Increasing the Quality of Web systems

By inserting requirements of accessibility and usability

Ana Luiza Dias
Renata Pontin de Mattos Fortes
Paulo Cesar Masiero
Agenda

• Research context
• State of the art
• Hypothesis
• Theoretical Background
  – Web Engineering
  – Requirements elicitation
  – Usability and Accessibility
• Extending the Web Engineering Process Framework
• Case Study
• Advantages and limitations
• Next steps
Research context

• Quality
  – is defined as the totality of characteristics of an entity that gives it the ability to satisfy explicit and implied needs (ISO 8402)

• Quality of software
  – is compliance about functional and performance requirements explicitly declared, the development patterns clearly documented and implicit characteristics that are expected of all professionally developed software (Pressman)
State of the art

• The software industry is becoming increasingly important and complex, requiring that the software organizations to invest in quality of their development processes

• The requirements elicitation is one of the activities that can help software organizations to deal with this scenario, especially the definition of initiatives that can improve the requirements elicitation and activities analysis (Vale et al.)
Hypothesis

• To collaborate with this context and considering the importance of human resources for software development, this paper presents a list of non-functional requirements that must be considered for Web engineering, during the development of all types of Web systems. In accordance with:
  – accessibility guidelines of the WCAG (Web Content Accessibility Guidelines) (W3C)
  – usability heuristics (Nielsen and Molich)
Hypothesis

• Lists of non-functional requirements

<table>
<thead>
<tr>
<th>Usability</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1</td>
</tr>
<tr>
<td>The system must provide a GUI-based interface and navigation patterns.</td>
</tr>
<tr>
<td>U2</td>
</tr>
<tr>
<td>The system must provide visibility the state system, i.e. it is necessary show the user the place where he is navigating.</td>
</tr>
<tr>
<td>U3</td>
</tr>
<tr>
<td>The system must provide phrases and concepts familiar to the user rather than system-oriented terms.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accessibility</th>
</tr>
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<tbody>
<tr>
<td>A1</td>
</tr>
<tr>
<td>The system must provide alternative text for sonorous and visual content.</td>
</tr>
<tr>
<td>A2</td>
</tr>
<tr>
<td>The system must ensure the perception of content and graphics elements even when viewed without colors.</td>
</tr>
<tr>
<td>A3</td>
</tr>
<tr>
<td>The system must use correctly HTML tags with proper structural elements and style sheets to control presentation.</td>
</tr>
</tbody>
</table>
• To carry out the activities that are part of Web engineering, it is necessary to perform them in accordance with a process or development method.

(Web Engineering Process Framework)

(Pressman and Lowe)
The first contact with users happens in the communication phase and it is necessary to consider accessibility and usability from that moment.
Theoretical Background
Web Engineering

• The first contact with users happens in the communication phase and it is necessary to consider accessibility at that moment.

To collect and formalize business needs and description of objectives.
The first contact with users happens in the communication phase and it is necessary to consider accessibility and usability from that moment.

**Theoretical Background**

**Web Engineering**

- Activities:
  - Formulation
  - Requirements elicitation
  - Negotiation

**Diagram**

- Communication
- Planning
- Modeling
- Implantation
- Construction

Beginning and end of each cycle
Theoretical Background
Web Engineering

• The first contact with users happens in the communication phase, then it is necessary to consider accessibility and usability in this moment.

Requirements
Elicitation
Formulation
Negotiation

Requirements are a list of features required by the customer (functionality)

Communication
Beginning and end of each cycle

Planning
Modeling
Implantation
Construction
Theoretical Background
Web Engineering

The first contact with users happens in the communication phase, then it is necessary to consider accessibility and usability in this moment.

Activities

- Formulation
- Requirements elicitation
- Negotiation

To match what users want to do in the system (functionalities) and how they can use it (accessibility and usability).

Communication

Beginning and end of each cycle
Pressman and Lowe defined 5 tasks for Requirements elicitation:

1. Describe the Web system
2. Define users’ categories
3. Develop requirements document
4. Develop usage scenarios
5. Indicate the efforts of each use case

(Pressman and Lowe)
Pressman and Lowe defined 5 tasks in Requirements elicitation:

1. Describe the Web system
2. Define users' categories
3. Develop requirements document
4. Develop usage scenarios
5. Indicate the efforts of each use case

To describe the goals and objectives of the Web system that will be developed.
Pressman and Lowe defined 5 tasks in the Requirements elicitation activity:

1. Describe the Web system
2. Define users' categories
3. Develop requirements document
4. Develop usage scenarios
5. Indicate the efforts of each use case

To define descriptions for each category, i.e., according to skill level, users' role, etc.
Theoretical Background

Requirements elicitation

• Pressman and Lowe defined 5 tasks in Requirements elicitation:

  1. Describe the Web system
  2. Define users' categories
  3. Develop requirements document
  4. Develop usage scenarios
  5. Indicate the efforts of each use case

To create a document that describes functional and non-functional requirements
Theoretical Background
Requirements elicitation

Pressman and Lowe defined 5 tasks in Requirements elicitation:
1. Describe the Web system
2. Define users' categories
3. Develop requirements document
4. Develop usage scenarios
5. Indicate the efforts of each use case

To describe how a user interacts with a specific function of the system.
Pressman and Lowe defined 5 tasks in Requirements elicitation activity to identify the effort required to develop each usage scenario defined.

1. Describe the Web system
2. Define users' categories
3. Develop requirements document
4. Develop usage scenarios
5. Indicate the efforts of each use case
Theoretical Background
Usability and Accessibility

• **Accessibility** and **usability** are crucial factors in the development of Web systems because they are designed to allow for interaction and increase people's satisfaction when they are interacting with computers.

• Reasons that justify investment in these factors (Shneiderman):
  – increase competitive advantage
  – the perceived value of the system
  – minimize subsequent costs
Extending the Web Engineering Process Framework

- Web Engineering Process Framework

1. Describe the Web system
2. Define users' categories
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5. Indicate the efforts of each use case
Extending the Web Engineering Process Framework

- Extending Web Engineering Process Framework

Tasks have been added to consider the **accessibility** and **usability** characteristics in Pressman and Lowe tasks.
Extending the Web Engineering Process Framework

1. Describe the Web system
2. Define users' categories
3. Develop requirements document
4. Develop usage scenarios
5. Indicate the efforts of each use case

2.1 Define types of disabilities
3.1 Check checklist of accessibility and usability
4.1 Check restrictions of users
5.1 Indicate the efforts of each accessibility and usability characteristic
In **task 2.1** the types of users’ disabilities should be defined according to this list:

<table>
<thead>
<tr>
<th>Disabilities</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hearing Disability</strong></td>
<td>These users have difficulty in accessing (perceive/hear) certain information that is available through of audio devices.</td>
</tr>
<tr>
<td><strong>Physical Disability</strong></td>
<td>These users have difficulty in controlling keyboard, mouse or any assistive technology and some interactions usually end up spending more time than a normal user.</td>
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<td><strong>Mental Disability</strong></td>
<td>These users have difficulty in understanding the meaning of Web content.</td>
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<tr>
<td><strong>Visual Disability</strong></td>
<td>These users have difficulty in accessing information from texts, graphics, pictures, flashes, videos, etc.</td>
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<td>Association of two or more deficiencies.</td>
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Extending the Web Engineering Process Framework

1. Describe the Web system
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1.1 Define types of disabilities
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Extending the Web Engineering Process Framework

• Examples of checklists

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Extending the Web Engineering Process Framework

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1.1 Define types of disabilities
2.1 Check checklist of accessibility and usability
3.1 Check restrictions of users
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In task 4.1 it is necessary to define requirements to support the interaction of the user with the system considering disabilities noticed in the task 2.1 and checklists of usability and accessibility in the task 3.1.

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The system must provide subtitles or transcripts

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<td>These users have difficulty or any assistive technologies result in them spending more time.</td>
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<td>These users have difficulty understanding and processing information about Web content.</td>
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The system must ensure that the contents are accessible using the keyboard using few keys.
Extending the Web Engineering Process Framework

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The system must show information about the total context of the web system.
The system must increase the contrast of colors, including graphics, fonts and backgrounds.

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Consider one or more solutions according to disabilities noticed.
In task 5.1 the effort of each requirement must be defined.
The system must provide subtitles or transcripts

Effort Indicator *
*(1 to 4)

The system must ensure that the contents are accessible using the keyboard using few keys

The system must show information about the total context of the web system

The system must increase the contrast of colors, including graphics, fonts and backgrounds
Extending the Web Engineering Process Framework

Indicating this effort means:

Accessibility and usability requirements are as important as other requirements.

Because of that, it is necessary to consider them during the whole development.
These tasks added can support:
- develop a usable and accessible Web system;
- increase quality;
- users’ interaction with web system, since the requirements are the main way to know users, whether or not users with special needs.
• To show how the tasks added to the framework can support web engineering

  − Software called AgendAloca
    http://garapa.intermidia.icmc.usp.br:3000/agendaloca
Case Study

Requirements elicitation

1. Describe the Web system
2. Define users' categories
3. Develop requirements document
4. Develop usage scenarios
5. Indicate the efforts of each use case

- Define types of disabilities
- Check checklist of accessibility and usability
- Check restrictions of users

Indicate the efforts of each accessibility and usability characteristic

AgendAloca
• AgendAloca is a Thesis Committee Manager System used at USP
Case Study

• Users of this system:
  – STUDENTS: can access the system to schedule date and hour of the presentation
  – PROFESSORS: can access the system to choose in which examination committee they will participate as evaluators
• **Multiple disabilities** – because there is not a specific disability in the target group of users of this system
• Example:

  – Functional Requirements

  • The system must ask for: USP number, full name, email address and category to register users

  • The system, after registration, must automatically create a password that will be sent to the users’ e-mail ...
Case Study

- Non-functional Requirements
  - Usability
    - The system must show the state of the system, i.e., it is necessary to show the user where he is navigating...
  - Accessibility
    - The system must provide text as alternative for sonorous and visual content...
Case Study

View System Information

<table>
<thead>
<tr>
<th>Use Case</th>
<th>View System Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Actor</td>
<td>Student, Professor</td>
</tr>
<tr>
<td>Goal</td>
<td>This use case describes the actions the user to query the system information.</td>
</tr>
<tr>
<td>Start</td>
<td>The user decides to view the information about the marking system stalls.</td>
</tr>
<tr>
<td>Identifier(s) satisfied the requirements</td>
<td>R20</td>
</tr>
</tbody>
</table>
| Scenario:         | 1. This use case begins when the user hits the "About" menu.  
                   | 2. The system presents information on the page as: system version, responsible for the system, contact the person responsible, etc.. |
| Priority:         | Low                     |
| When available:   | Second increment         |
| Frequency of use: | Low                     |
### Case Study

#### View System Information

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2. The system presents information on the page as: system version, responsible for the system, contact the person responsible, etc.. |
| Priority: | Low |
| When available: | Second increment |
| Frequency of use: | Low |
| Interaction: | • Via PC-based web browser and internet connection.  
• Accessibility: Via web browser with a screen reader.  
• Accessibility: Via keyboard. |
## Case Study

### Use Case Table

<table>
<thead>
<tr>
<th>Use Case Number</th>
<th>Description</th>
<th>Effort indicator*</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>10</td>
<td>Provide subtitles or transcripts</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Provide breadcrumb</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Ensure terms familiar to users</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Give a search area</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Provide keyboard access</td>
<td>4</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
Case Study

Thesis Committee Manager AgendAloca
Graduation Supervised Project I and II

Login
Forgot your password?

2012 © | Help | About the system

University of Sao Paulo (ICMC/USP)
Case Study

- Examples of the use of accessibility and usability non-functional requirements in AgendAloca
Case Study

- Examples of the use of accessibility and usability non-functional requirements in AgendAloca

Contrast of colors
Case Study

• Examples of the use of accessibility and usability non-functional requirements in AgendAloca

Options to make the letter bigger or smaller
Case Study

• Examples of the use of accessibility and usability non-functional requirements in AgendAloca

Text alternative for sonorous and visual content
Case Study

- Examples of the use of accessibility and usability non-functional requirements in AgendAloca
Case Study

- Examples of the use of accessibility and usability non-functional requirements in AgendAloca

Help and documentation
Case Study

- Examples of the use of accessibility and usability non-functional requirements in AgendAloca

Searching area where the user can search what he/she wants
Case Study

- Examples of the use of accessibility and usability non-functional requirements in AgendAloca
Case Study

• Examples of the use of accessibility and usability non-functional requirements in AgendAloca

Breadcrumb to show the path that the user navigated in the system
Advantages and Limitations

• Considering accessibility and usability characteristics will support people with disabilities as well as people without disabilities

Promoting more inclusive Web and increasing the quality of Web system
Advantages and Limitations

• Accessibility and usability must be considered during the whole Web engineering process

• Considering accessibility and usability just in a specific activity do not guarantee accessible and usable system
As future work, we intend to ensure that the accessibility and usability requirements will be added in other activities in each phase of the Web engineering process.
References

References

Thank you very much!

• Contacts:
  – anadias@icmc.usp.br
  – renata@icmc.usp.br
  – masiero@icmc.usp.br

• URL:
  – http://www.labes.icmc.usp.br/~anadias
  – http://garapa.intermidia.icmc.usp.br:3000/agendaloca