From Research to Impact: Key Insights from Mada Edge

Khansa Chemnad, Amira Dhouib, Oussama El Ghoul, Achraf Othman
Mada Center
kchemnad@mada.org.qa
Doha P.O. Box 24230, Qatar
Mada Center
adhouib@mada.org.qa
Doha P.O. Box 24230, Qatar
Mada Center
oelghoul@mada.org.qa
Doha P.O. Box 24230, Qatar
Mada Center
aothman@mada.org.qa
Doha P.O. Box 24230, Qatar

Abstract- Mada Edge stands at the forefront of digital accessibility and assistive technologies, leading pioneering research and innovation to address accessibility barriers for people with disabilities. This paper provides a comprehensive analysis of the center's interdisciplinary studies, significant publications, and large-scale projects. Key initiatives such as the Jumla Sign Language Project and the BuHamad virtual interpreter exemplify transformative advancements in promoting inclusivity across events, governmental initiatives, and educational platforms. The breadth of publications spans multiple domains and types, reflecting Mada Edge's holistic approach to digital accessibility research.

Keywords- sign language, assistive technologies, accessibility, interdisciplinary

1. Introduction

One of the major global challenges is the persistent digital divide faced by people with disabilities, limiting their access to essential services, education, and public participation. Despite technological advancements, accessibility barriers continue to exclude significant portions of the population. In the United States, only 63.8% of people with disabilities use the internet compared to 83.4% of those without disabilities [1]. This digital exclusion is further exacerbated by the high costs of home internet, unemployment rates, and accessibility issues with websites and digital content. In the Arab world, the digital divide is particularly pronounced. Data from Arab Barometer surveys indicate that internet usage rates differ markedly along demographic lines, with disadvantaged segments of society, including persons with disabilities, being less likely to use the internet. The Arab Web Accessibility Study, conducted by Mada, the Assistive Technology Center Qatar, provides compelling evidence of the lack of digital accessibility in the Arab world. This comprehensive study evaluated over 4000 websites across 22 Arab countries, covering sectors such as government, education, healthcare, and

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commerce. The findings reveal significant gaps in web accessibility standards across the region, highlighting the need for substantial improvements to ensure digital inclusivity for individuals with disabilities [2]. Furthermore, a scoping review of assistive technology (AT) interventions for individuals with autism spectrum disorder (ASD) in Arab countries identified several barriers to digital accessibility [3]. These include caregiver uncertainty about the use of AT and a lack of awareness among professionals and the general Arab community regarding assistive technologies. The review emphasizes the scarcity of data on the prevalence and effectiveness of AT use for individuals with ASD in Arab countries, indicating a need for more rigorous studies across diverse demographic groups and national regions [3].

Mada Edge addresses this pressing issue by advancing digital accessibility and assistive technologies through rigorous research and innovation. The center focuses on bridging gaps by fostering interdisciplinary collaboration, generating impactful knowledge, and developing tailored solutions for diverse disability groups. In Qatar, Mada Center has been at the forefront of enhancing digital accessibility. The center has contributed to the development of the National e-Accessibility Policy, a pioneering document in the MENA region that addresses accessibility to websites, mobile apps, telecommunications services, and public access electronic kiosks [4]. Mada has also influenced key policies in Qatar's digital sector, ensuring the implementation of digital accessibility standards in government services [5].

This paper highlights Mada Edge's key contributions, showcasing how its research has translated into tangible societal impact and fostered greater inclusivity in various sectors. The integration of digital accessibility within technological advancements is paramount in empowering individuals with disabilities, fostering equitable access to communication, technology, and public services. Mada Edge leads this mission through rigorous research and innovation in assistive technologies. The center focuses on addressing accessibility gaps by fostering interdisciplinary research, generating knowledge, and developing assistive solutions. Collaborations with international organizations and governmental bodies ensure that innovations align with the diverse needs of people with disabilities. This paper outlines major initiatives and highlights contributions from Mada Edge’s research activities between the period 2022 - 2024, underpinned by comprehensive publications across various domains.

2. Research Center Accreditation and Achievements

The accreditation of Mada Center by QRDI as an official research institution signifies a significant milestone [6], reinforcing its commitment to producing high-quality research outputs. This recognition underscores the center’s contributions to academic literature, technological innovation, and policy development in the realm of digital inclusivity. Notable achievements include the publication of numerous peer-reviewed articles, book chapters, and conference papers addressing assistive technologies and inclusive design. Mada Edge’s publications span 29 outputs, including 9 journal articles, 7 conference papers, 7 literature reviews, and 2 datasets during the period 2022-2024.

3. Major Projects and Initiatives

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3.1. Jumla Sign Language Project

The Jumla Sign Language Project is a milestone in enhancing accessibility for the hearing-impaired community. The initiative developed the first extensive Qatari Sign Language dataset to advance continuous sign language processing [7]. Key achievements included collection of over 10,000 motion capture records over two years, video recordings of 900 sentences signed by 50+ hearing-impaired individuals and two sign language interpreters, and multi-angle, true-depth video captures for enhanced accuracy and flexibility. This project bridges significant communication gaps for the hearing-impaired community.

3.2. BuHamad Trademark

BuHamad, Qatar's first 3D virtual sign language interpreter, highlights Mada Edge's innovation [8]. Achieving 98% sign cloning accuracy, BuHamad is trusted and embraced by the deaf community. Key deployments include on the Ministry of Social Development and Family website [9], at the AFC Asian Cup Qatar 2023 [10], FIFA 2022 [11], and in Qatar Airways safety videos [12]. The BuHamad interpreter enhances accessibility for the deaf community by providing real-time interpretation services. Acceptance by the community and successful public deployment underscore the significance of this initiative in bridging communication gaps and promoting inclusivity.

3.3. Majlis and Nafath Periodicals

Mada Edge organized Nafath Majlis, a quarterly event aligned with the Nafath periodical, to discuss trends in digital accessibility and assistive technology [13]. Topics covered include Interdisciplinary Approaches in Assistive Technologies, Next-Generation User Interfaces, Advances in Sign Language Processing, Accessibility Standards and Innovations. These sessions facilitated knowledge exchange and collaboration within the field.

3.4. Arab Web Accessibility Study

The Arab Web Accessibility Study evaluated over 4000 websites across Arab countries to assess their compliance with international accessibility standards [2]. This large-scale study provided valuable insights into sector-wise accessibility gaps, emphasizing the need for enhanced digital inclusivity in the Arab region. Key findings highlight disparities in accessibility across government, educational, and commercial sectors, prompting targeted recommendations for improving web accessibility.

3.5. International Consortium and Collaboration

Mada Edge actively collaborated with international partners through consortiums and joint research projects. These partnerships facilitated knowledge exchange, fostering innovation in assistive technologies. Mada Edge's involvement in global conferences and workshops amplified

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awareness of digital accessibility challenges, contributing to the development of inclusive policies and solutions on a global scale.

3.6. Publication Domains Focus

Mada Edge's research initiatives spanned multiple domains and addressed various types of disabilities. A significant portion of Mada Edge's publications targeted assistive technologies, with 13 papers dedicated to this domain, reflecting the center's core mission of enhancing accessibility tools and resources. Special education and autism research formed another vital area, comprising 8 papers aimed at supporting individuals with autism spectrum disorder [14,15]. Digital accessibility initiatives included 6 papers, highlighting efforts to ensure inclusive digital environments [5,16,17]. Additionally, Mada Edge explored artificial intelligence in education [18,19], elderly care technology, and cultural accessibility, each with 2 papers. The center also addressed various types of disabilities, with papers focusing on hearing impairments [20], autism spectrum disorder [21], general disabilities, and to elderly and cognitive impairments [22,23]. These publications exemplified Mada Edge's commitment to broadening the scope of accessibility solutions across multiple sectors and communities.

4. Conclusion and Future Directions

Mada Edge has consistently demonstrated its leadership in advancing digital accessibility and assistive technologies through rigorous research, impactful publications, and groundbreaking projects. By addressing the needs of diverse disability groups and fostering interdisciplinary collaboration, Mada Edge has set a strong foundation for inclusive innovation. The success of initiatives like the Jumla Sign Language Project and the BuHamad virtual interpreter highlights the tangible benefits of applied research in bridging accessibility gaps.

Moving forward, Mada Edge aims to expand its influence by developing new AI-driven assistive technology solutions and strengthening international collaborations. Future efforts will focus on addressing emerging challenges in accessibility, ensuring equitable access to digital resources for all communities. Through continued innovation and knowledge-sharing, Mada Edge aspires to shape a more inclusive and technologically advanced society, empowering individuals with disabilities to thrive in an increasingly digital world.

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