Usability Heuristic Evaluation for Phayao Province E-Government Portal, Thailand

Noptanit Chotisarn[*], Chontipan Plengvittaya, Davit Sanpote and
Mathaya Ratchakom

Software Engineering Valley, Department of Software Engineering,
School of Information and Communication Technology,
University of Phayao, Phayao, 56000, Thailand
*Corresponding author. E-mail: noptanit.ch@up.ac.th, noptanit.c@gmail.com

ABSTRACT

Currently, Thai government emphasized on the development of digital government. There is clearly seen that the government has been announced a digital government as a main policy to combine an information technology into all terms of government process. This research has been used to demonstrate and observe in Phayao province. The government agencies of Phayao aimed to integrate all significant information of Phayao such as education, travel and government within the smart province project. In addition, there are some objectives to indicate the achievement of this research including of a response of users to keep them using the website frequency by using the methodology of user testing called the strategy of Usability Heuristics to evaluate strength and weak points between the groups of student who has/has not earned an experience and knowledge of this testing tool. According to the result and discussion, the strength point of the Phayao portal website was the aesthetic and minimalist design. On the other hand, the weak point. From an overall perspective between both groups, the visible usability issues raised up similarly. To concluded that, the system of Phayao portal site is usable for both groups, appropriately.

Keywords: web portal technology, usability heuristic, e-government

INTRODUCTION

One of strategies of Smart Government 2020 road map is to coverage and improve efficiency of e-government services via smart provinces (Thailand. Ministry of Information and Communication Technology 2015). Thai citizens are supposed to be involved with the plan, leading to equality for living in digital inclusion. Therefore, the collaboration group to frame Smart Phayao was co-operated among organizations in Phayao including School of Information Communication and Technology (ICT), University of Phayao (UP), Phayao provincial government administrative organization, etc. The purpose of the co-operation is the enhancement of using technologies to service citizens and boost travelling aspects. These might support

living in 4 aspects including agriculture, travelling, hospitality and education. In the first stage of the Smart Phayao plan, Phayao portal was proposed to be the hub of e-services in Phayao in terms of e-government, travelling and UP services.

Usability for the system is necessary because the system is widely published. Usable system might encourage users to use them often. In addition, the system is supposed to be evaluated for addressing visible usability problems by heuristic checklist (Nielsen 1995). The structure of the paper is as follows. In the next section, a review of web portal and usability heuristic evaluation are described, followed by research methodology. The design of the usability evaluation questionnaire is shown in Section 3. The results are discussed in Section 4. Section 5 concludes the paper.

RELATED WORK

Phayao Portal was designed from some patterns of web portal especially government web portal. This portal was constructed based on as these following. Web portal or portal site brings information together from diverse sources as a uniform way (Lee 2015). The content was shown as a uniform way based on the intention of users. For example, iGoogle is a multi-information web portal built to help their users who want to use various Google functions in one page.

The similarity of web portals is gathering information from various sources and the themes of content depend on the intended users. For e-government, government agencies continue to take advantage of the Internet to improve and provide services. Portals are now used by private sector firms, non-profit organizations, and governmental agencies (Gant and Gant 2002). The most important service is contributing information to the public. One of web portals that used for communicate between the government and their citizens called government web portal or e-government portals.

In 2002, from previous study of Jon P. Gant and Diana Burley Gant, they provided the state web portal functionality as 4 functions. First, openness is a key component of web portals as it underlies the idea of the portal as a non-stop shop for government e-service. Second, customization, all web portals provide generic content tailored to meet the needs of the average portal visitor. Next, usability, portals deliver value to the user as a function of how accessible and usable the features on the site are. Last, transparency, a well-designed e-government portal should employ various transparency and accountability features to enhance the level of public trust and legitimacy (Gant and Gant 2002). All functions from the mentioned, the usability is emphasized for this research because the Smart Phayao project needs to ensure the users having different skills to reach a target of the portal.

In year of 1995, the research area relevant to a strategy of heuristic evaluation which developed by Jakob Nielsen (Nielsen 1995), this strategy described information to identify and analyze problem participate with the design of user interfaces. Move to a more detailed analysis, there are 10 heuristics has been used to

test with several web portals to improve and identify type of problems during the development of website as follows.

1) Visibility of system status, the software should be clear by notifying users to update information related to feedback within responsible time.

2) Match between system and the real world. The software should be able to communicate with human's language.

3) User control and freedom, this topic mentioned that the mistake can be occurred in any situation

4) Consistency and standard, the system contains standards of layout design, font size and also the system should require an appropriate input for users.

5) Error prevention checklist, the system should prepare for all kinds of failure in any situation.

6) Recognition rather than recall, the system need to provide the tracking system for users to use less of memory to remember where they have been visited.

7) Flexibility and efficiency of use, the flexible system is greater than the restrict system because of the flexibility of system can be used in various type of users.

8) Aesthetic and minimalist design, the presentation of content should be distinct between other content and use a tight of information.

9) Help users recognize, diagnose and recover from errors mentioned that the failure message which display on a screen should be the word of human instead of the word of computer machine.

10) Help and documentation, this instruction is another important tools for users to understand all of the system before they play around the system.

All in all, Phayao portal is a government web portal created for used in smart province project that combine the interdisciplinary of usability by using various practices as the models to study and implementation.

RESEARCH METHODOLOGY

Development Process

There were 4 phases of system development including data surveying, information architecture, system construction, and system evaluation. Firstly, data surveying, the group of information systems involved with Phayao was surveyed. First, e-government services, e-government services in official Phayao site (http://www.phayao.go.th) were collected. Next, travelling, the famous social network site (http://www.facebook.com) and search engine site (http://www.google.com) were queried by the criteria word "Phayao". Third, e-services of UP, these filtered from official university site (http://www.up.ac.th). Secondly, information architecture. Sites from the previous step organized into appropriate category. Refer to e-government services surveyed, these most categorized by minister and organization. Additionally, sites grouped by types of services based on benchmarking with Thailand e-Government Portal (accessed via http://www.egov.go.th). Secondly, for travelling aspect, there also were 3 viewpoints of this part regarding events, editors' picks and well-known sites by statistics. First, current events and upcoming events were

provided to show what is going on and next happenings in Phayao. Next, editors' picks, viral sites chosen by the site administer team or recommended by users were displayed for trendy. And then, top 6 sites in travelling category by search criteria (Phayao) in the Web Analytics of Thailand Web Stat Directory of Thailand Website site (http://truehits.net) were presented. For e-services of UP, the group of e-services was provided for external persons focused on applying for study and job, and for basic information. Sites organized by types of services and divisions. For internal users, e-services were served in the official UP site, not included in the system.

Thirdly, system building phase, systems development life cycle (SDLC) was used as a frame of the system construction stages. U.S. Web design standard as a best practice was studied for the system's layout, which is an open source UI components and visual style guide to create consistency and beautiful user experiences (U.S. Digital Service and 18F 2015). The point is responsive web design applied to the system for supporting mobile users as well. The site's layouts adjust to different screen sizes.

Last, system measurement, usability heuristic evaluation was used to examine the usable level of the site and to address most visible usability issues. The detail of the evaluation is going to be described in the next section.

Usability Evaluation Checklists
The evaluation checklist is one of the most efficiency methodologies to filter mistakes and check the quality of the project. Eventually, there were already published the example of heuristic evaluation checklist indicated (Pierotti 1995). However, there are some checklists of each rules were not related to the Phayao web portal. According to this trouble, the team decided to select the most necessaries checklists from each rule. After the questionnaire has been release from the 10 usability heuristics strategy (Nielsen 1995), there were 2 groups of volunteers to complete this 10 usability heuristics evaluation of this site.

In addition, the first group (G-I) of volunteers was the students of software engineering who have never used this Phayao web portal. The second group (G-II) was the students who have experienced about Human Computer Interaction subjects (HCI).

Furthermore, these sub topics are related to the behavior of the first time uses. In terms of 'Match between users', this topic mentioned about the logical of natural system to support and response to the first time uses appropriately. G-I does not have much to learn at the first time they visit the website. Move to the next point of 'Error prevention topics', this topic explained about the mistake between users and the system because the first time users have less time to learn all functions within the system meanwhile system can guide the right track for the users to follow. Whenever the system detects an error, it will notify the new users such as pop-up message and red color for valid input to follow the right track. The next subtopic is 'Consistency and standard', this topic is all about the standard of the design such as the standard of

input type and layout, G-I supposed to understand the basic of system process by themselves.

In the second group (G-II), the volunteers are the software engineering students who ranked in the top 10 score of the HCI class. These students have more abilities of the system perspective than G-I above so that they will be able to provide effective comment to developer and researcher. As the 3 sub topics out of 10 in heuristic has mentioned above, the rest of it will be tested with the second group of volunteers as well.
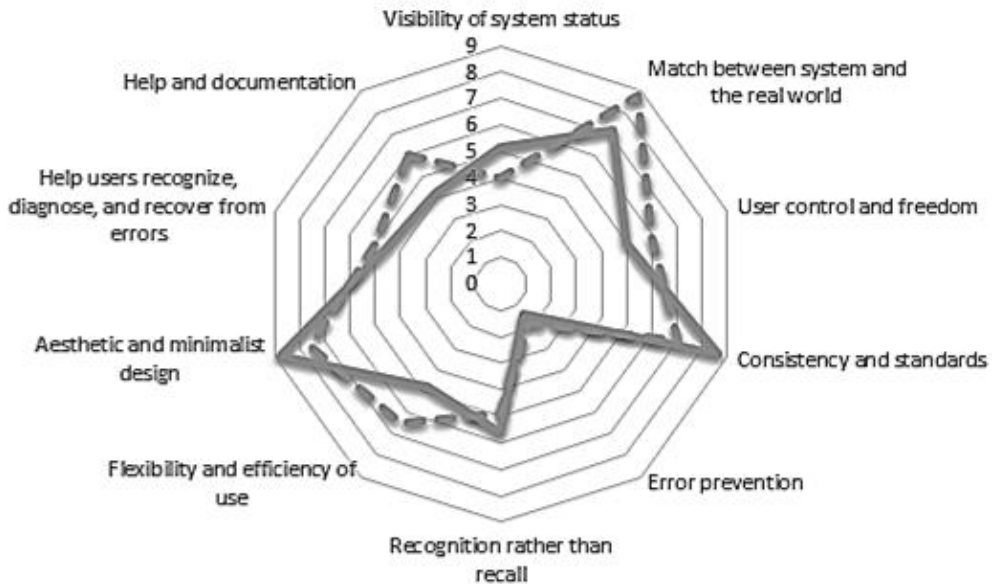
Analysis Evaluation

The both groups were assigned to answer the same questionnaire containing 10 groups (H1, H2, …, H10) of usability heuristic and for each group has a sub-question about 3-10 questions, so there were 58 questions. The data analysis used data from "have, not have and not sure" questions of all students and a summation of each sub-question and average its. Steps of the analysis of an evaluation form as follows. First, Interpreting the answer "have, not have and not sure" in each group to numerical as 1, -1, 0 respectively, for used in the next step. Second, Plot the table for each group by used the column as sub-questions number (H1.1, H1.2 …) and row as each student number (S.1, S.2, …, S.10), assigned the interpreted value in each intersection of column and row.

Table 1 The example plotting parameter between student G-I and the first group of 10 heuristic rules (H1)

G-I	S.1	S.2	S.3	S.4	S.5	S.6	S.7	S.8	S.9	S.10	$\sum$
H1.1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
H1.2	1	1	1	1	1	0	1	0	1	1	8
H1.3	1	1	1	1	1	1	1	1	1	1	10
H1.4	1	1	1	1	1	1	1	1	0	1	9
H1.5	1	1	1	0	1	1	1	1	1	1	9

Third, sum the value of each column, it is summation value of each sub-questions. Next, average the summation value as each group value of heuristic. The 10 group's heuristic value used for plotting the radar graph as visualization in terms of representing this data visually helping to identify problem areas in the overview, and easier to compare between the test groups. In conclusion of analysis using the radar chart for visualization (Figure 1), however, the result can be explained in different ways. As an illustration, the both are contrast and what is the same (G-I is straight line, G-II is dot line). The result will be discussed in the next part of this research.

Figure 1 Overall perspective of 10 usability heuristic, dotted line for expert group and thick line for novice group

RESULTS AND DISCUSSION

According to the result of the 10 heuristic evaluation, it can be divided into 3 groups named, highly extinction (PP), high (PF) and fail (FF), respectively (Table 2). Moreover, the group showing the score above 5.00 out of 10.00 named pass (P) and the group which showing the score below 5.00 out of 10.00 named fail (F).

To begin with the group of PP, the result shown that most of the users understand capabilities of top 10 heuristic usability checklists, perfectly. For example, in terms of the user control and freedom, the group of student was able to use the web portal appropriately. Move to the next example of the match between icon, it can be shown that almost icons occur on a screen were able to communicate to the users properly.

The next point is the consistency, the website relocated layout design to support user's need and also provide the information to describe detail below each images. Furthermore, the minimal design was another striking point raise up the detailed of the used of the management of information architecture to separate each significant part for users.

Table 2 The result of heuristic evaluation between G-I and G-II

Heuristic Evaluation	G-I	G-I P/F	G-II	G-II P/F
Visibility of system status	5.20	P	4.00	F
Match between system and the real world	7.20	P	8.80	P
User control and freedom	5.00	P	6.00	P
Consistency and standards	8.63	P	7.00	P
Error prevention	1.40	F	1.80	F
Recognition rather than recall	5.57	P	4.86	F
Flexibility and efficiency of use	4.75	F	6.50	P
Aesthetic and minimalist design	8.80	P	7.60	P
Help users recognize, diagnose, and recover from errors	4.50	F	5.00	P
Help and documentation	4.25	F	6.00	P
Average	5.53	P	5.76	P

In the second group of high (PF), the result showed the differential perspective between G-I and G-II. To begin with the checklist of heuristic in terms of the visibility of system status, the number of G-I is greater than G-II. It can be said that G-I has been already earned more HCI experience than G-II so that it was able to understand each functional in web portal and also they can detect more unexpected output than the other group, significantly. For example, the way to define user require an experience of HCI before using the web portal to match the menu list and the familiar vocabulary.

In the next checklist of the flexibility and efficiency of use, as the statement mentioned above, G-II already contained a skill of HCI then they can analyze each failure more than G-I. These failures are an obstacle to shut down some functional into the system. In addition, G-II also understood more qualification of Help users recognize, diagnose, and recover from errors and Help and documentation than G-I, significantly. As an illustration, G-I found the error show 404 which means that the page could not be found on the server. On the other hand, G-I ignored this situation. Moreover, the plan for future will be done on the user scenario test to focus on deeper issues.

Move to the last group of fail (FF), the result from the evaluation showed the same aspect that the web portal contained less of the error prevention. This perspective can be described that the web portal aims to group all necessary information for users so that the web should not be complex and hardly to find information. Moreover, the high number of an error prevention is able not to keep the user in long term.

On the other hand, the average results of all heuristic of both groups are above 5.00 out of 10.00 called P in G-I as 5.53 and G-II as 5.75. The results show the both the groups of users who have different skills and experiences but the average score of heuristic are nearly close to each other group and above a half of score. It can be indicated the both users have nearly the same attitude with this portal. It fulfils the objective of this portal that made for people who have different skill levels and abilities. Overall, an agreement 90% confidence interval of the expert group was 5.53 ±1.15 and novice group was 5.76 ± 1.03.

CONCLUSIONS AND FUTURE WORK

From an overall perspective, there are different aspects between the groups of participants. From the above, G-I was able to reach this research's aims. In terms of the evolution of the portal according to the result, the weak point of each section scoring below 5.00 out of 10.00 was needed to be investigated. In future work, these will be used to improve the portal. Keys of investigation can be considered in various aspects as follows. The first aspect is to improve the weak point by applying principle of government web portal. Next, the task scenarios testing (McCloskey 2014) can be applied to find out concerns. After that, there will be an improvement of the site by refactoring and reverse engineering (Eilam 2011). Requirement changes might occur because of humans' subjective thinking such as user experience and personal bias (Chotisarn and Prompoon 2013). Therefore, the heuristic was needed to be verified against requirements and design specification. In conclusion, the usability is an important key success of the engagement between government sites and people such as Phayao portal.

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