

Accessible tourism: using technology to increase social equality for people with disabilities

Trinidad Domínguez Vila, Lucía Rubio-Escuderos and Elisa Alén González

Abstract

Purpose – Information and communication technologies are being increasingly used across various sectors including the tourism industry. However, equitable access to online information remains a significant challenge, especially for people with disabilities (PwD). There is a pressing need for research into the accessibility of the internet to promote social equality. This study aims to identify patterns in both the technical accessibility and the content information related to accessibility and disability that is available on the official websites of leading global tourist destinations.

Design/methodology/approach – A cluster analysis assessed the technical accessibility of the websites, while a principal component analysis evaluated the content information concerning accessibility and disability.

Findings – There has been a substantial improvement in the technical accessibility of tourism websites over that described in earlier studies. There have been no advances in content information on accessibility and disability, which continues to be very heterogeneous and dispersed.

Originality/value – This evaluation of the technical accessibility and content related to accessibility and disability on tourism websites provides a basis for developing strategies to eliminate barriers that PwD encounter in accessing tourism information. To augment the efficacy of big data inputs, it is imperative to homogenise variables associated with technical access and content information on accessibility. Such standardisation will improve the functionality of algorithms critical to the Internet of Things and artificial intelligence technologies. These enhancements are likely to spur innovations that bridge the inequality gap and promote environments where technology serves as a cornerstone of social inclusion and equality.

Keywords Disability, Web accessibility, Accessible tourism, Content information, Technical accessibility

Paper type Research paper

无障碍旅游：利用技术提高残疾人的社会平等

摘要

目的：信息和通信技术在包括旅游业在内的很多行业的应用越来越广泛。互联网是游客不可或缺的工具，但并非每个人（在本研究中为残疾人、PwD）都能以相同的方式获取可用信息。有必要对无障碍使用互联网进行研究，以促进社会平等。本研究旨在识别全球主要旅游目的地官方网站的技术可及性以及网站内容上有关可及性和残疾信息的规律。

设计/方法/途径：聚类分析评估了网站的技术可及性，主成分分析评估了网站的可及性和残疾的相关内容信息。

研究结果：与早期研究中描述的相比，旅游网站的技术可访问性有了实质性的改善。关于无障碍和残疾的内容信息没有任何改善，仍然非常异质性和分散性。

原创性：本研究对旅游网站的技术可及性以及有关可及性和残障人士的内容信息的评估为制定以消除残疾人旅游所面临的障碍的未来战略奠定了基础。为了提高大数据输入的有效性，技术可及性和可及性内容信息相关的变量必须标准化和同质化。这将提高关键算法的效率，以增加物联网和人工智能技术的功能。这些改进可以促进创新，缩小不平等差距，并营造让技术成为社会包容和平等基石的环境因素。

关键词

文章类型 研究型论文

(Information about the authors can be found at the end of this article.)

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Turismo accesible: uso DE LA tecnología Para promover LA igualdad social DE las personas con discapacidad

Resumen

Objetivo: Las tecnologías de la información y la comunicación (TIC) se utilizan cada vez más en diversos sectores, incluido el turístico. Sin embargo, el acceso equitativo a la información online sigue siendo un reto importante, especialmente para las personas con discapacidad. Existe una necesidad acuciante de investigar la accesibilidad de Internet para promover la igualdad social. Este estudio identifica patrones en la accesibilidad técnica y en el contenido de la información sobre accesibilidad y discapacidad disponible en las páginas web oficiales de los principales destinos turísticos mundiales.

Diseño/metodología/enfoque: Un análisis de conglomerados evaluó la accesibilidad técnica y un análisis de componentes principales analizó el contenido de la información sobre accesibilidad y discapacidad en los sitios web.

Resultados: Se constata una mejora sustancial en la accesibilidad técnica de las páginas web de turismo con respecto a los resultados de estudios anteriores. No ha habido avances en el contenido de la información sobre accesibilidad y discapacidad, que sigue siendo muy heterogénea y dispersa.

Originalidad: Esta evaluación de la accesibilidad técnica y del contenido de la información relativo a la accesibilidad y la discapacidad en las páginas web turísticas proporciona una base para desarrollar estrategias que eliminen las barreras con las que se encuentran las personas con discapacidad para acceder a la información turística. Para mejorar la eficacia de las entradas de big data, es necesario estandarizar las variables relacionadas con la accesibilidad técnica y el contenido de la información sobre accesibilidad. Esta normalización mejorará la funcionalidad de los algoritmos fundamentales para el internet de las cosas y las tecnologías de inteligencia artificial. Es probable que estas mejoras impulsen innovaciones que reduzcan la brecha de la desigualdad y promuevan entornos en los que la tecnología sirva como piedra angular de la inclusión social e igualdad.

Palabras clave Accesibilidad web, Información de contenidos, Discapacidad, Turismo accesible, Accesibilidad técnica

Tipo de papel Trabajo de investigación

1. Introduction

Information and communication technologies (ICTs) are becoming increasingly important in most economic and social fields, including in tourism (Lee *et al.*, 2021). The COVID-19 pandemic accelerated this transition (Go and Kang, 2023), causing an increased use of ICTs. The internet has become indispensable for tourists seeking information on all aspects of travel, making decisions and communicating with both service providers and other travellers (Hootsuite, 2022).

The United Nations (UN) has recognised the right of all to access ICTs, including internet services (UN, 2012). Tourism has also been recognised as being a right for all because it can bring happiness and well-being to people's lives (McCabe, 2020). However, not everyone has the same access to the information available on the internet or to tourism. People with disabilities (PwD) are among the groups negatively affected. They face significant obstacles in accessing information on websites, which persist before, during and after travel, thereby undermining their ability to undertake and enjoy tourism experiences (Deville and Kastenholz, 2018; Rubio-Escuderos *et al.*, 2021). The barriers to accessibility are extensive, affecting all aspects of the experience, including access to information, local transport, accommodation, site visits, participation in cultural or sporting events. Furthermore, the nature of these experiences is significantly shaped by the tourist's specific type and degree of disability (World Tourism Organization, UNWTO, 2014). PwD encounter more difficulties than people without disabilities, which can jeopardise the pleasure associated with trips (Deville, 2003), especially during the planning phases (Deville and Kastenholz, 2018). Additionally, the lack of access to tourism information creates major obstacles during the planning and decision-making processes of travel (Buhalis and O'Connor, 2005). The inconsistency, contradictions and inaccuracies in the information regarding accessibility lead to considerable frustration and significant challenges for PwD when travelling for tourism purposes (Buhalis and Michopoulou, 2011; Darcy, 2010; Michopoulou and Buhalis, 2013; Rubio-Escuderos *et al.*, 2021).

Two specific barriers to accessing tourism information are of particular concern (UNWTO, 2015). The first relates to the technical accessibility of websites, that is, can PwD readily use the technologies and tools provided by websites? Websites, tools and technologies should be designed so that PwD can use them (i.e. understand them, navigate through them, interact with them) while being able to make active contributions (World Wide Web Consortium, W3C, 2017). The second barrier relates to the content information on accessibility and disability available on websites. Content information includes tags, meta data, designations, annotations, information and documentation available on websites (Free Content License Agreement, 2017).

Accessibility in tourist destinations, training on how to care for PwD in the service sector and providing good-quality information on accessibility are crucial for avoiding discrimination against the group (Buhalis and Michopoulou, 2011; Darcy, 2010; Michopoulou and Buhalis, 2013; UNWTO, 2016). This type of discrimination can affect the over one billion people with a disability, a number that continues to rise because of population aging and the increased incidence of chronic diseases (WHO, 2023). If we consider all potential beneficiaries of accessibility measures, such as people with transitory disabilities, families with children and pregnant women, the market ranges from 20% [World Health Organization (WHO), 2018] to 30% (Darcy, 2010) of the world's population. This makes it a highly lucrative market for tourism destinations (Domínguez Vila *et al.*, 2013; Buhalis and Michopoulou, 2011). To grasp this opportunity, tourism operators must develop and provide products and services that adhere to the accessible tourism value chain (UNWTO, 2015). Any breaks in the chain render the tourism offerings inaccessible, thereby diminishing the entire tourism experience (WHO, 2011; Buhalis and Michopoulou, 2011). The accessible tourism value chain encompasses several critical components, including planning, information and booking, transport, accommodation, food and beverages, tourism environments, tourism resources and public tourism administrations (UNWTO, 2015).

The recent importance attached to accessibility issues can be attributed to their increasing economic and social impact, as well as heightened legislative focus. The International Convention on the Rights of Persons with Disabilities (CRPD), adopted by the UN General Assembly in 2006 (signed by 165 countries), seeks to protect their rights and dignity (UN, 2006). It recognises the need to include them in society and the importance of accessibility at all levels, including access to website information and to tourism. Furthermore, the UN's 2030 Agenda for Sustainable Development promotes sustainability in tourism destinations, including accessibility and the inclusion of PwD (UNWTO, 2016), specifically in Sustainable Development Goals 1, 3, 9, 10 and 11 (Buhalis *et al.*, 2023).

Despite the importance of accessibility in social, economic and legislative terms, PwD are still denied access to ICTs (UNWTO, 2014, 2015). They have problems with the technical accessibility and content information on accessibility and disability, mainly due to the design of software (front) and the lack of updated and appropriate information (Domínguez Vila *et al.*, 2018; Florido-Benítez, 2023). There is, therefore, a clear need for research in the field of tourism, accessibility and internet technologies that can provide tools to increase social equality. Social equality exists when all individuals in a society have equal rights, liberties and status, including civil rights, freedom of expression, autonomy and equal access to public goods and social services (Norouzi, 2021). Social equality, a fundamental pillar of inclusive tourism, creates a more equitable society by removing barriers and discrimination (Innodays, 2020). Alongside social equality, the other core pillars of inclusive tourism – accessibility and universal design – enable marginalised groups to participate more fully in tourism (Scheyvens and Biddulph, 2018). Given the size of the sector which might benefit from inclusivity measures, more focus should be put on accessible tourism; this focus can learn much from examinations into inclusive tourism (Darcy *et al.*, 2020).

This study aims to perform a dual analysis of online accessibility by evaluating both the technical aspects and the content information related to accessibility and disability present

on the world's official destination websites. The goal is to identify patterns in technical accessibility and content information, which will facilitate the establishment of homogeneous, standardised variables to enhance the functionality of relevant ICTs. Specifically, a uniform treatment of these variables across tourism websites could generate substantial big data, enabling the development of more effective algorithms. Such advancements would maximise the interoperability of innovative digital solutions that leverage artificial intelligence (AI) and the Internet of Things (IoT), two pivotal ICT trends in the tourism industry (Yuan *et al.*, 2019).

2. Literature review

The two principal models of disability used to understand accessibility are the medical and the social model. The medical model posits that the problems faced by PwD derive from the limitations imposed by their own impairments, considered to be individual, for which the only remedy is medical treatment or interventions (Duignan *et al.*, 2023; Velarde, 2012). The social model suggests that individual limitations should not exclude PwD from undertaking daily-life activities on the basis that society understands their issues and takes the necessary measures to remove barriers (Barnes and Mercer, 2010). People are not disabled by their impairments, but by the disabling barriers they face in society (Gouzman *et al.*, 2023). The social model as applied to tourism proposes that the limitations encountered by PwD are caused not by their physical conditions, but by destinations not taking their needs into account by making the adaptations necessary to ensure inclusion (Darcy and Buhalis, 2011). The social model perspective mainly influences examinations into ICTs used in accessible tourism (Khetarpal, 2014). Tourism information technologies have become an increasingly popular research subject, mainly focused on the interactions of people, technology and organisations; the next challenge will be based on big data and the evolution of the IoT and AI (Yuan *et al.*, 2019). This boom in technologies highlights network accessibility issues, which create barriers for PwD when they plan their trips (Porto *et al.*, 2019). Governmental authorities, using legislation, can encourage tourism stakeholders and companies to take advantage of the growing use of ICTs (Yuan *et al.*, 2019) to focus on accessibility and provide PwD with, accessible standardised offers (Shahzadal and Elgammal, 2023). The European Accessibility Act (2019) affirms that ICTs/digital platforms should make it possible to eliminate many of the obstacles faced by PwD (Fernández-Díaz *et al.*, 2023).

Web accessibility in tourism has been regarded as being a broad concept related to information and online accessibility (Buhalis and Michopoulou, 2011). There is general consensus that the information available on the internet on tourism infrastructure and services should be accessible, detailed, transparent, up-to-date, visible and presented in understandable formats, especially for PwD with visual, auditory and intellectual challenges (Buhalis and Michopoulou, 2011; Darcy, 2010; Michopoulou and Buhalis, 2013; UNWTO, 2014). Furthermore, it must be recognised that not all PwD experience the same limitations, necessitating information that is tailored to their specific needs; disability is not homogeneous (Darcy, 2010; Michopoulou and Buhalis, 2013).

When discussing Web accessibility, it is crucial to differentiate between technical accessibility and content information on accessibility and disability. About content information, studies have revealed that most websites provide very general content information on accessibility and disability, and are not always compatible with assistive technologies (Michopoulou and Buhalis, 2013; Mobility Mojo, 2020). Although some examined specific areas, for example, online brochures (Benjamin *et al.*, 2021; Cloquet *et al.*, 2018), hotel websites (Mobility Mojo, 2020; Wang *et al.*, 2020) and online platforms (Fernández-Villarán *et al.*, 2021), none conducted in-depth analyses of content information about accessibility and disability; nonetheless, they showed there is insufficient online content information on accessibility and disability. The UNWTO (2014) report lists criteria to improve website content information for

accessibility beneficiaries: credibility, visibility, updatedness, comprehensibility and completeness. The [UNWTO \(2014\)](#) report is taken in the present study as a reference to determine the variables to be analysed in relation to the content information on accessibility and disability of accessible tourism value chain components ([UNWTO, 2015](#)).

On the other hand, there has been a notable increase in recent years in research into the technical accessibility of tourism websites. Some examples, which generally reported positive developments, examined accommodation ([Teixeira et al., 2021, 2023](#)), transport ([Pant and Shina, 2020](#)) and tourist destinations ([Domínguez Vila et al., 2018, 2020](#)). These studies used the globally recognised Web content accessibility guidelines (WCAG) from the World Wide Web Consortium (W3C). Various tools were used to assess the technical accessibility levels of websites. The present study used the Web accessibility test (TAW) as an analysis tool, following similar research in the field ([Domínguez Vila et al., 2020](#); [Teixeira et al., 2021](#)). These two studies, and the others cited above, concluded that, while websites now have more technical accessibility, more work is needed, mainly in relation to their compatibility with the assistive technologies used by PwD, navigation, adaptation and alternatives to text.

States that support human rights have gained increased impetus to enhance accessibility and monitor these improvements through the CRPD. This convention also allows them to benchmark their progress against other nations ([Domínguez Vila et al., 2013](#); [Porto et al., 2019](#)). This will require data collection about disabilities ([Darcy et al., 2020](#)). Efforts are being made to develop accessible information services that enable PwD to enjoy social and cultural activities, tourism, leisure and free time ([Domínguez Vila et al., 2020](#)). Websites are seen as key promotional tools/sources of information for decision-making about tourism-based travel ([Del Vasto-Terrientes et al., 2015](#)). Nonetheless, the reality is that official tourism websites lack technical accessibility ([Domínguez Vila et al., 2020](#); [Fernández-Díaz et al., 2023](#)) and have scarce content information on disability and accessibility ([Fernández-Villarán et al., 2021](#); [Wang et al., 2020](#)). The 2030 Agenda aims to develop inclusive and sustainable tourism, with accessibility being a key pillar ([Buhalis et al., 2023](#)). Hence, there is a growing need to undertake research to provide a solution to this lack of accessibility, given the rapid development of ICTs and the opportunities presented by big data and the evolution of the IoT and, obviously, AI ([Yuan et al., 2019](#)).

3. Methodology

The [Euromonitor International, 2022](#) report on the top 100 global city destinations, ranked based on visitor numbers, is used in the present study as a reference to evaluate the technical accessibility and the content information on accessibility and disability in the official websites of these destinations. An abridged version of the report was used (freely accessible to registered users). The report applies 54 metrics across six key pillars important for successful destination performance: economic and business performance (e.g. gross domestic product), tourism policy and attractiveness (e.g. political stability), health and safety (e.g. medical services), tourism performance (e.g. international arrivals), tourism infrastructure (e.g. accommodation resources) and sustainability (e.g. petrol-free public transport). From the initial 100 destinations, those that did not have an official country tourism website that provided information and those that offered only administrative information, were excluded, leaving a final sample of 71 ([Appendix 1](#)).

The analysis examined the two perspectives, technical accessibility and content information on accessibility and disability. As aforementioned, the technical accessibility analysis drew on the TAW, following similar studies ([Domínguez Vila et al., 2018, 2020](#); [Teixeira et al., 2021](#)). These studies analysed the level of technical accessibility of websites based on the WCAG 2.1 proposed by the W3C (this, and the AA/AAA levels, etc. discussed below, are explained in [Appendix 2](#)). The analyses were made based on the AA and AAA levels (not level A, as this is mandatory in many countries and, therefore, does not provide relevant

information). Web Accessibility Initiative (WAI)-AA Level is obtained when there are no automatic problems of Priorities 1 and 2 and the manual problems indicated in these priorities have been discarded ([Appendix 2](#)). WAI-AAA level is achieved when there are no automatic or manual problems for any priority. The assessment of the level of accessibility is based on 12 guidelines formulated to help designers make the website accessible, founded on four main principles: perceivable, operable, understandable and robust. The guidelines contain compliance criteria associated with levels A, AA and AAA that establish the extent to which the requirements are met. The aim of the process is to ensure that technical accessibility is testable in terms of the requirements to address the needs of different user types and situations ([W3C, 2020](#)). The success criteria of the TAW test are classified based on the number of problems automatically detected, warnings that require manual review and not-reviewed incidents that require full manual analysis. To obtain interpretable results for the technical accessibility of the websites, a non-hierarchical (k-means) cluster analysis was used to generate groups of destinations that followed similar patterns in relation to the number of not reviewed incidents, warnings for levels AA and AAA, following similar research ([Domínguez Vila et al., 2018, 2019, 2020](#)).

An analysis of the content information on accessibility and disability was also carried out. The information on accessibility and disability on the websites was collected using the keywords: accessible, accessibility, disabled, disability and accessible tourism ([Gillovic et al., 2018](#)). Handicap and paraplegic were included because this terminology is used in Africa. These terms were used because the communication and operational strategies of tourism policymakers and stakeholders are not homogenised ([Leiras and Caamaño-Franco, 2023](#)). The keywords were entered into the websites' search engines, and the outputs reviewed one by one, discarding repeated information and information that did not deal strictly with accessibility or disability. For websites without search engines, the searches were made using an internet search engine, each output being accessed and reviewed individually. The information obtained was organised based on its typology, following the elements of the accessible tourism value chain ([UNWTO, 2015](#)). These (aforementioned) elements were examined using the following variables: accommodation; beaches, lakes and others; events; food and beverage; general destination information; health care and treatments; heritage and tourist sites; routes; shopping; sport and adventure; theatre, cinema, theme parks and others; tours; transport; and travel agencies with accessible tourism products. A principal component analysis identified the factors that explained the correlations of the variables and the variance observed in a large number of variables ([Nettleton, 2014](#)). The aim was to better understand the relationships between the variables and identify any significant patterns in the information provided by the websites.

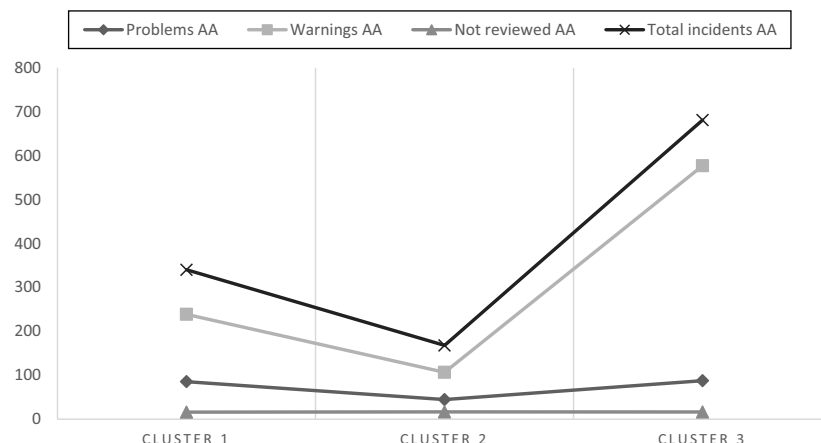
4. Results and discussion

4.1 Analysis of the technical accessibility of websites

As the k-means analysis could not determine the exact number of clusters, the Calinski–Harabasz (CH) index was used. This index is the ratio of between cluster centre variance and the sum of within-cluster variance for all clusters, which provides the optimal number of clusters ([Dolimicar and Leisch, 2015](#)).

For the technical accessibility analysis of level AA, a dendrogram and the k-means method were used to identify clusters of destinations with similar patterns in relation to the number of problems, warnings and not reviewed incidents. Different numbers of clusters were evaluated, from two to seven; finally, a Cluster 3 solution was chosen, as it obtained the highest CH index (188.640). [Figure 1](#) shows that problems and warnings were significant in the sample, while not reviewed incidents were insignificant. Cluster 2 returned the best results, with the lowest number of problems, warnings and not reviewed incidents. It was the most populous cluster, with 33 cases and differed mainly from Clusters 1 and 3 in that it had a lower number of warnings and less pronounced problems. Cluster 1, the second

Figure 1 Cluster analysis for destination websites that obtained WAI-AA level



Cluster 1 (26): Singapore, New York, Rome, Tokyo, Taipei, Prague, Barcelona, Milan, Jonor Bahru, Athens, Ha Long, Toronto, Beijing, St. Petersburg, Brussels, Jerusalem, Penang Island, Kyoto, Zuhai, Vancouver, San Francisco, Guilin, Buenos Aires, Da Nang, Nice, Abu Dhabi	Cluster 2 (33): Hong Kong, Macau, Paris, Dubai, Kuala Lumpur, Istanbul, Seoul, Miami, Osaka, Los Angeles, Shanghai, Ho Chi Min, Denpasar, Vienna, Cancun, Berlin, Orlando, Moscow, Venice, Dublin, Florence, Sydney, Munich, Jakarta, Budapest, Copenhagen, Auckland, Tel Aviv, Frankfurt, Stockholm, Jeju, Porto	Cluster 3 (6): Amsterdam, Las Vegas, Lisbon, Marrakesh, Warsaw, Lima
		Missing cases (6): London, Guangzhou, Madrid, Melbourne, Krakow, Rhodes

ANOVA						
	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Problems AA	13785.371	2	2521.210	62	5.468	0.007
Warnings AA	589178.696	2	3237.240	62	182.000	0.000
No reviewed AA	2.284	2	1.949	62	1.172	0.316

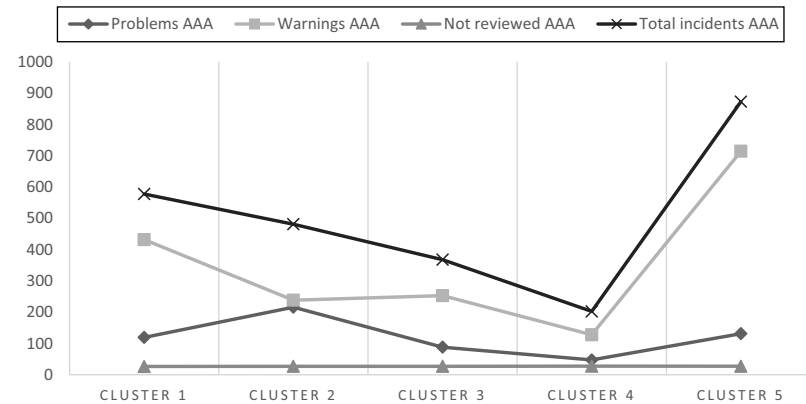
Source: Figure by authors

largest, with 26 cases, had more than 200 warnings, while Cluster 3, the smallest, with only six cases, had more than 500 warnings, making it the worst in terms of accessibility.

For WAI.AAA level, a similar analysis was conducted using k-means, resulting in five distinct clusters (CH index of 182.729). Figure 2, as for the AA level, shows that problems and warnings were significant, but the not reviewed incidents had insignificant impact. The analysis revealed that Clusters 3 and 4 were the most populous and the best in terms of accessibility. Cluster 3 showed the highest accessibility levels, with fewer warnings and problems than Cluster 4. This was followed by Clusters 2 and 1, which differed mainly in the number of problems and warnings. Cluster 2 had more than 200 problems and fewer warnings than Cluster 1, while Cluster 1 had more than 100 problems and almost twice as many warnings as Cluster 2. Finally, Cluster 5, with Cluster 2, had the lowest number of cases. However, it had the highest number of incidents, mainly based on its around 700 warnings. In summary, significant differences were found between the clusters in terms of problems and warnings at both the AA and AAA levels of accessibility, indicating that some destinations are more accessible than others.

The k-means pattern results for the AA and AAA levels of technical accessibility were remarkably consistent. Cluster 2 for AA involved the same destinations as Cluster 4 for

Figure 2 Cluster analysis for destination websites that obtained WAI-AAA level



Cluster 1 (6): Rome, Amsterdam, Las Vegas, Milan, Athens, Toronto	Cluster 2 (4): New York, Jonor Bahru, Moscow, Vancouver	Cluster 3 (23): Hong Kong, Singapore, Delhi, Tokyo, Taipei, Prague, Seoul, Barcelona, Ha Long, Florence, Beijing, St. Petersburg, Brussels, Jerusalem, Penang Island, Kyoto, Zhuhai, San Francisco, Guilin, Buenos Aires, Da Nang, Nice, Abu Dhabi
Cluster 4 (28): Macau, Paris, Dubai, Kuala Lumpur, Istanbul, Miami, Osaka, Los Angeles, Shanghai, Ho Chi Min, Denpasar, Vienna, Cancun, Berlin, Orlando, Venice, Dublin, Sydney, Munich, Jakarta, Budapest, Copenhagen, Auckland, Tel Aviv, Frankfurt, Stockholm, Jeju, Porto	Cluster 5 (4): Lisbon, Marrakech, Warsaw, Lima	Missing cases (6): London, Guangzhou, Madrid, Melbourne, Krakow, Rhodes

ANOVA

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Problems AAA	31051.983	4	2169.468	60	14.313	0.000
Warnings AAA	369839.989	4	2203.782	60	167.821	0.000
No reviewed AAA	1.796	4	3.020	60	.595	0.668

Source: Figure by authors

AAA, and both presented the lowest number of incidents. The websites in these clusters had the highest accessibility levels for both AA and AAA. Cluster 3 for AA, and Cluster 5 and part of Cluster 1, for AAA, exhibited the worst results. Their websites featured many warnings. Cluster 1 for AA coincided almost entirely with Cluster 3 for AAA (except for Hong Kong, Singapore, Delhi, Seoul and Florence). It also shared some characteristics with Cluster 2 (except Moscow) and part of Cluster 1 (Rome, Athens and Toronto). These clusters showed an intermediate level of accessibility, but featured many warnings.

In summary, there was a similar pattern in the accessibility of the websites for both AA and AAA accessibility levels. Groups were categorised into different levels of accessibility – high, medium and low –, consistent with similar studies (Domínguez Vila *et al.*, 2018, 2020). However, these classifications were not influenced by geography, tourist flows or the population of PwD residing in the destination. Specifically, there was no direct correlation between geographical location, tourist numbers, the presence of PwD living in the destination and the websites' accessibility levels. While there has been an increase in research articles focusing on technical accessibility, these studies do not explore these variables, with the exception of geographical location (Domínguez Vila *et al.*, 2020).

4.2 Analysis of the content information on accessibility and disability

A descriptive analysis was performed to identify patterns in the content information on accessibility and disability on the websites ([Appendix 1](#)). Given their breadth and diversity, they were grouped by continent. The aim was, through benchmarking, to better understand how information on accessibility and disability was presented. The variables of the accessible tourism value chain ([UNWTO, 2015](#)), discussed in the methodology section, were analysed. For each variable, the number of total results for all destinations in the sample were identified (see [Table 1](#)). Thus, for example, accommodation had 4,468 outputs for search terms in the sample. In Europe, 2,905 references were identified, representing 36.56% of the total results of all the outputs of the variables. The European destination with the most trips for this variable scored 668, and the least scored 0. The accommodation variable in Europe represented 62.23% of total trips for all destinations.

The results showed that Europe had the most information on resources offered on the websites, featuring the most destinations (67); Oceania had the best average results per destination, although it had only three destinations. The Americas and Asia followed Oceania, while Africa had information only on Marrakech, focusing only on information about “Accommodation”. The areas with the most information on disability and accessibility were “Accommodation” and “Food and beverages”, while “Health care and treatments”, “Routes”, “Sport and adventure” and “Travel agencies with accessible tourism products” were least frequent. Given the many variables analysed, it was difficult to identify patterns, but similarities between the Asia and Oceania websites were observed. To explore these similarities in greater depth a principal components factor analysis with standardised extraction was applied. Extractions were performed for 2, 3, 4 and 5 components, with the best explained variances observed for the two-component model (see [Table 2](#)).

The similarity in patterns between the Asian and Oceanian destinations was substantiated. The variables were categorised into two groups. The first contained fundamental product information, encompassing details related to “Accommodation” and “Food and beverages”. The second could be described as an augmented or supplementary product category, bringing together variables such as “Beaches, lakes, and others”, “Events”, “General destination information”, “Heritage and tourist sites”, “Theatre, cinema, and others” and “Transport”. The only differences between Asia and Oceania relate to the variables “Health care and treatments” and “Travel agencies with accessible tourism products”. While these variables were significant for both, in Asia the sign was negative and in Oceania, positive. In addition, in the Asian case, the variables “Health care and treatments” and “Travel agencies with accessible tourism products” were not very representative. Their values were low and, while they were not well represented in the model, their negative signs indicate a low presence in the websites. The opposite was true for Oceania, where it was observed that these were very important variables based on their presence in the websites.

The two study objectives, that is, to analyse the technical accessibility and content information on accessibility and disability in the main global official tourist websites, were achieved. For the former, compared to the results of similar research ([Domínguez Vila et al., 2018, 2019, 2020](#)), an improvement in the level of technical accessibility was observed in the majority of the websites, with a reduction in the number of incidents. These incidents (problems, warnings and not reviewed) were classified in similar groups. In relation to website content information, this was not homogeneous, a situation aggravated by the lack of common standards/criteria, such the WCAG criteria used to assess the technical accessibility of the sites. Thus, with the exception of Oceania and Asia, content information was diverse and dispersed.

These issues are of high relevance as precise information is crucial for accessibility among seniors and PwD ([Wang, 2011; Nigg and Peters, 2022](#)). For these groups, particularly PwD, an effective strategy necessitates extensive stakeholder collaboration ([Ivars-Bidal et al., 2019](#)).

Table 1 Sample description of content information on accessibility and disability on the official tourism websites of the world's top city destinations

Content information	Europe (67 destinations)				Asia (25 destinations)				Oceania (3 destinations)				America (13 destinations)				Africa (1 destination)			
	% continent	Variable total	Sum	Min-max	% continent	Variable total	Sum	Min-max	% continent	Variable total	Sum	Min-max	% continent	Variable total	Sum	Min-max	% continent	Variable total	Sum	Min-max
Accommodation (N = 4,468)	36.56	62.23	2,905	0-668	65.32	6.26	292	0-253	28.05	17.16	801	61-668	43.61	13.60	635	0-277	100	0.75	35	35-35
Beaches, lakes and others (N = 284)	2.28	63.73	181	0-50	6.26	9.86	28	0-16	2.03	20.42	58	1-50	1.17	5.99	17	0-9				
Events (N = 466)	5.27	89.91	419	0-180	1.57	1.50	7	0-5	0.88	5.36	25	0-17	1.03	3.22	15	0-5				
Food and beverages (N = 4,538)	30.80	53.92	2,447	0-1,444	1.12	0.11	5	0-3	51.26	32.26	1,464	0-1,444	42.72	13.71	622	0-594				
General destination info. (N = 128)	1.06	65.63	84	0-20	2.01	7.03	9	0-2	0.28	6.25	8	1-6	1.85	21.09	27	0-20				
Health care and treatments (N = 14)	0.13	71.43	10	0-3	0.67	21.43	3	0-2	0.04	7.14	1	0-1	0.00							
Heritage and tourist sites (N = 1,519)	12.79	66.89	1,016	0-398	12.98	3.82	58	0-22	14.67	27.58	419	1-398	1.79	1.71	26	0-14				
Routes (N = 42)	0.49	92.86	39	0-12	0.67	7.14	3	0-1	0.04	2.38	1	0-1	0.00							
Shopping (N = 333)	3.40	81.08	270	0-160	2.24	3.00	10	0-4	0.67	5.71	19	0-12	2.34	10.21	34	0-29				
Sport and adventure (N = 96)	0.86	70.83	68	0-14	0.00				0.56	16.67	16	1-14	0.82	12.50	12	0-6				
Theatre, cinema, theme parks and others (N = 370)	3.74	80.27	297	0-73	4.03	4.86	18	0-6	0.77	5.95	22	2-16	2.27	8.92	33	0-12				
Tours (N = 104)	1.04	79.81	83	0-38	0.22	0.96	1	0-1	0.25	6.73	7	0-5	0.89	12.50	13	0-12				
Transport (N = 165)	1.47	70.91	117	0-22	2.68	7.27	12	0-3	0.49	8.48	14	1-9	1.51	13.33	22	0-7				
Travel agencies with AT (N = 11)	0.13	90.91	10	0-4	0.22	9.09	1	0-1	0.04	9.09	1	0-1								

Source: Table by authors

Table 2 Standardised factor analysis of the accessibility and disability content information of the websites of the main tourist destinations by continent

Variables	Component matrix							
	Europe		Asia		Oceania		America	
	1	2	1	2	1	2	1	2
Accommodation	0.583			0.245		0.984	0.740	
Beaches, lakes and others		0.976	0.940		0.977			0.960
Events	0.740		0.224		0.987		0.677	
Food and beverages		−0.065		0.940		0.983	0.971	
General destination information	0.623		0.548		0.946		0.957	
Health care and treatments	0.642			−0.262		0.981	–	–
Heritage and tourist sites		0.976	0.940		0.977			0.960
Routes		0.976	0.940		0.977			0.960
Shopping		0.920	0.747			0.911	0.954	
Sport and adventure	0.692		–	–	–	–	0.671	
Theatre, cinema, theme parks and others	0.761		0.754		0.981			0.741
Tours	0.869			0.910	0.997		0.982	
Transport	0.895		0.806		0.999			0.799
Travel agencies with AT	0.885			−0.119		0.981	–	–
Explained variance	76.69		75.90		100		82.23	

Source: Table by authors

Several approaches are possible. Firstly, all the stakeholders should collaborate to develop the websites – both in technical aspects and content information-based on principles of co-operation (Dillenbourg *et al.*, 1995; Collins *et al.*, 2003). The industry must also address the integration of ICT solutions for accessible tourism, focusing on functionality (Ramos-Soler *et al.*, 2019), trustworthiness (Mckercher and Darcy, 2018) and accuracy of information (Kusufa *et al.*, 2022). Another approach involves stakeholders, primarily the destination management organisation (DMO), managing and facilitating connections to specialised websites on accessible tourism. For example, Japan's official tourism website redirects users to two expert websites: Accessibility Japan and Accessibility Travel Japan. However, this strategy presents challenges, as effective ICT use, especially internet, needs minimising the number of required clicks to enhance, because travellers often abandon their journey if too many clicks are required (Korpinar, 2023). The number of clicks is not related to failure but it is linked with the perceived difficulty of navigation. For this reason, it is advisable for websites to have their own search engine that allows users to easily access information (Jiménez Iglesias *et al.*, 2018). In this research, most of the websites analysed had their own search engine, but if the users wanted to get information without the own search engine, they had a lot of clicks. It is imperative that the official tourism websites provide standardised information that is easily and quick to find for PwD (Connell and Page, 2019; Nigg and Peters, 2022). Subsequently, each DMO may decide whether to offer additional information in the official website or redirect to expert websites. Regardless of the approach, DMOs have a specific responsibility to collect and organise this information, either independently or in collaboration with service providers (Dinis and Breda, 2023: 243).

Despite increased interest from DMOs over the past decade in showcasing accessibility to highlight their efforts in different areas, the challenges previously cited have diminished these initial intentions. Nonetheless, this trend is now reversing. Nowadays, there are clear efforts aimed at enhancing disability and accessibility of tourism destinations, given the growing interest in destination attractiveness and well-being (Hartwell *et al.*, 2018:1834). The DMOs have to try to provide accurate, up-to-date online information to both current and potential providers of accessible services (Kling and Ioannides, 2019). The ultimate goal of DMOs should be to develop user-friendly websites that not only facilitate the planning of trips for PwD but also help during their travels (Hefny, 2024).

5. Conclusions

As digital landscapes become increasingly integral to societal functions, ensuring equal access to ICTs emerges as a critical facet of social equality. There is an urgent need to guarantee ICT access on an equitable basis for all individuals, which is essential not only for participation in modern society but also for empowering marginalised communities. In this regard, the present study explored the existing shortcomings in providing equal access to information and critically analysed the content information on accessibility and disability provided in official websites of the main global tourist destinations, offering a strong base for discussion and action points. In the short term, further digitisation of the tourism sector is expected, which should provide tourism companies who can embrace the key element of accessibility with business opportunities (Yang *et al.*, 2019). This opportunity rests on three main pillars. Firstly, PwD are an increasingly important and numerous segment, which will only become larger with population ageing [World Health Organization (WHO), 2018]. Secondly, there is growing interest, in tourism, in promoting inclusion, ensuring equal rights and, at least nominally, in technical accessibility and content information (Domínguez Vila, 2018; Florido-Benítez, 2023). Thirdly, accessibility has been identified as a key element in inclusive tourism, in line with the principles established in the 2030 Agenda and the CRPD, among other international frameworks (Buhalis *et al.*, 2023).

The presence of the internet in many links of the tourism chain (UNWTO, 2015) and the increasingly significant role of tourism experience ratings by potential consumers, are evident (Hootsuite, 2022). However, the prevalent lack of technical accessibility in tourism websites and applications, coupled with the absence of content information on accessibility and disability, deprives users of the information they need to enjoy tourism products and make informed decisions (Porto *et al.*, 2019). This situation discriminates against PwD, who are denied the same access to information and opportunities as the rest of the population, contravening laws that recognise equal access to ICTs, including internet services (UN, 2012).

In recent years, there has been a notable improvement in the technical accessibility of websites, with most destinations achieving satisfactory results at AA and AAA levels (Domínguez Vila *et al.*, 2020; Teixeira *et al.*, 2021). The study found no direct correlation between geographical location, tourist number, quantity of PwD living in the destination and the level of accessibility of the website. These findings are consistent with similar research, which has identified the visibility, level of detail, accuracy and completeness of information as the main problems (Domínguez Vila *et al.*, 2018; Teixeira *et al.*, 2021). Therefore, it is essential for websites to have a clear and orderly structure, minimise unnecessary links and avoid automatic redirects. Websites should also provide initial content that is easy to follow and adapt, enhancing compatibility with other assistive devices (Domínguez Vila *et al.*, 2018, 2020; Teixeira *et al.*, 2021).

Achieving full inclusivity in Web accessibility requires a deep understanding of how PwD themselves perceive and evaluate the technical accessibility of websites. Despite its critical importance, limited research has focused on this perspective, largely due to the inherent challenges posed by the heterogeneity of disabilities. A study by Todorov *et al.* (2022) used direct feedback from blind individuals and uncovered issues not detected by automated methods, such as inaccessible menus that do not work with screen readers and drop-down lists that fail to open with the “enter” key. The W3C WCAG guidelines, information provided by DMOs and legislative pressure are forcing entities to comply with accessibility standards (Shahzadal and Elgammal, 2023; UNWTO, 2014), paving the way for a more equitable future in accessibility.

However, the situation differs with content information on accessibility and disability, which has a clear focus, firstly, on accommodation (Mobility Mojo, 2020) and food and beverages (Hemsley *et al.*, 2023) and, secondly, on heritage and tourist sites (Silva *et al.*, 2020), regardless of destination, country or continent. There is great heterogeneity and dispersion, and there is no clear pattern in the way information is collected and presented (with the exception of Asia and Oceania, where fundamental product information and an augmented/

supplementary product blocks were observed). The lack of explicit controls for non-compliance in national and international regulations and policies, and the absence of common standards for technical accessibility, pose a major challenge (Porto *et al.*, 2019). This lack of standards limits the effectiveness of ICT tools. ICTs are transforming the tourism industry through the opportunities generated, mainly, by AI, but also by big data and the IoT (Yuan *et al.*, 2019). AI is characterised by personalisation, autonomy, awareness of/ reactivity to the environment, learning and adaptation to change, communication and task completion (Moussawi and Koufaris, 2019). These factors enhance system quality (conversational intelligence of the interaction itself), information quality (outcome of the interaction) and users' perceptions that the technology has human-like intelligence (Ling *et al.*, 2023). Thus, social equality can be advanced through the innovations provided by AI, which can help disadvantaged people and marginalised communities and support social tourism programmes (Majid *et al.*, 2023). It will be essential to address this gap, and standardise content information on accessibility and disability and technical accessibility on tourism websites. This will allow PwD to make the most of ICTs, based on the global homogenisation of big data, which should facilitate the interoperability of innovative digital solutions to develop more effective algorithms to increase the functionality of AI and IoT. IoT and AI-based innovations can bring change through sustainable tourism development (Majid *et al.*, 2023). This would provide more equal opportunities for all, regardless of ability and contribute to long-term inclusive and accessible tourism (2030 Agenda).

Finally, it should be noted that this research may have limitations based on the sample analysed, and the data coded, given that website content is continually updated. It would be interesting to increase the sample and analyse in depth the patterns in continents, such as Oceania and Africa, with very low representation. This approach would enable the testing of content information variables using specific algorithms to assess any increases in the functionality of IoT and/or IA across websites from various continents. Furthermore, it would facilitate the examination of potential structural correlations. The results could enhance the DMO's efforts to improve both the online information and the accessibility.

Notes

- 1 www.w3.org/WAI/ER/tools/
- 2 www.w3.org/TR/UNDERSTANDING-WCAG20/complete
- 3 www.w3.org/TR/WCAG20/
- 4 <https://tawdis.fundacionctic.org/>
- 5 <http://tawdis.fundacionctic.org/tools/comoFuncionaTaw.html?lang=es>

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Appendix 1

Table A1 Top 100 city destinations in the world for 2022 (Euromonitor International, 2022)

Position	Destination	Country	Tourism official websites
1	Hong Kong	Hong Kong	www.discoverhongkong.com/us/index.html
2	Bangkok	Thailand	No website
3	London	The UK	www.visitlondon.com/
4	Macau	Macau	www.macaotourism.gov.mo/en/
5	Singapore	Singapore	www.visitsingapore.com/en/
6	Paris	France	www.parisinfo.com/
7	Dubai	United Arab Emirates	www.visitdubai.com/en/
8	New York	The USA	https://es.nycgo.com/
9	Kuala Lumpur	Malaysia	www.visitkl.gov.my/visitklv2/
10	Istanbul	Turkey	https://visit.istanbul/en/
11	Delhi	India	www.delhitourism.gov.in/delhitourism/index.jsp
12	Antalya	Turkey	https://antalyatouristinformation.com/
13	Shenzhen	China	www.sz.gov.cn/en_szgov/travel/index.html
14	Mumbai	India	No website
15	Phuket	Thailand	No website
16	Rome	Italy	www.turismoroma.it/en
17	Tokyo	Japan	www.gotokyo.org/en/index.html
18	Pattaya	Thailand	No website
19	Taipei	Taiwan	www.travel.taipei/en/
20	Mecca	Saudi Arabia	No website
21	Guangzhou	China	www.eguangzhou.gov.cn/2017-11/23/c_113221.htm
22	Prague	Czech Republic	www.praguecitytourism.cz/en
23	Medina	Saudi Arabia	No website
24	Seoul	South Korea	https://english.visitseoul.net/index
25	Amsterdam	The Netherlands	www.iamsterdam.com/en
26	Agra	India	No website
27	Miami	The USA	www.miamiandbeaches.com/
28	Osaka	Japan	https://osaka-info.jp/en/
29	Los Angeles	The USA	www.discoverlosangeles.com/business
30	Shanghai	China	www.meet-in-shanghai.net/
31	Ho Chi Minh	Vietnam	www.visitcmc.vn/en/page/lien-he
32	Denpasar	Indonesia	https://denpasartourism.com/home
33	Barcelona	Spain	www.barcelonaturisme.com/wv3/es/
34	Las Vegas	The USA	www.visitlasvegas.com/
35	Milan	Italy	www.yesmilano.it/en
36	Chennai	India	No website
37	Vienna	Austria	www.wien.info/en
38	Jonor Bahru	Malaysia	https://tourismjohor.my/
39	Jaipur	India	No website
40	Cancun	Mexico	www.caribemexicano.travel/cancun/
41	Berlin	Germany	www.visitberlin.de/es
42	Cairo	Egypt	No website
43	Athens	Greece	www.thisisathens.org/
44	Orlando	The USA	https://es.visitorlando.com/
45	Moscow	Russia	https://discovermoscow.info/
46	Venice	Italy	www.veneziaunica.it/en/content/visit-venice-0
47	Madrid	Spain	www.esmadrid.com/
48	Ha Long	Vietnam	https://halongtourism.info/
49	Riyadh	Saudi Arabia	www.visitsaudi.com/en/see-do/destinations/riyadh
50	Dublin	Ireland	www.visitdublin.com/guides
51	Florence	Italy	www.visitflorence.com/
52	Ha Noi	Vietnam	https://tourism.hanoi.gov.vn/
53	Toronto	Canada	www.destinationtoronto.com/
54	Johannesburg	South Africa	www.joburg.org_
55	Sydney	Australia	www.sydney.com/

(continued)

Table A1

<i>Position</i>	<i>Destination</i>	<i>Country</i>	<i>Tourism official websites</i>
56	Munich	Germany	www.muenchen.de/en/tourism
57	Jakarta	Indonesia	www.jakarta-tourism.go.id/
58	Beijing	China	https://english.visitbeijing.com.cn/
59	St. Petersburg	Russia	www.visit-petersburg.ru/en/
60	Brussels	Belgium	www.visit.brussels/en/visitors
61	Jerusalem	Israel	www.itraveljerusalem.com/
62	Budapest	Hungary	www.budapestinfo.hu/
63	Lisbon	Portugal	www.visitlisboa.com/es
64	Dammam	Saudi Arabia	No website
65	Penang Island	Malaysia	https://mypenang.gov.my/?lg=en
66	Heraklion	Greece	www.heraklion.gr/en/visitor
67	Kyoto	Japan	https://kyoto.travel/en/
68	Zhuhai	China	www.cityofzhuhai.com/
69	Vancouver	Canada	www.destinationvancouver.com/
70	Chiang Mai	Thailand	No website
71	Copenhagen	Denmark	www.visitcopenhagen.com/
72	San Francisco	The USA	www.sftravel.com/
73	Melbourne	Australia	www.visitmelbourne.com/
74	Krakow	Poland	https://visitkrakow.com/
75	Marrakech	Morocco	https://visitmarrakech.com/es/
76	Kolkatta	India	No website
77	Cebu	Philippines	No website
78	Auckland	New Zealand	www.aucklandnz.com/visit
79	Tel Aviv	Israel	https://visit.tel-aviv.gov.il/
80	Guilin	China	https://visitguilin.org/
81	Honolulu	The USA	www.gohawaii.com/islands/oahu/regions/honolulu
82	Hurgada	Egypt	No website
83	Warsaw	Poland	https://warsawtour.pl/en/main-page/
84	Mugla	Turkey	No website
85	Buenos Aires	Argentina	https://turismo.buenosaires.gob.ar/es
86	Chiba	Japan	www.visitchiba.jp/
87	Frankfurt	Germany	www.frankfurt-tourismus.de/en/
88	Stockholm	Sweden	www.visitstockholm.com/
89	Lima	Peru	https://visitalima.pe/
90	Da Nang	Vietnam	https://danangfantasticity.com/en/
91	Batam	Indonesia	No website
92	Nice	France	www.explorenicecotedazur.com/en/
93	Fukuoka	Japan	https://yokanavi.com/es/
94	Abu Dhabi	United Arab Emirates	https://visitabudhabi.ae/en
95	Jeju	South Korea	www.visitjeju.net/en
96	Porto	Portugal	https://visitporto.travel/pt-PT/home#/
97	Rhodes	Greece	https://rhodeswelcome.gr/
98	Rio de Janeiro	Brazil	http://riotur.rio/es/bienvenido/
99	Krabi	Thailand	No website
100	Bangalore	India	No website

Appendix 2. The WCAG and the TAW test

The W3C provides a list with 166 tools. Web accessibility evaluation tools are software programmes/online services that help determine if Web content meets accessibility guidelines [1], that is, the Web Content Accessibility Guidelines (WCAG). The WCAG has evolved from WCAG1.0 to WCAG 2.1. This analysis uses the WCAG 2.0. The WCAG 2.0 cover a broad range of recommendations to create more accessible Web content for a greater number of people with disabilities (PwD), including blindness/poor vision, deafness/auditory impairment, learning/cognitive problems, restricted mobility, speaking impairments, photosensitivity or any combination of the above [2].

The WCAG 2.0 provide layers of guidance:

1. *Principles*. Four principles that provide the foundation for Web accessibility: perceivable, operable, understandable and robust.
2. *Guidelines*. Based on these core principles, 12 guidelines provide the basic goals that authors should attain to make content more accessible to PwD. These guidelines are [3]:
 - Perceivable:
 - 1.1 Text alternatives
 - 1.2 Time-based media
 - 1.3 Adaptable
 - 1.4 Distinguishable
 - Operable:
 - 2.1 Keyboard accessible
 - 2.2 Enough time
 - 2.3 Seizures
 - 2.4 Navigable
 - Understandable
 - 3.1 Readable
 - 3.2 Predictable
 - 3.3 Input assistance
 - Robust:
 - 4.1 Compatible.
3. *Success Criteria*. For each guideline, testable success criteria are provided to allow the WCAG 2.0 to be used where requirements and conformance testing are necessary, such as in design specification, purchasing, regulation and contractual agreements. To meet the needs of different groups and different situations, three levels of conformance are defined: A (lowest), AA and AAA (highest).
4. *Sufficient and Advisory Techniques*. For each of the guidelines and success criteria in the WCAG 2.0 document itself, the W3C working group documented a wide variety of techniques. The techniques are informative and fall into two categories: those that are sufficient for meeting the success criteria and those that are advisory.

The Web Accessibility Test (TAW) is a Web-based tool that gathers and analyses information on the degree of accessibility of websites, based on WCAG guidelines. The results provided are presented according to the following structure [4]:

1. Markup view: similar to the TAW report in the WCAG 1.0, where the issues identified are highlighted on the website. These issues are shown in three blocks: *problems* (corrections are needed); *warnings* (which require human review); and *not reviewed* (which require a thorough human review). The four basic principles are applied to each of these:
 - Perceivable: information and user interface components must be presented to users in ways they can perceive. This means that users must be able to perceive the information being presented (it cannot be invisible to all of their senses).
 - Operable: user interface components and navigation must be operable. This means that users must be able to operate the interface (the interface cannot require interactions that the user cannot perform).
 - Understandable: the information and the operation of the user interfaces must be understandable. This means that users must be able to understand the information and the operation of the user interface (the content or operation cannot be beyond their understanding).

- Robust: content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including those using assistive technologies. This means that users must be able to continue to access the content as technologies evolve (as technologies and user agents evolve, the content should remain accessible).
- 2. Detail: where atomic checks are shown, including the lines of code where issues have been detected, grouped by each of the 12 basic principles.
- 3. List: this is a summary in table format, grouped by each of the basic principles, which indicates the results obtained in the checks against the regulatory guidelines.
- 4. The analysed page is displayed with alert icons indicating the accessibility problems found. The problem identified could be automatic and/or manual. Automatics are problems that the TAW tool knows violate the WCAG guidelines (e.g. an image without text). Manuals are problems that need to be reviewed by the developer (e.g. the need for a long description for images). These icons indicating manual and automatic problems have three priority levels [5]: Priority 1 in red colour, Priority 2 in orange colour and Priority 3 in green colour.

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