Digital Accessibility

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Abstract— **This paper summarizes five papers in a session of the track "Digital Accessibility". The research work deals with the following key issues of this track:**

- **Digital accessibility as a socio-technological challenge.**
- **The use of technological innovations for inclusion.**
- **Accessible teaching in the digital era.**

This editorial depicts how the contributions in this track address still under-researched areas of accessibility of digital, media, and interaction-related content in the realms of visual and hearing disabilities. The special track highlights how teaching, work, and leisure can be facilitated by new technologies and socio-technological approaches for creating expertise and awareness and raises questions about situation- and setting-related access. Thereby, potential new research streams in areas such as student and workforce enablement and corporate social responsibility on the one hand, to computer programming and electronic engineering on the other hand for a new level of accessibility are demonstrated.

Keywords: inclusion, disabilities, blindness, WCAG, higher education, navigation, open source, serious games, electronic aid, CSR, programming.

I. INTRODUCTION

IT and media content are poorly accessible by users with impairments, creating impediments to learning, in the workplace, and in everyday life.

Taking these hurdles into account, the United Nations' Directive 2016/2102 (Web Accessibility Directive) and the EU Directive 2019/882 (European Accessibility Act), among others, have lately been postulating digital inclusion for persons with e.g. visual and hearing-related disabilities. The United Nations' "Convention On The Rights Of Persons With Disabilities" (CRPD), Article 24, accordingly demands the right for inclusive education in particular.

For a seamless user experience on the internet, the Web Content Accessibility Guidelines (WCAG) have been set out accordingly the World Wide Web Consortium, W3C. Until these directives and guidelines are brought to fruition, affected users will continue to experience hurdles in education, in the workplace, and everyday life.

The current situation in the European Union (EU) may serve as an example of how far the clear and rigorous demands of supernational bodies currently are from being realized. As of yet, only the EU public sector is required to implement digital accessibilities for websites and IT applications. Tests however reveal that most standard websites are not readable by screen readers or accessible for Braille users. More complex software such as e-Government applications are as standard not accessible as frameworks of large manufacturers are being used. The market volume of the public administrations is not powerful enough to make these manufacturers redesign their technologies towards digital accessibility. Moreover, reprogramming such applications from scratch is far too costly given the comparatively low numbers of users requiring them – at least in the argument of authorities –, leaving the current situation more than dissatisfactory.

Companies and IT manufacturers in the EU are not yet required to provide accessible IT to their staff, customers, and the public. Global green activism has shifted the focus from the so-called triple bottom line of sustainability – economic, social, and environmental well-being – towards the prevalence of the climate preservation view. Accordingly, the "sustainability" agenda of firms has become predominantly environmental, anticipating such demand from stakeholders. An according EU Directive demanding accessible IT services may thus earliest be due in the next decade. Whether the internal pressure of Corporate Social Responsibility will require firms to consider disabled users' needs before that time, remains to be seen.

Inclusive education is a theoretical fundamental right to all children and students. However, publishers still refute the high cost of accessible media such as coursebooks. Disability services are required to provide tailored contents for each student's special needs – such as tactile graphics, audio transcription, discussion aids by smartphone apps and tablets, and accessible educational games.

Navigating without personal guidance is an important human right as well yet poorly implemented. Research in the direction of using echo in mobility applications experiments for a collision-less campus itinerary. Autonomous driving may teach lessons for blind pedestrian navigation in the future as well.

The virtualization of lectures, seminars, and school lessons in the wake of the Covid-19 pandemic has constituted a certain relief for some students. However, it has also put a strain on teaching personnel, often "digital immigrants" who themselves found virtual teaching poorly accessible. Therefore, a new population of "situation-specific" impaired teaching staff has been created, pointing to the philosophical dimension of an assumed "relative disability".

Relatively disabled are also persons with less ability to acquire new technological skills and capabilities, such as with learning difficulties. For those, it is important to nevertheless perform sophisticated activities and assume high-level professions. One step into this inclusive direction is the approach to enable complex programming of serious games.

II. SUBMISSIONS

The first paper about "Digital Accessibility in Multinational Enterprises: a Meta Study" by Deitmer et al. in [1] addresses the current challenges for multinational enterprises in adopting accessible information practices. Far from being just a technical task, the implementation of barrier-free information, dialogue, and administrative media constitutes a potential economic burden that can only be achieved by board-level advocacy. Whereas Corporate Social Responsibility emphasizes transparency, green innovation, societal well-being and over-fulfilment of due diligence, the path by which stakeholders of all abilities are included into communication and information practices has not yet been trodden. And yet, if brought to fruition by companies, seamless communication might be the source of superior competitive advantage. The current paper underlines the lack of research as to managerial practices by which digital accessibility could be implemented, suggesting the testing of absorptive capacity as an organizational learning concept and the methodological use of Soft Systems Methodology.

The paper by von Zabiensky et al. [2], "A Framework for Developing Modular Mobility Aids for People with Visual Impairment: An Indoor Navigation Use Case", details the creation of electronic travel aids for visually impaired persons by combining modules for environment detection and obstacle recognition. Even though modules for the realization of human machine interfaces (HMIs) have been created in abundance, their implementation in innovative aids is often impeded by the lack of transparency as to source codes and the absence of an application programming interface (API). This dilemma constitutes a major impediment to modular implementation and testing of components such as interchanging GPS and RFID for enabling both outdoor and indoor navigation. Such modular implementation has been enabled in the current research by creating a novel Robot Operation System (ROS2 in succession to a prior, Linux-style, ROS). Acting as a kind of middleware, this ROS2 works with nodes, topics, services, parameters, launch files, thus facilitating agile development and serialization as well as reuse of code. Connecting sensors, controls, additional information, and displays, this technical platform was tested successfully in a proof-of-concept implementation.

Third, the paper "Design of an Accessible VR-Escape Room for Accessibility Education" by Mateen et al. [3] deals with the tension of information science education and the Game Accessibility Guidelines (GAG) aiming at removing disability-related barriers. These impediments which future information scientists have to be knowledgeable of are of motoric, cognitive, visual, auditory, linguistic, and of general nature. On the input dimension, controller-based movements are to be customized to needs of limited mobility, and feedback augmented by color filtering and vibration feedback for an inclusive user experience (UX). Even though the cost incurred for accessible programming, particularly in virtual reality applications, may be considerably higher given the required output dimensions of visual, acoustic, and tactile signals, the reach of such applications may well increase in favor of the disabled population to enable veritable inclusion in leisure and serious games. This paper details how awareness for the Game Accessibility Guidelines can be raised among IT students by simulating various disabilities in a VR-escape room sequence.

The fourth paper by Voß-Nakkour et al. in [4], "The Tension Field of Digital Teaching from the Perspective of Teachers", introduces a new quality of digital accessibility into the discussion. It is about the hurdles which teaching staff of universities experience when they suddenly lecturing virtually rather than in presence as was the case in the Covid-19 pandemic. Interviewing lecturers and professors of various disciplines, some of the hurdles and setbacks experienced in this disruptive situation were identified. Lack of devices, of technical and methodical training as well as legal reservations caused some disturbance from the outset. The didactical concept that had proven beneficial for years – like feedback, location-based learning, social dynamics and groupwork, and dialogue – had to be replaced by a two-dimensional display via technology that in practice lacked all these effects. The better timing potential of subsequent or parallel sessions however was named as the positive side of the medal. For the students, there were some benefits as well. Asynchronous work and learning blocks as well as the possibility to ask questions anonymously were considered as facilitating in virtual teaching by lecturers and professors, demonstrating that, though losing some digital accessibility through virtual teaching, some may be gained in turn.

Conclusively, the paper by Hossain et al., "UEmbed: An Authoring Tool to Make Game Development Accessible for Users Without Knowledge of Coding" [5] in its first facet points to the need to make programming skills accessible to interested persons without technical knowledge. The use of game engines is often tedious for the creative yet unexperienced with a low budget. In comparison with technology already available on the market, this dilemma is overcome in this contribution by introducing a browser-based, open- source authoring tool based on the Unreal Engine, additionally with access to the Unreal Marketplace providing convenient templates. This authoring tool, called UEmbed, serves as a platform for the second accessibility facet of the paper: the development of a serious game demonstrating disability issues in accordance with the European Accessibility Act in a playful scenario. With an exemplary workflow of how the educational game was created, hands-on directions for collaborative programming are outlined. The serious game provides a detailed and immersive 3D-scenario, thus ensuring best didactical user experience. Low-barrier programming concepts like UEmbed will accelerate the creation of more accessible leisure content as well, meaning

an ever-increasing inclusion of people with disabilities in everyday life.

III.   CONCLUSION

A variety of results in the current research on digital accessibility are presented in this special issue. The authors point to the most imminent topics and tasks in the realm of socio-technological and didactical inclusion. The contributions also highlight the path in which further academic scrutiny on the one hand and technological development on the other is to take in the future:

• Advance the conscience of managers, technical staff, and the wider society towards accessible user experience.
• Accelerate innovation for disability aids using the latest technological advances.
• Incorporate distance learning and online teaching development and formation into future didactical strategies.
• Accelerate innovation for disability aids using the latest technological advances.
• Include less abled and poorer developers and users into all possibilities of information technologies as to formation, profession, everyday life, and leisure.

ACKNOWLEDGMENT

REFERENCES

[1]   A. Deitmer, M.M. Moehring, and J. Vilas-Boas da Silva, "Digital Accessibility in Multinational Enterprises: a Meta Study", in Special Track "Digital Accessibility", along with the 8th Conference on Universal Accessibility in the Internet of Things and Smart Environments, SMART ACCESSIBILITY 2023, IARIA XPS Press, 2023.

[2]   M. Kreutzer, G. Fridman, O. Özdemir, S. Reuter, and D. Bienhaus, "A Framework for Developing Modular Mobility Aids for People with Visual Impairment - An Indoor Navigation Use Case", in Special Track "Digital Accessibility", along with the 8th Conference on Universal Accessibility in the Internet of Things and Smart Environments, SMART ACCESSIBILITY 2023, IARIA XPS Press, 2023.

[3]   S. Mateen, P. Wiesemüller, and S. Voss-Nakkour, "Design of an Accessible VR-Escape Room for Accessibility Education", in Special Track "Digital Accessibility", along with the 8th Conference on Universal Accessibility in the Internet of Things and Smart Environments, SMART ACCESSIBILITY 2023, IARIA XPS Press, 2023. -

[4]   S. Voß-Nakkour, A. Tillmann, M. Eichhorn, and F. Kühn, "The Tension Field of Digital Teaching from the Perspective of Teachers", in Special Track "Digital Accessibility" , along with the 8th Conference on Universal Accessibility in the Internet of Things and Smart Environments, SMART ACCESSIBILITY 2023, IARIA XPS Press, 2023.

[5]   I. Hossain, L. Weist, and S. Voss-Nakkour, "UEmbed: An Authoring Tool to Make Game Development Accessible for Users Without Knowledge of Coding", in Special Track "Digital Accessibility", along with the 8th Conference on Universal Accessibility in the Internet of Things and Smart Environments, SMART ACCESSIBILITY 2023, IARIA XPS Press, 2023.