Preliminary review of jobs, skills and competencies for implementation of Digital Accessibility

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Abstract. *This paper presents a preliminary review of jobs, skills and competencies that have been identified as needed for implementation of Digital Accessibility. The results indicate that new professions have been created to handle Digital Accessibility in organizations, as well as existing professions have changed by its introduction . Best practices of Digital Accessibility are presented in the local environment (Slovenia). The de facto industry Standards for ensuring digital accessibility are presented briefly, together with the skills that are needed to ensure digital accessibility in an organization. The paper is concluded by presenting the identified existing trainings and courses to master the discipline of Digital Accessibility.*

Keywords. Digital Accessibility, WCAG, literature review, Web Accessibility

1 Introduction

It is hard to imagine recent life without the Internet and the World Wide Web (shortened, the Web), particularly. The Web has become for many users the most important source of information, library, meeting place, storage room for data, access to the government, travel agency, entertainment area, and more. Transferring activities into the digital environments at any particular time produced an involuntary digital gap between those who had access to the Web and those who do not, and those who are able not only to access provided content, but also make some use of it.

Especially, the integration of Web browsers into mobile devices and granting free Internet access at public places, narrowed digital gap and allowed access to the majority. Possession of the equipment and access to the web contents have been shown as beneficial for the majority of people; however, it has excluded many others because of their inability to use standard methods of access (Brophy and Craven,

2007). According to research (Brophy & Craven, 2007), people with disabilities are most at risk of being excluded from having access and, consequentially, active participation in society.

As the EU population ages, it is expected that about 120 million people are going to be affected by 2020, which makes them a significant group. For them, equal integration into society, including digital access, can be a serious challenge (European Commission, 2018a; European Parliament, 2018).

According to the EU Parliament (European Commission, 2012) only one-third of the 761,000 EU public sector websites meet basic web accessibility Standards. In its estimation, more than 167 million EU citizens have difficulty in accessing public websites to use online public services. Furthermore, they represent a huge market potential for businesses which use digital approaches, and, therefore, possible economic gains by reaching a larger customer base. The European Union e-competence framework mentions accessibility as a role in job position ICT Accessibility tester and digital accessibility as a part of the User Experience Design (done in building phase) (European Committee for Standardization, 2014). In the framework no examples of standards or best practices of ensuring accessibility are presented and are left to be chosen.

Digital Accessibility is becoming a must. The Directive (EU) 2016/2102 on making the websites and mobile apps of public sector bodies more accessible (European Commission, 2018b) was published on 2 December 2016, and entered into force on 22 December 2016 (Member States had until 23 September 2018 to transpose the text into their national legislation). Therefore, it is important that website developers, designers, marketing and public relations personnel, as well as managers and policy makers, have the knowledge and skills for improving accessibility of the websites/ mobile apps to disabled visitors, visitors with smartphones, and visitors with other devices intended to browse the web.

The aim of this paper is to investigate the knowledge, skills and competences that key stakeholders (managers, web designers, web content authors and editors, people from the field of Marketing and PR, IT developers, policy makers) need according to the Web Content Accessibility Guidelines (WCAG) in order to respond to the needs of people with various disabilities to participate fully in the Web environment and benefit from the digital era. Furthermore, the research of jobs, training and best practices is presented in order to depict the current state of the Digital Accessibility field in the world, and to serve as a foundation for future development of the field. A proposal is introduced of a certified digital accessibility training project.

1.1 Digital Accessibility

According to W3C (World Wide Web Consortium, 2019) web accessibility means that websites, tools, and technologies are designed and developed so that they can be used by people with disabilities. This refers to all kinds of disabilities, including auditory, cognitive, neurological, physical, speech and visual.

Other factors that web accessibility is concerned with include the devices from which users access the web (e.g. mobile phones, wearables and smart devices), changing abilities due to aging, temporary disabilities (e.g. injuries) and situational limitations (e.g. quiet no audio environment) (World Wide Web Consortium, 2019).

The goal of accessibility is that web content is available to any person regardless of their hardware, software, language, location or ability (World Wide Web Consortium, 2019).

Two main streams exist toward better accessibility. The first one is development of new hardware solutions, which allows the handicapped to utilize digital devices. The second stream is inclusion of software solutions and web content design toward WCAG goals. The latter is a topic of interest of this paper. Parallel with development of digital solutions, responsibility of their use should be shared between users of digital contents and providers of it, with the greater load and responsibility on the providers. Because adaptation of web contents to WCAG calls for specialized skills, a window was opened to new jobs and professionalization.

2 Research design

2.1 Project structure

An Erasmus+ Certified Digital Accessibility Training project started in September 2018 in order to meet the specifications of the European legislation, Directive (EU) 2016/2102 on the accessibility of the websites and mobile applications of public sector bodies, which directs that all websites and mobile apps of the public sector need to be accessible to all by the year 2020.

The project includes six partnering organizations from four participating European countries: Slovenia, Poland, Greece, and Spain. These partners together have been developing a certified digital accessibility training, which will be offered to diverse groups of key stakeholders as a response for increasing labour market needs for experts in the field of Digital Accessibility in Europe.

2.2 The aim of the project

The training will offer specialized courses for the following job positions: (1) Digital Accessibility Manager; (2) Digital Accessibility Tester; (3) Web developer with expertise in Digital Accessibility; and (4) Web designer with expertise in Digital Accessibility.

The modules developed (with short summaries of what chapter will present where ambiguous) for these courses will be: (1) Introduction to Digital Accessibility – what is digital accessibility, why is it important, etc.;
(2) Managing Digital Accessibility;
(3) Web developing for Digital Accessibility – the programming phase of creating websites, what must be followed;
(4) Web designing for Digital Accessibility – design of websites, not actual implementation, but wireframing and preparing sketches to follow in development;
(5) Implementation of Digital Accessibility;
(6) Evaluation of Digital Accessibility – verification phase, verifying that the products are digitally accessible with automated tools and manual checkups.

It is intended that the project outcomes contribute to better access of training and qualifications for all through making all material free for download from an online platform. Furthermore, this kind of project will have an impact on the social inclusion of people with disabilities by promoting and encouraging awareness and learning of stakeholders about accessible websites and applications.

Additionally, it will strengthen the professional development of trainers and teachers. The project will improve the quality of training (initial education and continuous development), the quality of teachers, trainers and other professionals in the sector, and it will make courses more relevant to the labor market.

The project is comprised of various activities, among which a desktop research was carried out. The aim of the desktop research was to investigate a) Job opportunities that arise from the need for Digital Accessibility, b) Changes to job positions that happened due to Digital Accessibility, c) Existing trainings and certifications on Digital Accessibility and d) Best existing practices on Digital Accessibility in every one of the participating countries. The results of the desktop research, which were summarized in a document, entitled "The analysis of Digital

Accessibility skills, trainings, job roles, and best practices", will be the main focus of this article.

3 Desktop research

3.1 Review process

A literature review was carried out to identify the skills, jobs, trainings and best practices related to Digital Accessibility. We used the search strings on job portals "Digital Accessibility" and "Web Accessibility" and on the digital libraries we combined them with or operators and the terms "skills", "competencies" or "certification".

The search was conducted in digital libraries, employment portals and other websites (Google, LinkedIn) in November 2018. All 15 investigated websites are listed in Table 1.

Table 1. Searched websites

	URL
Digital libraries	
ACM DL	dl.acm.org
IEEE	ieeexplore.ieee.org
Web of Science	apps.webofknowledge.com
Science Direct	sciencedirect.com
Scholar	scholar.google.com
Sage	journals.sagepub.com
Employment portals	
IT Job Watch	itjobswatch.co.uk
Indeed	indeed.com
TechnoJobs	technojobs.co.uk
Glassdoor	glassdoor.com
EuroTechJobs	eurotechjobs.com
Wow Jobs	wowjobs.ca
Jora	au.jora.com
Other websites	
Google	google.com
LinkedIn	linkedin.com

We identified 30 resources that were connected to Digital Accessibility skills, 12 of them were conference and journal articles, and 18 were employment listings. 98 job postings related to Digital Accessibility were discovered; after removing duplicates (same job posting to multiple websites), 89 employment ads remained. 20 existing trainings and 8 cases of best practices were identified for Digital Accessibility.

3.2 Results

We merged job titles when synonyms for the same position were used (e.g. developer – programmer, user interface engineer – UI engineer, etc.), and when positions included an adjective of job position seniority (e.g. senior, junior). A total of 89 job vacancies were discovered for a total 48 different job positions.

The jobs shown in Table 2 were identified to be potentially connected with Digital Accessibility, according to employers' requirements. Jobs that would not exist independently without the context of Digital Accessibility are **bolded**, the absolute number of occurrences is shown in the N column.

Table 2. Job positions related to Digital Accessibility

Job titles	N
Front End Engineer, **Web Accessibility Specialist**	4
Accessibility Engineer, Accessibility Specialist, Front End Developer, Front End Web Developer, User Interface Developer, **Web Accessibility Coordinator, Web Accessibility Quality Assurance Analyst**	3
Developer Tools Accessibility Engineer, Frontend Engineer, **Web Accessibility Software Engineer**, **Web Accessibility Analyst**	2
Digital Inclusion Manager**, Digital Information Accessibility Coordinator**, **Digital Quality Assurance & Accessibility Analyst**, Digital UI Engineer, Director, Software Engineering (PHP/DevOps/Scrum), Full Stack Web Services Developer, **Accessibility Analyst**, **Accessibility Coordinator**, **Accessibility Program Director**, Javascript Developer, Lead Software Developer, Lead Web Developer, **Accessibility Digital Product Manager**, **Online Course Accessibility Specialist**, Quality Assurance Analyst (Web Accessibility), **Technical Accessibility Leader**, User Interface/Web/App Designer, **Web Accessibility Lead**, Software Developer – User Experience Tools and Web Platform for Amazon Web Services, **508 Test Engineer**, User Interface Manager, User Interface Architect, User Interface Engineer, User Experience and User Interface Design Lead, User Experience Consultant, User Experience Designer, **Web Content Accessibility Guidelines – Accessibility Test Engineer**, **Web Content Accessibility Guidelines – Accessibility Tester**, **Web Accessibility ADA Compliance**, **Web Accessibility and Emerging Technology Librarian**, **Web Accessibility Consultant – User Experience Specialist**, **Web Accessibility Programmer**, **Web Accessibility Specialist**, **Web Accessibility Tester**, **Web Content Accessibility Analyst**, **Web Developer Accessibility Specialist**, Web Manager	1

There is a wide range of professions, with Web Accessibility Specialist being the most common one identified. It can also be seen that job listings come from all stages of ensuring Digital Accessibility,

namely, the design phase, development phase, evaluation phase and conformance testing phase. As such, it is seen that not only are new professions being created, existing positions are constantly adapting to the new accessibility norms and technologies.

3.3 Skills and Standards related to Digital Accessibility

We identified skills related to Digital Accessibility from the perspective of employers, such as, what do they expect from their employees and from the perspective of Digital Accessibility Standards and Guidelines? The skills were identified by reading analyzing the employment ads mentioned in previous chapter (3.2).

Skills identified from employers were identified mostly as independent skills that were necessary even before the need for Digital Accessibility, but can be used to aid it; examples of such skills include user testing, user experience, usability testing, user interface design, etc. Other types of skills were those connected directly with accessibility and include: Accessibility compliance evaluation, inclusive design, designing and developing WCAG compliant websites, automating accessibility testing, etc.

We continued by identifying the following Standards from the World Wide Web Consortium that relate to Accessibility (the focus of each one is explained underneath them):

- Web Content Accessibility Guidelines 2.1 (World Wide Web Consortium, 2018b)

  Explains how to make web content more accessible to people with disabilities. The focus is on web pages and web applications. It is the current version of the Standard, the biggest change compared to the previous version (WCAG 2.0), is that the current one also includes Standards for mobile devices.

- Web Accessibility Initiative Accessible Rich Internet Applications 1.2 (World Wide Web Consortium, 2018a)

  Define a way to make web content and web applications more accessible to people with disabilities. Not only a Standard, but also a framework. Particularly useful for dynamic content and advanced user interface controls developed with Ajax, HTML, JavaScript, and related technologies.

- User Agent Accessibility Guidelines (World Wide Web Consortium, 2015b)

  Explains how to increase the accessibility of user agents (browsers, browser extensions, media players, readers and other web content rendering applications).

- Authoring Tool Accessibility Guidelines (World Wide Web Consortium, 2015a)

  Explains how to make the authoring tools accessible so that people with disabilities can use them, and helps authors create more accessible web content.

After examining each of these Standards thoroughly, we've identified 13 technology independent high level skills that a developer should master to be truly competent in Digital Accessibility: (1) Understanding Web Accessibility, (2) Managing the technical aspects of Web Accessibility (3) Enabling publishing of accessible web content, (4) Understanding accessible visual web design (and CSS), (5) Creating accessible images, (6) Creating accessible multimedia materials, (7) Accessible page structuring, (8) Developing site navigation and orientation, (9) Creating accessible Tables, (10) Creating accessible forms, (11) Basics of accessible scripting and WAI-ARIA (Accessible Rich Internet Applications), (12) Creating mobile accessible solutions, (13) Accessibility conformance evaluation.

3.4 Best practices related to Digital Accessibility in Slovenia

Each of the partner countries was concerned with best practices of ensuring Digital Accessibility from their local organizations, companies and individuals. Since the 2020 deadline is approaching quickly, public sector websites are more and more inclined to upgrade and rework their websites to be built in accordance with Digital Accessibility requirements.

The effects of increasing awareness about Web Accessibility in Slovenia are already seen by a rise in the development and design of accessible websites. Analysis was made of some websites that present best practices of Web Accessibility. The websites were selected by searching the most popular websites in Slovenia and by identifying the websites mentioned on the Union of the Blind and Partially Sighted of Slovenia (Zveza društev slepih in slabovidnih Slovenije, 2019) which regulary review accessibility of websites and award national accessibility certificates. It was found that all reviewed websites from the public and private sectors followed the Guidelines of WCAG 2.0 for website design and development. The majority of websites included the most commonly used adjustments for web content presentation, defined by WCAG 2.0, for example: The option to increase and decrease the font size, option to choose a different font type, not using moving images (GIFs), images are provided with descriptions, use the descriptive names of the links and videos are mostly equipped with subtitles.

Most of the reviewed websites are also optimized for use by different types of devices (computers, tablets, mobile phones), various web browsers and operating systems. Only two websites mentioned compliance with WCAG 2.0 explicitly (UNHCR, 2019; Shell, 2019), one website (Slovenski etnografski muzej, 2019) includes the description of what was

changed so that the compliance with WCAG 2.0 was improved, while others include descriptions of the considered Guidelines (Zavod za zdravstveno zavarovanje, 2019; Republika Slovenija Računsko sodišče, 2019; GlaxoSmithKline d.o.o., 2019; Mestna občina Ljubljana, 2019) and use web technologies (Mestna občina Ljubljana, 2019; Republika Slovenija Računsko sodišče, 2019). Surprisingly, two websites (LIDL, 2019; Nacionalna agencija Republike Slovenije za kakovost v visokem šolstvu, 2019) have the A3C certificate for Web Accessibility that was granted together by the Union of the Blind and Partially Sighted of Slovenia (Zveza društev slepih in slabovidnih Slovenije, 2018) and the Institute for Good Content (Institute for Good Content, 2019). Therefore, both websites mentioned above can be defined and treated as best practices for Web Accessibility.

3.5 Trainings related to Digital Accessibility

An analysis of existing trainings showed that the number of Web Accessibility trainings and courses has been increasing. Education of Web Accessibility is carried out both by universities (e.g. (Bennett, 2014; Ortner and Miesenberger, 2005; Central Washington University, 2019; Georgia Institute of Technology, 2019; Media Access Australia, 2019)) and by private organizations (e.g. (OLC Institute, 2019; WebAIM, 2019)). Some of the trainings are payable and others are provided freely (e.g. (Udacity and Google, 2019; Ryerson University and Canvas.net, 2019)). European Union sponsored trainings have also appeared (e.g. (Høgskolen i Oslo og Akershus et al., 2017)).

The common objective of all trainings and courses is to teach participants how to design and develop the websites, and how to provide and improve Web Accessibility. Reviewed courses are based on either the WCAG standard or WAI-ARIA, or even both (e.g. (Ryerson University and Canvas.net, 2019)). Some courses include only the theoretical details of Web Accessibility (e.g. (Bureau of Internet Accessibility, 2019)), while others are strictly technically oriented. The latter are usually divided into specific content areas (e.g. emphasis on ensuring the accessibility of video with HTML and CSS (Green, 2018), accessibility of PDF files (Chelius, 2015) and/or linked to:

- specific programming languages (e.g. JavaScript (Ryerson University and Canvas.net, 2019)),
- specific markup languages (e.g. HTML (Ryerson University and Canvas.net, 2019)),
- specific style sheets (e.g. CSS (Ryerson University and Canvas.net, 2019)),
- specific content management systems (e.g. WordPress (Dolson, 2015)),
- specific operating systems (e.g. Android App Development (Iwashima, 2018)),

- specific tools (e.g. InDesign (Brady, 2018)), etc.

Identified courses usually lasted a shorter time, while the reviewed trainings lasted longer. The identified trainings offered wider content, and, in most cases, included both a detailed theoretical background of Web Accessibility Guidelines, and technical knowledge of implementation and developing based on Web Accessibility Guidelines. The most known and established certification in the Web Accessibility domain in the USA is IAAP Certification (IAAP, 2019), that offered two levels of certification: A professional level credential and technical level credentials. The certification is prepared to educate two types of Web Accessibility specialists. The first certification is IAAP Certified Professional in Accessibility Core Competencies (CPACC) and the second one is AAP Web Accessibility Specialist (WAS).

4 Conclusion

Digital Accessibility is a field that has gained focus in recent years. The demographic trends in the European Union have created a significant need for digital accessibility of the web. This has been reinforced by the introduction of EU legislations that demand public sector websites and mobile applications to be digitally accessible (Hermann, 2018). This has created new job opportunities (e.g. Web Accessibility Specialist, Web Accessibility Coordinator, Web Accessibility Software Engineer, Web Accessibility Analyst), and changed existing ones (e.g. work of Front End Engineers, User Interface Developers, etc.), and Digital Accessibility was found to be related to a total of 48 different job positions, some existing, and some created by the need for accessibility. Four Standards (WCAG 2.1, WAI-ARIA 1.2, UAAG, ATAG) have been identified for ensuring Digital Accessibility. Digital Accessibility of public sector websites has been found to be good, and several private websites have also conformed to the Standards of Web Accessibility as presented in best practices. Different trainings have been identified and presented, offered both by private and public institutions.

The preliminary review results will be used to aid with preparation of digital accessibility certification courses that will be created as a part of the output of Erasmus+ European Union project KA2-VET-16/18.

The Digital Accessibility field offers much potential, both from researchers and the financial perspective. It is a growing field, and a field from which we will all eventually benefit .

Acknowledgments

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