



Higher education accessibility information in practice. A report on the accessibility of European Universities

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Abstract

This present study examines the accessibility of European universities for students with disabilities, drawing on two data sources. The first data source, a desk research, examined publicly available information on the websites of 171 universities from 38 European countries. In this desk research, we performed an audit of university websites and analysed the availability of accessibility services. The second data source, an online survey was distributed to accessibility/diversity offices at 124 universities, with full responses received from seven institutions in various European countries. The study reveals a significant disparity in accessibility resources and support services across European regions. Universities in Northern Europe, the UK, and Ireland exhibit a higher level of accessibility, both in terms of website accessibility and the availability of comprehensive support services. In contrast, universities in Eastern and Southern Europe often lag behind, with less visible accessibility information on websites, limited resources for accessibility offices, and fewer assistive technologies available to students. The most common accessibility issues identified on university websites are ambiguous labels, insufficient colour contrast, and poorly structured navigation. These issues can pose significant challenges for students with visual impairments, cognitive disabilities, and other accessibility needs. The study highlights the need for increased investment in accessibility resources and support services across all European universities, particularly in under-resourced institutions and regions. It underscores the importance of ensuring that all students, regardless of disability, have equal access to education and opportunities.

Keywords Accessibility services · University education · Inclusion · Webpage accessibility

1 Introduction

Web accessibility is essential for ensuring equitable access to information, resources, and opportunities for individuals with disabilities, particularly within higher education institutions, where inclusivity remains critical. A truly accessible institutional website supports a culture of accessibility, as mandated by the World Wide Web Consortium (W3C) guidelines and various legal frameworks, including the European Web Accessibility Directive (WAD) and the Americans with Disabilities Act (ADA) [1–5]. However, studies reveal persistent accessibility barriers on public websites across Europe (EU), underscoring a pressing need for higher education institutions to comply with these standards and provide accessible digital environments for all users [6, 7].

Addressing these barriers is crucial, as approximately 27% of the EU population lives with some form of disability, a demographic that remains underrepresented in higher education [8]. While the number of students with disabilities in universities is increasing, only 29% of individuals with

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disabilities achieve a tertiary degree compared to 44% of their non-disabled peers. This gap highlights the need for inclusive policies and support mechanisms reinforced by EU initiatives like the UN Convention on the Rights of Persons with Disabilities (UNCRPD) [9] and the European Skills Agenda [10]. Such frameworks aim to improve accessibility in education, supported by the European Social Fund Plus and the EU Digital Education Action Plan, both of which allocate resources toward inclusive digital learning environments.

Despite legislative and funding support, accessibility challenges remain widespread among EU universities. Notably, institutions are mandated to provide accessibility statements that transparently communicate the accessibility status and commitment to continual improvement. However, research indicates that accessibility statements and adherence to accessibility guidelines vary significantly across the region [2, 11, 12]. Additionally, inconsistent support services across EU member states present further challenges for students with disabilities, who rely on a range of accommodations, including assistive technologies and learning support, to navigate the educational landscape [13–17].

The present study contributes to this discourse by analysing the accessibility of 124 university websites and evaluating the support services provided to students with disabilities. By combining desk research with survey data from university accessibility offices, we assess the availability and quality of these resources, focusing on bridging the accessibility gaps that affect disabled students' participation and success in higher education.

The paper is structured in the following way. Section 2 reviews related works on the accessibility of higher education and provides context for our three-phase study. Section 3, the Present Study, describes the methodology of each of the study phases, including desk research and online survey. In Sect. 4, we present the results of the study. Finally, in Sect. 5, we discuss the findings and conclude this article with a set of recommendations for fostering accessibility in higher education in Sects. 6 and 7.

2 Related work

This study is related to two perspectives on the accessibility of higher education resources: the accessibility of higher education institutions' websites and access services made available in higher education institutions.

2.1 Accessibility of higher education institutions' websites

Campoverde-Molina et al. [18] conducted a systematic literature review to consolidate and analyse accessibility

evaluations conducted on university websites, including YouTube videos and PDF documents. This research aimed to compile papers published up to March 2021. The review analyzed 42 papers that evaluated a total of 9,140 universities across five continents and 68 countries. They found the most common errors occurred in the following guidelines: text alternatives, adaptive, distinguishable, keyboard accessibility, navigable, readable, predictable, input assistance, and compatibility. Importantly, none of the universities' websites that were analysed were found to be compliant with web accessibility standards (WCAG 2.0) [19]. Macakoğlu et al. [20] conducted another study in 2023 that examined prospective student websites published by universities in Europe, North America, and Oceania. This research identified that the websites of universities in North America demonstrated greater adherence to accessibility and user experience guidelines on prospective student websites. In general, the websites analyzed had low compliance levels according to WCAG 2.0. Moreover, Fakrudeen et al. [21] used automated online testing tools to evaluate WCAG 2.0 compliance of 134 university home pages in the United Arab Emirates, Saudi Arabia, and Qatar. The findings revealed a lack of correlation between the identified accessibility challenges and the universities' ranking, indicating that higher-ranked institutions may still face considerable barriers to achieving compliance with established accessibility standards.

The accessibility of university websites constitutes one of the many barriers that students with disabilities face, alongside architectural, bureaucratic, educational, and social challenges that are not inherent to their diverse abilities [22, 23]. These obstacles hinder their ability to pursue higher education on equal footing with their peers without disabilities. This study then aims to collect and unify data across EU member states to assess the current accessibility landscape and identify gaps that must be addressed to ensure equitable access to education for all students. By doing so, we can better understand how to implement effective strategies and support systems that facilitate inclusive education.

2.2 Higher education access services

There is a large body of literature that discusses support services that students with disabilities engage with at college and university [13–17].

For instance, Lopez-Gavira et al. [24] highlight several essential factors that can help promote inclusive education, such as the importance of faculty members' positive attitudes towards students with disabilities, the need for reasonable adjustments to be made in teaching methodologies, evaluation systems, and resources to ensure that students with disabilities can learn effectively, and the use of technology to enhance access to learning.

However, as Marcus-Quinn [11] discusses, accessibility has traditionally been addressed on a case-by-case basis, where individual students request specific accessible materials, such as modified textbooks. This reactive approach can be administratively burdensome and leaves gaps in service provision. Moving beyond this model, Mack et al. [25] advocate for an “accessibility ecosystem”—a collaborative network of faculty, staff, and institutional leaders addressing accessibility collectively.

Faculty readiness and institutional support are central to effective accessibility but face significant barriers. Fernández-Batanero et al. [26] underscore the lack of faculty training in inclusive teaching practices and limited access to adapted materials. Institutional support for accessibility programs is often limited by inadequate resources and funding, while Fennelly-Atkinson and LaPrairie [27] note that many university employees remain unaware of existing accessibility policies, complicating cohesive implementation.

To address these challenges, García González et al. [22] emphasize the need for enhanced training on disability awareness within universities and across society. Such training not only prepares faculty to understand assistive technologies like Braille and screen readers but also underscores the importance of accessible digital content [28].

Building an institutional culture of accessibility is equally important. Lister et al. [29] suggest that universities allocate resources for staff development, prioritizing inclusivity initiatives with sustainable impact. A robust culture of commitment to accessibility fosters resilience to institutional changes, ensuring that inclusivity remains integral to the university’s mission. Additionally, creating communities of practice where faculty can share resources on accessibility technology integration could strengthen support networks within institutions [30].

Lastly, dedicated accessibility services tailored to students with disabilities are crucial. Fernández-Batanero et al. [26] argue that universities should provide specialized support services, allowing students to access resources seamlessly without repeated individual requests. Such proactive strategies contribute to a more supportive and inclusive educational experience.

In summary, advancing accessibility in higher education requires both structural and cultural shifts that reinforce institutional support for students with disabilities. By embedding accessibility within university frameworks and equipping faculty with essential resources and training, institutions can build a foundation for inclusive education. This study contributes to these efforts by consolidating data on accessibility practices and conditions across European universities, providing a clearer understanding of the progress and challenges in fostering an accessible educational environment.

3 Present study

The present study comprised three phases triangulating different data sources, aiming to characterize the accessibility landscape across Higher Education institutions in Europe. By employing triangulation we attempt to enhance the reliability and validity of the findings. This approach allows us to cross-verify data from multiple perspectives, ensuring that our conclusions are robust and well-supported [31]. The first phase involved a semi-automatic audit of the top European university and college websites (see Sect. 3.1). The second phase employed desk research to collect information on accessibility and diversity services available to students (see Sect. 3.2). The third phase of the study implemented an online survey. The survey was administered to the diversity/accessibility offices of top European universities. The questions focussed on the availability of diversity and accessibility services at the universities, in addition to the resources, needs, and challenges facing the diversity/accessibility offices (see Sect. 3.3). The detailed methodology of each study phase is presented in the following subsections.

3.1 Accessibility of university and college websites—website accessibility automated audit

This study, conducted during January–March 2023, has drawn on information publicly available on university and college websites. There were 171 Universities included in the study. This included up to seven top-ranked universities, based on the Times Higher Education report [32]. The list of countries (and university websites) included in this study is as follows: Austria (6), Belarus (1), Belgium (6), Bulgaria (2), Croatia (3), Cyprus (3), Czech Republic (6), Denmark (6), Estonia (3), Finland (6), France (6), Georgia (1), Germany (6), Greece (6), Hungary (5), Iceland (2), Ireland (6), Italy (6), Latvia (3), Lithuania (5), Luxembourg (1), Malta (1), Montenegro (1), Netherlands (5), Norway (6), Northern Cyprus (2), Poland (7), Portugal (6), Romania (6), Russia (6), Serbia (2), Slovakia (6), Slovenia (3), Spain (6), Sweden (7), Switzerland (6), UK (6), Ukraine (6). The countries included in the analysis were divided into five geographical groups (Eastern, Western, Northern, Southern, and the UK and Ireland) based on the division proposed by Royal Berglee [33].

3.2 Accessibility and inclusiveness services available on university and college websites—desk research

As a follow-up to the website accessibility check, we conducted desk-based research on the accessibility and inclusiveness services publicly available on university and college websites. The support categories were applied in the next stage of this study, which involved an online survey.

3.3 College and university accessibility/diversity offices services and needs—online survey

The online survey, consisting of 28 questions, based on the desk research was distributed via e-mail between April 14 and June 1, 2023, to 124 Universities' accessibility/diversity offices whose email addresses were collected during desk research. All email addresses were publicly available on the websites. There were two reminders to participate in the survey. However, the response rate was relatively low: while 20 respondents started the survey, only seven completed all the questions. In total, universities from the following 17 countries participated in the survey. Austria, Belgium, Croatia, Cyprus, Czech Republic (2), Denmark, Estonia, Finland, Ireland, Lithuania, the Netherlands, Norway, Poland, Romania, Spain (2), Slovenia, the United Kingdom (2).

4 Results

4.1 Analytical plan

Six independent coders used Google Lighthouse to audit the accessibility score for each website and list accessibility issues. Google Lighthouse is an open-source, automated tool that audits a website's performance and accessibility. The accessibility score is calculated based on a weighted average of all accessibility audits. Weighting is based on user impact assessments [34]. The results of the audit presented in Sect. 4.2 are summarized with the analysis of variance (ANOVA) followed by pairwise comparisons with HSD Tukey correction for multiple comparisons when needed [35].

After extracting from the websites the information about the support offered to students with disabilities, we conducted a qualitative thematic analysis. The analysis was supported by ChatGPTv3 which was used as an organizational tool to categorize the identified accessibility and inclusiveness services (see Sect. 4.3).

All data obtained from the online survey with accessibility offices were the subject of analysis based on frequencies due to the small number of responses (see Sect. 4.4).

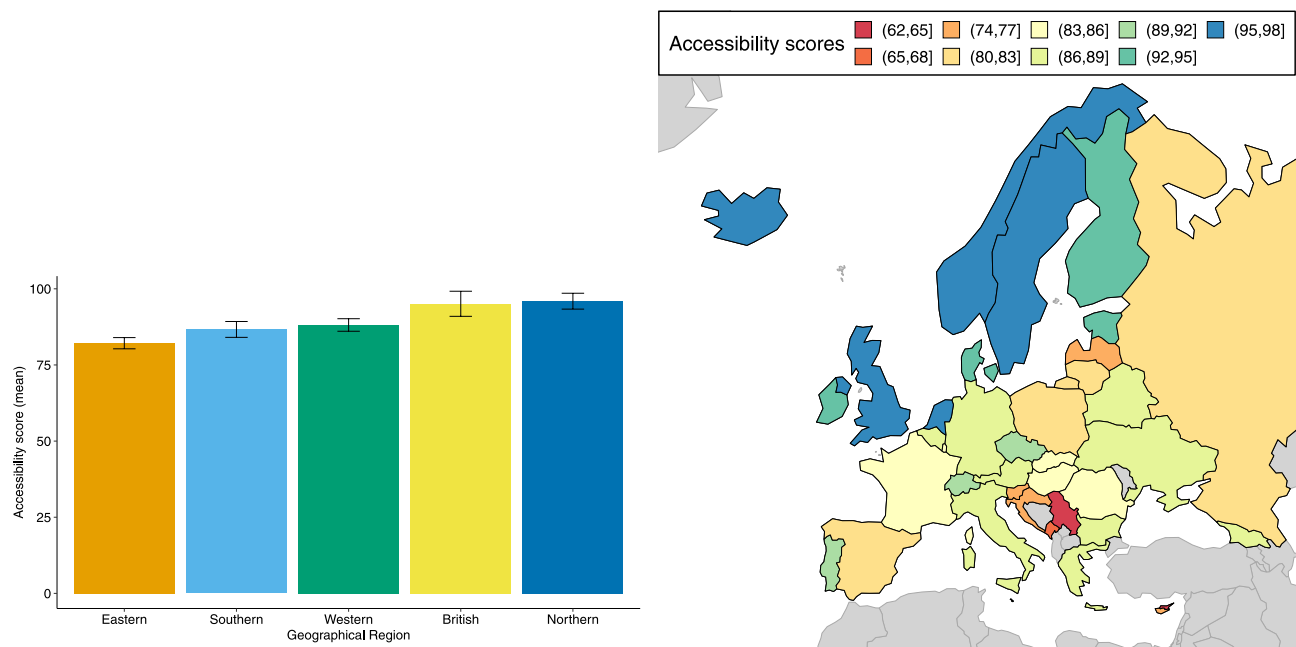
4.2 Website accessibility automated audit

The accessibility scores were relatively high with an average score equal to 87.36 ($SD=7.46$, $max.=100$, $min.=47$). The difference in accessibility scores between the geographical regions was tested with a one-way ANOVA, revealing a significant effect of the geographical region, $F(4, 166)=11.60$, $p<0.001$, $\eta^2=0.219$ (see Fig. 1a). The websites from Northern countries have a significantly higher accessibility score ($M=95.9$, $SE=1.83$) than Eastern ($M=83.1$, $SE=1.22$), Southern ($M=84.1$, $SE=1.65$), and Western countries ($M=88.5$, $SE=1.54$). Also, British universities' web pages' accessibility score ($M=92.1$, $SE=2.74$) exceeded the web pages from Eastern and Southern countries. All other comparisons were not significant. Figure 1b presents a colour-coded geographical representation allowing for a more detailed understanding of differences between geographical regions (the contour of the presented map was created based on the Eurostat data available through the Eurostat R package [36, 37]).

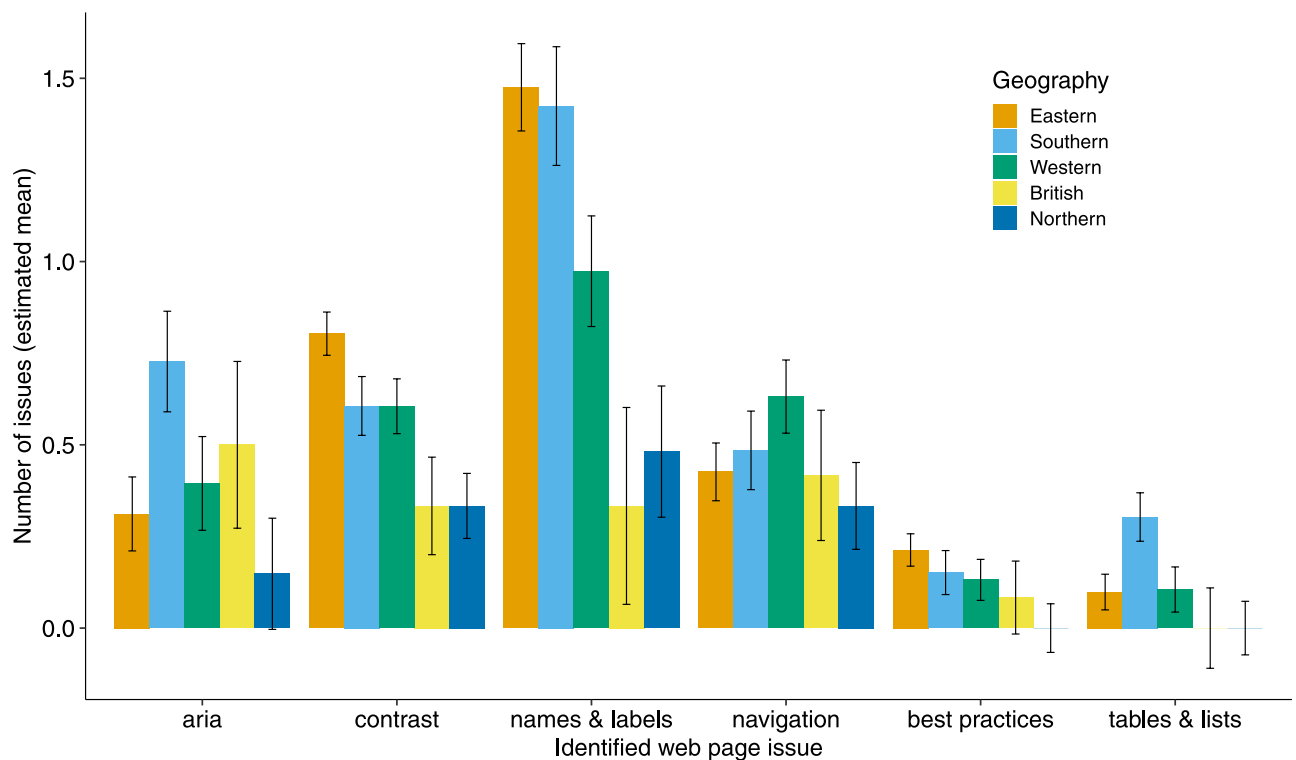
We also examined accessibility issues of the websites across different European regions, and performed a two-way ($5(region) \times 6(issues)$) mixed-design ANOVA, see Fig. 1c). The Google Lighthouse [34] automatic inspection categorised the issues. The analysis revealed a significant main effect of the geographical region $F(4, 166)=9.70$, $p<0.001$, $\eta^2=0.049$, suggesting that Northern countries websites had, in general, significantly fewer accessibility issues ($M=0.22$, $SE=0.06$) than Southern ($M=0.62$, $SE=0.05$), Eastern ($M=0.56$, $SE=0.04$), and Western ($M=0.47$, $SE=0.05$) countries. There were noteworthy disparities observed between the websites of British universities and those from the Eastern region ($p<0.05$) as well as the Southern region ($p<0.01$) regarding the number of accessibility issues.

The significant main effect of the accessibility issues $F(3.33, 553.15)=33.72$, $p<0.001$, $\eta^2=0.137$ suggests that the most common issue was associated with names and labels, e.g., buttons without accessible names, lack of alternative text, etc. ($M=0.94$, $SE=0.08$). The second most common issue was that the background and foreground colours had an insufficient contrast ratio ($M=0.54$, $SE=0.04$) and the third most common issues relate to the navigation through websites ($M=0.46$, $SE=0.05$). An issue that featured to a much lesser extent related to tables and lists ($M=0.01$, $SE=0.03$).

The interaction between geographical region and accessibility issues, $F(13.33, 553.15)=3.48$, $p<0.001$, $\eta^2=0.067$ (see Fig. 1c) suggests that the issues with the contrast are most



(a) Comparison of average tested universities' websites scores in different regions of Europe. (b) Geographical distribution of tested universities' websites scores in European countries (scores are represented by colour map - see the legend).



(c) The average number of accessibility issues types on European universities' main web pages across different geographical regions.

Fig. 1 Tested Universities' websites accessibility scores and accessibility issues found on these websites

often on websites in Eastern countries ($M=0.80$, $SE=0.06$) and the least often in British ($M=0.33$, $SE=0.13$) and Northern ($M=0.33$, $SE=0.09$) countries. Similarly, for issues with names and labels, we observed the highest number for Eastern ($M=1.48$, $SE=0.12$) and Southern countries ($M=1.42$, $SE=0.17$) compared to British ($M=0.33$, $SE=0.27$) and Northern ($M=0.48$, $SE=0.18$) countries. For ARIA-related issues, the only significant difference ($p<0.05$) was between Northern ($M=0.15$, $SE=0.15$) and Southern ($M=0.73$, $SE=0.14$) countries.

4.3 Desk research of websites content

When compared between different European regions, 100% of UK university websites listed accessibility offices with easy to identify contact information. Fewer than 94% of the websites for Western and 70% for Northern Universities had accessibility offices listed. Eastern and Southern countries' universities made this information visible in, accordingly, 63% and 58%.

The results of our qualitative thematic analysis reveal the following support categories: learning support, examination support, coaching and counselling, individual mentoring, and legal and financial support. This revealed that extensive support for students with disabilities is not only restricted to the direct learning process but also to career planning and support outside the university, e.g., in finding accessible accommodation or financial support. In the following section, we describe the range of support services identified on university websites, detailing specific types of assistance available to students with disabilities. These support categories include:

- **Learning and note-taking support:** Teaching adjustments, Teaching aids, Aid from appointed teachers, E-reading room, Hand-outs and lecture notes in alternative formats, Assistive technology for note-taking, Talking books, Adapted course literature, Adapting faculties.
- **Examination support:** Exam adjustments (font size enlarged during exams, extended time during exams), Examination assistive technology;
- **Coaching and counselling:** Psychological counselling, Career counselling, Social counselling, Mental health advice and mentoring;
- **Individual mentoring:** Individual study mentors, Extra tuition with supervisor, Personalized study program, Advice on organizing studies, Individual teaching of selected subjects in cooperation with faculty coordinators, Individual support plan, Assistance in applying for aid;
- **Legal and financial support:** Legal representation, Mediation for study-related problems, Mediation with

teaching staff, Financial aid, External grants, Remission of tuition fees, External internships, Work offers, Longer loan period, Free registration.

Beyond these broad support categories, universities also offer a long list of assistive technologies and specific services to meet the day-to-day needs of students with disabilities. These resources, aimed at enhancing accessibility and mobility, include electronic reading magnifiers with speech output, text readers, scanning pens, ergonomic mice and keyboards, listening systems, induction loops and FM systems, portable hearing loops, and resource rooms. Additional campus accessibility features, such as blind-friendly maps of the university, travel assistance and adapted transport support, ramps and lifts, and wheelchair-friendly facilities, further support students' navigation and independence.

In addition to assistive technologies, universities provide other specialized resources to support students with disabilities. These include: a battery of diagnostic tests for specific learning difficulties, child care, personal assistants and interpreters, orientation and mobility training, advice on personal assistance outside of school, harassment help desk, help with accommodation, non-medical help, copying and scanning services, high-quality library scanner, and specialized electronic resources.

We believe that the desk-based research results provide valuable insights into the level of support offered by institutions to those in need of support services. However, as with any qualitative aspect of research, it is only through direct follow-up with the individuals and offices involved that we can critically analyze the data and fully understand the available services and their specific forms. The support categories identified on the universities' websites informed the design of the survey, shaping the questions, answer choices, and rating scales used.

4.4 Online survey

4.4.1 The accessibility policy implementation

Most of the universities (seven out of 13 answers provided) admitted to having implemented an inclusion policy in line with the European Accessibility Act. Three (3) participants admitted that their universities do not have such a policy. Additionally, there were three responses indicating "I don't know."

Participants responded to the question "What type of physical access is available for students at your university?" The responses showed that the universities are physically accessible through the installation of wheelchair-friendly facilities, e.g., ramps, lifts (7), and blind-friendly maps of the university (3). One university also offers guide dogs. Only one of the eight universities that provided a response

to the question does not offer any physical accessibility resources to their students.

4.4.2 The accessibility/diversity offices organization

The accessibility offices that participated in the study were established between 1980 (e.g., University of Edinburgh) and 2022 (e.g., University of Ljubljana). The accessibility offices have different names, e.g., Student Support and Activity Centre; Disability and Learning Support Service; Diversity, Inclusivity, and Equality Office; Disability Affairs Office; Office of Students with Disabilities; or the Unit for the Attention of People with Disabilities. Typically, fewer than five people are working permanently within an accessibility office, and there was only one University (UK), where more than 15 people engaged regularly in activities related to making the university more accessible for people with disabilities.

Less than half of the offices have a separate annual budget allocated to them (four out of 10 responses). The overall annual budget for running the accessibility service at these offices is less than 50,000 EUR (five out of seven responses); only two offices reported a higher budget. The funding comes from the institution, with two offices receiving additional support from specific government funds or external corporate sources. For example, the budget allows for supporting teachers in creating additional materials when necessary (four out of 10 cases). Some offices also receive external funding, such as European Social Funds or support from National Agencies, to purchase equipment.

In conclusion, the survey suggests that while many universities have implemented inclusion policies and established accessibility offices, the level of resources and support varies widely among these institutions. Most offices

operate with limited budgets and staff. Additional external support, including funding and equipment procurement, is often necessary to supplement their efforts.

4.4.3 Students supported by the accessibility/diversity offices

Respondents claimed that the approximate percentage of students with a disability that are registered at the universities varied between less than 0.5% of all students (four universities), through 1 – 2% (two universities), 2 – 5% (two universities), up to more than 5% (two universities). Table 1 summarizes how frequently different disabilities are represented.

Participants identified various types of disabilities among university students. Commonly represented disabilities included ADHD, Dyslexia, mental health conditions, and physical disabilities. However, students with Autism Spectrum Disorder (ASD), blindness or vision impairments, Deaf and Hard of Hearing (DHH), as well as those with other significant ongoing illnesses were less frequently represented. Occasionally, students with neurological conditions, such as Brain Injury and Epilepsy, accessed accessibility services. Disabilities such as Developmental Coordination Disorder (DCD), Dyspraxia, Dyscalculia, Significant Numeracy Difficulties, and Speech and Language Communication Disorders were relatively rare among beneficiaries of these services.

4.4.4 The accessibility/diversity offices information policy

The Accessibility/Diversity Offices employ various methods and opportunities to inform students about their services and support. They inform students mostly before registration (8) and during studies (7), but also during orientation days (4), at registration (5), and after registration (5). To inform

Table 1 Distribution of different types of disabilities among students using university support services, with each value representing the number of institutions selecting each response

Disability	Frequency			
	Never	Rarely	Occasionally	Frequently
ADD/ADHD	0	0	3	4
Autistic spectrum disorder (incl. Asperger's Synd.)	1	3	3	2
Blind/vision impairment	0	6	3	0
Deaf/hard of hearing	0	5	3	1
Developmental co-ordination disorder (DCD)	3	2	2	0
Dyslexia/significant literacy difficulties	1	1	0	5
Dyscalculia/significant numeracy difficulties	2	3	1	1
Mental health conditions	0	1	1	7
Neurological condition (incl. Brain Inj. or Epilepsy)	0	3	3	1
Physical disability	0	2	2	4
Significant ongoing illness	1	3	1	1
Speech and language communication disorder	2	3	2	0

The categories rarely and very rarely were summarized and presented together in the table. The same applies to frequently and very frequently categories

students about the services, webpages are used most frequently (9), then face-to-face communication with students (8), meetings during open days and events (6), emails to all students (5), and leaflets (4). The multi-faceted approach to the information policy ensures that students have access to information about the available support services at different stages of their academic journey, promoting inclusivity and accessibility within the university environment.

4.4.5 Services provided by accessibility/diversity offices

The Accessibility/Diversity Offices strive to provide comprehensive support to students with disabilities, addressing a wide range of needs to ensure inclusivity and equal opportunities within the academic environment. They provide diverse support in several types of accessibility services starting from general coaching and counselling, legal and financial support, living assistance, individual custom-tailored study plans, learning support, and support during examinations.

Regarding legal and financial support, while legal representation is rare (1), mediation for study-related problems (4) or mediation with teaching staff (4) are more commonly offered. The students can benefit from financial aid (4), external grants (4), remission of tuition fees (3), external internships (3), work offers (3), free registration (2), longer loan period (2) and subsidies for housing costs (1). They provide coaching and counselling services including psychological counselling (7), career counselling (6), mental health advice and mentoring (5), Autism mentoring (1), and social counselling (4). In most of the institutions, there is a separate office providing these supports (6 out of 8 responses). An individual support plan is often created (5), and mentoring support is provided (3). When required, personal interpreters (3), personal assistants (3), or tutors (1) assist students with special needs. The office staff also provides advice on personal assistance outside of academic activities, e.g., help with barrier-free accommodation (3). The support during exams includes extended time during exams (8), enlarged font size (6), screen readers (6) or reading pens (1), a human assistant (reader) (5), or scribe (1), separate and individual exam room (4), additional computer (3) or comfort breaks (1). One participant mentioned that their office provides individual organization of study resulting in extended deadlines. The note-taking support includes: assistive technology for note-taking (6), e.g., speech recognition software (4), note-taking solutions (4), document digitalization (5), photocopies and lecture notes in alternative formats (5), adapted course literature, e.g., talking books (6), and a human assistant for note taking in lectures and other classes (4), or digital recorders and other hardware equipment (1). Other assistance includes copying and scanning services (5), harassment helpdesk (3), orientation and mobility around

the campus training (5), diagnostic tests of specific learning difficulties (2), and child care (1).

4.4.6 Assistive technologies available for students

The offices offer a wide variety of assistive technologies available for students, such as computers with adapted programs (7), ergonomic mice and keyboards (7), text readers (6), and electronic reading magnifiers with speech output (5), Assistive technology for note-taking (3), listening systems (4), induction loops and hearing loops (4), FM systems that transmit audio signals to the student by radio waves (3), and scanning pens (1). One of the offices was equipped with a range of other specialist assistive software and hardware.

Some accessibility offices (4) offer an equipment loaning system for the students. For example, they loan laptops, mice and keyboards, recorders, and electronic magnifiers. Their staff are also open to suggestions and try to organize whatever students need to minimise/manage the impact of their disability, learning difference, health, or neurodiverse condition on their studies (1). One of the offices reported to have a partnership with an external organization that lent the University a wide array of equipment.

4.4.7 Support for teaching faculty

The offices also provide some support to teaching faculty (6 out of 8 responses) by counselling them on how to ensure an inclusive (academic) environment, teacher training/seminars/workshops about specific special needs, recommendations on how to communicate, and preparing study materials for student support. They also consult teachers when facing challenges in working with students.

4.4.8 Accessibility/diversity offices needs

As part of the survey, office representatives were asked to specify up to five of the most important needs of their office. The offices seem to be understaffed with the greatest need being additional human resources including (4 out of 6) specialist mentoring and support for students with mental health challenges and neurodiverse conditions. Financial support emerged as the second most important need (4), which would enable, for instance, the purchase of necessary equipment. The third identified need was improving collaboration with colleagues across the university to ensure the implementation of adjustments and foster a greater understanding of the needs of disabled students especially within the academic community. This shift in attitude among academic staff would promote greater openness to alternatives to traditional means of teaching and learning methods. Additionally, office representatives emphasized the need to raise awareness about available student support services and

to involve other students, such as note-takers, and mentors. The office staff called also for guidelines from accessibility experts and the government. Finally, they highlighted the need for adjustments to university buildings were mentioned, advocating for more barrier-free places in the university, improved personal emergency evacuation plans, and more resources to support student skill development, such as the FM system.

4.5 Summary of findings

4.5.1 Policy implementation and organizational structure

Most universities surveyed have implemented inclusion policies in line with the European Accessibility Act. Furthermore, accessibility offices have been established across these institutions, but the number of staff and the resources available to these offices vary significantly. This suggests a disparity in the level of support and resources dedicated to accessibility across universities.

4.5.2 Student support and representation

The survey indicates a wide range of disabilities among students, with ADHD, Dyslexia, mental health conditions, and physical disabilities being the most common. The proportion of disabled students varies across institutions, and the representation of specific disabilities like ASD, blindness, and significant ongoing illnesses is less frequent. This suggests a need for broader inclusivity and representation in accessibility services.

4.5.3 Information dissemination

Accessibility/Diversity offices employ a multi-faceted approach to inform students about their services, using methods such as web pages, face-to-face communication, open-day events, and emails. This approach ensures that students are informed about available support services at different stages of their academic journey.

4.5.4 Services and assistive technologies

Accessibility offices strive to provide comprehensive support through a variety of services including coaching, counseling, legal and financial support, exam assistance, and note-taking support. A wide range of assistive technologies is also available to students, including computers with adapted programs, text readers, and ergonomic hardware. However, the availability of these services and technologies varies across institutions.

4.5.5 Faculty support

Accessibility offices also provide support to teaching faculty, offering training and advice on how to create an inclusive academic environment. This indicates a holistic approach to accessibility, involving both students and faculty in the process.

4.5.6 Identified needs

The survey highlights the need for more human resources, financial support, and effective liaison with colleagues across the university. The need for more barrier-free places within the university, improved emergency evacuation plans, and additional resources to support students develop their skills was also emphasized. This suggests that while significant strides have been made in accessibility, further improvements are still needed.

5 Discussion

This study audited the accessibility of European universities' websites and investigated the support services universities provide to students with disabilities through online data and survey responses from 21 higher education institutions across 17 European countries. This dual approach allowed us to evaluate both the accessibility of online information and the extent of support services offered by these institutions, thereby portraying a comprehensive picture of the accessibility landscape in European higher education.

Our findings reveal several common accessibility issues on university websites, including ambiguous labels and insufficient contrast. These barriers can significantly impact individuals with visual or cognitive impairments by hindering navigation and comprehension. Accessibility disparities were also observed across regions, with Northern European universities generally achieving higher accessibility scores than their Southern and Eastern counterparts. These results align with broader studies indicating that website accessibility remains inconsistent across Europe, even in public sector institutions required to meet the Web Content Accessibility Guidelines (WCAG) [19, 38].

Beyond web accessibility, the survey uncovered variability in accessibility services provided to students with disabilities. Most universities have accessibility offices and policies, but their visibility and resources differ widely. While some institutions offer comprehensive support—including career planning, assistive technologies, and personalized learning accommodations—others lack essential resources or fail to represent a full spectrum of disabilities. Such inconsistencies highlight a need for more standardized support structures across European universities.

To address these gaps, universities could increase the visibility of their accessibility offices on institutional websites and broaden inclusivity in their support services, especially for under-represented disabilities. Enhancing staff and technological resources dedicated to accessibility would help level the playing field for students with diverse needs. Additionally, fostering cross-regional collaborations among universities could facilitate the sharing of best practices, help mitigate regional disparities, and promote a more inclusive approach to accessibility across Europe.

In conclusion, higher education institutions are responsible for providing equitable access to information and support for all students, regardless of disability. By improving web accessibility, enhancing support services, and establishing collaborative networks, universities can create more inclusive digital and physical learning environments. These actions are essential for complying with legal standards and advancing a culture of accessibility and inclusion within European higher education.

It is important to note the low response rate in the survey, which may limit the scope of our findings related to accessibility/diversity offices, their services, and needs. While a higher response rate would have strengthened the broader applicability of the findings, qualitative research often relies on the principle of saturation, where data collection and analysis are considered sufficient once no new insights emerge. This study adopts an incremental approach to saturation, recognising that analysis does not suddenly become ‘rich’ or ‘insightful’ with the addition of a single response but rather deepens gradually. The key consideration is not whether saturation has been fully achieved, but rather how much saturation is sufficient to draw meaningful conclusions. In line with this perspective, saturation is treated as an ongoing and cumulative process, guided by the researchers’ judgment rather than a fixed threshold [39]. An important contributing factor emerges in our findings—professionals working in student support services are often overstretched, limiting their availability to participate in such surveys. This practical constraint reflects a broader issue in higher education: the limited resources dedicated to disability support services, which in itself underscores the importance of the study’s findings. Expanding on this in future studies may be beneficial to the body of literature and to understanding the gap in the availability of services.

6 Recommendations

6.1 Increased visibility of accessibility offices and information on university websites

Ensuring that information about accessibility services is prominently featured on university websites is crucial for

fostering an inclusive environment for students with disabilities. Accessibility offices supporting students’ academic, physical, and mental well-being should be easy to locate online and provide comprehensive details about available services. For many students, the journey to finding support begins with navigating the institution’s website. Clear, prominent links to accessibility resources, contact information, and detailed descriptions of available services—such as assistive technologies, mental health support, and academic accommodations—can significantly impact a student’s academic experience. Additionally, universities could benefit from integrating testimonials or case studies, offering insight into how these services have positively impacted the experiences of other students [2, 11]. Universities should also ensure that these web pages comply with accessibility standards, making them compatible with screen readers, navigation aids, and other assistive technologies to support all students [38].

6.2 Investing in more resources and staff for accessibility offices, particularly in under-resourced institutions and regions

Accessibility offices in higher education institutions often operate with limited budgets, staff, and resources, especially in under-resourced regions, exacerbating disparities in the level of support available across universities. Increasing investments in these offices would allow institutions to expand their service offerings and enhance their response to the diverse needs of students with disabilities. This funding could be directed toward hiring additional staff, including specialists in assistive technology, disability services, and mental health support, ensuring that each student can receive personalized assistance. Moreover, financial resources could also enable universities to procure and maintain up-to-date assistive technologies, such as speech-to-text software, ergonomic devices, and mobility aids [13, 24]. Institutions may also consider allocating funds for the continuous professional development of accessibility staff, providing them with training on emerging technologies and accessibility practices. Such investments would empower accessibility offices to create a supportive academic environment, improving student retention and success rates, especially in universities that traditionally struggle to secure resources for disability services [17].

6.3 Implementing mandatory accessibility training for faculty and staff

While accessibility services are critical for supporting students, faculty and staff also play an integral role in fostering an inclusive learning environment. Making accessibility training mandatory for all faculty and staff members

can help bridge the gap in awareness and understanding of students' needs and create a campus culture that actively supports inclusion. Training should cover essential topics such as Universal Design for Learning (UDL) principles, communication techniques, and strategies for making course materials and assessments accessible [16]. In addition, training should address best practices for creating accessible digital content, as many courses have increasingly adopted online learning components. Providing faculty and staff with these resources would enhance their ability to accommodate diverse learning needs and foster a more inclusive environment that empowers students to engage in their education actively. Ongoing training sessions, accessible toolkits, and incentives for participation could encourage a long-term commitment to accessibility, enabling staff and faculty to stay updated on evolving standards and technologies [15].

6.4 Establishing a platform for sharing best practices and resources between universities across Europe

A collaborative platform for sharing accessibility resources and best practices could be a valuable resource for universities across Europe, especially for those in under-resourced regions or those lacking extensive accessibility expertise. Such a platform could be organized as a digital repository, where universities can share research findings, guidelines, training materials, policy documents, and case studies related to accessibility initiatives [40]. Moreover, this platform could facilitate the creation of a network of accessibility professionals who can share their insights, troubleshoot issues, and develop regionally appropriate solutions for accessibility challenges. By leveraging the experiences of institutions with established, successful accessibility approaches, universities can adopt proven strategies, avoiding the inefficiencies associated with trial and error. The European Union or relevant educational bodies could support the platform to ensure long-term sustainability, potentially offering access to grant information, funding opportunities, and joint research initiatives aimed at improving accessibility in higher education [6, 11].

7 Conclusion

This study comprehensively evaluates web accessibility and support services for students with disabilities across European higher education institutions. By examining institutional websites and surveying accessibility offices, we identified significant disparities in accessibility and support services, with institutions in Northern Europe generally achieving higher levels of compliance with accessibility standards than those in Southern and Eastern Europe.

Common web accessibility issues—such as ambiguous labels, inadequate contrast, and poorly structured navigation—pose substantial barriers for students with disabilities, underscoring the need for continued improvement in digital accessibility [38].

Beyond web accessibility, our findings reveal a wide variance in the resources available to accessibility offices across universities and inconsistent visibility and inclusivity in the support services offered. While some institutions provide extensive support, including personalized accommodations, career counselling, and assistive technologies, others lack essential resources, leading to a fragmented landscape of accessibility services across Europe. Addressing these disparities will require strategic investments, stronger policy frameworks, and collaborative initiatives.

To foster a more inclusive educational environment, we recommend enhancing the visibility of accessibility offices on university websites, increasing resources for accessibility services, mandating accessibility training for faculty, and establishing a cross-regional platform for sharing best practices and resources. These recommendations aim to bridge the current gaps in accessibility and create a cohesive approach that supports all students, regardless of their disabilities [13, 17].

An interesting point to consider is that promoting the presence of people with disabilities within higher education environments can have broader impacts. Increased visibility and interaction with individuals with disabilities can raise awareness and normalize accessibility among all students, including those without disabilities. This exposure can lead to a more inclusive culture, extending even to the workforce, where awareness often remains a barrier to accessibility. Thus, increasing accessibility in universities not only benefits students directly but also helps to break the cycle of low awareness and limited representation. This principle is supported by the findings from Cao and Loiacono [41], who identified that exposure to people with disabilities and an understanding of their specific needs are key incentives for engaging with accessibility guidelines. Their study suggests that direct interaction with individuals with disabilities can motivate greater commitment to accessibility practices, reinforcing the importance of visibility and inclusion within higher education environments.

In conclusion, higher education institutions play a critical role in ensuring equal access to education for students with disabilities. As digital learning continues to evolve, universities must foster a culture of accessibility that prioritizes compliance with established guidelines, invests in robust support services, and facilitates knowledge-sharing across regions. These actions will not only fulfil legal obligations but also contribute to a genuinely inclusive academic landscape across Europe, empowering students with disabilities to thrive in their educational pursuits and beyond [15, 24].

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Declarations

Conflict of interest No conflict of interest related to the work presented in this manuscript is known to any of the authors.

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References

- Bennett, D., Knight, E., Divan, A., Kuchel, L., Horn, J., van Reyk, D., et al.: How do research-intensive universities portray employability strategies? A review of their websites. *Aust. J. Career Dev.* **26**(2), 52–61 (2017). <https://doi.org/10.1177/1038416217714475>
- Providenti, M.: The art of the accessibility statement. *Internet Ref. Serv. Q.* **10**(1), 47–62 (2005). https://doi.org/10.1300/J136v10n01_04
- Goode, J.: ‘Managing’ disability: early experiences of university students with disabilities. *Disabil. Soc.* **22**(1), 35–48 (2007). <https://doi.org/10.1080/09687590601056204>
- Alahmadi, T., Drew, S.: An evaluation of the accessibility of top-ranking university websites: accessibility rates from 2005 to 2015. *J. Open Flexible Distance Learn.* **21**(1), 7–24 (2017). <https://doi.org/10.61468/jofdl.v21i1.273>
- Lourens, H., Swartz, L.: ‘Every now and then you slip up and then you are in trouble’: the responsibility on students with visual impairments to access reasonable accommodations in South Africa. *Int. J. Disabil. Dev. Educ.* **67**(3), 320–335 (2020). <https://doi.org/10.1080/1034912X.2019.1587152>
- Lynn, T., Kennedy, J., Rosati, P., Fox, G., O’Gorman, C., Curran, D., et al.: Web accessibility of Irish local government websites. In: ICDS. IARIA; (2023). pp. 47–54. https://www.researchgate.net/profile/Pierangelo-Rosati/publication/370214924_Web_Accessibility_of_Irish_Local_Government_Websites/links/64463f04017bc07902d622d6/Web-Accessibility-of-Irish-Local-Government-Websites.pdf
- Hammberg, M., Kemény, P., Laurin S.: Access denied: the (in)accessibility of European political party websites. European disability forum. <https://www.edf-feph.org/publications/access-denied-the-inaccessibility-of-european-political-party-websites/>. Accessed 17 June 2024
- Council of the European Union: disability in the EU: facts and figures. <https://www.consilium.europa.eu/en/infographics/disability-eu-facts-figures/>. Accessed 17 June 2024
- United Nations. Convention on the rights of persons with disabilities (CRPD). <https://social.desa.un.org/issues/disability/crpd/convention-on-the-rights-of-persons-with-disabilities-crpd>
- European Commission and Directorate-General for Employment, Social Affairs and Inclusion. Union of equality—Strategy for the rights of persons with disabilities 2021–2030. Luxembourg: Publications Office (2021). <https://doi.org/10.2767/31633>
- Marcus-Quinn, A.: The EU accessibility act and web accessibility directive and the implications for digital teaching and learning materials. *Routledge Open Res.* **1**, 30 (2022). <https://doi.org/10.12688/routledgeopenres.17581.1>
- Vollenwyder, B., Petralito, S., Iten, G.H., Brühlmann, F., Opwis, K., Mekler, E.D.: How compliance with web accessibility standards shapes the experiences of users with and without disabilities. *Int. J. Hum. Comput. Stud.* **170**, 102956 (2023). <https://doi.org/10.1016/j.ijhcs.2022.102956>
- Couzens, D., Poed, S., Kataoka, M., Brandon, A., Hartley, J., Keen, D.: Support for students with hidden disabilities in universities: a case study. *Int. J. Disabil. Dev. Educ.* **62**(1), 24–41 (2015). <https://doi.org/10.1080/1034912X.2014.984592>
- Plotner, A.J., Marshall, K.J.: Navigating university policies to support postsecondary education programs for students with intellectual disabilities. *J. Disabil. Policy Stud.* **25**(1), 48–58 (2014). <https://doi.org/10.1177/1044207313514609>
- Seale, J., Georgeson, J., Mamas, C., Swain, J.: Not the right kind of ‘digital capital’? An examination of the complex relationship between disabled students, their technologies and higher education institutions. *Comput. Educ.* **82**, 118–128 (2015). <https://doi.org/10.1016/j.compedu.2014.11.007>
- Wadlington, C., DeOrnellas, K., Scott, S.R.: Developing effective transition reports for secondary students: a nationwide survey of college and university disability support personnel. *Exceptionality* **25**(3), 207–215 (2017). <https://doi.org/10.1080/09362835.2017.1283623>
- O’Shaughnessy, T.J.: Universal design for learning and accessibility: a practitioner approach. In: *Handbook of Research on Applying Universal Design for Learning Across Disciplines: Concepts, Case Studies, and Practical Implementation*, pp. 25–47. IGI Global, Hershey (2021). <https://doi.org/10.4018/978-1-7998-7106-4.ch002>
- Campoverde-Molina, M., Luján-Mora, S., Valverde, L.: Accessibility of university websites worldwide: a systematic literature review. *Univ. Access Inf. Soc.* **22**(1), 133–168 (2023). <https://doi.org/10.1007/s10209-021-00825-z>

19. Initiative (WAI), W3C Web Accessibility.: Web Content Accessibility Guidelines (WCAG) 2 Level AA Conformance. <https://www.w3.org/WAI/WCAG2AA-Conformance>
20. Macakoğlu, ŞŞ., Peker, S., Medeni, İT.: Accessibility, usability, and security evaluation of universities' prospective student web pages: a comparative study of Europe, North America, and Oceania. *Univ. Access Inf. Soc.* **22**(2), 671–683 (2023). <https://doi.org/10.1007/s10209-022-00869-9>
21. Fakrudeen, M., Rajan, A., Alameri, A.H.M., Almheiri, A.M.L.O.: Assessing higher education websites in the middle east: a comparative analysis of UAE, Saudi Arabia, and Qatar. In: 2023 9th International Conference on Information Technology Trends (ITT), pp. 226–231. IEEE, Piscataway (2023). <https://doi.org/10.1109/ITT59889.2023.10184230>
22. García González, J.M., Gutiérrez Gómez-Calcerrada, S., Solera Hernández, E., Rios-Aguilar, S.: The twisting road to access to higher education for people with disabilities in Spain. *Int. J. Disabil. Dev. Educ.* **70**(5), 829–842 (2023). <https://doi.org/10.1080/1034912X.2021.1910932>
23. Ye, K., McCoy, S.: Examining the post-school decision-making and self-determination of disabled young adults in Ireland. *Disabilities* **4**(3), 459–476 (2024). <https://doi.org/10.3390/disabilities4030029>
24. Lopez-Gavira, R., Moriña, A., Morgado, B.: Challenges to inclusive education at the university: the perspective of students and disability support service staff. *Innov. Eur. J. Soc. Sci. Res.* **34**(3), 292–304 (2021)
25. Mack, K.A., Sidik, N.A., Desai, A., McDonnell, E.J., Mehta, K., Zhang, C., et al.: Maintaining the accessibility ecosystem: a multi-stakeholder analysis of accessibility in higher education. In: Proceedings of the 25th International ACM SIGACCESS Conference on Computers and Accessibility. ASSETS '23, pp. 1–6. Association for Computing Machinery, New York (2023). <https://doi.org/10.1145/3597638.3614547>
26. Fernández-Batanero, J.M., Montenegro-Rueda, M., Fernández-Cerero, J.: Access and participation of students with disabilities: the challenge for higher education. *Int. J. Environ. Res. Public Health* **19**(19), 11918 (2022). <https://doi.org/10.3390/ijerph191911918>
27. Fennelly-Atkinson, R., LaPrairie, K.N.: Analysis of associated factors that influence the accessibility of online higher education. *J. Appl. Instruct. Des.* **12**(2), 29–47 (2023). <https://doi.org/10.59668/722.13021>. (Publisher: EdTech Books)
28. Sanderson, N.C., Kessel, S., Chen, W.: What do faculty members know about universal design and digital accessibility? A qualitative study in computer science and engineering disciplines. *Univ. Access Inf. Soc.* **21**(2), 351–365 (2022). <https://doi.org/10.1007/s10209-022-00875-x>
29. Lister, K., Pearson, V.K., Coughlan, T., Tessarolo, F.: Inclusion in uncertain times: changes in practices, perceptions, and attitudes around accessibility and inclusive practice in higher education. *Educ. Sci.* **12**(8), 571 (2022). <https://doi.org/10.3390/educsci12080571>
30. Chun, J., Williams, T.O.: A community of practice for professional development in technology integrations for accessibility: a case study of a faculty inquiry group. *Coll. Teach.* **69**(3), 126–137 (2021). <https://doi.org/10.1080/87567555.2020.1832435>
31. Thurmond, V.A.: The point of triangulation. *J. Nurs. Scholarsh.* **33**(3), 253–258 (2001). <https://doi.org/10.1111/j.1547-5069.2001.00253.x>
32. THE Times Higher Education.: Times Higher Education Report. THE—Times Higher Education. <https://www.timeshighereducation.com/>
33. Berglee, R.: World Regional Geography: People, Places and Globalization. University of Minnesota Libraries Publishing, Minneapolis (2012). <https://api.semanticscholar.org/CorpusID:159335430>
34. Google Developers.: Lighthouse accessibility scoring
35. R Core Team.: R: A Language and Environment for Statistical Computing. Vienna, Austria. <https://www.R-project.org/>
36. Lahti, L., Huovari, J., Kainu, M., Biecek, P., Hernangomez, D., Antal, D., et al.: eurostat: Tools for Eurostat Open Data [Computer software]. R package version 4.0.0. <https://github.com/rOpenGov/eurostat>
37. Lahti, L., Huovari, J., Kainu, M., Biecek, P.: Retrieval and analysis of Eurostat open data with the eurostat package. *R J.* **9**(1), 385–392 (2017). <https://doi.org/10.32614/RJ-2017-019>
38. Martins, B., Duarte, C.: A large-scale web accessibility analysis considering technology adoption. *Univ. Access Inf. Soc.* **23**, 1857–1872 (2023). <https://doi.org/10.1007/s10209-023-01010-0>
39. Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., et al.: Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual. Quant.* **52**(4), 1893–1907 (2018). <https://doi.org/10.1007/s11135-017-0574-8>
40. Jordanoski, Z., Meyerhoff Nielsen, M.: The challenge of web accessibility: an evaluation of selected government websites and service portals of high, middle and low-income countries. In: Proceedings of the 16th International Conference on Theory and Practice of Electronic Governance. ICEGOV '23. Association for Computing Machinery, New York, pp. 101–110 (2023). <https://doi.org/10.1145/3614321.3614343>
41. Cao, S., Loiacono, E.: Perceptions of web accessibility guidelines by student website and app developers. *Behav. Inf. Technol.* **41**(12), 2616–2634 (2022). <https://doi.org/10.1080/0144929X.2021.1940278>
42. CRediT Standing Committee.: CRediT—Contributor Role Taxonomy. <https://credit.niso.org/>
43. Allen, L., O'Connell, A., Kiermer, V.: How can we ensure visibility and diversity in research contributions? How the Contributor Role Taxonomy (CRediT) is helping the shift from authorship to contributorship. *Learn. Publ.* **32**(1), 71–74 (2019). <https://doi.org/10.1002/leap.1210>

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