Collaborative Web Accessibility Improvement System: A Real-World Deployment
Social Accessibility

- Social computing + accessibility
- Any user can improve accessibility of any web page without changing original content.
- Any visually impaired user can join the improvement process through various collaboration mechanisms.

1) Encounter a problem in Web content.

2) Respond by using authoring tools.

3) Access the improved page!
Collaborative Web Accessibility Improvements: Tottori Prefecture Site

- Crowd-sourcing to create jobs for people with disabilities.
- A local government in Japan (Tottori Prefecture) integrated a collaborative Web accessibility improvement system developed by IBM Research into their website.
User Involvement and Prompt Support

Current improvement model:

- Content
  - Persons with disabilities, seniors, etc.
  - Communication team (and or Designers?)
  - Fix!
  - Developers

Mashup Model:

- Content
  - Issue reports
  - Renovators
  - Fix!
  - Communication team (and or Designers?)
  - Developers
New Method to Improve Accessibility - Mashup

Usual Model

Gov. Website

Server-side code modification required.

Browser

Screen Reader

User with Disabilities

Back-stage Model

Gov. Website

“One line code”

Browser

Screen Reader

User with Disabilities

“Behind the scene” improvements.

Front-stage Model

Gov. Website

WAIS

Browser

Screen Reader

User with Disabilities

“Front stage” improvements

Mashup!

Social Accessibility

Mashup!

Access tool

Mashup!
## WCAG 2.0 Support

<table>
<thead>
<tr>
<th>Guideline</th>
<th>WAIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Automated Check</td>
</tr>
<tr>
<td><strong>Perceivable</strong></td>
<td></td>
</tr>
<tr>
<td>Text Alternatives</td>
<td>✓ (mostly)</td>
</tr>
<tr>
<td>Time-based Media</td>
<td>Information</td>
</tr>
<tr>
<td>Adaptable</td>
<td>✓ (partially)</td>
</tr>
<tr>
<td>Distinguishable</td>
<td>✓ (partially)</td>
</tr>
<tr>
<td><strong>Operable</strong></td>
<td></td>
</tr>
<tr>
<td>Keyboard Accessible.</td>
<td>✓ (partially)</td>
</tr>
<tr>
<td>Enough Time</td>
<td>✓ (partially)</td>
</tr>
<tr>
<td>Seizures</td>
<td>Information</td>
</tr>
<tr>
<td>Navigable</td>
<td>✓ (partially)</td>
</tr>
<tr>
<td><strong>Understandable</strong></td>
<td></td>
</tr>
<tr>
<td>Readable</td>
<td>✓ (partially)</td>
</tr>
<tr>
<td>Predictable</td>
<td>✓ (partially)</td>
</tr>
<tr>
<td>Input Assistance</td>
<td>✓ (partially)</td>
</tr>
<tr>
<td>Robust</td>
<td>✓ (partially)</td>
</tr>
</tbody>
</table>
Site-wide Evaluation System Example

- An example of existing Japanese local government site consisting of 20,000 pages.
- Vertical axis: green = navigability, red = listenability, and blue = compliance.
- Horizontal axis is pages sorted from bad to good.
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Improvements of Accessibility Score

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## Number of Automatically Detected Problems

<table>
<thead>
<tr>
<th>Problem Type</th>
<th>5-Nov-10</th>
<th>24-Dec-10</th>
<th>24-Feb-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space separated characters</td>
<td>22,499</td>
<td>13,943</td>
<td>11,134</td>
</tr>
<tr>
<td>Broken intra-page links</td>
<td>12,588</td>
<td>1,068</td>
<td>1,538</td>
</tr>
<tr>
<td>Redundant alternative texts</td>
<td>8,500</td>
<td>5,345</td>
<td>3,831</td>
</tr>
<tr>
<td>Images without alt attribute</td>
<td>2,642</td>
<td>1,546</td>
<td>1,034</td>
</tr>
<tr>
<td>Inappropriate alternative texts</td>
<td>1,728</td>
<td>521</td>
<td>38</td>
</tr>
<tr>
<td>Others</td>
<td>4,229</td>
<td>2,985</td>
<td>2,986</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52,186</strong></td>
<td><strong>25,408</strong></td>
<td><strong>20,561</strong></td>
</tr>
</tbody>
</table>
## Participants

<table>
<thead>
<tr>
<th>Organization</th>
<th># of renovators</th>
<th>Non-impaired</th>
<th>Motor disability</th>
<th>Other</th>
<th># of supporters (support, education, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIC</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A</td>
<td>19</td>
<td>0</td>
<td>9</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>0</td>
<td>10</td>
<td>13</td>
<td>7</td>
</tr>
</tbody>
</table>
Focus of Each Organization

- In order to accumulate expertise, we assigned a few specific issues to each organization.

<table>
<thead>
<tr>
<th></th>
<th>Alternative text</th>
<th>Label</th>
<th>Space separated characters</th>
<th>Headings</th>
<th>Intra-page link</th>
<th>Reading order</th>
<th>Page title</th>
<th>Blink tag</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIC</td>
<td>6,131</td>
<td></td>
<td>4,904</td>
<td>1</td>
<td>11,616</td>
<td></td>
<td>153</td>
<td>41</td>
<td>22,846</td>
</tr>
<tr>
<td>A</td>
<td>5,723</td>
<td></td>
<td>19,789</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25,519</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,353</td>
<td></td>
<td></td>
<td>2,353</td>
</tr>
</tbody>
</table>
## Renovation results

<table>
<thead>
<tr>
<th>Organization</th>
<th>Work period</th>
<th># of renovators</th>
<th>Total hours (*)</th>
<th># of metadata</th>
<th>Productivity (Metadata per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tottori Prefecture Information Center (TIC)</td>
<td>Oct. 2010 - Mar. 2011</td>
<td>2</td>
<td>672h</td>
<td>22,846</td>
<td>34.0</td>
</tr>
<tr>
<td>B (NPO)</td>
<td>Nov. 2010</td>
<td>4</td>
<td>672h</td>
<td>2,353</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td><strong>25</strong></td>
<td><strong>4,424h</strong></td>
<td><strong>50,718</strong></td>
<td></td>
<td><strong>11.4</strong></td>
</tr>
</tbody>
</table>

* Total hours includes educations, etc.
Site-wide Metadata Inference

Create metadata for the “Rational Team Concert” Project page.

Automatic inference for The “Jazz Foundation” project page

Now, the metadata covers (maybe) all of the project pages.

Open another project page...

One click!
Efficiency of Accessibility Metadata

- In this phase, we used a conservative method (create a piece of metadata for each problem) in most cases to train novice renovators.
- After renovators became experienced, we started to test page-wide/site-wide metadata to improve the efficiency.

<table>
<thead>
<tr>
<th></th>
<th>12-Nov-10</th>
<th>24-Dec-10</th>
<th>24-Feb-11</th>
</tr>
</thead>
<tbody>
<tr>
<td># of metadata (applied)</td>
<td>884</td>
<td>37,526</td>
<td>41,960</td>
</tr>
<tr>
<td># of fixed problems per metadata</td>
<td>1</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>max # of fixed problems by one metadata (per webpage)</td>
<td>1</td>
<td>30</td>
<td>86</td>
</tr>
<tr>
<td>max # of fixed problems by one metadata (per website)</td>
<td>1</td>
<td>12,171</td>
<td>11,787</td>
</tr>
</tbody>
</table>

(per 50,000 pages)
Lessons learned

- **Consensus with site owners**
  - Need to have consensus on the methods and rules of fixes
    - Rules for heading levels, rules for alternative texts, etc.
  - Need to share the rules among workers before starting the work.

- **Step by step**
  - Need to take into account learning curve of workers.
  - Start from simple fixes, and then step up to more advanced fixes.
    - More complicated issues, use inference engine to apply one metadata to other pages, etc.

- **Page design should not be effected**
  - To get acceptance from page owners, metadata should not change the appearance of a page.
    - Spacing between characters, font sizes, etc.

- **Personalization of the tools**
  - Renovators are persons with disabilities with different requirements.
  - Interface should be customizable to maximize the productivity.
    - Button size, commands, etc.
Comments from Morimoto-san (Tottori)

- More than 40000 pages on the site

- 300 people are updating Web pages
  - They are required to check and fix themselves.
  - CMS is working, but not enough to achieve best accessibility

- Massive number of “old contents” before accessibility guidelines

**WAIS decreased the cost + created jobs for PwD**
Future Work

- Dynamic content

- Major renovations
  - Functions to allow collaboration between end-users, accessibility experts, and developers.

- Original page modification

- Multimedia

- More job creation!!
Thank you!

Acknowledgement

This project is supported by the Ministry of Internal Affairs and Communications of Japan as part of its Information and Communication Technology Furusato Genki Project.
Web Accessibility Improvement System (WAIS)

- New cloud-based service to enable collaborative accessibility improvement
- Tottori-Prefecture (Nov. 2010)

1) Problem determination

Seniors and people with disabilities

Assistive technology (Voice browsers, screen readers)

1') Check

Government Agencies

e-Gov site

1) Report

2) Repair

Accessibility Metadata

Problem

Instruction, Lecture service

Renovators

Experts

NPOs, etc.

3) Improve

New type of job opportunities for persons with disabilities