Activities for Improving Web Accessibility

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In response to the growing number and diversity of persons using the Internet, the role of Websites has become more important as can be seen in electronic applications. Government agencies and local governments have started to develop Websites that can be easily accessed by more persons, including older persons and persons with disabilities, in accordance with the u-Japan plan formulated based on the Disabled Persons Fundamental Law as well as the government policies such as New IT Reform Strategy. Improvement of a model such as "Operation model for public Website" is a part of this initiative. To address this trend, Fujitsu formulated the Fujitsu Web Accessibility Guidelines in 2002. Since then, Fujitsu has made various efforts to promote Internet use, such as the free distribution and sales of diagnosis tools, and the sales of Web accessibility assistance tools. The Web Content Accessibility Guidelines—the de facto international standards—was revised in the latter half of fiscal 2008, and JIS X 8341-3—the equivalent Japanese Industrial Standard—will be revised in 2009. This paper reviews Fujitsu's activities for improving Web accessibility to date, mainly from the viewpoint of human-centered design, and proposes future issues and directions.

1. Introduction

With the spread of the Internet, the Web environment has changed drastically. The number of Website users has increased and the diversity of the Web population has become more conspicuous. At the same time, Websites have been assuming more important roles recently as can be seen in Websites for electronic applications, on-line banking and on-line shopping. Government agencies and local governments have started to develop Websites that can be easily accessed by more persons in accordance with the u-Japan plan formulated based on the Disabled Persons Fundamental Law as well as government policies such as the New IT Reform Strategy. Improvement of a model such as "Operation model for public Website" is a part of this initiative.

Meanwhile, Fujitsu has placed its efforts in the improvement of Web accessibility. Fujitsu's Web accessibility diagnosis tool has been downloaded more than 200 000 times in total and its Web accessibility assistance tool "WebUD"[1)] has been introduced to more than 90 Websites centered on the Websites of government agencies and those of local governments.

These activities and their results contributed greatly to a series of awards given to Fujitsu Websites as below: 1st place in Nikkei Personal Computing "Corporate Usability Ranking 2005", "Corporate Usability Ranking 2006" and "Corporate Usability Ranking 2008". Further, Fujitsu's Web accessibility diagnosis tool was given multiple awards including "Software Product of the Year 2006", "GOOD DESIGN AWARD 2006" and "Universal design award 08". Its Web accessibility assistance tool "WebUD" also received "KIDS DESIGN AWARD 2007".

Against this background, the WAI (Web

Accessibility Initiative)[2] of W3C (World Wide Web Consortium) is planning to revise WCAG (Web Content Accessibility Guideline) from Version 1.0 to Version 2.0.[3] To reflect this change, JIS X 8341-3: "Guidelines for older persons and persons with disabilities—Information and communications equipment, software and services—Part 3: Web Content"[4] is planned to be revised in the near future.

This paper reviews Fujitsu's activities for improving Web accessibility to date, mainly from the viewpoint of human-centered design (HCD) processes, and proposes future issues and directions.

2. HCD and Web accessibility

Fujitsu explains that "accessibility" is "an idea and/or degree of ease of use for persons with disabilities, older persons, and various types of persons in accessing equipment, hardware, software, services and the environment".

As a method to realize this concept, application of HCD defined in "JIS Z 8530: Ergonomics—Human-centered design processes for interactive system"[5] is considered. The JIS Z 8530 is a JIS version of the more widely-known ISO 13407: Human-centered design processes for interactive systems.[6]

The implementation of HCD can be interpreted as an implementation of a "customer-driven" concept. The "customer" here includes various types of persons including persons with disabilities, older persons and children, and this is connected to the consideration of universal design. This means to aim at the improvement of accessibility and usability. A customer-driven concept that gives consideration to various types of persons has been strived for more or less by parties creating/operating Websites for a long time. However, the Web accessibility in this context refers to the efforts to make these approaches more effective and efficient so that it should give high level of satisfaction to the Website users.

3. Various approaches from the standpoint of HCD

Referring to JIS Z 8530 "5. Principles of HCD" and "7. HCD activities", the approaches to date are introduced. "5. Principles of HCD" describes the items that should be considered always in implementing HCD. Four principles are defined in this section and the activities necessary to realize these principles are explained in "7. HCD activities". The relationship of these HCD principles and the various types of approaches are shown in **Table 1**, and the relationship of HCD activities and the various types of approaches are shown in **Table 2**.

Table 1
HCD principles and approaches for improving Web accessibility.

HCD principles	Approaches for improving Web accessibility				
	Guidelines	Diagnosis tools and integration of diagnosis functions	Diagnosis service by concerned party	Education/ Publication activities	Assistance tools
a) The active involvement of users and a clear understanding of user and task requirements	●		●	△	
b) An appropriate allocation of function between users and technology	●	△		△	●
c) The iteration of design solutions		●	△		△
d) Multi-disciplinary design	△			●	

●: Applicable, △: Partially applicable

3.1 Guidelines

In the area of Web accessibility, JIS X 8341-3 was announced in 2004. Since then, many Websites have been created based on this guideline.

In 2002, Fujitsu formulated "Fujitsu Web Accessibility Guidelines",[7),8)] which was then revised to a new version in 2004 while integrating the corresponding JIS provisions. This guideline has been applied to Fujitsu's public Websites.

In the HCD principles of JIS Z 8530, this substitutes "the active involvement of users and a clear understanding of user and task requirements" and "an appropriate allocation of function between users and technology". Further, it can be interpreted as generalized and manifested know-how concerning "to understand and specify the context of use", "to specify the user and organizational requirements" and "to produce design solutions" of HCD activities.

JIS X 8341-3 and "Fujitsu Web Accessibility Guidelines" were documented based on adequate examination of requests from persons with disabilities and older persons and by reflecting these requirements to be satisfied in the contents while giving consideration to their feasibility. The achievement of the aforementioned JIS Z 8530 requirements without these guidelines when making each page of a Website is ideal but not practical.

3.2 Diagnosis tools and integration of diagnostic functions

It is extremely important to verify compliance with guidelines at each step of Website design/construction. Based on the HCD principles of JIS Z 8530, this corresponds to "the iteration of design solutions" or, in terms of HCD activities, "to evaluate designs against requirements".

Further, the diagnosis should be carried out also by the administrator/operator of the whole Website in order to implement policy formulation of the Website operation, or, to understand accessibility of their own Website as a whole, rather than being carried out by Web designers/developers who verify the applicable specifications. This corresponds to "To identify need for human-centred design" in terms of HCD activities in JIS Z 8530.

Anyway, it is extremely useful to make mechanical diagnosis available as a software program to diagnose compliance to the requirements that are not dependent on the knowledge based on persons' experiences.

Therefore, Fujitsu has developed and pre-

Table 2
HCD activities and approaches for improving Web accessibility.

HCD Activities	Approaches for improving Web accessibility				
	Guidelines	Diagnosis tools and integration of diagnosis functions	Diagnosis service by concerned party	Education/ Publication activities	Assistance tools
• Identify need for human-centred design	△	●	△	●	
a) Understand and specify the context of use	●		●	△	
b) Specify the user and organizational requirements	●		●	△	
c) Produce design solutions	●			△	●
d) Evaluate designs against requirements	●	●	●	△	△
• System satisfies specified user and organizational requirements					●

●: Applicable, △: Partially applicable

sented the Web accessibility diagnosis tools and the software services integrating this function as below:

1) Diagnosis tool: Fujitsu Accessibility Assistance[9),10)]

A series of software tools that enables easy diagnosis whether or not a Website is accessible for older persons and persons with visual disabilities or color blindness. It has the following three applications (**Table 3**):

2) Diagnosis and Correction Tool: WebInspector Pro[11)]

While Fujitsu Accessibility Assistance can be used only for diagnosis, this application has a feature to simplify correction of the problems. This application has been distributed since 2006 as a paid application.

3) Diagnosis tool: Customization service

Fujitsu offers a customization service, where Fujitsu Accessibility Assistance or WebInspector Pro is customized into a diagnosis tool with a diagnosis feature based on the customer-specific guidelines.

Being mainly centered on the diagnosis function at source level as HMTL and CSS, it is possible to add diagnosis functions that are applicable to each customer-specific Website as a customer-specific rule.

4) Integration into Contents Management System (CMS)[12)]

Table 3
Three tools of Fujitsu Accessibility Assistance.

WebInspector Diagnose HTML and CSS. Comes in Japanese, English, Chinese and Korean versions	
ColorSelector Judge the legibility of background and text colors. Comes in Japanese, English, Chinese and Korean versions	
ColorDoctor Simulates the display content according to grayscale and color characteristics. Comes in Japanese and English versions	

Introduction of Contents Management System (CMS) is going on for Websites comprised of several ten thousand or several hundred thousand pages.

The primary CMSs developed and offered by the Fujitsu Group such as i-City Portal, Web Core Enterprise and GWebLink-Neo include diagnosis features of a level equivalent to those of WebInspector and WebInspector Pro.

When introducing a CMS, the creator of each Webpage uses CMS Web format to create, add and correct contents instead of independently editing the HTML source. The CMS format requests each creator to input the title, headline and main text as its input data. The data entered in CMS Web format are then merged into design templates for the CMS. The data at this stage can be referenced using a browser.

Regarding the page-specific accessibility, problems can be screened out more easily by adding the diagnosis feature of WebInspector to this CMS. For instance, an "accessibility diagnosis" button may be arranged on the CMS Web format to offer a diagnosis function. The availability of alt attributes in images as well as the combination of text color and background color should be considered often as the page-specific issue. Diagnosis of these aspects should be made possible based on this function.

3.3 Diagnosis service by concerned party

Participation of persons with disabilities as a concerned party will increase the importance of diagnosis services in future for efficient and effective realization of accessibility at a higher level.

Verification using diagnosis tools is a mechanical evaluation and it does not include heuristic evaluation by persons while giving consideration to the context of use. Further, screening out of problems by persons in normal health who understand guidelines may lead to some qualitative insufficiencies in comparison with the review of the Website by persons with disabilities and/or older persons (concerned party) who reference the

Website for evaluation.

Such a participation of the concerned party as an end user is a natural consequence of the implementation of the principle of HCD in JIS Z 8530 "the active involvement of users and a clear understanding of user and task requirements". Active involvement of the concerned party including the persons with disabilities and older persons is an ideal approach in this initiative. In general, persons with disabilities have demonstrated extremely high motivation to be a part of HCD initiative.

3.4 Education and publication activities[13),14)]

Guidelines and diagnosis tools are consolidated know-how for improving accessibility. It is possible to share know-how by using them. However, it is difficult to use them in an appropriate manner without any preliminary knowledge.

"Multi-disciplinary design", cited as a principle of HCD in JIS Z 8530, can be interpreted as a recommendation to urge participation of persons of various types of professions who have awareness about Web accessibility in the processes of constructing and operating Websites. While the level of awareness about Web accessibility has been enhanced in recent years, it is still far from a sufficient level.

Therefore, it is a practical approach to urge participation of persons of various professions who have already participated in the processes of Website construction/operation. Namely, by having them fully understand Web accessibility, it is possible to achieve "multi-disciplinary design".

Therefore, as an approach for sharing know-how as its main purpose, inviting persons involved in Website construction/operation to educational seminars may be considered. If it is difficult for these persons to gather together in a certain place at a specified time, it may be useful to provide them with opportunities for learning on a flexible schedule by themselves through publications and e-learning.

Of course, it is still far from an adequate level of knowledge for Web accessibility. However, such an approach may impress on them the importance of Web accessibility as an aspect of Website quality improvement, which corresponds to "To identify need for human-centred design" in terms of HCD activities in JIS Z 8530. While the importance of "To identify need for human-centred design" has been rather underestimated so far, we consider that this aspect is extremely important in promoting penetration of HCD involved with accessibility.

3.5 Assistance tools

In an attempt to improve accessibility by end users, some issues cannot be addressed sufficiently only by improving the contents. To improve these issues, Fujitsu has developed and is offering assistance tools for Web accessibility.

In terms of the HCD principle in JIS Z 8530, it corresponds to "an appropriate allocation of function between users and technology". It is an important issue to examine which function to be allocated to what extent so that the final accessibility can be improved.

It is important to consider "how much should be covered by contents?" and "how much consideration should be made by browsers and assistance technologies that intervene between contents and users?" This not only means splitting work to be carried out among responsible parties but also implies the necessity to consider the extent to which each party can participate, centered on the respective scope of responsibility. Each party should consider that it can cover the scope somewhat outside its own scope of responsibility, though it should be done while giving consideration to the surrounding situations.

In developing contents, developers need to take browsers displaying the contents into account as well as the assistance technologies and information devices used by persons with disabilities and/or older persons. The improvement measures should be implemented based on these

considerations.

The Web accessibility assistance tool "WebUD" is a Web browser that gives consideration to persons with reduced vision, persons with color blindness, persons with intellectual disabilities, persons with limb disabilities, older persons and foreign residents. This tool supports a text read-out function, enlargement/reduction of letters and figures, change of text and background colors, display of phonetic pronunciation of Chinese letters (Kanji), input support based on software keyboard and so on. As a part of Website accessibility improvement, this tool has been introduced to each Website and end users can use the features free of charge.

4. Future challenges and forecasts

Thinking of a series of results cited in the previous section, our HCD-conscious approaches to date can be considered fruitful. Nevertheless, the system to construct/operate Websites, environmental conditions and the technologies used in Websites are changing constantly.

4.1 Measures for addition and revision of standards and guidelines

Revisions of two widely used standards (WCAG and JIS X 8341-3) are being planned. Further, the US Federal Government stipulated that the electronic and information technologies "shall be developed, expedited, maintained and/or used". Besides, work targeted for revision of §508 of Rehabilitation Act[15] in 2010 is in progress.

Particularly, JIS X 8341-3 is virtually the primary source for Web accessibility initiatives in Japan based on its association with Article 67 of the Industrial Standardization Act (Respect for the Japanese Industrial Standards). In revising the standard, the main emphasis is placed on international harmonization by eliminating inconsistencies between standards. As a consequence, conformance to JIS X 8341-3 will continue to be mandatory also in future in the Japanese market.

Also in overseas markets, particularly in the United States, harmonization of standards (mainly §508 of Rehabilitation Act) with WCAG 2.0 will be promoted.

Taking these situations into account, the "Fujitsu Web Accessibility Guidelines" need to be reviewed while focusing on the consistency with these standards.

4.2 Measures for growing population of Web users

The new WCAG 2.0 is likely to integrate consideration for persons with hearing disabilities and cognitive disabilities. In Japan, consideration for foreign residents and children is increasing its importance amid a declining birthrate and an aging population. The clarification of issues facing a wider range of persons including the aforementioned and the realization of consideration for these persons need to be promoted in future as before on a continuous basis. It goes without saying that the results of these approaches should be shared among various parties mainly through guidelines.

4.3 Further quality improvement of existing efforts

One approach in this initiative is a redefinition of support needed by Website creators and operators in the process of constructing/operating Websites from the standpoint of considering them as users. It is essential to present appropriate innovations depending on the identified needs.

For instance, to allow easy capture of the current status of accessibility level of the whole Website, the existing efforts to improve accessibility on a page-by-page basis are insufficient. It is also effective to diagnose accessibility in combination with other quality issues such as the grammatical aspect instead of only evaluating accessibility.

Meanwhile, it may be necessary to recheck if the method of evaluating Web accessibility is

correctly understood in the current stage while focusing on the improvement of awareness about Web accessibility.

For instance, the fact that the diagnosis tools can only identify issues that can be checked mechanically has not been fully recognized. Persons often misunderstand that achieving the result "No problem detected" by using the currently distributed diagnosis tool is important and it guarantees an adequate level of accessibility and compliance to the guidelines.

4.4 Measures for new technology trends

In recent years, some emerging technologies have been observed including Rich Internet Application (RIA) that emphasizes the interactive operability focusing on the usability of persons in normal health.

RIA accessibility is reviewed also within the framework of WAI as "Accessible Rich Internet Applications (WAI-ARIA)". Similar to the case with WCAG, the center of this review is the consideration in terms of contents. Nevertheless, to ensure accessibility of this application to end users, considerations in terms of browsers and assistance technologies are necessary.

In this process, it may be important as an aspect of accessibility effort to customize browsers and assistance technologies depending on the contents.

For instance, it may be necessary to propose a customized program dedicated to accessibility improvement for specific contents while focusing on the customization of browsers and assistance technologies at the program level (e.g. offering of plug-ins). This indicates a possibility of applying this method to the improvement of accessibility for various Web applications.

5. Conclusion

This paper summarized Fujitsu's efforts for Web accessibility and gave explanations centered on HCD.

As mentioned above, our HCD-conscious approaches to date can be considered effective. However, giving consideration to the renewal of applicable standards, change of awareness about accessibility and emerging new technologies, it may be that we should move on to the next stage of Web accessibility improvement. It is essential to promote our approaches for Web accessibility by targeting a higher level of quality based on the experiences and knowledge obtained through our efforts to date.

References

1) Fujitsu: WebUD. (in Japanese). *http://jp.fujitsu.com/about/design/ud/webud/*
2) Web Accessibility Initiative: Web Accessibility Initiative (WAI). *http://www.w3.org/WAI/*
3) WAI: Web Content Accessibility Guideline 2.0 (WCAG2.0). *http://www.w3.org/TR/WCAG20/*
4) JIS X 8341-3: 2004. "Guidelines for older persons and persons with disabilities—Information and communications equipment, software and services—Part 3: Web Contents".
5) JIS Z 8530: 2000. Ergonomics—Human-centered design processes for interactive system.
6) M. Kurosu et al.: Book for Understanding ISO13407 (in Japanese), 1st Version, Tokyo, Ohmsha, 2001.
7) Fujitsu: Fujitsu Web Accessibility Guidelines. (in Japanese). *http://jp.fujitsu.com/webaccessibility/*
8) Fujitsu: Fujitsu Web Accessibility Guidelines. *http://www.fujitsu.com/global/webaccessibility/*
9) Fujitsu: Fujitsu Accessibility Assistance. (in Japanese). *http://jp.fujitsu.com/about/design/ud/assistance/*
10) Fujitsu: Fujitsu Accessibility Assistance. *http://www.fujitsu.com/global/accessibility/assistance/*
11) Fujitsu: WebInspector Pro. (in Japanese). *http://segroup.fujitsu.com/consulting/strategy/accessibility/wipro/*
12) Fujitsu: Fujitsu Accessibility Engine. (in Japanese). *http://jp.fujitsu.com/about/design/ud/assistance/engine/*
13) Fujitsu: Easy-to-Understand Web accessibility & Usability (Revised Version). (in Japanese). *http://jp.fujitsu.com/about/design/ud/assistance/books/*
14) Fujitsu FOM: Easy-to-Understand Web accessibility & Usability: e-learning. (in Japanese). *http://www.fom.fujitsu.com/elearning/course/ywu.html*
15) Section508. *http://www.section508.gov/*

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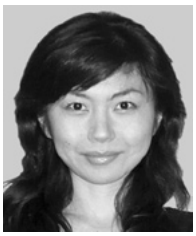

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