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ICT - Information and Communication Technologies Theme

D3.5 User Interface Guidelines for Cycle 2

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Work Package Leader: Dr Kuo-Ming Chao (University of Coventry)

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Table of Contents

Executive Summary	4
Background and Motivations.....	4
Relationship with Deliverable D3.4	5
Deliverable D3.5 User Interface Guidelines for Cycle 2.....	5
User Interface guideline for DEHEMS	8
User Interface Design Methods.....	10

Executive Summary

This document is concerned with user interface (UI) design guidelines and principles as defined in Deliverable 3.5. It is important to device guidelines that are easy to follow and ultimately result in an effective and interesting user-system interaction. The general guidelines on user interface design are prepared by mining research literature and studying well accepted approaches to user interface design and usability.

The main objective of this deliverable is to provide UI design guidelines for designing an effective UI for DEHEMS system which is intuitive, clear and easy to use and understand. Our focus in this document is on web based user interface design rather than command line interface, because DEHEMS is intended to provide a web based GUI (Graphical User Interface) to its users.

This document will serve as a guideline for design and implementation of user interface design in cycle 2 of the DEHEMS project.

Background and Motivations

User Interface plays an important role in acceptance or rejection of a system by its users. A system with a good user interface design addresses the issues concerning usability, look and feel; and easy interaction of users with the system. A poor UI design can cause frustration and distress may even drive some users away from using the system.

The focus of the UI design guidelines is how to make DEHEMS system's user interface better for the users keeping in mind their goals, needs, skills and experience. The guidelines are meant to ensure that user's needs and goals are at the heart of UI design decisions.

In UI design well known and well accepted guideline and usability principles will be adhered to. DEHEMS users' interaction with the system is through a web browser. Our goal is to provide well-designed interfaces and screens to DEHEMS users in order to enable them to interact with DEHEMS in a user friendly and enjoyable way.

The majority of guidelines provided in this document are applicable to both graphical and command line environments, even though our main emphasis is on graphical environment.

Relationship with Deliverable D3.4

The deliverable D3.4 is concerned with user interface guidelines for Cycle 1. The focus of D3.4 is mainly on accessibility and browser compatibility aspects of the UI. This deliverable focuses on overall user interface design guidelines that will be followed in DEHEMS system user interface design. In fact this deliverable is extension of D3.4 and gives detailed UI design guidelines that are important for maintaining consistency in interface design and development; and ensures the usability of the DEHEMS system .

Deliverable D3.5 User Interface Guidelines for Cycle 2

The aim of this deliverable is to provide guidelines for developing effective and user-friendly UI. These guidelines are specifically concerned with contents of UI screens and facilitate the best way to present information on the screens. There are two groups of guidelines concerning general guidelines for UI design and specific guidelines concerning DEHEMS website. The DEHEMS website UI design guidelines are prepared following feedback from Birmingham, Manchester, and Bristol living labs.

Following are general guidelines for UI design compiled from research literature and text books on UI design^{i,ii, iii, iv, v, vi}

1. Consistency

- User interface should behave in consistent ways all the time for all screens
- Terminologies and icons used between various screens must be consistent
- Colour should be consistent between screens of similar functions

2. Simplicity

- Break complex task into simple tasks
- Use similar object to perform similar actions
- Give users only what they need to perform their tasks
- Break long sequence into separate steps
- Use icons that users are familiar with

3. System Messages

- Use specific and constructive words in error messages (e.g. avoid general message such as “invalid entry”)
- Provide user centered wording in messages
- Avoid using threatening and alarming messages (e.g. illegal command)
- Make system to take blame for errors (e.g. illegal command vs. unrecognized command)

4. Human Memory Limitation

- Do not flash important information onto screen for brief time period
- Organize information into a small number of chunks
- Provide ongoing feedback on what has just happened
- Let user recognise rather than recall information.
- Minimise memory loads by limiting quantity of information

5. Feedback

- Let the user know that computer is working and that it received and respond to user action.
- Provide appropriate feedback (e.g. feedback that confirms the physical operation user just did. This may include all forms of feedback such as system beep and, mouse clicks, etc).
- Provide appropriate semantic feedback (e.g. feedback that confirm the intention of an action like “are you sure you want to delete this record”).
- Provide appropriate status indicators to show progress of lengthy actions performed by the users (e.g. copy bar when saving a file)

6. Cognitive Directness

- Minimise mental transformation of information
- Use meaningful icons and letters
- Use appropriate cues such as direction arrows

7. Attention

- Use attention grabbing techniques cautiously (e.g. over using of blinks and flashing messages etc.)
- Don't not use more than four different fonts sizes per screen
- Don't use all upper case letter, user mix of upper and lower case letters
- Use high contrast colour
- Do not put red text on blue background

8. Display

- Use balanced screen layout - try to balance information in each screen quadrant
- Group information logically
- Make sure screen changes little from one screen to the next within a functional task situation
- Use easy to use icons.

9. Individual differences

- Accommodate individual differences in user experience (from novice to expert user)
- Accommodate user preferences by allowing them to some degree of customisation of screen layout and appearances etc.
- Allow alternative forms of commands (through key combination)

The above mentioned guidelines are generic in nature and they are applicable to both web based UI and handheld devices UI.

User Interface guideline for DEHEMS

Following UI considerations and guidelines should be taken into account while designing DEHEMS user interface. These guidelines set minimum requirements, so the designers are free to use their creativity to make user interaction with DEHEMS system entraining and engaging.

1. Ease of Comparison of Energy Consumption Data: The DEHEMS user interface should enable users to make their energy comparison based on choices shown below. These choices are not exhaustive list of comparison that DEHEMS' users would like to make; further choices can be included as required. This functionality could be implemented as dropdown menu, in order to eliminate chance of user's typing errors.
 - Who is best in terms of energy usage in my locality?
 - What appliance in my home is consuming most energy?
 - What is my energy consumption compared to average energy consumption of others in my Street/City or similar house
2. Information Display:
 - Tabs should be used instead of text links with small font (Currently main page of the DEHEMS does not have any tab)
 - User should be able to increase and decrease font size. Some information in current website is put in small font, so they are difficult to be read by some users.
 - Dashboard: Current site has small fonts; tab should be used to display information on dashboard page.
 - Contrasting colour combination should be used in energy consumption graph (Current green and purple combination is not an effective combination)
 - X-axis and Y-axis of graph should values of x-axis and y-axis displayed.
 - Graphs should be displayed in different shapes e.g. pie and bar etc.
 - Graph information should be explained rather than just displaying two numbers when cursor is put in graph.
 - Avoid displaying false/misleading figures on energy saving

3. Alerts

- Sound Alert (Critical points, for example when one exceed their set target of energy usage)
- DEHEMS website should allow users to register to receive SMS alert on events of their interest.

4. Convenience

- Give option of remembering password on specific computers
- If the users forget their password, they can be recovered via email

5. Summary Information and Energy Saving Tips

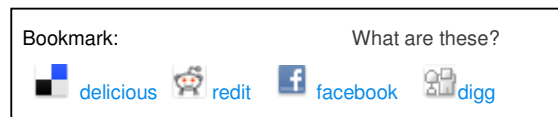
- Monthly summary information on energy consumption should be available to users for saving on their local machine
- Tips should be displayed dynamically on side in panel

6. Appliances


- Users should be able associate devices with other house members. User should be able to view list of his appliance and then select appliance he/she wants to register with other house member (Multiple selection allowed).

7. Social Networking

Booking marking icons for social networking should be provided at bottom of the page e.g.



8. Help and FAQ

- Help icon should be displayed on labels of various fields and other relevant places to provide explanation e.g. 
- A tab of FAQ should be provided

User Interface Design Methods

There are three commonly used methods for user design.

Wireframing:

When creating a usable UI for a web based application one of the most important things to do is to make sure that the user interface is planned well before you start building. The most common and reliable way to plan an interface is to create wireframes. A wireframe is a simply sketch of how the layout of the website should look and behave. It is a layout of a web page that demonstrates what interface elements will exist on key pages. Wireframes are useful for conveying the general page structure and content requirements for individual web pages. The main advantage of wireframe is that it ensures that the page content and functionality is positioned correctly based on user and business needs. The focus of wireframes is on content, labels and structure rather than the visuals.

User Flow Charting and Storyboarding:

Flow charting and storyboarding are used to decide what the exact sequence of screen should be that user has to traverse. They offer a high-level view of the interface of a system. A storyboard is like a wireframe, but instead of one sketch a series of detailed interfaces are wireframed in order to step through sequence of screens.

They are useful for facilitating high level communication between users and UI designer but their ability to check errors in design is limited^{vii}.

Prototyping:

Prototyping is typically done in preparation of usability test. Instead of trying to figure out the pitfalls and problems of the design from the designer's point of view, the design is handed to the actual users for testing.

There are two types of prototypes:

1. Paper prototypes: They are similar to wireframes in that they are hand drawn interfaces on a paper. Testing with paper prototyping is done very early in the development cycle.

2. HTML/CSS prototype: It allows early testing of web site. It is a cost effective way of testing interfaces before creating a full blown web site.

During first cycle of DEHEMS HTML/CSS prototype method is used. Cycle 2 will also employ this method due to its proven effectiveness of the method in cycle 1.

Minor Issues with Current User Interface

1. Duplication of login / register functionality on main page. One of them should be removed.
2. Under Live Energy Usage, three columns representing information on lowest live usage, DEHEMS average and highest live usage are confusing. Explanation of the information is required. Explanation may be provided by allowing user to click on a question mark next to labels and displaying descriptive text.
3. The background colour of DEHEMS users and total energy usage counters displays are not consistent, background colours of the last digit of the energy usage counter is purple.
4. On Dashboard page following changes are recommended:
 - Last update information needs to be removed from top purple bar, it is not consistent with other pages.
 - Label such as “Current live energy usage” should be below the meter indication usage.
 - Energy usage graph should be modified to show scale both on x-axis and y-axis. Explanation needs to be provided for these values.
 - Three tabs (kwh, cost, CO2) under “usage so far for this month” labels. Are they only applicable to monthly usage? Such tabs are missing from live energy usage meter.
 - Reduction of information on this page - there should be separate sections based on logical separation of information, so users can get relevant information easily without trying hard to figure out what is what?
5. Colour: Most users do not find purple and green colour combination an attractive combination. The designer should consider user other colours with green.

Conclusion

User interface is concerned with the way an application's functionality is presented to its users. User interface is as important as system functionalities. It plays a pivotal role in acceptance and rejection of its application by the users. An application that is difficult to use will not be used by its users. It is important to have a set of user interface guidelines in place that ensures easy, intuitive and meaningful interaction with the system. In this deliverable, we have conducted literature review to identify a list of good practices for designing UI. We also conducted interviews with end users to obtain their feedback on the use of the current design. As a result, we combine the above findings to make recommendations. This deliverable provides UI guidelines that will be adhered to in creating user interface for the DEHEMS system.

Future Development

In this deliverable we have provided general guidelines for user interface and specific or local guidelines for DEHEMS user interface. We have also pointed out some issues with DEHEMS current user interface that are not inline with the UI guidelines. The future work on UI design guidelines will be focused mainly on local rules or style guide for DEHEMS system and evaluation of user interface to ensure that guidelines were followed in creation of the DEHEMS interface.

Implication for other work packages

This deliverable has direct implication on D2.13. Deliverable D2.13 is concerned with actual user interface design of the DEHEMS system. The UI design will be carried out adhering to UI design guidelines provided in this deliverable.

ⁱ Wilbert O. Galitz, The Essential Guide to User Interface Design, John Wiley & Sons, Inc, 2002.

ⁱⁱ Jakob Nielsen, User Interface Direction for the Web, Communication of the ACM, 1999.

ⁱⁱⁱ Geraldine Fitzpatrick, Greg Smith, Technology-Enabled Feedback on Domestic Energy Consumption: Articulating a Set of Design Concern, Pervasive Computing IEEE CS, 2009.

^{iv} Leham H. Reeves, Jennifer Lai, James Larson, Guidelines For Multimodal User Interface Design, Communication of the ACM 2004.

^v Jakob Nielsen, Ten Usability Heuristics, http://www.useit.com/papers/heuristic/heuristic_list.html

^{vi} Scott Meyers, The Most Important Guideline? Design, IEEE Computer Society, 2004.

^{vii} Deborah L. Stone, Stone, Caroline Jarrett, Open University, User Interface Design and Evaluation,