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Study of Information Architecture using Card Sorting Technique: A Case in Inland Revenue Board of Malaysia, Official Website

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ABSTRACT

A high increase number of web applications can be seen from days to days where people foresee that searching information using a web portal make life easier and simplify daily task. Due to this demand, the increase numbers of online web applications are not only applied to e-commerce but also to academics and government field itself. Malaysia has been seen to keep in pace with this demand and many e-government websites are now accessible by the citizens online. By providing online platform, citizens are now having more options in resolving matters related to e-government and no longer need to always walk into the physical buildings. However, providing an online platform only is not reliable if the information or services placed in the web portal is not user-centred. This study will perform a study on current Information Architecture (IA) in Inland Revenue Board of Malaysia (Lembaga Hasil Dalam Negeri Malaysia (LHDN)) official website. Information Architecture (IA) is a discipline in determining an efficient way on how information in online website should be arranged in order to deliver information effectively and efficiently. From the preliminary study conducted, respondents felt that it is not easy to search for intended information on LHDN web portal as the arrangement of menu are not fulfil respondents' logical relationship. Web observation on LHDN official website has also carried out to observe and finally identified problems in term of information architecture. The objectives of this research are to investigate issues relating to information architecture on LHDN official web portal, to evaluate existing information arrangement used on LHDN official web portal using card sorting analysis and to propose a user centred Information Architecture's mainframe for LHDN official web portal. With the collected requirements from the questionnaire, this study will propose a user-centered information arrangement for LHDN official web portal. Card sorting technique will be used in this study to see respondents' logical mental model in arranging and grouping set of menus in LHDN official web portal. Findings from this study can be used a support alternative for the website architect to enhance LHDN information architecture hence all the information and services provided on the web portal can be fully utilized and improve users' browsing experience.

Key words: Web portal, Information Architecture (IA), card sorting technique, e-government, user-centered information

1. INTRODUCTION

Web portal is a web application that provides services in terms of information-guidance to the user. Reference [1], stated that there are wide meanings of web portal defined by different people. A web portal serves as a web service that guide users to the right information needed. A Web portal also a gateway to information and services from multiple sources that facilitate users and allow access to the content in one or more learning repositories [2].

Since Internet usage is rapidly growing and demandable, government institutions have been seen to come with own-defined web portal. Malaysia nowadays also promoting the use of Internet and has been seen to keep pace with the rapid development of Information Technology. As according to [3], Malaysia government has launched the Electronic Government initiative which generally known as

e-Government. E-government which also known as e-gov, defined as a diffused neologism used to refer to the use of information and communication technology (ICT) to provide and improve government services, transactions and interactions with citizens, businesses and other arms of government [4].

However, regardless of increasing number of online web portal are being developed todays, there has been number of issues with web portal either in terms of usability or reliability. It is a common issue where there are websites that has been not designed in efficient ways in terms of information structures, accessibility to the website, the interface used are not convenient to the users and many more. These entire issues can result to the disappointed users and bad browsing experience will caused users leaving the website without getting the acquired information, products or services that users are looking for. In Malaysia, Malaysia Government Portal and Websites Assessment (MGPWA) is an assessment body which responsible to ensure that all Malaysia's e-government sites are comply with the defined standardization [5].

The way of how information is placed in a web portal to be understandable is defined as Information Architecture. Information architecture is created by the American architect Richard Saul Wurman in 1875 which is after the popularization of computer networks [6]. The creation of Information Architecture (IA) has been identified as a method that can increase competitiveness, enables cost reduction as well increase productivity in organizations [7]. Information architecture is a form of information planning for information control, decision making and IT development where it develops principles that reflect business requirements for information, applications and IT infrastructure [8]. Information architecture objective is to provide value of information to the business as well as information utilization guidance for businesses. As according to [9], information architecture helps organization to develop information-centric organization and information consistently. The most widely used definition for information architecture was written by Peter Morville and Lou Rosenfeld [10] in which they defined Information Architecture as the structural design of shared information, the combination of organization, labelling, search and navigation systems within web sites and intranets, the art and science of shaping information products to support usability and find-ability and an emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape. Since each of website uniquely different in terms on functionality, there is no specific wireframe for website information architecture [11]. However, there are two main basic things for Information Architecture which are identification and definition of site contents or functionality and the underlying organization, structure that define relationship between a site's contents or functionality.

Usability has become a common and important criterion for successful products including the information component of the products. Development of a software product needs to be evaluated to ensure that it meets the objective [12]. Usability defined as the extent to which a product can be used by specific group of users to achieve defined goals with efficient, effective and satisfaction [13]. One of the most important aspects of software quality is usability where [14] defined as the degree which a software product can be used by certain users, fulfilling some factors such as efficiency, efficacy and satisfaction.

Card sorting is a one of the popular techniques that commonly used in order to get the user requirement especially in arranging information on the web site. Card sorting is a user-centered design tool capable of increasing the usability of a system and improving the design of the interactive systems [15]. It is a methodology that can be used to capture users' mental models of how information is organized in a software interface [15]. Aligned with the increase in new technologies that rapidly developing recently, the numbers of novice users that lack of skills in computer science has grown exponentially. Therefore, applications can easy to be used when the applications conform to the user' mental models. As according to [16], card sorting technique is defined as an established method for knowledge elicitation and has been widely used in various fields such as Psychology, Knowledge Engineering, Software Engineering and Web Site Design. Card sorting is useful in the early stages of design, when first grappling with what word to use for the label links that will make up the navigation structure of a Web site [17]. In a nutshell, card sorting techniques provide a good base for a structure of a system or website.

Good information architecture resulted to an effective web portal where users can search for the intended information easily. Therefore, it is important for the web developer to come out with a good information architecture designed which can lead to the usefulness of the web portal and increase users' browsing experience. As according to [18], information architecture determines how to organize the site's content, how to design structure so that users can quickly find the required information.

2. PROBLEM STATEMENT AND RESEARCH BACKGROUND

This research aim is intended to identify the effectiveness of the information architecture used in Lembaga Hasil Dalam Negeri Malaysia (LHDN) official website in terms of information's grouping and arrangement. LHDN official

website is a web-based system that provides information and services where users of the website can perform activities online. Even though LHDN is generally known as Malaysia government agency that specialized in taxes, there are still other services provided by LHDN to the citizens. For examples, information on tender prices, stamped duty rulings and self-financing services. Since numerous services being offered by LHDN, the official web portal will be accessed by many levels of users differs in terms of age, education background and careers scope.

Table 1:: Information Architecture Problem in LHDN web portal

Organization of Information	Consistency of Navigation
• Certain menu does not group together for example, e-Filing menu. This is the most popular menu especially early in the year where citizens are required to declare yearly income. There are main menu groups shows in main page as *Individual, Company, Employer, Tax Agent* and *Stamp Duty*. Thus, users who are looking for e-Filing will logically be clicking on either *Individual, Company* and *Employer* which represent themselves but unfortunately, they cannot locate this option as it was placed another area at the main page. • Menu for yearly *Monthly Tax Deduction* (MTD) scheduler and online calculator is grouped under Employer main menu where certain users who browsing the website as an *Individual* will also investigate this option to get information on yearly taxes to calculate their income tax monthly deduction. For users who do not much time to explore the website will leave the website and preferred to use search engine browser to look for this information. This can lead to unoptimized utilization of information even though the information is having been placed accordingly.	• There are few icons which leads to another browser upon clicking. Certain of these new websites which open in a new browser does not provide constant navigation to the main official website. • In the meanwhile, if users clicked on another icon i.e *e-SURVEY*, users can go back to the main LHDN official website by clicking on LHDN wording at the bottom of the page.

From the preliminary study conducted, most of users are mainly accessing LHDN official website to simplify their taxes enquiries. The services provided in LHDN website related to tax includes types of taxes, how to pay the taxes, downloadable forms and numbers of announcements and news on taxes and many more. This information is being accessed by different type of users which looking necessary information either as an individual, employer, and organizations. However, not all the information provided on the LHDN web portal are fully utilized by the users. Most of the users browse the LHDN web portal just to download forms or just to get an info related to their tax's enquiries. Since this research is focusing on Information Architecture (IA) thus the preliminary study earlier was done in identifying problems in terms of arrangement and navigations between the menus displayed in LHDN official website. This was achieved by conducting interview session with ten respondents. Table 1 presents the summarized result on the problem statement.

According to [19], the portal is designed to present only the information and tools that each user needs, without the clutter of information and tools that he or she does not use. Because of the complexity of the websites, users may find it hard to "help themselves" and to find the information they need [20]. As a result, users might give up in finding the required information on the website and will stop browsing the website. Information architecture is also significantly related to the usability of the websites. Therefore, what kind of information displayed on the website and how is the arrangement is very crucial since it defined the usability of a web portal as well as helping the users in resolving their inquiry or errands in a timely manner.

3. METHODOLOGY

Methods and steps used in order to carry out this research will be emphasized. All the outcome for each phase in the research methodology will be justified in order to add reliability and validity to this research.

3.1 Planning Phase

This phase, preliminary study has been carried out to gain an earlier sight on this research. Preliminary study is an initial exploration of issues related to a proposed quality review or evaluation. To gain an exploration for this project, an informal interview has been carried out with a random public people as the respondents asking general questions. The most stressed questions asked to the respondents is on the awareness on the LHDN official web portal existence and what are the activities that usually performed by the respondents on the LHDN official website. The respondents also have been asked on how the information arrangement in the web portal helps in acquiring the needed information.

3.2 Information Gathering Phase

Information Gathering phase is a crucial part where all the information will be gathered to develop a better understanding for the researcher to come out with a solid research's field. The LHDN official web portal which is accessible via http://www.hasil.gov.my/ link, has been identified to be used on this project. Web observation on this web portal has been carried out to see the information arrangement structures used. In addition, studies on the related fields to this research has been carried out in order to establish more understanding in conducting this research. The deliverables from this phase will be a literature review on the related topics. Furthermore, a more knowledge in Information Architecture (IA) also will be derived accordingly.

3.3 Data Collection and Analysis Phase

For the data collection activity, a set of questionnaires have been distributed to 40 random respondents and the results from the questionnaire have been analysed accordingly. In addition, a set of informal interviews have been conducted in order to gain more information and to support the data collected from the questionnaire activities. The questions uttered to the respondents includes the awareness of LHDN web portal among the respondents, what are the information that respondents are mostly looked for. Further to that, respondents also have been asked to describe on their feelings towards the menu arrangement placed in LHDN web portal helps in simplifying the tasks to search for acquired information. The Card-sorting technique will be performed with the 20 selected respondents in order to gain an insight and clear view on how the respondents categorizing the menu existed in LHDN web portal currently. For the data analysis, a tool call *UXSort* application will be used to analyse the data obtained from the Card-sorting technique sessions. 14 sets of cards have been created using *UXSort* application and the card sorting exercise has been conducted over 20 respondents as shown in Table 2.

Table 2: List of cards created using UXSort application for this card sorting test

No.	Card's Name	Card's Description
1.	Information Update	Menu where user read the guideline on how to update latest personal information
2.	Tax Exemption	Menu where user can get information on how to do exemption on their taxable income
3.	Tax Online Calculation	Menu where user can be directed to online LHDN e-calculator to calculate monthly tax deduction
4.	Tax payment channel	Menu where user can get information on authorities that can accept tax payment
5.	Tax Agent Application	Menu where user can register as a Tax Agent
6.	New Employee	Menu where user can get information on how to register new employee
7.	Employee Resignation	Menu where user can get a guideline on how to notify LHDN on staff's resignation
8.	Tax Schedule by Year	Menu where user can click to get information on current year/past years tax schedule
9.	TENDER	Menu where user can check current tender issued by LHDN
10.	BUDGET	Menu where user can get latest news on yearly budget released by government
11.	Individual	Menu that define type of user accessing the website
12.	Company	Menu that define type of user accessing the website
13.	Employer	Menu that define type of user accessing the website
14.	Tax Agent	Menu that define type of user accessing the website

UXSort application provides three types of clustering which are Single Linkage, Average Linkage and Complete Linkage. Single Linkage will always measure the minimum distance found between items in each cluster while differ from Complete Linkage where it always measures the maximum distance between clusters' items. While Average Linkage provides accurate evaluation of the distance between clusters as average linkage calculated and averaged the distance between clusters. For this card sorting exercise, Average Linkage will be used to present the analysis result in the dendogram graph.

Name	Title	Company	Email	Phone	Note	Sort Status	Total Buckets	Total Cards
Adibah	Ms				Teacher / 27 years old	Complete	5	14
Pauziah	Madam				Housewife / 55 years old	Complete	4	14
Atirah	Ms				Student / 20 years old	Complete	3	14
Ricky Cheong	Mr				IT Senior Executive // 34 years old	Complete	2	14
Khairina	Ms				QA Tester / 26 years old	Complete	2	14
Arshad Lukman	Mr				Retired staff // 58 years old	Complete	9	14
Asraf	Mr				Productione engineer / 28 years old	Complete	9	14
Nisa	Madam				Housewife / 28 years old	Complete	4	14
Malliga	Ms				Admin staff / 40 years old	Complete	4	14
Liew	Mr				Store keeper / 35 years old	Complete	3	14
Khai Loon	Mr				IT programmer / 25 years old	Complete	3	14
Saw Ping Wai	Mr				IT programmer / 36 years old	Complete	4	14
Anusha	Ms				IT Support / 31 years old	Complete	4	14
Nazreen	Mr				Student / 20 years old	Complete	4	14
Zanariah	Ms				Salesperson / 43 years old	Complete	3	14
Joanne Chong	Ms				HR executive // 32 years old	Complete	4	14
Suraya	Ms				Teacher / 29 years old	Complete	3	14
Chok	Mr				Retired staff / 50 years old	Complete	5	14
Rajesh	Mr				Technician / 40 years old	Complete	3	14
Aishah	Ms				Student / 22 years old	Complete	3	14

Figure 1: List of respondents whose results were selected for cluster analysis

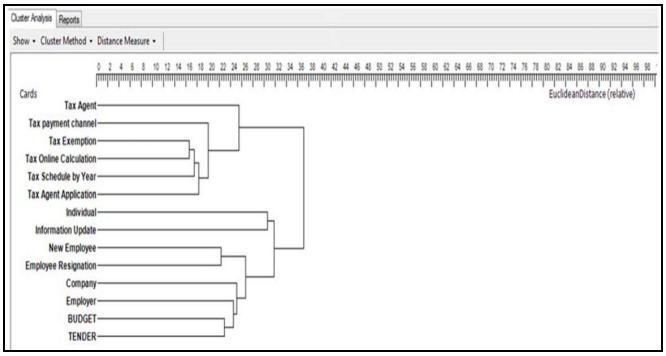

Figure 2: Dendogram of card sorting result exercise using Average Linkage

From the dendogram graph shown in Figure 2, the distance between each card is measured by using Euclidean Distance as the measurement. The horizontal axis of the dendogram represents the distance or dissimilarity between the clusters. The vertical axis represents the objects or clusters which are the fourteen cards that has been sorted by the respondents. List of conclusions that has been derived as below:

i. Tax online calculation card and tax exemption card are similar to each other.
ii. Tax Online Calculation, Tax Exemption and Tax Schedule by year cards are similar to each other than to Tax Agent Application card.
iii. Tax Agent Application, Tax Payment Channel and Tax Agent cards are similar to each other compared to Individual and Information Update cards. BUDGET and TENDER cards are similar than to Company and Employer cards.
iv. New Employee and Employee Resignation cards are similar to each other.
v. Company and Employer cards are similar to New Employee and
vi. Employee Resignation compared to Information Update and Individual cards.

Based on these results, the way of how respondents' majority do the grouping all the cards that are representing the menu in LHDN official website can be depicted.

3.4 Design Phase

In this design phase, information architecture for LHDN web portal will be proposed as per user requirements derived from the data collection and analysis phase. The design will be presented in a form of storyboards. A storyboard contains the user-centered information arrangement proposal for the LHDN web portal as shown in Figure 3.

3.5 Documentation Phase

This is the final phase for this research methodology. All the related modules such as data, information resulted from the analysis phase as well user feedback will be documented in a report.

4. RESULT

To accomplish the first objective, few methods have been carried out. Preliminary studies have been conducted via informal interview with random respondents with different background regarding the existence of Lembaga Hasil Dalam Negeri (LHDN) and on the common knowledge respondents know about LHDN. In addition, a web observation on LHDN official website has been carried out to observe and finally identified problems in term of information architecture. Moreover, questionnaires consist of relevant questions also have been distributed accordingly. From the questionnaire distributed among the 40 respondents, it can be concluded that LHDN official website are accessed by numbers of users from various range of ages, different job occupations background coming from different working sectors. In terms of age, there is a high percentage of age between 31 to 40 years old and also for those who are working in private sectors. Most of the respondents are holding executive level occupation. 80% of the respondents are well acknowledged on the LHDN official website. This probably due to respondent's current job might need to acquire information from LHDN or might be due to respondents' personal interest i.e. about individual taxes. While the rest of the respondents (20%) did not have knowledge on LHDN official website itself. Out of the 40 respondents, 45% of the respondents are accessing the website in less than 3 times per month. 30% of the total respondents are accessing it for 4 to 10 times monthly while the rest (25%) of the respondents are accessing the website for more than 10 times per month. As most of the respondents are having own career, this might be because they are checking their monthly tax deduction for their monthly income. Most of the respondents (45%) are looking for human-resource related info from LHDN official website. 40% of the total respondents are looking for individual related information and the rest of 15% respondents are looking for different information. Out of 40 respondents, 65% of respondents felt that more efforts needed in searching for their intended information in the LHDN website. Some of the respondents' reasons are, the information or menu arranged in LHDN official website make it looks too heavy causing respondents unable to straight found the intended information. Moreover, the respondents also stated due to this issue, respondents are preferred to give LHDN general line a phone call after giving up halfway browsing the website. This might be due to information-technology skills possessed by the respondents. From the result, 13 out of 40 respondents are disagreed that they can find their intended information or services in a short time period. This might be because the website poor grouping on the information or menu used and respondents need to put some effort to locate required information is located under which group menu. Majority of the respondents does not agree that on current information arrangement in the LHDN official website and the respondents do not find that the

information or services placed on LHDN official websites are able to enhance respondents' job productivity. In conclusion total of respondents are not well satisfied with the LHDN official website in term of comfort-of-use and the usefulness of the information placed in the system. When come to job productivity, users will expect the desired information searched on the LHDN official website can be completed quickly which will not be delaying the time for users to complete their daily tasks. In a nutshell, the data captured shows that total of respondents feel that it is not easy to find the intended information in the LHDN website. The website might provide the required information, but the arrangement of information used took respondents more time in searching.

As to accomplish the second objective the card sorting technique has been carried out over 20 respondents which are randomly chosen. The deliverable from this card sorting activities is the acknowledgement on how respondents groping all the specified contents on LHDN official web portal. A free open source software known as *UXSort* has been used to run the card sorting exercise. *UXSort* is an open source computer application software to run card sorting exercise. *UXSort* offers a computer aided system that allows the fast execution and simplifies the execution of card sorting exercise. This software allows user to plan card sorting activities, manage cards and participants, collect and analyse card sorting data and generate a report.

Based on the card sorting exercise performed with total of 20 respondents, a user-centred information architecture which is focused on the menu arrangement on the LHDN official website has been proposed. This part will fulfil the requirement of the third objective. This proposal is only shown on how those cards reflecting the menu in LHDN official website should be grouped together as per user-preferences. This study is only focusing on the main menus as per used in the card sorting exercise which is based on the data collected from the preliminary study described earlier. The proposal is illustrated in story board as Figure 3 below.

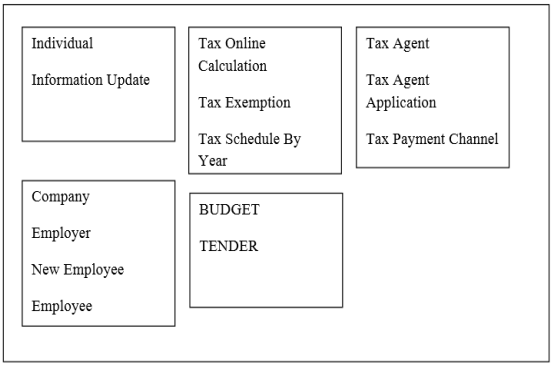

Figure 3: Storyboard on user-centered information architecture proposal for LHDN official website

This information arrangement is based on the result derived from the clustering analysis. There is a slight difference on how user grouped the information or menu in this card sorting exercise as compared to current arrangement in the LHDN official website. LHDN website is showing quite a large number of menus including navigation to the other website. However, based on the analysis derived, not all information displayed in LHDN website is fully utilized by the users. Most of the users are always browsing the LHDN official website to seek for same information in the difference time interval. In addition, the user will need to retrieve the information soonest possible however based on the preliminary study conducted earlier, some of the users felt that the information displayed in LHDN website is too complicated. Some of them will end up either walk in to LHDN physical offices or give LHDN's general line a call even it is time-consuming. Therefore, based on the information arrangement result above, the architect can get more idea on how to display the information in LHDN official website to produce a more user-centered website where can make users feel enjoyable browsing the website as well as enhancing users' job productivity by providing a quick and clear menu's navigation.

5. CONCLUSION

Lembaga Hasil Dalam Negeri (LHDN) has been used as a case to perform evaluation study in term of information arrangement. Despite taxes enquiry, LHDN also providing information and services in another areas like government's tenders. Information Architecture (IA) is a discipline that focuses in determines an efficient information arrangement in a website. There are few techniques available to determine an efficient IA however for this research study; a technique called card-sorting has been used by running an application named UXSort. Based on the results from the analysis, not all of information or services provided in LHDN official website is fully utilized by the respondents. The preliminary study had shown that the respondents felt the LHDN official website is displaying too complicated and crowded information. From the card sorting analysis, the respondents have grouped the menus in more simpler ways. In the other words, this shows that how simple and easy for the menu to be displayed or to be navigated so that users can resolve relevant enquiries in a timely manner. Therefore, it is crucial for LHDN official website to have an efficient arrangement information and services in order to ensure it will be fully utilized and will be reduced the needs to attend citizen's enquiry in manual ways.

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