ICT Accessibility for Persons with Disabilities

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***Abstract* - Accessibility is a key for the social and economic development of persons with disabilities. In the digital age, digital or ICT accessibility is imperative, which includes identifying and eliminating obstacles and barriers that persons with disabilities face in using ICT.**

The purpose of this article is to give a short introduction to the UN Convention on the Rights of Persons with Disabilities, universal design principles, assistive technology, accessibility, and relevant EU directives and standards.

Additionally, the Internet Society in Bosnia and Herzegovina's activities in empowering blind persons through computer training will be presented. Acquiring ICT skills is a necessary condition for access to the opportunities offered by the Internet, which is in line with the Internet Society mission - Internet for All.

Keywords - accessibility; assistive; disability; ICT; rights of persons with disabilities.

I. INTRODUCTION

According to the 2011 World Report on Disability by the World Health Organization and the World Bank it is estimated that 15% of the global population or more than a billion persons in the world have some form of disability [1]. Due to aging populations, this number is expected to be higher as persons are likely to develop impairments as they age.

Persons with disabilities are among the most vulnerable in the global population. Generally, persons with disabilities have poorer health, lower education achievements, fewer economic opportunities, and higher poverty rates than persons without disabilities. The obstacles they face in their daily lives as well as the lack of available services have significantly contributed to this situation. Often faced with stigma and stereotypes in society, which is even more pronounced in the case of women with disabilities.

Information and Communication Technology (ICT) can contribute towards the empowerment and independence of persons with disabilities. In this regard, ICT accessibility is recognized as a key priority in various global commitments.

The purpose of the United Nations Convention on the Rights of Persons with Disabilities as a legally binding commitment is to ensure that persons with disabilities worldwide can enjoy the same rights and opportunities as everyone else. Currently, the UN Convention on the Rights of Persons with Disabilities has been ratified by 184 countries and signed by 164 countries [2]. It is the first international human rights treaty requiring that ICT and systems be accessible as a necessary condition for persons with disabilities to live independently and with dignity on an equal basis with others.

This article is structured as follows, Section II gives a short introduction to concepts of universal design, assistive technology, accessibility, and status in this regard in Bosnia and Herzegovina. Section III is about Sustainable Development Goals implementation in Bosnia and Herzegovina and ICT accessibility as a powerful SDGs implementation tool, Section IV deals on the Internet Society mission and the Internet Society in Bosnia and Herzegovina's recent activities, and in Section V conclusion is drawn.

II. UNIVERSAL DESIGN, ASSISTIVE TECHNOLOGY, AND ACCESSIBILITY

In 1997 a working group at North Carolina State University USA, led by Ronald Mace, proposed seven principles of Universal design [3].

- Equitable Use
- Flexibility in Use
- Simple and Intuitive Use
- Perceptible Information
- Tolerance for Error
- Low Physical Effort
- Size and Space for Approach and Use

Identified in Article 2 of the UN Convention on the Rights of Persons with Disabilities, "Universal design" means the design of products, environments, programs, and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal design" shall not exclude assistive devices for particular groups of persons with disabilities where this is needed "[2].

In the second and third Report on Implementation of the UN Convention on the Rights of Persons with Disabilities in Bosnia and Herzegovina [4] is stated that there was no promotion of universal design adapted for persons with disabilities for all buildings, public services, and public transport, in the reporting period from the beginning of 2013 to the end of 2019.

Accessibility is identified in Article 3 of the UN Convention on the Rights of Persons with Disabilities as a condition that will enable persons with disabilities to

This document is an output from a project funded by the Internet Society

exercise their fundamental freedoms and human rights. Article 9 of the Convention sets out general obligations for the Member States to ensure that persons with disabilities have access on equal bases to ICT and to related facilities and services provided to the public [2].

Bosnia and Herzegovina has not adopted a comprehensive national accessibility strategy, instead, this area is regulated by relevant laws and bylaws. Information and communication accessibility for persons with disabilities in Bosnia and Herzegovina is defined by the 2017-2021 Bosnia and Herzegovina Electronic Communications Sector Policy and the Law on Communications [4].

Organizations of persons with disabilities are of the opinion that this area is well regulated by current laws, regulations, and ordinances, but in practice, there are still phenomena of neglect of the current legislation [4].

The European Web Accessibility Directive (Directive 2016/2102) has been in force since 22 December 2016. It lays down rules requiring the Member States to ensure that public sector bodies' websites meet accessibility requirements, regardless of the device and mobile application used for access. Although the Directive is binding on public sector sites and applications, it will also have a significant impact on many private companies that do business with the public sector and/or want to be socially responsible companies. The deadlines for the Web Accessibility Directive transposition are passed [5]:

- Website published after September 23, 2018: the deadline was September 23, 2019.
- Websites published before September 23, 2018: the deadline was September 23, 2020.
- Mobile applications: the deadline was June 23, 2021.

According to the study [6], the web accessibility of key legislative and executive institutions in BiH, the web content of public institutions does not meet the minimum standards of accessibility.

It is estimated that public procurement in the EU is around 14% GDP [7]. As public procurement can be a means to achieving social goals, a number of countries have developed an accessible ICT procurement system. European standard for public procurement of accessible ICT is the EN 301 549 standard, "Accessibility requirements for ICT products and services", where the user accessibility needs are summarized in eleven Functional Performance Statements as follows [8]:

- Usage without vision.
- Usage with limited vision.
- Usage without perception of color.
- Usage without hearing.
- Usage with limited hearing.
- Usage without vocal capability.
- Usage with limited manipulation or strength.
- Usage with limited reach.
- Minimize photosensitive seizure triggers.
- Usage with limited cognition.
- Privacy.

Directive (EU) 2019/882 on the accessibility requirements for products and services (European Accessibility Act) will apply from 28 June 2025. It aims to improve the trade of accessible products and services in the EU. According to Article 3 (37), European Accessibility Act (Directive (EU) 2019/882 on the accessibility requirements for products and services): "assistive technology means any item, piece of equipment, service or product system including software that is used to increase, maintain, substitute or improve functional capabilities of persons with disabilities or for, alleviation and compensation of impairments, activity limitations or participation restrictions" [9].

Assistive technology enables persons with disabilities to live more independently but also brings benefits for the wider population. For example, low floor buses can help parents with a baby carriage, buggies or for example captioning on TV can help persons whose first language is not the language of the programming content and can help persons in noisy environments, etc. It is expected more than two billion persons around the world will need at least one assistive product by 2030 [10].

Raising awareness about many categories of assistive technologies through catalogues of resources and devices of assistive technology, their characteristics and purpose contribute to their greater use [11]. One example of assistive technology is shown in Fig.1

Figure 1. Head wand - an example of assistive technology [11]

Persons with disabilities as vulnerable and marginalized groups are among the most affected by the global COVID-19 pandemic. Therefore, it is crucial to ensure inclusive digital communication during crises and emergency situations as they risk being ''left behind''.

In Bosnia and Herzegovina has been implemented substantial measures aim to ensure that all information including emergency information related to COVID-19 is available in accessible formats to all [12].

Also, awareness-raising activities have taken place on the importance of assistive technology in inclusive education and how a computer can help a person who cannot see, speak, or hear [13].

III. TOWARDS SUSTAINABILITY DEVELOPMENT GOALS ACHIEVEMENT

According to the newest Sustainable Development Report 2021, an official Sustainable Development Goals

(SDG) monitoring tool, Bosnia and Herzegovina is ranked as 47 of 165 countries in progress towards achieving SDG. The SDGs are disability-inclusive, let's look at 4 of 17 SDG indicators as an example, where the situation in Bosnia and Herzegovina [14] indicates the need for further improvement:

- SDG 4 – Quality education – equal and accessible and providing the needed assistance for persons with disabilities (information unavailable).
- SDG 8 – Employment – allowing persons with disabilities to fully access the job market (challenges remain, moderately improving).
- SDG 10 – Reduced inequalities -Social, political, and economic inclusion of persons with disabilities (challenges remain, information unavailable).
- SDG 11 – Sustainable Cities and Communities - creating accessible cities, accessible transport, accessible public spaces (major challenges, stagnating).

UN Agenda 2030 for Sustainable Development and seventeen Sustainable Development Goals (SDGs) are not legally binding, but governments are expected to achieve the SDGs. The country score for Bosnia and Herzegovina is 73.7 towards the target outcome (100). The country score per SDG is shown in Fig. 2.

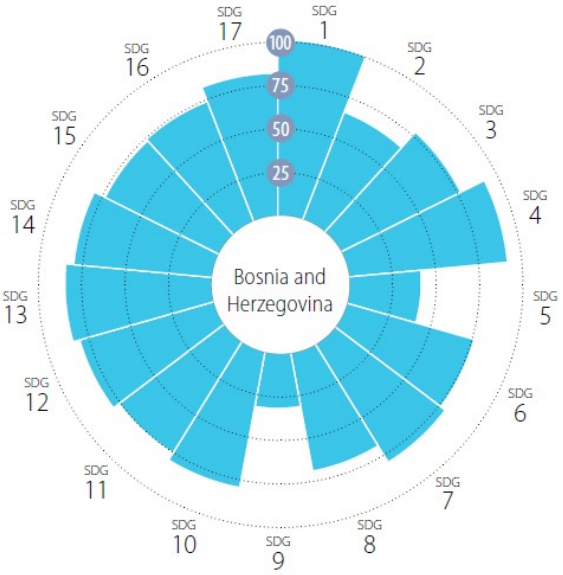

Figure 2. Average Performance by SDG [13]

As access to ICT is an important means of implementation of the SDGs, therefore, accessible ICT can be considered as a high priority.

IV. Internet Society in Bosnia and Herzegovina Activities in Blind Persons Empowerment

The Internet Society (ISOC) was formed in 1992 by Vint Cerf, Bob Kahn, and other early pioneers who focused on a vision that the Internet is for everyone [15].

ISOC Chapters are central to the work of ISOC, bringing together members to lead programs and activities at the local level, according to the ISOC mission of a bigger and stronger Internet, Internet for All. There are 125 Chapters on six continents in the world.

The Internet Society's Accessibility Special Interest Group is one example of how the ISOC community comes together to address issues, find, and share improvements, and keep pushing towards that goal of the Internet for everyone. As it is noted in Digital Accessibility Guidelines published by the Internet Society, apart from accessibility, are many other barriers need to be overcome so that persons with disabilities can benefit from the Internet [16]. These are:

- Affordability – barriers due to low income and limited educational opportunities.
- Culture – barriers due to stereotypes.
- Availability – barriers due to limited availability of the Internet.
- Lack of awareness – barriers due to limited understanding of how persons with disabilities use ICT technology.

As stated in the Internet Society Action Plan 2022, the efforts of the Internet Society will include strengthening the community by providing them with the knowledge and resources they need. This is only one segment in a roadmap to keep the Internet a resource for everyone, everywhere.

Internet Society in Bosnia and Herzegovina was founded in 2020 by a group of Internet enthusiasts, with the aim of encouraging and promoting the development and use of the Internet to its full potential.

According to the Census of Population, Households and Dwellings in Bosnia and Herzegovina issued by the Agency for Statistics of Bosnia and Herzegovina, 294,058 or 8,33% of the total population belongs to persons with disabilities. In this regard the number of persons with visual impairments is 52.301, with hearing impairments is 21.575, with walking impairments is 96.978, and with multiple disabilities is 110.230 [17].

Although a significant number of persons with disabilities, there is not significant enough ICT capacity building. For example, there is a lack of ICT capacity building for persons who became blind persons in later life and thus did not have training in the process of regular education. Therefore, following the ISOC mission "Internet for All", the Internet Society in Bosnia and Herzegovina conducts computer training for blind persons. This activity is funded through the project "Enhancing the barrier-free Internet through the blind people empowerment", by the Internet Society, in the scope of the Beyond the Net program. The training is conducted for each candidate individually, by a lecturer who is a blind programmer with many years of experience. One part of the training is held at the place of residence of the candidate, and the other part of the training is held online, with each candidate receiving a laptop for training and permanent use. In addition, selected candidates will receive additional training for

lecturers, so that they can transfer the acquired knowledge to others [18].

When we talk about computer training for blind persons, in addition to the skills that should be mastered by every person who uses a computer, the blind person is met with a number of additional difficulties and skills that need to be mastered, namely the inability to use the screen keyboards and limited mice usage. Screen reader programs, of which JAWS and NVDA are the most popular in our country, largely solve objective problems related to the non-use of screens and mice.

The problem of not knowing the keyboard layout at the very beginning of computer training makes it difficult and significantly slows down the course of training. Although keyboards are accessible to blind persons, learning to work on the keyboard is challenging for blind and partially sighted persons, as it requires long-term proper practice using all fingers.

In contrast to standard group training, when it comes to training the blind and visually impaired persons to work on a computer, the training should be tailored to each person individually and held individually. This is necessary on the one hand because a blind person needs to devote more time and attention to instructors, and on the other hand, instructors for training blind and partially sighted persons are, as a rule, blind or partially sighted persons themselves. Additionally, as screen readers are used, this would lead to the mixing of sounds if done in groups. The main prerequisite for the normal operation and proper functioning of one computer with screen readers is its customization for individual use by a completely blind person.

The blind persons empowerment through computer training is just a part of the broader ICT accessibility concept that the Internet Society in Bosnia and Herzegovina intend to focus on in the coming period.

V. CONCLUSION

Internet and ICT are powerful tools for promoting the rights of persons with disabilities. During the COVID-19 pandemic, more than ever ICT accessibility is needed, where small actions can help to make health emergency preparedness and response, virtual meetings, work from home, online education, and other activities more inclusive.

Particularly in developing countries, provision of ICT skills, affordability, and availability are necessary to ensure the full inclusion of persons with disabilities. Assistive technology enables and promotes inclusion and participation, especially of persons with disability, aging populations, and persons with non-communicable diseases. Procurement of ICT accessibility products and services and application of universal design with increased elements of accessibility during the design phase should be encouraged. In the activities of the Internet Society in Bosnia and Herzegovina in improving ICT skills for persons with disabilities, the main conclusion is that the involvement of persons with disabilities from the beginning is fundamental. Understanding the needs of persons with disabilities is crucial in finding the right approach, and only training in consultation with persons with disabilities can make a full contribution to the empowerment of persons with disabilities.

It is important to include people with disabilities in decisions and activities related to improving their quality of life, as this is the only way to do so. Therefore, in addition to our belief in the motto "Internet is for Everyone", our dedication is that in all our activities towards the empowerment of persons with disabilities in the future we will continue to respect the slogan "Nothing About Us Without Us".

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