

# Improvement of Web Content Accessibility for Competition Results Distribution

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The competition results distribution system is the most widely used system in the Olympic and Paralympic Games Tokyo 2020. The users include athletes, broadcasters, spectators, athletic organizations, press, and staff. At the Olympic and Paralympic Games Sydney 2000, visually impaired people from Australia complained to the organising committee that they could not use the results delivery system. This was the world's first lawsuit regarding Web accessibility. The Olympic and Paralympic Games Tokyo 2020 will place even greater emphasis on Web accessibility than in the past Games. In the development of the results distribution system, where it is challenging to ensure Web accessibility, we conducted expert tests that were taken by visually impaired people. We identified more than 100 issues that did not conform with the accessibility guidelines and worked to improve them. This article describes the outline of the initiatives and solutions to the issues.

**Keywords :** Accessibility, Competition results, User testing, WCAG, JIS X 8341-3

## 1. Introduction

Advances in technology allow people to collect the information they want anytime, anywhere, and in various ways. However, not all people can take advantage of this convenience. Particularly for people with disabilities, technology has the power to make things possible that they might otherwise have given up. Nevertheless, some technology services are still inaccessible to people with disabilities.

Web creator Tim Berners Lee says, "The power of the Web is in its universality. Access by everyone, regardless of disability, is an essential aspect". The World Wide Web Consortium (W3C), founded by Tim Berners Lee, explains, "Web accessibility means that websites, tools, and technologies are designed and

developed so that people with disabilities can use them". Web accessibility also benefits people without disabilities<sup>(Note 1)</sup>. Accessibility is essential for people with disabilities and is helpful for everyone in various situations.

The Tokyo 2020 Organising Committee has identified "diversity and harmony" as one of the basic concepts of the Games<sup>(Note 2)</sup>. In line with this concept, the accessibility of the Games' technology services was to be improved to ensure that information is accessible to everyone, regardless of race, color, gender, sexual orientation, language, religion, politics, disability, or other disadvantages.

Under these circumstances, the Tokyo 2020 Organising Committee worked to improve the Web accessibility of the results distribution system for the Tokyo 2020 Olympic and Paralympic Games (hereinafter referred to

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The Journal of The Institute of Electronics, Information and Communication Engineers, Vol.105, No.8, Supplement, pp.174-181, August 2022  
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(Note 1) W3C Accessibility  
<https://www.w3.org/standards/webdesign/accessibility>

(Note 2) Conference Vision  
<https://www.tokyo2020.jp/ja/games/games-vision/index.html>

as “Tokyo 2020 Games”), which is the system with the most users.

## 2. The Olympics and Web Accessibility

### 2.1 Litigation Case in the Sydney 2000 Games

The Olympic and Paralympic Games and Web accessibility are closely related: In 2000, a user with visual impairment in Australia sued the Sydney 2000 Olympic Games Organising Committee. The user claimed that the inability to use the official website of the Sydney 2000 Olympic Games with screen readers and Braille displays was a violation of the Disability Discrimination Act (DDA). The lawsuit was the world’s first web accessibility lawsuit<sup>(Note 3)</sup>. The visually impaired plaintiffs demanded the following three items by the time of the Games (September 2000).

- (1) Provide alternative text for all images
- (2) Ensure access from the Schedule page to the Index of Sports
- (3) Ensure access to the Results Tables on the website during the Games

The Sydney Organising Committee responded as follows:

- (1) Alternative text for images was being progressively implemented as part of continual development.
- (2) Access from the “Schedule page” to the “Index of Sport” was possible by inputting the required Uniform Resource Locator (URL) into the web browser directly.
- (3) Access to the Results Tables would cause the respondent unjustifiable hardship to comply as the site had already undergone “substantial implementation” and planning. The resolution for that would cost an estimated 150 million yen over 368 working days.

In the judgment, the plaintiff’s request was fully approved. The Organising Committee was ordered to make all improvements before the start of the Games.

In the end, the Organising Committee compensated the plaintiff because only partial improvements could be made before the start of the Games.

## 2.2 Games Result Distribution Service and Web Accessibility

Among the functions of the results distribution system, developed by the global partners and provided at each Olympic and Paralympic Games, the results pages, in particular, are used not only by the media and other Games officials but also by viewers around the world through the official website and mobile applications. To provide easy-to-understand information to a wide range of viewers regardless of disabilities, the content of the competition results distribution system must be updated in real time. This had to be done using a large amount of non-textual content, such as complex tables and graphs, to provide numerical data such as scores and times, which are actual competition data. This data must be accessible to viewers with and without disabilities. This is a characteristic that makes it hard to ensure Web accessibility.

## 3. Tokyo 2020 Web Accessibility Policy

### 3.1 Web Accessibility Guidelines

The International Paralympic Committee (IPC) has established the “IPC Accessibility Guide”<sup>(Note 4)</sup>, which the Olympic and Paralympic host cities and Organising Committees must follow. The Guide’s 7.5.10 Communication requires that websites meet the W3C accessibility guidelines.

The Web Content Accessibility Guidelines (WCAG)<sup>(Note 5)</sup> of this W3C Recommendation include three levels:

A : A minimum required level to secure accessibility  
AA : A level required for public organizations in other countries

AAA : It is not recommended to set AAA as a target level

W3C recommended WCAG 2.0 in 2008, which changed to ISO/IEC 40500 : 2012 and JIS X 8341-3 : 2016. The contents of these three guidelines are all identical.

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(Note 3) Minimize Legal Risk

<https://www.w3.org/WAI/business-case/#minimize-legal-risk>

(Note 4) IPC Accessibility Guide

[https://www.paralympic.org/sites/default/files/2020-11/IPC%20Accessibility%20Guide%20-%204th%20edition%20-%20October%202020\\_0.pdf](https://www.paralympic.org/sites/default/files/2020-11/IPC%20Accessibility%20Guide%20-%204th%20edition%20-%20October%202020_0.pdf)

(Note 5) Web Content Accessibility Guidelines (WCAG) 2.1

<https://www.w3.org/TR/WCAG21/>

### 3.2 Tokyo 2020 Accessibility Guidelines and Policies

Based on the IPC Accessibility Guide, the Tokyo 2020 Organising Committee developed the “Tokyo 2020 Accessibility Guidelines”<sup>(Note 6)</sup>, which were approved by the International Paralympic Committee (IPC). The Guidelines’ 2.4.3 Website Criteria states that the website should be developed to include all people as users and meet the requirements of the W3C Accessibility Guidelines. The W3C Accessibility Guidelines are the most important guidelines for the Tokyo 2020 Games. Under this policy, the competition results distribution system to be made available on the official website during the Games was also designed to comply with the AA level of the Web Content Accessibility Guidelines (WCAG) 2.1.

## 4. Validation of Web Accessibility

Web accessibility of the competition results distribution page was evaluated using two methods: ‘Heuristic Diagnostics’ method, which is a process where experts use a thumb rule to measure the accessibility of user interfaces in independent walkthroughs and report issues, and ‘Accessibility User Test’ method, in which actual users verify the operation of the system under development. This is because some issues may not be noticed only by heuristic diagnostics.

### 4.1 Heuristic Diagnostics

Accessibility experts conducted the following diagnostics based on their experience:

- (1) Checklist creation: A checklist of 30 items for Level A and 20 items for Level AA was created for the achievement criteria.
- (2) Selection of target screens: 53 screen templates were selected for the competition results distribution system.
- (3) Validation and issue definition: 103 issues that did not conform to the success criteria were extracted.
- (4) Creation of improvement plan and instructions for improvement: Present the impact, cause, and specific improvement plan to the developer and give instructions for improvement.

The 103 issues in March 2020 were reduced to 8 issues in December 2020 through repeated improvements and

validations. The issues remaining from the current Games were handed over to the Organising Committee for the next Games.

### 4.2 Accessibility User Test

While extracting issues through heuristic diagnostics and proceeding with the improvement, we conducted user tests twice to check from the user’s perspective. It was to determine if there were any omissions, if improvement was sufficient, and if users with visual impairments could use the assistive technology tools (screen reader and magnifier) without any issues. The Tokyo 2020 Organising Committee has conducted two user tests with screen readers and magnifiers. The Tokyo 2020 Organising Committee hoped to gain knowledge and insight into the digital tools used by people with disabilities and encourage the participation of the younger generation in the Tokyo 2020 Games. The test subjects were students with visual impairments enrolled at the Tsukuba University of Technology (the first national university in Japan to make visually impaired and hearing-impaired students a condition for admission). The test subjects were two Japanese-language test websites for the Olympic and Paralympic Games results distribution system. The test scenarios were the Olympic and Paralympic Games, where 12 tasks were set for each. Seven visually impaired students were employed as testers for the first and ten for the second. The test environment consisted of using their PCs and their screen readers (NVDA, PC-Talker, JAWS), magnifiers (Windows standard), and high-contrast displays (inverted black and white). Since the user test and heuristic validation are evaluated from different perspectives, the number of questions was counted independently for each.

#### 4.2.1 Results of the First User Test (Conducted in November 2020)

There were 33 issues, of which 18 required improvements, excluding minor issues. The breakdown of these 18 issues to the WCAG success criteria is as follows:

- 1.3.1 (A) “Info and Relationships”: 2 issues
- 1.3.2 (A) “Meaningful Sequence”: 2 issues
- 2.4.4 (A) “Link Purpose”: 1 issue

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(Note 6) Tokyo 2020 Accessibility Guidelines  
<https://www.tokyo2020.jp/ja/organising-committee/accessibility/index.html>

- 2.4.5 (AA) “Multiple Ways”: 6 issues
- 2.4.6 (AA) “Headings and Labels”: 5 issues
- 3.2.4 (AA) “Consistent Identification”: 2 issues

These issues, which all tester students indicated they would like to see fixed, are presented in 5.1.10.

#### 4.2.2 Results of the Second User Test (Conducted in March 2021)

There were 39 issues (the number of issues increased from the first round because there were three more testers and some test scenarios were changed), except for minor issues, three issues that required improvements. The breakdown of the three cases that did not meet the WCAG success criteria is as follows.

- 1.3.2 (A) “Meaningful Sequence”: 2 issues
- 3.2.4 (AA) “Consistent Identification”: 1 issue

Among these issues, the issue that many of the testers indicated that they would like to see fixed was the inability to find the desired event. This was because there were too many choices in the menu for event selection. This issue needed to be addressed as described in 5.2 below.

### 5. Major Web Accessibility Issues and Improvements

As mentioned above, more than 100 issues required improvements due to non-compliance with WCAG 2.1, Level A and Level AA accessibility requirements. The major issues and improvements among these issues are described below.

#### 5.1 Major Issues and Improvements

Below is a list of significant issues identified during validation and testing and their remedies.

##### 5.1.1 Color is Used as the Only Visual Means of Conveying Information

[Nonconformance with WCAG Success Criterion 1.4.1, “Use of Color”(Level A)]

Users who have difficulty distinguishing between colors cannot distinguish between gold, silver, and bronze medals because the medals are identical in shape (Figure 1).

→Improvements were made to add text information within the image of the medals (Figure 2).

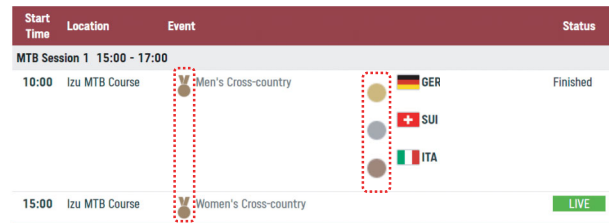


Figure 1 Issue of Medal Identification in the Competition Results Display



Figure 2 Improvement of Medal Identification in the Competition Results Display

#### 5.1.2 Text Alternative is Not Provided for Medal Images

[Nonconformance with WCAG success criteria: 1.1.1 “Non-text Content”(Level A)]

Because no alternative text (alt attribute) is set for the medal image (img element), the screen reader reads “medal1.png” as the image file name. The screen reader user cannot obtain the medal information (Figure 3).

→We improved the medal image (img element) to provide a text alternative such as alt=“gold medal”.

#### 5.1.3 There is No Heading for the Competition Icons

[Nonconformance with WCAG success criteria: 1.3.1 “Info and Relationships”(Level A)]

The text “live” was not marked up as a heading, so users could not understand that the competition was live when they read the competition name on the competition icon (Figure 4).

→Improvements made to mark up the text “live” with heading elements and set supplementary information (title attribute).

#### 5.1.4 Semantic Elements and Attributes Not Being Used in the Detailed Competition Results Table

[Nonconformance with WCAG success criteria: 1.3.1 “Info and Relationships”(Level A)]

### Medalists

All days | All Sports | All NOCs | All Medalists | Search

NOC	Name	Discipline	Event	Medal
Australia	GUBECKA	Marathon Swimming	Women's 10km	Gold
Egypt	ELAMRAWY Marwan Ahmed Aly Morsy	Marathon Swimming	Men's 10km	Silver
France	OLIVIER Marc-Antoine	Marathon Swimming	Men's 10km	Silver
Greece	GIANNIOTIS	Marathon Swimming	Men's 10km	Silver
Italy	BRUNI Rachele	Marathon Swimming	Women's 10km	Gold
Kazakhstan	KHUDYAKOV Vitaliy	Marathon Swimming	Men's 10km	Gold
Spain	VILLAECLJA GARCIA Erika	Marathon Swimming	Women's 10km	Bronze

Figure 3 Issue of Medal Images in the Event Result Display



Figure 4 Issue of Heading in the Competition Schedule Display

No.	Name	Min.	Points	S-EFF	1PT	FT	2PT	HGL	KAS	DRV	BS	BZR	DNK
4	BURTON Natalie	DNP.											
5	CAMBAGE Elizabeth	7:10	6	1.50	1/1	1/1	2/2	1					1
6	GEORGE Cayla	7:10	9	1.50	2/2	1/1	3/3	6	2	2	1		1
7	TALBOT Stephanie	7:10	6	1.20		2/2	2/3	8	8				
Team													
Totals		7:10	21	1.40	3/3	4/4	7/8	15	10	2	1		2

Figure 5 Issue of Reading Out Numbers in the Detailed Competition Results Table

Because heading and data cells are not correctly associated with each other using the <th> element and scope attribute, screen reader users cannot understand what the numbers are or which athlete's information they are about because only the numbers are read out continuously (Figure 5).

→Improvements were made to associate heading cells with data cells using the <th> element and scope attribute.

#### 5.1.5 Labels Not Being Provided for Competition Result Scores

[Nonconformance with WCAG success criteria: 1.3.1 "Info and Relationships" (Level A)]

Since no headings or labels are provided for the scores, screen reader users cannot understand the meaning of the numbers read out (i.e., which team's score) (Figure 6).

→The score section was improved to include the team names, such as title="final score of Japan".



## Player Statistics - Women's Pool Round - 3x3 Basketball

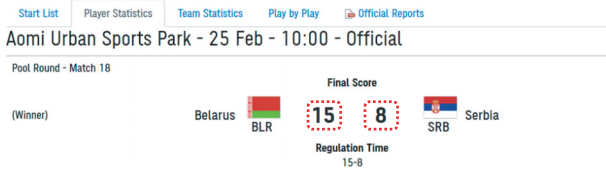


Figure 6 Issue of Reading Out Competition Results Score

## Results - Men's Bronze Medal Match

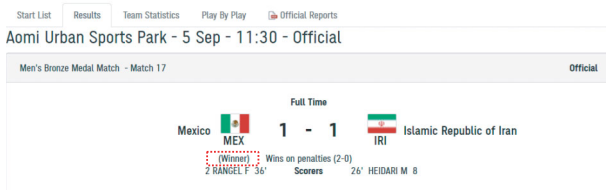


Figure 7 Issue of Reading Out the Winner in the Competition Results

### 5.1.6 The Order of Code Description in the Competition Result Score Not Being Appropriate

[Nonconformance with WCAG success criteria:1.3.1 "Info and Relationships"(Level A)]

The screen reader reads "Iran Winner" to read the HTML source code in the order of its description.

This misinforms the screen reader user that Mexico is a Winner when it is not a Winner (Figure 7)".

→The relevant information was improved in the source code to be written in sequence without separating them.

### 5.1.7 Page Title Not Written Properly

[Nonconformance with WCAG success criteria:2.4.2 "Page Titled"(Level A)]

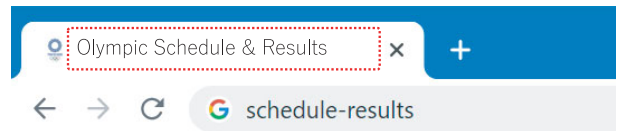
The screen reader first reads the page title. The screen reader user cannot understand that this is an archery page unless the text of the page is read out as well (Figure 8).

→The page title has been improved to include the name of the competition (Figure 9).

### 5.1.8 Inability to Recognize the Link Destination from the Link Text

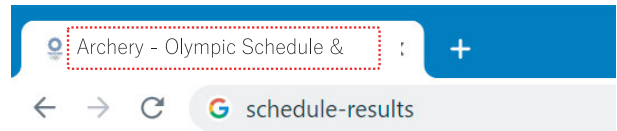
[Nonconformance with WCAG success criteria:2.4.4 "Link Purpose"(Level A)]

The name of the country, athlete, and sport is a link, but users cannot tell what page the link will take them to by just looking at the link text (Figure 10).



## Olympic Schedule & Results - Archery

Figure 8 Issue of Notation in Page Title



## Olympic Schedule & Results - Archery

Figure 9 Correction of Page Title Notation

Country/NOC	Name	Sport	Event	Medal
Canada	ACHONWA Natalie	3x3 Basketball	Men	🥉
Canada	AYIM Miranda	3x3 Basketball	Men	🥉
Canada	FIELDS Nirra	3x3 Basketball	Men	🥉

Figure 10 Issue of Not Being Able to Find Links

国	アスリート	スポーツ
USA	Caeleb Dressel	水泳
AUS	Emma McKeon	水泳
AUS	Kaylee McKeown	水泳

Figure 11 Issue of Not Being Able to Find Links

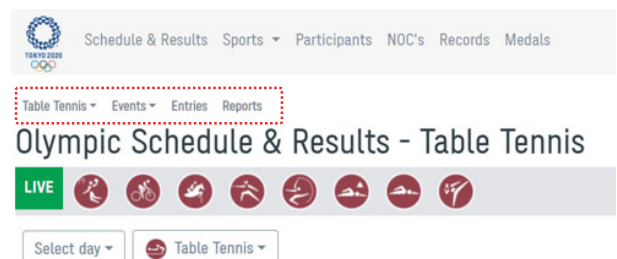


Figure 12 Issue of Not Noticing Submenus



Figure 13 Issue with Competition Names Not Listed in Alphabetical Order

→The link text has been improved to set the destination page's title using the title attribute (Figure 11).

### 5.1.9 The Existence of Submenus Going Unnoticed [Nonconformance with WCAG success criteria : 2.4.5 "Multiple Ways" (Level AA)]

Screen reader users do not notice the existence of submenus because they are placed above the h1 heading (Figure 12).

→This issue affected all pages and was difficult to correct due to development resource and schedule constraints, so it was addressed with the alternative measure "accessibility help" described below.

### 5.1.10 The Competition List Not Being in the Order of the 50-character Kana Syllabary on the Japanese Page

[Nonconformance with WCAG success criteria : 1.3.2 "Meaningful Sequence" (Level A)]

Screen reader users cannot select the desired competition from the competition list because the competition list is not in the order of the 50-character kana syllabary (Figure 13). Since no specific requirements were initially presented, the order of the competition names on the Japanese page was numerals, katakana, and kanji in the JIS code. The English page



Figure 14 Accessibility Help

was in alphabetical order.

→The order of the competition names was improved so that they were in the order of the 50-character kana syllabary, combining kana and kanji.

## 5.2 Alternate Solutions for Issues That are Difficult to Fix

Among the issues identified in the user test, large-scale improvements that would affect the entire system could not be implemented due to constraints on development resources and schedule. As an alternative, we implemented a help page, “Accessibility Help”, for users who use assistive technologies (e.g., screen readers) (Figure 14).

The following four items are included on the help page :

- (1) How to use a pull-down menu at the top of a page
- (2) How to find an event schedule
- (3) How to find a ‘live now’ event
- (4) How to find Baseball or Softball

## 6. Wrap-up

The factors that contributed to the success of the Tokyo 2020 Organising Committee’s Web accessibility improvements can be summarized as follows :

- (1) Conducting user testing
  - The authentic voice from users resonates well with developers.
  - Problems are found that the experts were unaware of.
- (2) Represent an ordering of priority for each issue. Priority levels were set based on the

opinions of visually impaired users and were set at three levels : high, medium, and low. These are different from those stipulated in the project.

- (3) The developer was presented with specific HTML source code improvement solutions and screen images of the improvements.
- (4) Indicate the issues to the developer when they are non-compliant with the success criteria of the WCAG and any areas where the users will have issues.

We believe these points will make it easier to proceed with Web Accessibility improvements.

We are confident that the significant improvements in Web accessibility achieved in the competition results distribution system, based on the testing and proposed improvements proactively conducted by the Tokyo 2020 Organising Committee, will be carried over to future games.

Finally, we would like to thank the faculty, staff, and students of the Tsukuba University of Technology for their cooperation as testers and NTT Claruty Corporation for their cooperation as facilitators in the user test.

(Received February 28, 2022 ; Revised March 31, 2022)



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