%)
Authoring Tool Accessibility Guidelines (ATAG)	66 (58%)	20 (18%)	11 (10%)	14 (12%)	2 (2%)	0
User Agent Accessibility Guidelines (UAAG)	62 (55%)	18 (16%)	11 (10%)	18 (16%)	3 (3%)	1 (1%)
ISO 9241-171:2008 Guidance on Software Accessibility	65 (58%)	18 (16%)	7 (6%)	12 (11%)	10 (9%)	1 (1%)
ISO 9241-210:2010 Human-centered design for interactive systems	58 (51%)	18 (16%)	8 (7%)	15 (13%)	10 (9%)	4 (4%)
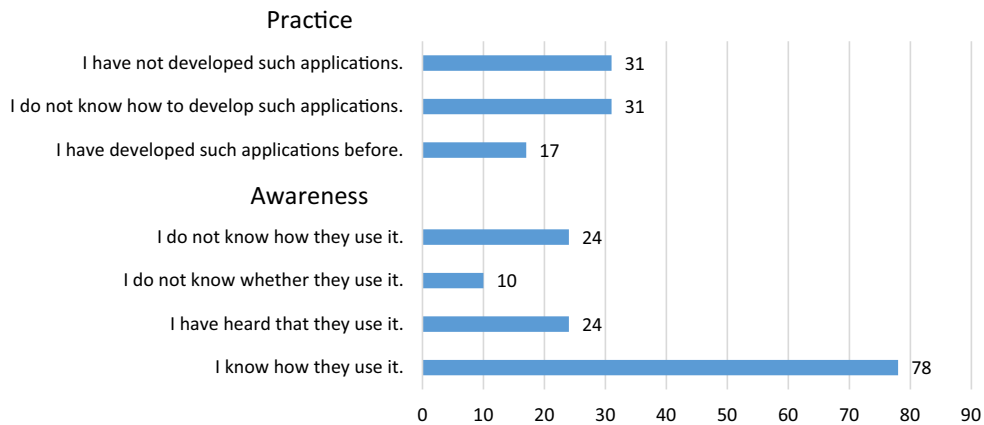
Fig. 2 Experience and awareness of participants (frequencies) regarding the use of web applications by the disabled

in this study, 42 (37%) reported to have no knowledge of any of the international guidelines and standards presented in Table 3, and almost half of these participants ($n = 19$) did not have any training in this area. Therefore, it is considered that organizing training programs in web accessibility would be very beneficial in increasing the knowledge and awareness of UXPs in this area.

4.1.3 Understanding user needs

The study also aimed to determine the experience of the UXPs concerning web accessibility and their awareness of how people with disabilities use web applications (Fig. 2). According to the responses, 69% of the participants ($n = 78$) reported that they knew how people with disabilities used web applications and 21% ($n = 24$) stated that they did not know how these people use web applications. Only 9% ($n = 10$) stated that they did not know whether web applications were used by these people or not. The remaining 21% ($n = 24$) stated that they had heard that people with disabilities used web applications.

Concerning the practical experience of all participants regarding web accessibility, only 15% ($n = 17$) had previously developed a web application for disabled users, while 27% ($n = 31$) did not have any experience in developing these applications. Furthermore, a high number of

respondents (27%, $n = 31$) did not know how to develop such applications.

The participants who reported having developed web applications for disabled users worked in the informatics ($n = 6$) and education ($n = 6$) sectors. More than half of the participants with no experience in developing such applications (68%, $n = 21$) worked in large-scale organizations. Of the participants that did not know how disabled users used web applications, half ($n = 12$) did not have any previous training, whereas most of the participants who reported to know how disabled users use web applications (77%, $n = 61$) had participated in courses, in-service or online training in web accessibility.

4.1.4 Motivation of web accessibility

Regarding assistive technology, 39% of the participants ($n = 44$) were most familiar with speech recognition software, followed by screen magnifiers (31%, $n = 35$), screen readers (30%, $n = 34$), Braille printers or embossers (20%, $n = 23$), alternative keyboards (19%, $n = 21$) and alternative mice and joysticks (16%, $n = 18$). Only 5% of the respondents ($n = 6$) reported that they were not familiar with assistive technology (Fig. 3).

Of the UXPs that participated in the study, 32% ($n = 36$) reported the reason for being interested in web

Fig. 3 Familiarity of participants with assistive technologies (frequencies)
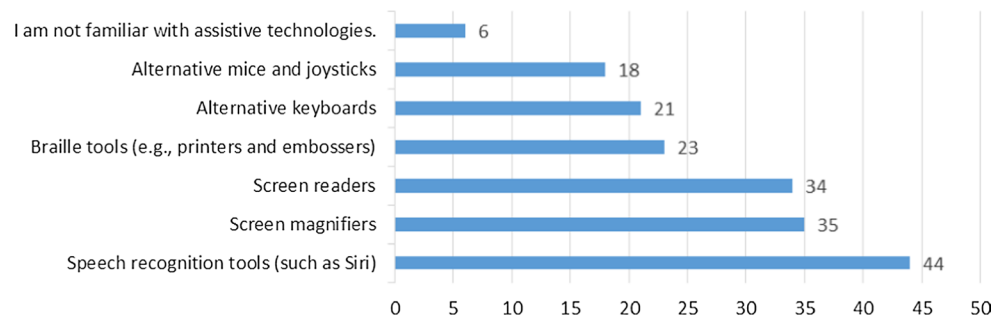
Fig. 4 Personal and organizational motivation for being interested in web accessibility

accessibility was that it should be inclusive and allow everyone to use the web. Other motivations included developing better products (27%, $n = 30$), finding research opportunities (12%, $n = 13$), being ethical (10%, $n = 11$) and ensuring search engine optimization (8%, $n = 9$). Only one participant stated that his interest resulted from organizational requirements and three participants considered that being involved in this area increased their level of income. Similarly, regarding organizational motivation, being inclusive was the highest on the list (19%, $n = 21$) followed by customer requirements (14%, $n = 16$), developing better products (12%, $n = 13$), increasing income (12%, $n = 13$), organizational requirements (6%, $n = 7$) and abiding by the laws (5%, $n = 6$) (Fig. 4).

Only 17% of the UXPs ($n = 19$) stated that their organization considered web accessibility to be very important. Twenty-four participants (21%) thought that their organization did not attach any importance to this area. Furthermore, more than half of the participants (66%, $n = 74$) were found to work in organizations that had a medium- or low-level positive attitude toward web accessibility.

4.2 Common practices

The following sections present results for the research questions addressing common practices (discussed in Sect. 3.2.1).

4.2.1 Web accessibility as part of the projects

Most the UXPs (69%, $n = 78$) reported that they had not considered web accessibility in their previous projects. The remaining participants (31%, $n = 35$) had included web accessibility in their projects for an average of 4.2 years (SD = 2.80) (minimum 1 and maximum 11 years).

Almost half of the participants ($n = 57$) believed that it was the responsibility of the product manager to make web applications accessible. This was followed by UX designer (36%, $n = 41$), user interface designer (35%, $n = 40$), project manager (35%, $n = 39$), UX manager (34%, $n = 38$) and developer (33%, $n = 37$). Other job titles with different specializations that were reported by the participants to be responsible for web accessibility were: UX strategist (31%, $n = 35$), UX psychologist (29%, $n = 33$), UX analyst (28%, $n = 32$), UX researcher (27%, $n = 30$), UX expert (26%, $n = 29$), UX consultant (25%, $n = 28$), UX engineer (22%, $n = 25$) and service designer (20%, $n = 23$) (Table 4).

4.2.2 Difficulties in ensuring web accessibility

The UXPs who stated that they included web accessibility in their projects ($n = 35$), were asked about the difficulties they faced. The most significant responses to this open-ended question included increased project cost and duration as well as time and resource restrictions in the project development life cycle. In addition, some participants commented on the

Table 4 Job titles reported by participants to be responsible for web accessibility

Job title	Frequency (n)	Percent-age (%)
Product manager	57	50
Usability/UX designer	41	36
User interface designer	40	35
Project manager	39	35
Usability/UX manager	38	34
Developer	37	33
Usability/UX strategist	35	31
Usability/UX psychologist	33	29
Usability/UX analyst	32	28
Usability/UX researcher	30	27
Usability/UX expert	29	26
Usability/UX consultant	28	25
Usability/UX engineer	25	22
Service designer	23	20

difficulty of fully understanding the needs of disabled users due to accessibility not being perceived as an obligation or requirements not being clearly specified before commencing accessibility activities.

Other major difficulties reported by the participants included a lack of subtexts as design components and the use of visual elements other than text to focus on a specific part of the design; however, these visual elements are not easily understood by the users. The respondents also stated that although designers paid attention to the use of subtexts and tags when coding, these elements were often disregarded due to time and resource restrictions.

Another difficulty faced by the participants was their lack of knowledge and awareness regarding web accessibility. Furthermore, the participants confronted problems due to the editors not paying attention to accessibility features when adding new content to a web application that had originally been designed as accessible.

4.2.3 Web accessibility evaluation techniques

It was found that only 17% of the UXPs ($n = 19$) worked with people with disabilities. All these participants also reported that they considered web accessibility when carrying out projects ($n = 19/35$). This means that the remaining participants, who developed accessible web applications within projects ($n = 16$), achieved this without regular communication with disabled users. The same participants ($n = 35$) were asked for the approximate number of people with disabilities they worked with in their last project. The average number was determined as 8.6 with a minimum of 1 and maximum of 50. The disabilities ranged from

visual impairment ($n = 15$), partial sight ($n = 2$) and hearing impairment ($n = 3$) to mental disorders ($n = 2$) and physical impairment ($n = 2$). The participants mentioned that they also worked with elderly as one of the target groups of web accessibility.

The participants who undertook web accessibility work in their past projects were also asked which evaluation methods they used. According to the responses, 15 participants performed tests with people with disabilities and 8 participants checked the conformance of their web applications to accessibility guidelines. The remaining participants mentioned using assistive technology products ($n = 4$), CSS verification ($n = 4$), HTML verification ($n = 4$) or conducting tests with elderly ($n = 4$). None of the participants in the study used accessibility evaluation tools to test their applications.

4.2.4 Why not

The UXPs who stated that they did not consider web accessibility in their projects were asked to explain their reasons to determine why accessibility is not a natural part of project activities. The significant reasons given by the participants were lack of awareness (21%, $n = 24$), accessibility not being required by the target group/customer (19%, $n = 21$) and lack of training/knowledge (15%, $n = 17$).

This was followed by accessibility being outside participants' job descriptions (14%, $n = 16$), time restrictions (12%, $n = 14$), lack of support from the management (12%, $n = 13$), not being responsible for accessibility (12%, $n = 13$), organization not considering accessibility to be a requirement (11%, $n = 12$), lack of human resources (10%, $n = 11$) and budget restrictions (9%, $n = 10$). A small number of participants mentioned the insufficiency of legal arrangements (8%, $n = 9$) and lack of guidelines to help them in this process (6%, $n = 7$) (Table 5).

5 Discussion

In our survey, only 29% of the participants reported that they did not receive any training on web accessibility. However, 71% indicated that they had received training via online courses or training programs organized by their organization. This result was surprising considering that in Turkey, the undergraduate or postgraduate curricula do not include any courses dedicated to web accessibility and there is also no public training available in this area. Therefore, we believe that most of the participants considered being introduced to web accessibility as part of their courses as formal training. This is also clear from the participants' rating of the web accessibility definitions with 46% choosing a generic UX definition rather than the most widely accepted WAI definition [29]. In addition, 43% reported that they

Table 5 Participants' reasons for not considering accessibility in their projects

Reason for not considering web accessibility	Frequency (n)	Percentage (%)
There is a lack of awareness regarding accessibility	24	21
Accessibility is not required by the target group/customer	21	19
There is a lack of training/knowledge	17	15
Accessibility is outside my job description	16	14
There are time restrictions	14	12
There is a lack of support from the management	13	12
Accessibility is not my responsibility	13	12
Accessibility is not a requirement for the organization	12	11
There is a lack of human resources	11	10
There are budget restrictions	10	9
There is no legal arrangement	9	8
There is a lack of guidelines	7	6

had no knowledge of Web Content Accessibility Guidelines (WCAG), which are considered as a standard in the web development community and adopted as a formal standard in the web accessibility policy of some countries [27].

Furthermore, only 15% of the UXPs developed applications for people with disabilities, 69% stated that they had not previously considered web accessibility in their projects and only 17% worked with people with disabilities in their projects. These results show that in Turkey, specific web accessibility courses need to be developed or existing relevant courses such as those on HCI need to be significantly revised to train people in web accessibility and relevant standards. The officially translated versions of WCAG are already available [12] though they need to be widely distributed and used as part of training courses on web accessibility. UXPs should also be encouraged to participate in and work on projects, in which the target group is disabled users.

Most of the participants, who had received training and completed projects on web accessibility, mostly worked in the private sector. This mainly indicates that the private sector places more values on in-service and online training, and encourages the development of more projects in web accessibility; however, academic work is not supported to the same extent. The participants that worked in public institutions were found to have enrolled in fewer in-service training or online programs although they had undertaken more postgraduate work in web accessibility.

The results also showed that most of the participants were aware of assistive technologies with only 5% reporting that they were not familiar with them. However, as in the case of training and awareness, 69% of the participants reported that they did not consider web accessibility in their previous projects. This demonstrates again that the UXPs were aware of assistive technologies; however, very few of them integrated web accessibility into their projects

mainly due to lack of deep knowledge and understanding of web accessibility requirements.

The survey also showed that both the participants and their organizations undertook web accessibility projects in order to be inclusive of all user groups and develop better products. However, the organizations had additional motivational factors such as customer requirements and abiding by the laws. In terms of personal motivation, the responses that were different from organizational motivation were being ethical, finding research opportunities and ensuring search engine optimization. In terms of organizational versus personal motivations, organizations were more interested in increasing income and expanding their customer base. Therefore, in Turkey, organizations need to be made aware of the more concrete benefits of web accessibility in addition to the social benefits [24].

When asked, who should be responsible for ensuring accessibility, half of the participants mentioned project managers. This shows that a significant number of UXPs consider that managers (product, project and UX) in a project team should ensure that a web application is accessible for disabled users, which indicates the adoption of a top-down approach. In contrast, in the literature (e.g., [8, 26]) a bottom-up approach was also reported to be very important for ensuring web accessibility. This result can be related to the Turkish culture. Therefore, as a first step, people in managerial positions in Turkey should be made aware of the significance of web accessibility through education and training programs on this topic.

According to the results, only 17% of the UXPs worked with people with disabilities during their projects and accessibility evaluations. When asked about the techniques they used for this type of evaluation, none of the participants referred to accessibility evaluation tools, which may have resulted from their lack of knowledge in this area. In Turkey, UXPs need to be very well trained to fully understand the

overall evaluation methodology of web accessibility [25] and recognize the importance of including disabled users in the process of designing and evaluating applications.

In this survey, we also aimed to determine the UXPs' main reasons for not considering web accessibility in projects and the difficulties they faced during web accessibility practices. According to the results, the common reasons in order of popularity were as follows: lack of awareness, accessibility not being required by the target groups/customers, lack of training and knowledge, accessibility not being part of the job description, lack of support from the management, not being responsible for web accessibility, organization not considering accessibility to be a requirement, lack of human resources, and budget restrictions. When examining difficulties experienced by UXPs, several reasons overlap. In addition, participants addressed the difficulty of maintaining the accessibility of applications. They further commented that even if they delivered an accessible application, it was very difficult to maintain its accessibility once the project was completed since most of the time editors were not aware of accessibility requirements. These results are mostly consistent with those reported in the literature (see Sect. 2).

Based on the above reasons, we suggest that the following steps should be taken in Turkey: (i) increasing the general awareness of web accessibility, in particular by demonstrating the importance of inclusiveness to governmental organizations and encouraging civil societies to help the community to understand the importance of designing and developing accessible applications; (ii) organizing open courses and providing training material in order to ensure that web accessibility education is widely taught and education material in Turkish is widely available (e.g., most of the WAI training material should be translated into Turkish) [28]; and (iii) demonstrating the business benefits of being inclusive [24] in terms of reaching more customers and making more profit; (iv) increasing the awareness of UXPs concerning the necessity of integrating web accessibility into their web projects; (v) assuring UXPs and other parties responsible for ensuring the accessibility of web applications that undertaking this type of work is actually not time consuming and will not delay the delivery of their project [24].

Finally, this work is not without limitations. A total of 269 people accessed this study, of whom only 113 completed it. This might not look like a large sample, but, in Turkey, UX is only recently starting to become a popular profession; therefore, there are not many people working in the field. According to UXPA Turkey Chapter, which is the biggest organization for UXPs in Turkey, the number of the current active members is around 100. Considering this number, we believe that the survey has reached to nearly all members of the Turkish UX community.

To alleviate this problem, as part of our future work, we are planning to carry out in-depth interviews with people who have already provided their contact details while completing this survey. Finally, in our survey, we also asked participants to rate 33 web accessibility statements and these were not analyzed in this paper. In the future, we are also planning to further analyze those as we believe they would support our conclusions and make them stronger.

6 Conclusions and future work

To date, several studies have been published on web accessibility. However, a detailed review of the literature revealed that there was a need to thoroughly examine and demonstrate the current situation regarding the awareness, understanding and common practices of UXPs in Turkey. This survey was a first step in this area. Even though the participants consider themselves as trained or educated people in web accessibility, they were mostly found to be unfamiliar with web accessibility standards and assistive technologies that are essential for the effective use of web by disabled or elderly people. Furthermore, most of the UXPs did not work with people with disabilities in their development projects. To increase the understanding and awareness of UXPs and motivate them to undertake more practice in this area, there is a need for organizing efficient education and training programs on web accessibility. As a continuation of this work, for future research, we plan to conduct interviews with volunteer UXPs that participated in this study, to further investigate the results of the current study and propose areas of improvement and necessary changes to advance web accessibility practices in Turkey. Finally, the results of this research can be used as a reference to advance web accessibility practices and support the disabled community in Turkey.

References

1. Aizpurua, A., Harper, S., Vigo, M.: Exploring the relationship between web accessibility and user experience. Int. J. Hum Comput Stud. **91**, 13–23 (2016)
2. Akgül, Y., Vatansever, K.: Web accessibility evaluation of government Websites for people with disabilities in Turkey. J. Adv. Manag. Sci. **4**(3), 201–210 (2016)
3. Ballesteros, E., Ribera, M., Pascual, A., Granollers, T.: Reflections and proposals to improve the efficiency of accessibility efforts. Univ. Access Inf. Soc. **14**(4), 583–586 (2015)
4. Carter, J., Markel, M.: Web accessibility for people with disabilities: an introduction for web developers. IEEE Trans. Prof. Commun. **44**(4), 225–233 (2001)
5. ENABLED: Enabled web developer survey. http://www.enabled-web.org/publicresults/surveyresults/ (2005)
6. Ferreira, S.B.L., dos Santos, R.C., da Silveira, D.S.: Panorama of Brazilian web accessibility. In: Proceedings of the XXXI ANPAD Meeting—EnANPAD (2007)

7. Freire, A.P., Russo, C.M., Fortes, R.P.M.: The perception of accessibility in web development by academy, industry and government: a survey of the Brazilian scenario. New Rev. Hypermed. Multimed. **14**(2), 149–175 (2008)

8. Harper, S., Yesilada, Y.: Web Accessibility: A Foundation for Research. Springer. ISBN: 978-1-84800-050-6 (2008)

9. Ismailova, R., Inal, Y.: Web site accessibility and quality in use: a comparative study of government Web sites in Kyrgyzstan, Azerbaijan, Kazakhstan and Turkey. Univ. Access. Inf. Soc. **16**(4), 987–996 (2017). https://doi.org/10.1007/s10209-016-0490-z

10. Ismailova, R., Inal, Y.: Accessibility evaluation of top university websites: a comparative study of Kyrgyzstan, Azerbaijan, Kazakhstan and Turkey. Univ. Access. Inf. Soc. (2017). https://doi.org/10.1007/s10209-017-0541-0

11. Karkin, N., Janssen, M.: Evaluating websites from a public value perspective: a review of Turkish local government websites. Int. J. Inf. Manag. **34**(3), 351–363 (2014)

12. KAMIS (Kamu İnternet Siteleri Rehberi): http://www.kamis.gov.tr (2014). Accessed Dec 2016

13. Kurt, S.: Accessibility of Turkish university Web sites. Univ. Access Inf. Soc. (2016). https://doi.org/10.1007/s10209-016-0468-x

14. ISO 9241-171: Ergonomics of human–system interaction—part 171: guidance on software accessibility (2008)

15. ISO 9241-210: Ergonomics of human–system interaction—part 210: human-centered design for interactive systems (2010)

16. Lazar, J., Dudley-Sponaugle, A., Greenidge, K.D.: Improving web accessibility: a study of webmasters perceptions. Comput. Hum. Behav. **20**, 269–288 (2004)

17. Lopes, R., Isacker, K.V., Carriço, L.: Redefining assumptions: accessibility and its stakeholders. In: Miesenberger, K., Klaus, J., Zagler, W., Karshmer, A. (eds.) Computers Helping People with Special Needs. Volume 6179 of the Series Lecture Notes in Computer Science, pp. 561–568 (2010)

18. Oxford Dictionary. https://en.oxforddictionaries.com/definition/accessibility

19. Putnam, C., Wozniak, K., Zefeldt, M.J., Cheng, J., Caputo, M., Duffield, C.: How do professionals who create computing technologies consider accessibility? In: ASSETS'12, Proceedings of the 14th International ACM SIGACCESS Conference on Computers and Accessibility, pp. 87–94 (2012)

20. Menzi-Çetin, N., Alemdağ, E., Tüzün, H., Yıldız, M.: Evaluation of a university website's usability for visually impaired students. Univ. Access Inf. Soc. (2015). https://doi.org/10.1007/s10209-015-0430-3

21. Takagi, H., Kawanaka, S., Kobayashi, M., Sato, D., Asakawa, C.: Collaborative web accessibility improvement: challenges and possibilities. In: ASSETS'09, Pittsburgh, Pennsylvania, USA, pp. 195–202 (2009)

22. Tangarife, T.M., Mont'alvao, C.: What the Brazilian developers know about web accessibility and digital inclusion? In: Proceedings of the 6 USIHC—6 International Congress on Ergonomics, Usability, Interface Design and Human–Computer Interaction

23. W3C WAI: Introduction to web accessibility. http://www.w3.org/WAI/intro/accessibility.php (2005)

24. WAI Benefits: Developing a web accessibility business case for your organization: overview. https://www.w3.org/WAI/bcase/Overview.html. Accessed Nov 2016

25. WAI Method: Website accessibility conformance evaluation methodology (WCAG-EM) 1.0. https://www.w3.org/TR/WCAG-EM/. Accessed Nov 2016

26. WAI Planning: Planning and managing web accessibility. https://www.w3.org/WAI/impl/Overview.html. Accessed Nov 2016

27. WAI Policy: Policies relating to web accessibility. https://www.w3.org/WAI/Policy/. Accessed Nov 2016

28. WAI Intro: Getting started with web accessibility. https://www.w3.org/WAI/gettingstarted/. Accessed Nov 2016

29. Yesilada, Y., Brajnik, G., Vigo, M., Harper, S.: Understanding web accessibility and its drivers. In: Proceedings of the International Cross-Disciplinary Conference on Web Accessibility, W4A'12, pp. 19:1–19:9. ACM, New York, NY (2012)

30. Yesilada, Y., Brajnik, G., Vigo, M., Harper, S.: Exploring perceptions of web accessibility: a survey approach. Behav. Inf. Technol. **34**(2), 119–134 (2013)

31. Yurtay, N., Yurtay, Y., Adak, M.F.: An education portal for visually impaired. Proc. Soc. Behav. Sci. **171**, 1097–1105 (2015)