Ranjit Singh
Pondicherry University

Sibi PS
Pondicherry University

Accessibility and readability of website: An analysis of Online Travel Aggregators (OTAs) of India

Accessibility of websites for disabled people is a major concern in the contemporary digital world due to their dependence on tourism websites for planning and booking. However, in the tourism literature, scant is known for the accessibility and readability of OTAs websites. In response to the dearth of research, this study examines the accessibility and readability of OTAs websites in India. Accessibility was measured in terms of Web Content Accessibility Guidelines (WCAG) and readability through two different indices. A 4C approach (Cluster tendency, Cluster number, Cluster analysis and Cluster validity) was adopted for k- means of cluster analysis to understand the behaviour pattern. The study found that the OTAs website had numerous issues regarding WCAG and the text was difficult to read and understand, limiting disabled people from using the OTAs website. Based on the finding, some implications are discussed to improve the accessibility and readability.

Key words: OTAs websites, Accessible tourism, WCAG, Web accessibility, Web readability

Ranjit Singh
Department of Tourism
School of Management
Pondicherry University
Puducherry - 605014
India
Email: 1ranjit.singh86@gmail.com

Sibi PS
Department of Tourism
School of Management
Pondicherry University
Puducherry - 605014
India
Email: sibigeorgekutty@gmail.com

Ranjit Singh is a PhD Scholar at the Department of Tourism Studies, School of Management, Pondicherry University, Puducherry, India. His area of interest includes Accessible Tourism, inclusive Tourism, Information Technology and Bibliometric.

Dr. Sibi PS is an Associate Professor at the Department of Tourism Studies, Puducherry, India. She has obtained her Ph.D. in Tourism Studies from Pondicherry University. Her areas of interest are Special Interest Tourism, Travel Agency, Tour Operation, Accessible Tourism, Inclusive Tourism, and Gender.

Introduction

The application of the internet in tourism is referred as the engine for development with its significant impact on product development, promotion, distribution and consumption of tourism (Bastida & Huan, 2014). Probably it will continue in the future too. Particularly, website, a technology of the internet, has addressed the information need of tourism where customers can search for information, compare the service and book the product to satisfy their holiday requirements (Liang & Li, 2019). In the current tourism business environment, websites of Online Travel Aggregators (OTAs) are the significant sources for information and booking of tourism products and continue to expand their shares in the tourism and hospitality business (Mahapatra & Patra, 2019). Although many studies have been conducted based on OTAs, few of them recognize the issue of accessibility in the websites. It is the focal point of any website design and substantially impacts disabled people and people without disabilities while accessing websites (Henry, 2019).

Accessible tourism has been reported as a growing market segment of tourism (Darcy et al., 2010). These customers are participating in tourism activities frequently due to their increasing economic level and social integration and in some countries, they spend more than average in their vacation (World Tourism Organization, 2016). However, the agency of disabled people always encountered barriers in tourism, such as barriers in the physical environment, transportation and Information and Communication Technology (ICT) (Tao et al., 2019). Among the barriers, the problem in ICT, specifically web accessibility technology, substantially impacts disabled people in the prevalent web-based technology. Like others, they have the right to make the best use of the OTAs website for online booking and confirmation as the website has a unique advantage for disabled people. It makes them independent (Ritchie & Blanck, 2003). More importantly, it makes things possible for them (Borch & Strandbakken, 2019). However, this can be accomplished when websites and

technologies are easily accessible and follow the Web Content Accessibility Guideline (WCAG) specially formulated by World Wide Web Consortium (W3C) for disabled people. But this concept is not fully implemented in tourism websites, and existing studies reported that tourism websites are failed to comply with accessibility guidelines (Domínguez Vila et al., 2019a, 2019b). Till now, limited studies have been conceptualized in the accessibility of OTAs websites though not entirely in OTAs, but a combination of OTAs and other websites (Patra et al., 2014). Including accessibility, readability of the web content is also imperative to understand, interact and digest for better communication, especially for cognitive disabled tourists and learning-disabled tourists. However, it is often ignored in tourism websites (Shi, 2006).

The main objective of the study is to explore the accessibility and readability of OTAs websites of India. Accessibility and readability are determined by employing various online tools. Accessibility is measured based on the Conformance level AA of WCAG 2.0 and readability through Flesch Kincaid Reading Ease (FKRE) and Flesch Kincaid Grade Level (FKGL). A 4C approach (Cluster tendency, Cluster number, Cluster analysis and Cluster validity) is adopted for k-means of clustering. Cluster analysis is applied to group websites based on the similar pattern of behaviour in terms of WCAG.

Literature Review

Accessible tourism in India

Approximately one billion people are suffering from some form of disability globally, which is an equivalent of 15% of the total population (World Health Organisation, 2011). Their participation and spending in tourism have been recognized as an important contribution to the tourism economy. In India, 26.8 million disabled people are living (Government of India, 2016) and Ministry of Tourism (MOT), Govt. of India, has recognized them as a growing

group of the consumer in travel and leisure activity (Ministry of Tourism India, 2015). In order to include this group, a study was conducted by the Indian Institute of Tourism and Travel Management on behalf of MOT to assess the barriers encountered by Persons with Disabilities (PwDs) to avail tourism services. The result suggested that environment barriers, attitudinal barriers and information barriers were the significant challenges for accessible tourism (Chaudhary et al., 2010). After the report, MOT has taken various steps to include disabled people in tourism, such as barrier-free environment, barrier-free tourist attractions and facilities for disabled people in star category hotels (Government of India, 2018). However, MOT has failed to recognize the importance of web accessibility in the pervasive application of technology in tourism. PwDs have been confirmed that accessibility of tourism websites is a crucial factor in procuring information for travel-related services before purchasing and accessible information in the website is a great matter of concern about them (Buhalis & Michopoulou, 2011). In 2018, MOT issued a notification regarding guidelines to approve OTAs to increase quality and service for promoting tourism in India. However, nothing is referred related to accessibility of websites even it is aware that OTAs are doing business through their website (Ministry of Tourism India, 2018).

Online Travel Aggregator

OTAs are the intermediaries using internet as a medium to sell travel products and services such as hotels, airlines, car rentals, railways, and buses on behalf of tourism suppliers (Ministry of Tourism India, 2018). In the prevalent tourism market, 70% of customers use OTA for travel inspiration, 42% of customers want a chat platform during the trip to communicate OTA and 73% of customers rebook with an OTA. Because it is a one-stop shop for the customer to search, read, review and compare prices (Ephithite, 2019). Due to the growing use of OTAs, extensive study has been conducted to evaluate their websites from customer perspective. However, these studies are limited to service quality, performance and

website quality of OTAs website (Chen & Kao, 2010; Fu Tsang et al., 2010; Lin et al., 2009) and are unable to address the value accessibility in OTAs websites which is a paramount concept in the field of human computer interaction.

In India, the OTA market counts 40 to 50 % of the total transaction (Shroff, 2019). From the above fact, it is imperative to study OTA's website's accessibility and readability. However, no relevant study has been conducted to understand the accessibility of OTA's website in the equivalent growing online travel market and accessible customers. In the past studies by Patra et al. (2014), although not solely based on OTAs, it found a large violation in India's e-commerce websites in terms of WCAG 2.0. Another study by researchers Mounika, Karia, Sharma, and Biswas (2019) concludes that the IRCTC website violated the WCAG 2.0 success criteria regarding colour contrast, missing of alternative text and small font size.

Web accessibility

Web accessibility includes the tools and technologies that are designed and developed for disabled people to use the web. This technology helps integrate all form of disabilities that influence access to the website such as physical, speech, visual, neurological, cognitive and auditory. It is not only benefit for PwDs but also persons without disabilities (Henry, 2019). It is an initiative by W3C to make web content accessible for all, especially disable people. To achieve that purpose, W3C developed WCAG for the websites by consulting with individuals, organisations and accessibility experts. There are three guidelines in WCAG 1.0, WCAG 2.0 and WCAG 2.1 with three conformance levels (Level A = Low, Level = Medium and Level = High) in each guideline (Acosta-Vargas et al., 2018). However, WCAG 2.0 with conformance level AA is more prevalent in accessibility research and accepted by most countries in their websites (Domínguez Vila et al., 2019a).

WCAG has four principles: perceivable, operable, understandable and robust, which should be followed while developing and designing a website. The perceivable principle highlights the web content should be created, so it is easy to perceive for disabled people. It will help visually impaired, cognitive disability and deaf-blind people to perceive the information presented in the website. The operable principle focuses on the user must be able to operate the interference. This principle is designed to make the website accessible for physical disability, intellectual disability, visually impaired, people with photosensitive disorder and short attention span. The understandable principle emphasizes that the information must be understandable. Complying this principle in the website would certainly help intellectual disability, visually impaired, learning disability and physical disability people to understand the information and user interference. Lastly, the robust principle highlights the web content must be designed robustly to be accessible with the evolution of technology to the people using assistive technology or other agents (W3C, 2016).

In tourism, the accessibility of the website concept is limited to websites of Destination Marketing Organisations (DMOs) and hotel websites (Domínguez Vila et al., 2019a, 2019b; Williams et al., 2007). A study by Domínguez Vila et al. (2019a) examined the web accessibility of countries tourism website found that only Japan, South Korea and Hong Kong were compiled in terms of WCAG 2.0. In another study by the same authors based on the accessibility of Northern European countries, they concluded that among the 14 websites, only Norway's official website was noteworthy in terms of WCAG 2.0. Our study is based on the same concept by extending the compliance of W3C guidelines to OTAs' websites. We also add readability in our study, which is always neglected by tourism researchers (Shi, 2006).

Readability

Readability is the ease of reading, legibility, interest, or a combination of these (Dale & Chall, 1949). It is crucial to understand the text for decision making. Readability measures vocabulary and sentence difficulty by applying different indices such as SMOG Index, Automated readability index, Flesh Kincaid Grade level (FKGL), Flesch Kincaid Reading Ease (FKRE), etc. The concept is more prevalent in the health information website due to its importance to patient education (Jayaratne et al., 2014). The concept is unknown in tourism research and limited research has been conducted in tourism and hotel websites, although not OTAs. Sattari & Wallström (2013) examined Middle East countries' tourism websites found that these websites were difficult to understand and read the text. In addition to this, China's hotel websites produced the same level of difficulty in reading (Qian et al., 2017).

Methodology

Sample selection

This is an exploratory study to evaluate and understand the accessibility and readability of OTAs in India. This study has selected OTA's website because the existing literature largely highlights the accessibility issues in DMO and hotel websites, not in OTA's websites (Domínguez Vila et al., 2019b; Singh & Sibi, 2020). Furthermore, they are the primary transaction channel for tourists due to their convenience and transparency in cost provided by web technology (Pan et al., 2011). According to Ismail et al. (2019), 20 websites are a good sample for an exploratory study to understand accessibility. Based on this, the study selected 20 websites. For selecting 20 websites, the study searched "Online travel aggregators in India" in Google and the result of the first 20 OTAs websites are chosen for this research. Among the 20 websites, 19 were owned by private entities and one (IRCTC) was owned by Ministry of Railways, Govt. of India.

Data collection and analysis

Accessibility

Web Accessibility Evaluation Tool (WAVE) was selected to test the accessibility because it is the most comprehensive tool to test the accessibility as well as it visually represents the accessibility issues through various icons (Acosta-Vargas et al., 2018). Conformance level AA of WCAG 2.0 was adopted as most countries validate it for accessibility evaluation of web contents (Domínguez Vila et al., 2019a). The study was taken into account the Errors, Alerts and Features produced by the WAVE tool. Errors are the accessibility barriers that need to be corrected, and alerts are the probable barrier that can improve accessibility and features that require human analysis (WAVE, n.d.).

K-means of Cluster analysis was applied to classify the websites with similar characteristics and get inference from the accessibility result. According to Domínguez Vila et al. (2019b), it is the most useful method to identify the similar pattern of behaviour among the websites. Previously it was used by Domínguez Vila et al. (2018) and Ranjit et al. (2020) for the classification of websites. For better understanding, analysis and validity of clustering, we embraced a 4C approach (Cluster tendency, Cluster number, Cluster analysis and Cluster validity), which is given below:

Cluster tendency

The first step in cluster analysis is to identify whether the data is feasible for cluster analysis. This is measured by Cluster tendency. It determines the non-random structure of the data set. If the data is uniformly distributed, then it contains meaningful clusters. In this study, Hopkins statistics and Visual Assessment of Tendency (VAT) were used to determine cluster tendency (Alboukadel & Mundt, 2017).

Hopkins statistics is a statistical test to determine the distribution of data. This test is conducted with a threshold value of 0.5. If H < 0.5, then data is not uniformly distributed and statistically significant for cluster analysis (Han et al., 2012). VAT visually represents clusters' presence by indicating visual blocks along the diagonal in an order dissimilarity images (Alboukadel & Mundt, 2017).

Cluster number

Elbow method and Gap statistics were applied to obtain an optimal number of clusters (Charrad et al., 2014). The Elbow method's fundamental notion is to define the optimal number of clusters where the total Within cluster Sum of the Square (W_k) is minimum. The smaller value of W_k reflects the compactness of clustering. First, k means of cluster analysis ran with different values of k (here k is 1 to 10). W_k recorded for each value of k. Then a graph was plotted between the value of W_k at various values of k. As k increases the W_k will decrease. A point will come where further addition of k does not improve the value of W_k creates an Elbow. The value of k at which W_k declines the most (From steep to shallow) called Elbow is the optimal number of clusters (Han et al., 2012).

To validate the result of elbow method, Gap statistic was applied. It is a statistical method to formalize the heuristic elbow method (Tibshirani et al., 2001). It standardizes the W_k by comparing it with W_k^* (expected null reference distribution). The principle for selecting the right number of clusters is the largest gap between W_k and W_k^*. Hence the lowest value of k that maximizes the gap is the optimal number of clusters (Falasconi et al., 2007).

Cluster analysis

After satisfying the criteria of the cluster tendency and cluster numbers, cluster analysis was applied to the data.

Cluster validity

Cluster validity measures the quality, compactness, separation, and connectedness of clusters. It measures the average distance within the cluster and the average distance between clusters. For a meaningful result the average distance within the cluster should be small as possible and the average distance between clusters should be as large as possible (STHDA, n.d.). In this study, Silhouette analysis was used, which represents how well each observation has been classified. The silhouette plot exhibits how similar one observation to its own cluster in contrast to observation in the other clusters. A higher value (Close to +1) identifies the observation is well clustered (observation is well matched to its own cluster) than the between dissimilarity (poorly matched to neighbour clusters). A value close to -1 represents observation has been assigned to the wrong cluster. When the value is 0, an intermediate case indicates observation can be assigned either that cluster or its neighbouring cluster (Rousseeuw, 1987).

Readability

For readability analysis of OTAs website, Readability Test Tool was used, an online open-source tool by WebFX (WebFX, 2019). It is a free online tool that calculates the readability based on six readability indicators. This study considers FKRE and FKGL because these are the most widely used tools to calculate readability (Agrawal et al., 2019). FKGL computes readability score based on grade levels and FKRE measure the readability score between 0 to 100. Higher score represents better readability (Flesch, 1948). Independent sample t test was conducted to find the significance difference in readability of OTAs owned by Government

and Private Entities. The formulas of FKRE and FKRE for calculating readability are follows:

$$FKRE = 206.835 - 1.015\left(\frac{words}{sentences}\right) - 84.6\left(\frac{syllables}{words}\right) \quad (1)$$

$$FKGL = 0.39\left(\frac{words}{sentences}\right) + 11.8\left(\frac{syllables}{words}\right) - 15.59 \quad (2)$$

Data analysis, results and discussion

Accessibility

Table 1 Descriptive statistics of accessibility issue in OTAs websites

	N	Sum	Mean	SD	Min	Q1	Median	Q3	Max
Errors	20	854	42.7	24.4	3	19	46.5	68.7	42
Alerts	20	1320	66.0	47.5	2	14	67.5	115.0	186
Features	20	2354	117.7	243.1	0	6.5	17.0	58.50	862

Table 1 represents the descriptive statistics of the accessibility issues of OTA's websites obtained from the web accessibility evaluation tool. From the table, it can be seen that the total number of features (2354) is highest for errors (854) and alerts (1320) and also widely dispersed. The average issues per web page are around 42, 66 and 117 for errors, alerts, and features, respectively. That means disabled people may have encountered significant problems while accessing OTA's websites. The minimum issue per webpage is 0 and the maximum issues per webpage is 862 for errors, alerts and features. In terms of total issue based on errors, alerts and features, Railyatri had the lowest number of issues (21) and Travelguru had the highest number of issues (909) regarding WCAG 2.0.

Table 2 represents the most ignored success criteria of WCAG 2.0 for conformance level AA with techniques to correct OTAs websites' issues. The table also represents

problems encountered by various types of disabled tourists if the success criteria are not met. Among all the violated success criteria, Non-text content, Info and relationships, Contrast, keyboard, Bypass blocks, Link purpose and Heading and labels were the most violated success criteria, especially non-text content and keyboard were significant.

Pearson correlation was obtained to find out whether there is an association among accessibility issues. The result suggested that errors and alerts were positively related (r = 0.45) and errors and features were positively related (r = 0.22). However, there was no linear relation between alerts and features.

Table 2. Most violated success criteria of WCAG 2.0 in OTAs websites

Most violated Success criteria	Description	Some of the sufficient technique to overcome it
1.1.1.- Non-text Content	Alternative text for non-text content	G68, G82, G94, G95, G100, G143
1.3.1- Info and Relationships	Information and relationship should independent of change in format	ARIA16, ARIA17, G117, G14, H97
1.4.3- Contrast (Minimum)	Contrast ratio between text and background	G145, G148, G174, SL13
2.1.1- Keyboard	Keyboard interference	G202, H91, FLASH14
2.4.1- Bypass Blocks	Provide direct access to main content	G1, G124, H69, H70, SL25
2.4.4.- Link Purpose	Link text for the purpose of each link	G53, G91, H24, H30, H33
2.4.6- Headings and Labels	Clear and concise heading and labels	G130, G131

Source: W3C (2016)

Cluster analysis

The result of Hopkins statistics (H = .313) was significant, which indicates meaningful clusters are present in the dataset. Similarly, VAT identified visible blocks along the diagonal refers data is significant for cluster analysis. Figure 1 represents the VAT plot where red colour indicates small dissimilarity and blue colour identifies large dissimilarity.

Graphical representation of the elbow and gap statistic method is represented in Figure 2. Both methods identified a two-cluster solution for the data represented in dotted lines.

Figure 1. Visual assessment of cluster tendency plot

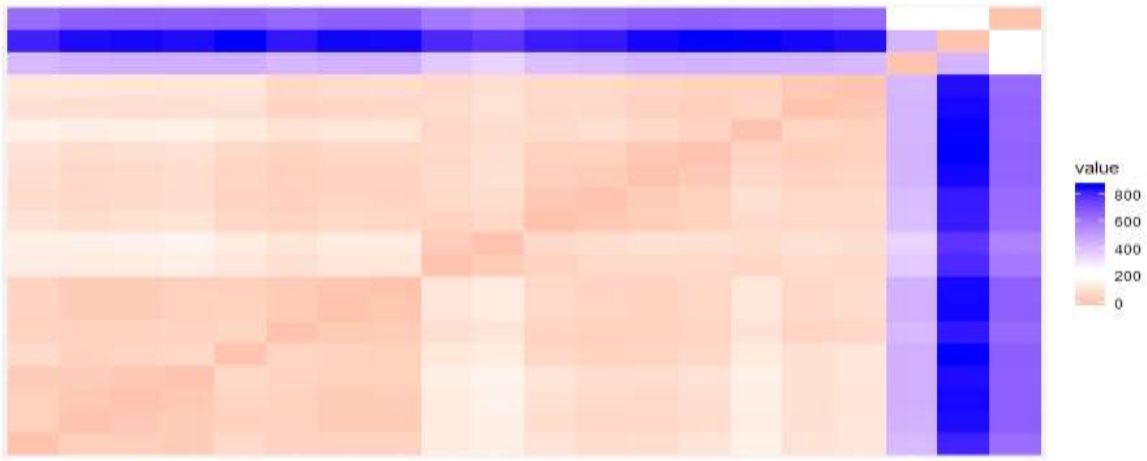
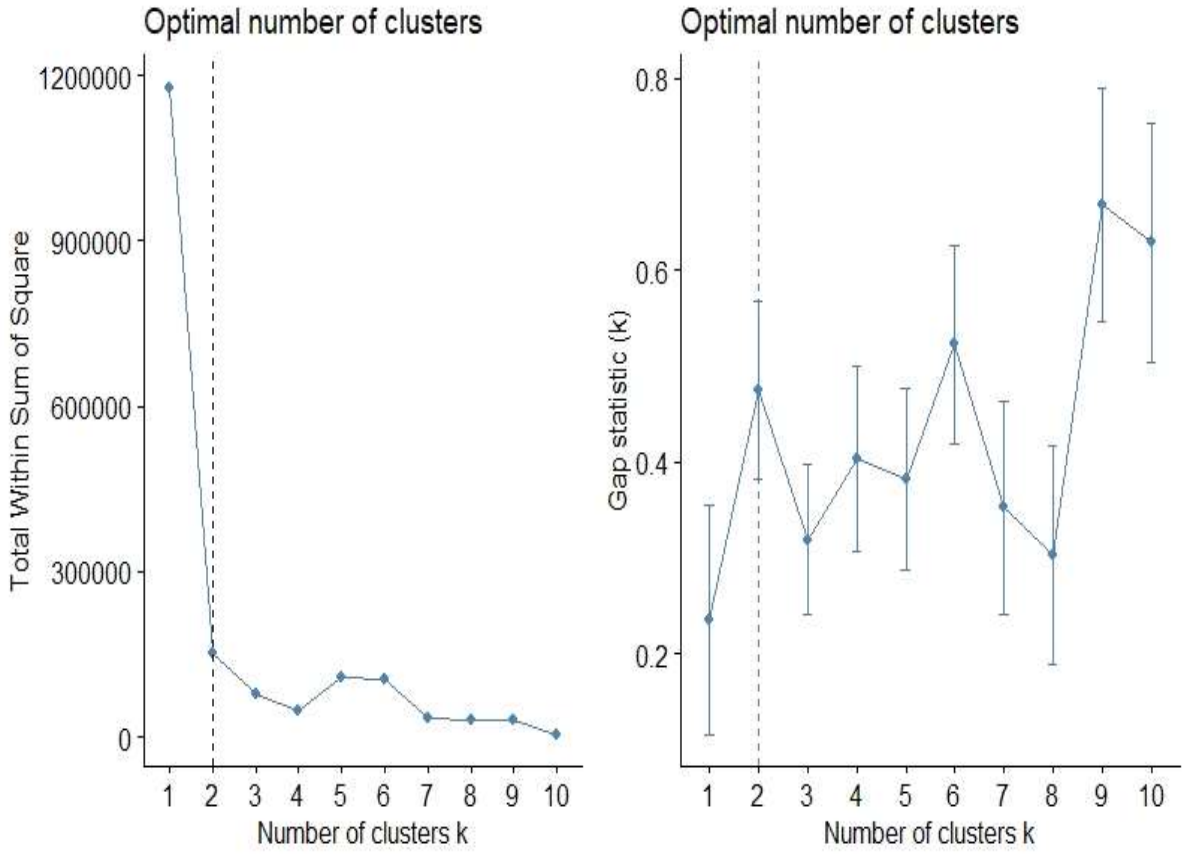


Figure 2. Number of clusters



The result of cluster analysis is given in Table 3. From the result, it can be seen that Cluster 1 has 17 cases (85%) and Cluster 2 has 3 cases (15%). The centroid of errors, alerts and features in cluster 1 is lowest in contrast to cluster 2. This represents websites that belonged to cluster 1 is more faithful towards WCAG 2.0 than cluster 2. It should be noted that the within-cluster sum of the squares is lowest in cluster 1 and highest in cluster 2. This indicates cluster 1 is more compact than cluster 2. The larger value of within-cluster sum of the squares of cluster 2 identified greater variability of the objects within the cluster. In terms of total issues, Railyatri and Oyorooms performed well and Cox and king and HolidayIQ performed worst with respect to accessibility guidelines. From the cluster analysis, it can be reported that cluster 1 OTAs with best performance and cluster 2 OTAs with worst performance. The cluster plot is given in Figure 3.

Table 3. Result of Cluster analysis

	Cluster 1	Cluster 2
No of Cases (OTAs websites)	17	3
Percentage of OTA website	85%	15%
Cluster center for errors	39.94	58.33
Cluster center for alerts	63.94	77.66
Cluster center for features	22.58	656.66
Within cluster sum of the squares	53146	97764
OTAs	Makemytrip, Yatra, Cleartrip, Ixigo, Oyorooms, Goibibo, Easemytrip, IRCTC, VIA, Redbus, Ezeego1, Abhibus, Paytm, HolidayIQ, Businidia, Railyatri and Cox and Kings	Travelguru, Ticketgoose and Thomas Cook

Silhouette analysis reported a positive result. For each observation, it was positive and for cluster 1, the average silhouette width was 0.88 and for cluster 2, it was 0.49. The total

average silhouette width was 0.83 which represents observations were clustered according to their similar characteristics. In addition to this, at k = 2, the silhouette width had a higher value in contrast to the other value of k. That confirms that our 2-cluster solution is valid and data is well clustered.

Figure 3. Cluster plot

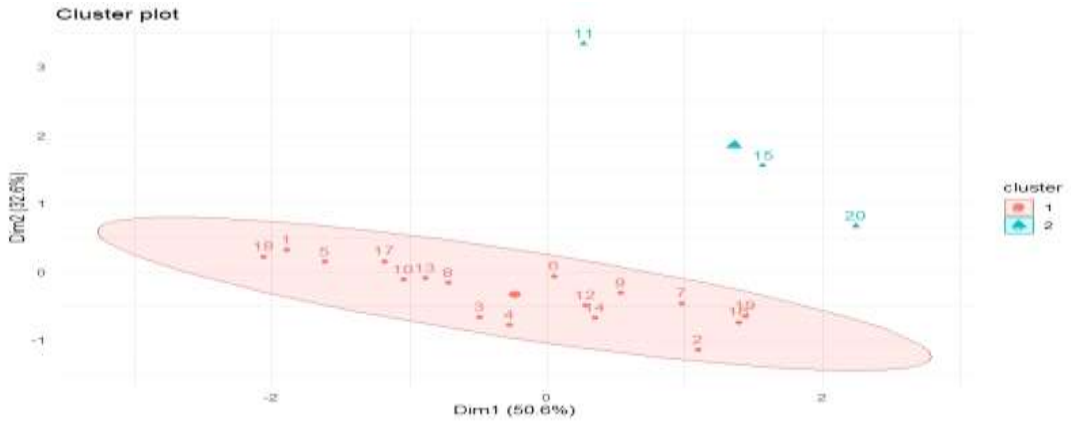
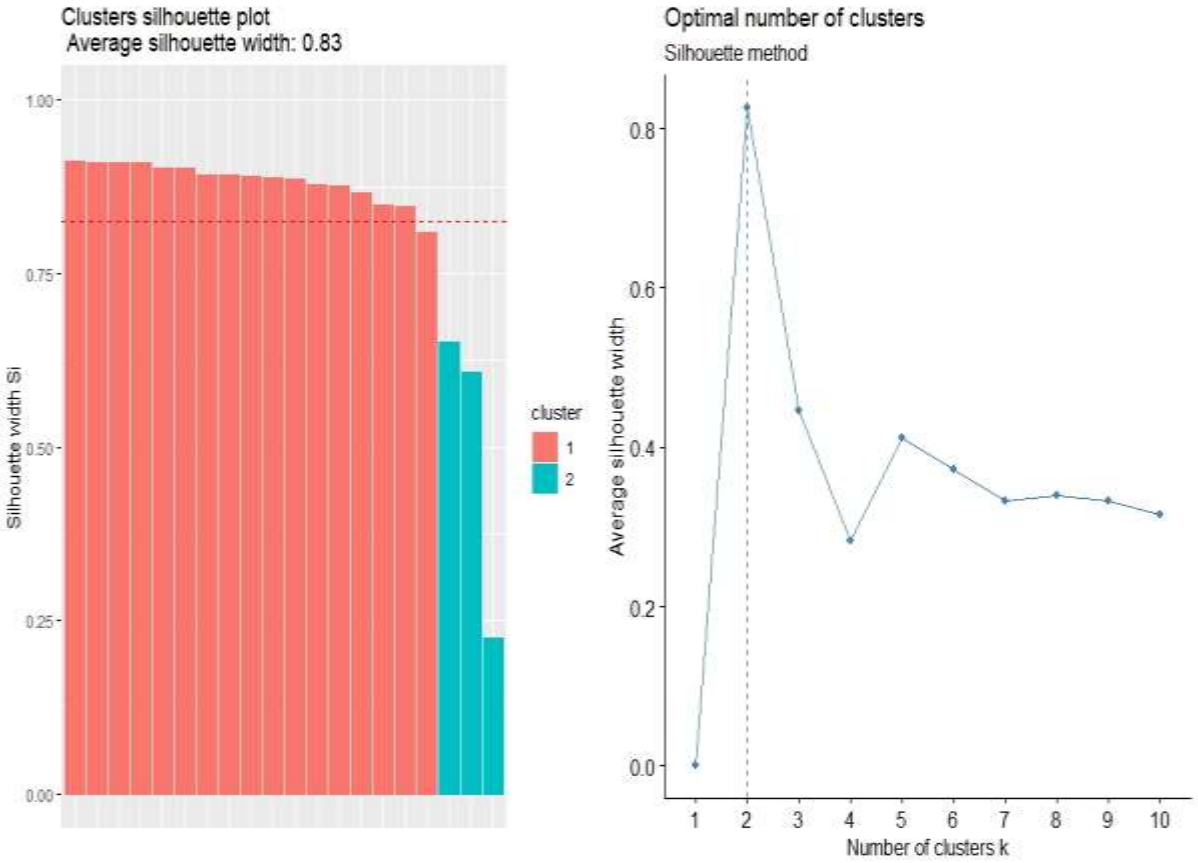


Figure 4. Silhouette analysis



Readability

Table 1 represents the readability score of 16 OTAs based on FKRE and FKGL because four websites did not respond to the readability algorithm. Among the 16 OTAs, one falls under the easy category, 3 falls under the standard category, 7 falls under the fairly difficult category, 4 falls under the difficult category and one falls under the very difficult category of readability (Flesch, 1948). If we appropriate it, then 4 OTAs are standard to read and 12 are difficult to read the web content. Surprisingly no website is very easy to read for comprehension. Among the OTAs, Railyatri had performed well in terms of readability with the highest score and low-grade level and IRCTC performed worst with the lowest score and higher-grade level.

Table 4. Readability result of OTAs websites

OTAs	FKRE	FKGL	Reading level
Railyatri	80.4	3	Easy
Ixigo	69.8	4.4	Standard
VIA	68.7	4.4	Standard
Easemytrip	68.3	4.9	Standard
Thomas Cook			Fairly
	58.9	6.9	Difficult
Travelguru			Fairly
	58.8	6.2	Difficult
Redbus			Fairly
	58.3	6	Difficult
Oyorooms			Fairly
	58.2	5.8	Difficult
Ticketgoose			Fairly
	54	6.6	Difficult
Ezeego1			Fairly
	53.6	6.5	Difficult
Busindia			Fairly
	51.3	6.7	Difficult
Cox and Kings	45.8	8.4	Difficult
Goibibo	45.5	7.7	Difficult
Paytm	39.8	8.3	Difficult
HolidayIQ	33.6	9.6	Difficult
IRCTC	23.7	11.1	Very difficult
Mean	54.29	6.65	
Std. Dev	14.44	2.05	

An Independent sample t-test was conducted to determine the significant difference between the readability of Government and Privately owned OTAs. The result was significant for both FKRE ($p = 0.023$) and FKGL ($p = .019$) between Government and private OTAs. This suggested Government owned OTAs web contents are difficult to read compared to privately owned OTAs.

Discussion

Accessibility issues to discrimination are of course, not warranted as various researches highlight the continual mistreatment and discrimination experienced by the disabled community over web (Acosta-Vargas et al., 2018). Past work by Patra, Dash, Mishra, (2014) and Mounika, Karia, Sharma, and Biswas (2019) also reported that India websites do not follow WCAG standards for disabled individuals. Domínguez Vila et al., (2019a) found that "Text alternative -1.1", "Navigable - 2.4" and "Adaptable - 1.3" were the major accessibility concern in official tourism websites of countries when accessing the website. Our study also confirms the aforementioned studies' findings that OTAs websites are not following the WCAG standards.

Not only Indian OTAs websites but also foreign OTAs are not adopting the norms of WCAG while designing their websites. A study conducted by Singh & Ismail, (2020) based on the OTAs websites identified several critical barriers for PwDs to access the website. These issues occurred due to web designers' unawareness and unfamiliarity regarding accessibility standards used by PwDs (Inal et al., 2019). According to Williams et al. (2007), web designers believe that complying with accessibility guidelines will increase the cost and detract the tourism websites' quality. However, the incorporation of accessibility guidelines in the website improves the website's quality and includes diverse groups of people, such as people with disabilities (Singh et al., 2020). In some countries such as the USA, accessibility

compliance is mandatory in websites; any failure to do so would undoubtedly bring a lawsuit against the organization (Shi, 2006).

The accessibility concept in OTAs is not well established in tourism literature due to limited studies mostly confined to Destination Marketing Organisations (DMOs) and hotel websites. Our findings were consistent with the previous work based on the accessibility of DMOs and hotel websites (Domínguez Vila et al., 2018; Williams et al., 2007). Even after highlighting the accessibility issues in websites, DMOs are not concerned about the importance of complying with WCAG in their websites (Domínguez Vila et al., 2019b). This reflects their unawareness about the importance of accessibility of web content in tourism, leading to digital divide. According to Lewthwaite (2014), web accessibility closely relates to rehabilitation and bears consideration.

The result of readability in our study was disappointing and most of the websites require a higher grade level to comprehend the text. It is important that together with accessibility for intellectual disabilities, cognitive disabilities, and tourists with difficulty reading (Fajardo et al., 2014). It is not only crucial for disabled people but also for non-disabled people. The ease of reading and understanding the text in the OTAs website is important to understand the product and service provided by them for avoiding any conflict during the vacation. Readability issues in the website are not unwarranted as previous research highlights the worth of readability in websites and its impact (Jayaratne et al., 2014; Qian et al., 2017). This study confirms these findings and expands to the OTAs' websites. Previous work by Sattari & Wallström (2013) and Lukaitis & Davey (2012) reported readability issues in tourism websites.

Conclusion, implication and future research

This study sought to explore the accessibility and readability of OTAs websites in the tourism industry and its influence on PwDs. As a result of growing social and economic status, these groups of customers frequently participated in tourism. As aware of the above fact, facilitating tourism to them information should be easily available for it and impediment should not be placed anyway. In the pervasive world, OTAs are the major source of information for planning and booking. Therefore, it is expected from them that their website should be accessible and readable. However, it is not reflected in the OTAs' websites of India. The findings revealed that most of the websites are not complying with WCAG to help PwDs for a better experience over the web. Not complying with the WCAG is a form of discrimination against disabled people (Shi, 2006).

India has ratified to the United Nations Convention on Rights of Persons with Disabilities (UNCPRD) to protect the rights of the disabled. Therefore, Compliance with WCAG should be added as a must fulfilled criteria for OTAs to grant approval/re-approval from MOT, Govt. of India. Furthermore, Government is not enforcing the existing rules and regulations that might be a criterion for the inaccessibility of websites (Domínguez Vila et al., 2019a). In addition, OTAs may be unaware of the existing policies and regulations for web accessibility technology and how it helps disabled people use websites. So, it is the duty of the web developer to design the website in accordance with WCAG. However, it is reported that they are unaware about the existing guidelines (Inal et al., 2019). Therefore, the organisation should make proper arrangements to train and educate the web developer thoroughly regarding accessibility guidelines. Furthermore, government can improve awareness about the importance of accessibility in website by various programmes. The OTA can test the accessibility with the available online accessibility tools to identify and fix the accessibility barriers. These evaluation tools are designed according to WCAG to determine the level of accessibility. Also, OTA can follow the technique mentioned in the WCAG

websites to meet the web accessibility standards for disabled people (W3C, 2016). OTAs can keep the paragraph short for increasing readability, carefully choosing the word, shorter sentence, and keeping it simple to make their web content easily readable (Cline, 2017).

This study contributed significantly to tourism and disability. First, it identifies compliance of WCAG in OTA's websites in India and their impact on PwDs. Although accessibility based on WCAG has been explored, these are studied on DMOs and hotel websites (Domínguez Vila et al., 2019b; Singh & Sibi, 2020). It is also important because OTAs are increasingly used for online information and booking by diverse customers, including people with disabilities. The identification of accessibility issues in the OTAs websites is a valuable contribution to the existing tourism literature. The findings highlight significant barriers in the websites that may directly impact PwDs. Second, this study supports the premise of the social model of disability that peoples are disabled due to the websites' barriers not by their impairment (Randle & Dolnicar, 2019). The findings emphasise the importance of universal design to protect and promote the rights of PwDs. Third, this research contributes to the rehabilitation of PwDs as it is closely connected with rehabilitation. Correcting barriers embedded in the website improves the accessible experience (Lewthwaite, 2014). Fourth, this study contributes the inclusion of people with disabilities in travel and tourism because accessible information is crucial for accessible tourism (Buhalis & Michopoulou, 2011).

This study took OTAs websites of India; future studies can be conducted on OTAs of various countries. Furthermore, a comparative analysis can be made between OTAs in India and other countries to understand any variation towards WCAG among the nations. This study addresses OTAs websites' accessibility and readability, but it is silent about the usability of OTAs' websites. So future studies can be conducted based on the usability of the websites.

Reference

Acosta-Vargas, P., Acosta, T., & Luján-Mora, S. (2018). Challenges to Assess Accessibility in Higher Education Websites: A Comparative Study of Latin America Universities. *IEEE Access*, *6*, 36500–36508. https://doi.org/10.1109/ACCESS.2018.2848978

Agrawal, G., Kumar, D., Singh, M., & Dani, D. (2019). Evaluating Accessibility and Usability of Airline Websites. In M. Singh, P. K. Gupta, V. Tyagi, J. Flusser, T. Ören, & R. Kashyap (Eds.), *Advances in Computing and Data Sciences* (pp. 392–402). Springer Singapore.

Alboukadel, K., & Mundt, F. (2017). *factoextra: Extract and Visualize the Results of Multivariate Data Analyses*. https://cran.r-project.org/web/packages/factoextra/factoextra.pdf

Bastida, U., & Huan, T. C. (2014). Performance evaluation of tourism websites' information quality of four global destination brands: Beijing, Hong Kong, Shanghai, and Taipei. *Journal of Business Research*, *67*(2), 167–170. https://doi.org/10.1016/J.JBUSRES.2012.10.008

Borch, A., & Strandbakken, P. (2019). User Involvement of People with Mild Disabilities in Technology Innovations: Does It Make a Difference? *Social Inclusion*, *7*(1), 136–151.

Buhalis, D., & Michopoulou, E. (2011). Information-enabled tourism destination marketing: addressing the accessibility market. *Current Issues in Tourism*, *14*(2), 145–168. https://doi.org/10.1080/13683501003653361

Charrad, M., Ghazzali, N., Boiteau, V., & Niknafs, A. (2014). NbClust: An R Package for Determining the Relevant Number of Clusters in a Data Set. *Journal of Statistical Software*, *61*(6), 1–36.

Chaudhary, M., Babu S., S., Dixit, S., & Yadav, C. (2010). *A report on Problems And Prospects Of Accessible Tourism In India*. https://tourism.gov.in/sites/default/files/2020-04/PPA.pdf

Chen, C.-F., & Kao, Y.-L. (2010). Relationships between process quality, outcome quality, satisfaction, and behavioural intentions for online travel agencies–evidence from Taiwan. *The Service Industries Journal*, *30*(12), 2081–2092.

Cline, C. (2017). *Flesch Reading Ease: Understanding It, Calculating It, Improving It*. https://www.verblio.com/blob/flesch-reading-ease

Dale, E., & Chall, J. S. (1949). The concept of readability. *Elementary English*, *26*(1), 19–26.

Darcy, S., Cameron, B., & Pegg, S. (2010). Accessible tourism and sustainability: a discussion and case study. *Journal of Sustainable Tourism*, *18*(4), 515–537. https://doi.org/10.1080/09669581003690668

Domínguez Vila, T., Alén González, E., & Darcy, S. (2018). Website accessibility in the tourism industry: an analysis of official national tourism organization websites around the world. *Disability and Rehabilitation*, *40*(24), 2895–2906. https://doi.org/10.1080/09638288.2017.1362709

Domínguez Vila, T., Alén González, E., & Darcy, S. (2019a). Accessibility of tourism websites: the level of countries' commitment. *Universal Access in the Information Society*. https://doi.org/10.1007/s10209-019-00643-4

Domínguez Vila, T., Alén González, E., & Darcy, S. (2019b). Accessible tourism online resources: a Northern European perspective. *Scandinavian Journal of Hospitality and Tourism*, *19*(2), 140–156. https://doi.org/10.1080/15022250.2018.1478325

Ephithite, J. (2019). *Top tactics OTAs can use to optimize conversions across the traveler journey*. https://www.travelport.com/blog/top-tactics-otas-can-use-optimize-conversions-across-traveler-journey

Fajardo, I., Ávila, V., Ferrer, A., Tavares, G., Gómez, M., & Hernández, A. (2014). Easy-to-read texts for students with intellectual disability: linguistic factors affecting comprehension. *Journal of Applied Research in Intellectual Disabilities*, *27*(3), 212–225.

Falasconi, M., Pardo, M., Vezzoli, M., & Sberveglieri, G. (2007). Cluster validation for electronic nose data. *Sensors and Actuators, B: Chemical*, *125*(2), 596–606. https://doi.org/10.1016/j.snb.2007.03.004

Flesch, R. (1948). A new readability yardstick. *Journal of Applied Psychology*, *32*(3), 221.

Fu Tsang, N. K., Lai, M. T. H., & Law, R. (2010). Measuring e-service quality for online travel agencies. *Journal of Travel & Tourism Marketing*, *27*(3), 306–323.

Government of India. (2016). *Disabled persons in India a statistical profile 2016*. http://mospi.nic.in/sites/default/files/publication_reports/Disabled_persons_in_India_2016.pdf

Government of India. (2018). *"Ministry of Tourism has taken Several Steps to make tourist destinations friendlier for the Differently Abled": Tourism Minister*. http://pib.nic.in/newsite/PrintRelease.aspx?relid=176963

Han, J., Kamber, M., & Pei, J. (2012). 10 - Cluster Analysis: Basic Concepts and Methods. In J. Han, M. Kamber, & J. B. T.-D. M. (Third E. Pei (Eds.), *The Morgan Kaufmann Series in Data Management Systems* (pp. 443–495). Morgan Kaufmann. https://doi.org/https://doi.org/10.1016/B978-0-12-381479-1.00010-1

Henry, S. L. (2019). *Introduction to Web Accessibility*. https://www.w3.org/WAI/fundamentals/accessibility-intro/

Inal, Y., Rızvanoğlu, K., & Yesilada, Y. (2019). Web accessibility in Turkey: awareness, understanding and practices of user experience professionals. *Universal Access in the Information Society*, *18*(2), 387–398. https://doi.org/10.1007/s10209-017-0603-3

Ismail, A., Kuppusamy, K. S., Kumar, A., & Ojha, P. K. (2019). Connect the dots: Accessibility, readability and site ranking – An investigation with reference to top ranked websites of Government of India. *Journal of King Saud University - Computer and Information Sciences*, *31*(4), 528–540. https://doi.org/https://doi.org/10.1016/j.jksuci.2017.05.007

Jayaratne, Y. S. N., Anderson, N. K., & Zwahlen, R. A. (2014). Readability of websites containing information on dental implants. *Clinical Oral Implants Research*, *25*(12), 1319–1324.

Lewthwaite, S. (2014). Web accessibility standards and disability: developing critical perspectives on accessibility. *Disability and Rehabilitation*, *36*(16), 1375–1383. https://doi.org/10.3109/09638288.2014.938178

Liang, S., & Li, H. (2019). Respond More to Good Targets: An Empirical Study of Managerial Response Strategy in Online Travel Websites. *E-Review of Tourism Research*, *16*(2/3).

Lin, D., Zhou, Z., & Guo, X. (2009). A study of the website performance of travel agencies based on the EMICA model. *Journal of Service Science and Management*, *3*, 181–185.

Lukaitis, A., & Davey, B. (2012). Web design for mature-aged travellers: readability as a design issue. *Journal of Marketing Development and Competitiveness*, *6*(2), 69–80.

Mahapatra, D. M., & Patra, S. K. (2019). A New Destination of Online Travel Business: A Case Study. *SEDME (Small Enterprises Development, Management & Extension Journal)*, *46*(2), 130–137. https://doi.org/10.1177/0970846419852520

Ministry of Tourism India. (2015). *New Accessible Tourism*. http://tourism.gov.in/new-accessible-tourism

Ministry of Tourism India. (2018). *Guideline to approve Online Travel Aggregators*. http://tourism.gov.in/sites/default/files/guideline/Approved OTA Guidelines Typed.pdf

Mounika, P., Karia, D., Sharma, K., & Biswas, P. (2019). Accessibility Evaluation of Three Important Indian Websites. In A. Chakrabarti (Ed.), *Research into Design for a Connected World* (pp. 243–254). Springer Singapore.

Pan, B., Zhang, L., & Smith, K. (2011). A mixed-method study of user behavior and usability on an online travel agency. *Information Technology & Tourism*, *13*(4), 353–364.

Patra, M. R., Dash, A. R., & Mishra, P. K. (2014). A quantitative analysis of WCAG 2.0 compliance for some Indian web portals. *International Journal of Computer Science, Engineering and Applications*, *4*(1), 9–24.

Qian, J., Law, R., & Wei, J. (2017). An exploratory study on the readability of hotel websites in China. In J. Vopava, V. Douda, R. Kratochvil, & M. Konecki (Eds.), *Proceedings of The 10th MAC* (pp. 215–221). MAC Prague consulting ltd.

Randle, M., & Dolnicar, S. (2019). Enabling people with impairments to use Airbnb. *Annals of Tourism Research*, *76*, 278–289. https://doi.org/https://doi.org/10.1016/j.annals.2019.04.015

Ritchie, H., & Blanck, P. (2003). The promise of the Internet for disability: a study of on-line services and web site accessibility at Centers for Independent Living. *Behavioral Sciences & the Law*, *21*(1), 5–26. https://doi.org/https://doi.org/10.1002/bsl.520

Rousseeuw, P. J. (1987). Silhouettes: A graphical aid to the interpretation and validation of cluster analysis. *Journal of Computational and Applied Mathematics*, *20*, 53–65. https://doi.org/10.1016/0377-0427(87)90125-7

Sattari, S., & Wallström, Å. (2013). Tourism websites in the Middle East: readable or not? *International Journal of Leisure and Tourism Marketing*, *3*(3), 201–214.

Shi, Y. (2006). The accessibility of Queensland visitor information centres' websites. *Tourism Management*, *27*(5), 829–841. https://doi.org/https://doi.org/10.1016/j.tourman.2005.05.012

Shroff, N. (2019). *On India's Growing OTA Market*. https://www.magzter.com/articles/9362/332807/5c749064c1a07

Singh, R., & Ismail, A. (2020). *Easy to Read (E2R) and Access for All (A4A): A Step to Determine the Understandability and Accessibility of Websites BT - Applications in Ubiquitous Computing* (R. Kumar & S. Paiva (eds.); pp. 13–35). Springer International Publishing. https://doi.org/10.1007/978-3-030-35280-6_2

Singh, R., Ismail, A., Sibi, P. S., & Singh, D. (2020). Compliance of accessibility in tourism websites: a pledge towards disability *Journal of Hospitality and Tourism Insights, 4(3),263*–281. https://doi.org/10.1108/JHTI-05-2020-0092

Singh, R., & Sibi, P. S. (2020). *Evaluation of hotel websites for disabled people : an accessibility approach*. *11*(12), 258–271. https://doi.org/10.34218/IJARET.11.12.2020.031

STHDA. (n.d.). *Clustering Validation Statistics: 4 Vital Things Everyone Should Know - Unsupervised Machine LearningEasy Guides*. Retrieved September 1, 2019, from http://www.sthda.com/english/wiki/print.php?id=241#targetText=Recall that%2C the silhouette width,indicating a very good cluster.

Tao, B. C., Goh, E., Huang, S., & Moyle, B. (2019). Travel constraint perceptions of people with mobility disability: a study of Sichuan earthquake survivors. *Tourism Recreation Research*, *44*(2), 203–216.

Tibshirani, R., Walther, G., & Hastie, T. (2001). Estimating the number of clusters in a data set via the gap statistic. *Journal of the Royal Statistical Society. Series B: Statistical Methodology*, *63*(2), 411–423. https://doi.org/10.1111/1467-9868.00293

W3C. (2016). *Techniques for WCAG 2.0*. https://www.w3.org/TR/WCAG20-TECHS/

WAVE. (n.d.). *WAVE Help*. Retrieved August 5, 2019, from http://wave.webaim.org/help

WebFX. (2019). *Readability Test Tool*. https://www.webfx.com/tools/read-able/

Williams, R., Rattray, R., & Grimes, A. (2007). Online accessibility and information needs of disabled tourists: A three country hotel sector analysis. *Journal of Electronic Commerce Research*, *8*(2), 157–171.

World Health Organisation. (2011). *World report on disability*. https://www.unicef.org/protection/World_report_on_disability_eng.pdf

World Tourism Organization. (2016). *Manual on Accessible Tourism for All: Principles, Tools and Best Practices*. World Tourism Organization. https://doi.org/doi:10.18111/9789284418091