Applying Heuristics Evaluation to Improve the Usability of Malaysia Accounting Training Management System

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Abstract. The website is a connection of communication between the organization and their customers. By using web applications customers can obtain information and deal with the organization. The user interface and the interface design of web-based application affect the interest and attention of the customers. The consideration of web navigation, web usability and web accessibility are compulsory to make a website was designed in a user-friendly format. This study aimed to evaluate system based on issues of interface design with focusing on human-computer interaction and user interface design which are error human handling and accessibility. The questionnaire based on questions from the User Interface Usability Evaluation (User Interface Usability Evaluation) was conducted to obtain feedback on the system developed. The findings and results of the questionnaire was used to assess whether the training management system design interface both in terms of handling and ease of access error information (error information handling and accessibility).

1. Introduction

Website become a common place that any information about the business of the organization was shared and displayed. The website become as a connection of communication between the organization and their customers. The user interface and the interface design of web based application affect the interest and attention of the customers [1][2]. Interface can be describing as a layout of the website. User interface can be deliberated as all aspects of information system which related to the users. Interface design for website must be made properly to get positive perception of the user on the contents and services provided in the website. It also must be prepared to facilitate the user's needs and make sure that the interface has elements of an easy to access, easy to understand, and easy to use [3][4].

Wells et al. [5] mention that website design with attractive visual make positive perception to the customer. The consistency, aesthetic, and the attractiveness of the website's appearance such as images, colors, fonts, shapes, animations, and layout reflect the visual design of a website [6]. Selection of the interface elements must be consistent and predictable because it will help in the task completion, efficiency and satisfaction [7].

In this study, Training Management System(TMS) for National Accounting Institute was evaluate using heuristic evaluation criteria. The module evaluates include the functioning for training information details, apply for training offered, training status and reports modules. The design issues that evaluated were error information handling and accessibility.
The rest of this paper is organized as follows. Section 2 presents background and related work, while section 3 gives the explanation research methodology, Section 4 presents experiment and Section 5 discuss about results of the study.

2. Background and Related Work

2.1. Definition

In order to establish the scope and get an overall picture of the adopted terms used in interaction design and human computer interaction in the web-based system or application and to ensure uniformity throughout this paper, we present the following definitions, organized in alphabetical order:

- **Human computer interaction (HCI)**: Comprises the study of human-computer interaction with the overall objective of informing the design of more humanly acceptable technology. HCI focuses on empirical methods to identify the most credible and valid interface design rules. From the HCI view, several main problems arise in the design of web-based training, the instrument, the customers, the activities and the environment [8].

- **Interaction design**: Connecting the digital environment with the human being. This link enables users to use digital products and devices, from desktop computers, phones and watches to websites, applications and games [9].

- **Interface design**: Refers to User Interface Design, which focuses on predicting what customers might need to do and ensuring that the interface has components that are simple to access, comprehend and use. Selection of the interface elements must be consistent and predictable because it will help in the task completion, efficiency and satisfaction [7]. The interface elements are including input controls, navigational components, informational components and containers.

- **Information architecture (IA)**: Focuses on organizing, structuring, and labelling content in an effective and sustainable way. The goal is to help users find information and complete tasks.

- **Visual design**: Focuses on the aesthetics of a site and its related materials by strategically implementing images, colors, fonts, and other elements.

2.2. Related Work

Existing Training Management System that have been taken into account and analyzed for their available features in comparison with the development of new TMS development system is IPN (Institut Perakaunan Negara). IPN was established to provide accounting and financial training to civil servants in Malaysia. Based on the revision of this system, there are some drawbacks found as listed in Table 1 which encloses the whole system.

**Table 1.** The list of issues in the existing TMS.

| Issues                        | Explanation                                                | Suggestions                                                                 |
|-------------------------------|------------------------------------------------------------|------------------------------------------------------------------------------|
| Long main page display        | Need to scroll down to get all information in the main page | The main page should display in exact page without any scroll                |
| Unorganised Menu              | In main page, menu stated by displaying as image but in other pages, its display in texts. | Menu must state in one place either on top or other places to make it easy to access |
| Redundant Information         | Menu and other information were                           | Menu and other information must be                                          |
A study of the existing system is also done based on the principles of usability heuristics based on stated principals [10]. The main aspect that flawed throughout the system is the design. The organization and consistency of design has failed to follow the usability heuristics for user interface design such as consistency and standards, as well as aesthetic and minimalist design.

The Table 2 shows the revision of the existing system based on the principles of usability heuristics.

| Principles                          | Details                                                                 | Availability in Existing TMS (Yes / No) |
|------------------------------------|-------------------------------------------------------------------------|----------------------------------------|
| Long main page display             | Need to scroll down to get all information in the main page             | No                                     |
| Match between system and the real world | Use the users' language, with words, phrases and concepts familiar to the user | No                                     |
| User control and freedom           | Support undo and redo                                                   | No                                     |
| Consistency and standards          | Users should not have to wonder whether different words, situations, or actions mean the same thing | No                                     |
| Error prevention                   | A careful design is better than good error messages to prevent a problem from occurring in the first place | No                                     |
| Recognition rather than recall     | Minimize the user's memory load by making                                | No                                     |
Flexibility and efficiency of use
objects, actions, and options visible
Allow users to tailor frequent actions

No

Aesthetic and minimalist design
Dialogues should not contain information which is irrelevant or rarely needed

No

Help users recognize, diagnose, and recover from errors
Error messages should be expressed in plain language, precisely indicate the problem, and constructively suggest a solution

No

Help and documentation
Provide help and documentation which such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large

No

These issues were considered as the initial requirements of the new TMS development. The results from the analysis were used for enhancement and upgrading the quality of the systems based on human computer interaction (HCI).

3. Research Methodology
In this process, a research methodology has been introduced to improve Training Management System in IPN. This research methodology divided into three phases which are analysis, design & development and evaluation as shown in Figure 1.

Figure 1 demonstrates the phases of Research Methodology for this research. It starts with phase 1: analysis on the existing system, design issues, Human Computer Interaction and web application. literature review was conducted based on these topics. Followed by phase 2: designing and developing new TMS based on design issues and implement usability heuristic to produce new TMS embedded with error information handling and accessibility. Research ends with phase 3: evaluation based on questionnaire given to expert users.
4. Experiment
In TMS, emphasis was made to ensure that the Error Information Handling taken into account in the implementation of this system. Certain features were implemented to minimize user errors when entering information and allows users to reduce errors include incorrect information. It is done by providing a helpful message to users and restrict their choice. For example, the user can simply choose the date of appointment prior to today's date as the applicant can only apply after he was appointed. Another, limited choice of the courses that are enrolled in the system which courses can only be selected via the dropdown list.

The implementation of the errors information handling in the web based system development involved the design of the web pages. In this system, design is based on the elements shown in Table 3.

| Element                                      | Function                          | Implementation on the system                  |
|----------------------------------------------|-----------------------------------|-----------------------------------------------|
| Avoid the error occurring in the first place | Avoid a potential error           | Date-picker for Training Date: the user should not be able to select a date prior to today |
| Show the user the field where the error has occurred | The error message shown below the relevant element | Highlight the message text with red colour |
| Use inline validation                        | Correct the error immediately     | Inline validation enables the customer        |
decrease the waiting time before the mistake occurs and decreases the opportunity of data loss in the form

Be polite – don’t blame the user
The message use word “please” and point out how to fix the error
The message should never place blame on the user

Be precise – clearly describe the issue, and how to resolve it
The message is specific
The message specifies the issue to be solved by the user

Reduce the work required to fix the problem
Keep the data that the user has entered
Display the key-in information to see if it appears incorrect and attempt to solve it

The error information handling elements which are related to error prevention heuristic principle are being highlighted in detailed on how the system is preventing the users from being distracted by the errors occurring while usage. Apart from that, this table is highlighting the failure of the developer to implement principle of recognition rather than recall by not displaying the entered data by user. Meanwhile, the elements of the error information handling applied in the TMS shown in Table 4.

**Table 4.** The elements errors information handling applied in TMS

| Element                                | Implementation on the system |
|----------------------------------------|------------------------------|
| Avoid the error occurring in the first place | Date-picker for Tarikh Lantikan: the user should not be able to select a date today or after to avoid a potential error because the date must come first before they apply for the courses |
| Show the user the field where the error has occurred | The error message shown below the relevant field which highlight the message text with red colour |
| Be polite – don’t blame the user       | The message for the error is by using the word “Sila…” |

Accessibility is a significant component of the site design and should be regarded throughout the phase of growth. There is a need to guarantee that all prospective consumers, including disabled individuals, can access the data readily. Accessibility focuses primarily on how a disabled individual can access or benefit from a site, system or application. Accessibility is an significant component of the
site design and should be taken into account throughout the design phase. By making the website accessible, it is necessary to guarantee that all prospective customers, including persons with disabilities, have a good user experience and can access the data readily [9]. By implementing web accessibility best practices, it also can improve the usability of the site for all users [10]. The best practice that is applied in this system are as shown in Table 5.

**Table 5. The accessibility elements**

| Content                  | Best Practice                                                                 |
|--------------------------|-------------------------------------------------------------------------------|
| Consistent Navigation    | Clear and logical designs will benefit the user                               |
| Keyboard Navigation      | The availability of keyboard navigation and hotkey shortcuts for standards keyboard control |
| Prioritize Text Clarity  | Increase clarity of letters and clarity of text blocks                        |
| Colour Code              | A colour code can make faster and more efficient communication               |
| Explanatory Link Text    | Include link descriptions that can be understood independently                |

There are three elements of accessibility that has been implemented in TMS are shown in Table 6 which are consistent navigation, prioritize text clarity and colour code.

**Table 6. The elements accessibility applied in TMS**

| Element                  | Implementation                                           |
|--------------------------|---------------------------------------------------------|
| Consistent Navigation    | Fix menus on the pages                                  |
| Prioritize Text Clarity  | Use suitable letters and text blocks for clarity         |
| Colour Code              | Choose colour code which can make efficient communication with the user |

The questions about User Interface Usability Evaluation were picked from the website of Gary Perlman at http://garyperlman.com/quest/. Only 22 related questions were selected, for the purpose of this study on error information handling and accessibility. These questions were group in four (4) which are System Usability, User Interface Satisfaction, Accessibility and User Guidance. The questions in the questionnaire are shown in Table 7.
| Questions                                                                 | Scale of Selection |
|--------------------------------------------------------------------------|--------------------|
| **System Usability**                                                     | 1 2 3 4 5 6 7      |
| This system is easy to use                                              | strongly disagree  |
| It was simple to use this system                                         | strongly disagree  |
| The system gives error messages that clearly tell me the problems       | strongly disagree  |
| Whenever I make a mistake using the system, I recover easily and quickly| strongly disagree  |
| It is easy to find the Information I needed                              | strongly disagree  |
| The information provided for the system is easy to understand            | strongly disagree  |
| The organization of information on the system screens is clear           | strongly disagree  |
| The interface of this system is pleasant                                 | strongly disagree  |
| **User Interface Satisfaction**                                          | 1 2 3 4 5 6 7      |
| Reading characters on the screen                                        | Hard               |
| Sequence of screens                                                     | Confusing          |
| Position of messages on screen                                          | Inconsistent       |
| Prompts for input                                                       | Confusing          |
| Error messages                                                          | Unhelpful          |
| **Accessibility**                                                       | 1 2 3 4 5 6 7      |
| Does it provide default values in certain field?                        | strongly disagree  |
| Is the shifting among windows easy?                                     | strongly disagree  |
| Is the menu selection by pointing?                                      | Bad                |
| Is the menu selection by keyed entry (key-in)?                          | Bad                |

Table 7. User Interface Usability Evaluation
5. Results
The respondents for the survey were selected from the existing users of the TMS whose are IPN’s Staffs. They are 10 expert users whose position are Accountants (2 users), Accountant’s Assistants (4 users) and office clerks (4 users). The findings of result were divided into four (4) group of feedback, which are feedback on System Usability, User Interface Satisfaction, Accessibility and User Guidance.

Feedback on System Usability are based on eight (8) questions. All these questions must be answered by the scale of 1 (strongly disagree) to 7 (strongly agree). The findings show that most users strongly agree with all the question. For the question of “The organization of information on the system screens is clear”, 100% of the respondents strongly agree that the new TMS has it. There are five (5) questions to get feedback on User Interface Satisfaction. These questions must be answered by the scale of 1 to 7. The scale of selection is different for each question. For Question “Reading characters on the screen” the scale from 1 (hard) to 7 (easy). For Question “Sequence of screens” the scale from 1 (confusing) to 7 (very clear). For Question “Position of messages on screen” the scale from 1 (inconsistent) to 7 (consistent). For Question “Prompts for input” the scale from 1 (confusing) to 7 (clear). For Question “Error messages” the scale from 1 (unhelpful) to 7 (helpful). The finding shows that more than 50% of the users give positive feedback. For the question “Reading characters on the screen”, 80% respondents choose it easy.

Feedback on Accessibility are based on six (6) question. These questions must be answered by the scale of 1 to 7 but the scales are whether ‘strongly disagree’ to ‘strongly agree’ or ‘bad’ to ‘good’. The finding shows that more than 80% respondents agree and replied good for all questions except on the question of “Does it provide default values in certain field? “. Feedback on User Guidance are based on three (3) questions. All these questions must be answered by the scale of 1 (bad) to 7 (good). For all questions, 70% and above respondents replied “good” for all questions. There is one respondent give nearly negative feedback on all three questions.

The results of the questionnaire to the expert users were point out that the characteristics or elements of error handling information and accessibility that have been implemented in the new system has achieved the expected goals to improve the system. Although not one hundred percent agree with such features but it gives positive feedback where more than 50% of respondents admit it. The summary of the results was show in Table 8.

| Does it require minimal cursor positioning? | Bad | Good |
| Does it require minimal steps in sequential menu selection? | Bad | Good |

**User Guidance**

| How helpful is the error message? | Bad | Good |
| Does it provide CANCEL option? | Bad | Good |
| Are erroneous entries displayed? | Bad | Good |

| 1 2 3 4 5 6 7 |
Table 8. The Respondents’ Feedback

| Question                                                                 | Respondents’ Feedback |
|--------------------------------------------------------------------------|-----------------------|
| **System Usability**                                                     |                       |
| This system is easy to use                                               | 80% strongly agree    |
| It was simple to use this system                                         | 60% strongly agree    |
| The system gives error messages that clearly tell me the problems        | 50% strongly agree    |
| Whenever I make a mistake using the system, I recover easily and quickly | 40% strongly agree    |
| It is easy to find the information I needed                              | 70% strongly agree    |
| The information provided for the system is easy to understand            | 90% strongly agree    |
| The organization of information on the system screens is clear           | 100% strongly agree   |
| The interface of this system is pleasant                                 | 50% strongly agree    |
| **User Interface Satisfaction**                                          |                       |
| Reading characters on the screen                                         | 80% easy              |
| Sequence of screens                                                      | 80% very clear        |
| Position of messages on screen                                           | 70% consistent        |
| Prompts for input                                                        | 50% clear             |
| Error messages                                                           | 70% helpful           |
| **Accessibility**                                                        |                       |
| Does it provide default values in certain field?                         | 70% strongly agree    |
| Is the shifting among windows easy?                                      | 70% strongly agree    |
| Is the menu selection by pointing?                                       | 60% good              |
| Is the menu selection by keyed entry (key-in)?                           | 60% good              |
| Does it require minimal cursor positioning?                              | 50% good              |
| Does it require minimal steps in sequential menu selection?             | 40% good              |
| **User Guidance**                                                       |                       |
| How helpful is the error message?                                       | 40% good              |
| Does it provide CANCEL option?                                           | 70% good              |
| Are erroneous entries displayed?                                         | 60% good              |
Based on feedback from respondents, more than 50% of them gave positive feedback on the TMS. This shows that the system has been developed to have the characteristics of good interface design. There are a small number of respondents giving negative feedback.

6. Conclusion
In this paper, we have presented the details Usability Heuristics Evaluation for National Accounting Training Management System followed by the discussion of adopted terms used in interaction design and human computer interaction in the web-based system or application as well as the existing TMS system that was analysed and stated the improvement to be done in the proposed development. The research methodology, results and surveys have been shared in order to provide a clear version of what is the root of this process and the expected outcome as well.

The development of the new TMS that takes into the elements of error information handling and accessibility have been implemented as described. Evaluation through questionnaires to actual users of the system showed that most of our users agree that this system has been improved in terms of interface design.

A further research must be done on the system because the system is not covered all the function in TMS. More studies need to be done on other considerations design issues such as internationalization. This system can be improved by using a bilingual and can be accessed through the mobile application.

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