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Evaluating Government Websites Using Extended Heuristic Method: A Case Study of Lao PDR

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Abstract: E-government websites have become very important tools for governments and citizens for providing and receiving information and services such as tax payment, registration for driver license, e-learning and many others. In order to make sure that information is adequately presented through E-government websites, it is necessary for governments to adopt a mechanism for validating websites to effectively publishing and disseminating of information online. In this study, a Heuristic Evaluation method was extended with Technology Acceptance Model (TAM), Diffusion of Innovation (DOI), Trust and Web Content Accessibility Guidelines (WCAG) to produce a new method to evaluate government websites. The study outcome has produced a set of 18 Heuristic rules for evaluating government websites, using Lao government websites as a case study. The results have indicated that most of Lao government websites need to pay more attention to these factors such as: Trust, Ease of Use, Service, Awareness, Usefulness, Style, Navigation and Flexibility.

Keywords: Evaluation, Heuristic method, E-government, Government Website, guidelines, Lao PDR.

1. Introduction

The Internet was introduced in the early 60's; however, not until early 90's that it became popular disseminating tools amongst people for publishing information amongst citizens, businesses and between government units, creating E-Government or Electronic Government.

E-Government is very powerful channel, combining computers and Internet to give better services and access to anyone including citizens, government officials and businesses; hence it can improve integration and transformation of work between various users. As a result, it leads to an increase in transparency and a decrease of corruption in government public sectors [1,2,3,4,5].

Website's usability is also very crucial part for public and private organization in determining how successful E-Government is, because good web usability design could indicate many visits, usage from many users and how popular a website is. Similarly, a good website also means providing effective use of communication tools between users and organizations. The ultimate goal is to provide specific content of government information effectively. This would require that government websites must be easy to understand for navigation, clear, easy to use, and require minimum effort from users. Moreover, consistency in designing of website is considered very important in order to avoid user confusion and frustration from finding information in government websites. Currently, most website designs were guided by World Wide Web Consortium (W3C) on the right practice for building websites such as Web Content Accessibility Guidelines (WCAG).

Similarly, the user interface in the field of Human Computer Interaction (HCI) is also important to consider for evaluation of websites. Other research-

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ers are focusing on cues that could have impact on trust which could range from the interface design, credibility and reputation of the system affecting trust specifically in users' perception of online environment [6].

Currently, different strategies and experiences were used by different web designers and developers. As a result, it has shown that at present there was no common agreement amongst government organizations of a technique or mechanism to be adopted as a standard guideline for evaluating government websites.

Particularly, in the case of Lao PDR, currently there are no laws or policies being used or implemented on these areas mainly on the use of Internet and websites, computer or Internet laws, privacy policy and user rights. Therefore, a specific evaluation method for evaluating of government websites must be considered in order to guarantee that all users, will accept, adopt and make use of information or contents that government is providing to them as a mean of effectiveness and improvement of communication, knowledge and understanding between government and its citizens.

2. Country Profile

Lao People's Democratic Republic (Lao PDR) or Laos, is a small landlocked country with the population of 5.62 million and land area of 236,800 sq. km. Laos is located in Southeast Asia that shares border with five countries: Cambodia, China, Myanmar, Thailand and Vietnam. Laos has rich natural resources cover with forest and most part of the country is mountainous. With only about 50 percent of the whole population has access to electricity through the national grid [7][8]. Laos is ranked 92nd for Telecommunication Infrastructure Index and 142nd for E-government readiness index (0.2421) and Internet penetration of 0.017 or roughly 2 out of 100 people [9].

3. Related Works

E-Government relies on the use of communication tools such as Internet, digital devices and ICT in order to enhance the working processes such as delivering of public goods/services to citizens, businesses and government organizations, and the authority processes as digital channel. It is resulted in significant improvement on government role for providing services and responsibility by enhancing services to its people and advancing the economy and businesses into a stable and strong society [10].

3.1 E-government Adoption Model

One of the key fundamental to determine the success of E-government adoption is to consider a few theories such as Acceptance Model (TAM) [11], Diffusion of Innovation (DOI) [12] and Trust [13,14,15]. With recent research work being proposed by Shareef et a.l [16] and Sang et al. [17] called theoretical framework and Government Acceptance Information System (GAIS) respectively, they may have some similar and overlap variables or factors. Obviously, they are different in context and purposes such that theoretical framework proposed by Shareef et al. [16] focuses on different acceptance behavior of users. It is also depending on the maturity level of government such as the state of organizational character, technology, economic and socials perspective of E-Government which could result in different level of successful. While GAIS's main purpose is to find out the influential factors that could affect users into accepting and adopting application or technology that government has provided them.

3.2 Evaluations Methods

There are many usability evaluation methods available such as cognitive walkthrough (CW), usability test (UT), heuristic evaluation (HE), and formal usability inspection [18, 19]. In recent years, HE

methodology was being adopted and improved into different variant such as HE++ [20], Heuristic of Ambient Displays [21], HE on virtual environment [22], and HE for paper-based web pages [23].

The main reasons behind the popularity of HE are its speed, widely used, inexpensiveness, and ease of implementation that require experts or developers themselves a few days to complete. Unlike other techniques, HE could be implemented with limited evaluator of 3-5 people which could detect high number of usability problems that could be implemented early till late of development life cycle.

3.3 Evaluation of Ambient Displays

Ambient displays evaluating technique was developed for displaying abstract and aesthetic peripheral displays portraying. Nielsen's heuristics was not suitable for ambient displays, because original heuristic method is concentrated on interactive and productivity systems, while ambient displays is considered to be passive or non-interactive and non-critical.

Ambient displays evaluation method was based on Nielsen's 10 original heuristic principles for software evaluation (Nielsen and Molich, 1990). In the research they have extended by modifying heuristic principles title and definition; furthermore, they have eliminated 6 original principles of Nielsen, due to the irrelevance for ambient displays and added 5 additional principle based on two reviews and group brainstorming session. Heuristic evaluation of ambient displays is believed to be an effective and improved technique for finding usability errors with ambient displays that could also be used in original intended field such as website [22].

3.4 Evaluation of Paper-based Web pages

Paper-based was developed for evaluating medical website for critical medical domain based on heuristic evaluation specifically for screen shots web pages for early stage of software development life cycle.

The method was derived from Nielsen 10 original principles and Shneiderman's eight golden rules developed based on the study by Zhang et al. [24] with 14 heuristic principles for usability heuristic evaluation for evaluating patient safety of medical devices. Conversely, Paper-based evaluation method did not propose any new heuristic principles; 5 out of 14 heuristic principles were derived and adopted for use in paper-based web pages evaluation method.

The results have found nearly 70% of usability problems. As a result, using paper-based of web pages screen shots of user interface was expeditious, inexpensive and straightforward to implement.

3.5 Evaluation of virtual reality applications

Virtual reality evaluation method was based on the study by Sutcliffe et al. [25] and proposed twelve heuristics that address usability and presence issues specifically for virtual reality and interaction environment application.

Research results have shown that virtual reality evaluation method has identified most of usability and serious errors within virtual reality environment. Furthermore, virtual reality evaluation method was developed based on Nielsen's heuristic principles and Virtual Reality VR design principles from the work by Sutcliffe et al. [25] with the total of 12 heuristic principles. With one noticeably difference from all other variants, heuristic evaluation for virtual environment was concentrated on how realistic of virtual environment such as objects must render, turn and react as realistic as possible, due to this reason a modification of scoring or rating from original with number 0-4 to Severity, Annoying, Distracting and Inconvenient; in addition, none of the 12 principles

were not directly derived from Nielsen's method [22].

4. Methodology

There are three phases undertaken within this research: Identification of potential principles and variables (Phase 1), Variables assessment (Phase 2) and Evaluation of government websites (Phase 3).

In Phase 1, the main objective of this is to identify the potential variables in order to produce a set of rules for further assessment by HCI or usability professionals and users as a suggestion for evaluating government websites. The whole process for identification phase consists of 4 steps: (1) Obtaining the set of potential variables, (2) Designing questionnaire in order to confirm the meaning with users' understanding of variables, (3) Data collection by handing out the questionnaire to users in different working areas and fields, and (4) Analysis of results to confirm the variables from both literature review and data collection obtained from users' understanding.

In Phase 2 – Assessment of variables, experts from various positions ranging from a researcher, a principle lecturer, Associate Professor and Professor from universities were requested to perform assessment on potential variables which involved ranking and giving a definition for each potential variable to produce the final list of accepted or confirmed list of variables to be used for evaluation on the next phase.

Finally, Phase 3 is to perform evaluation using suggested list of variables by 6 evaluators. Moreover, a summary of the evaluation processes/procedures, evaluation results and debriefing from evaluators' comments on the six government websites of Lao PDR (Ministry of Agriculture and Forestry, Ministry of Education, Ministry of Public Health, Ministry of Finance, Ministry of Foreign Affairs, and Ministry of Public Work and Transportation) was described.

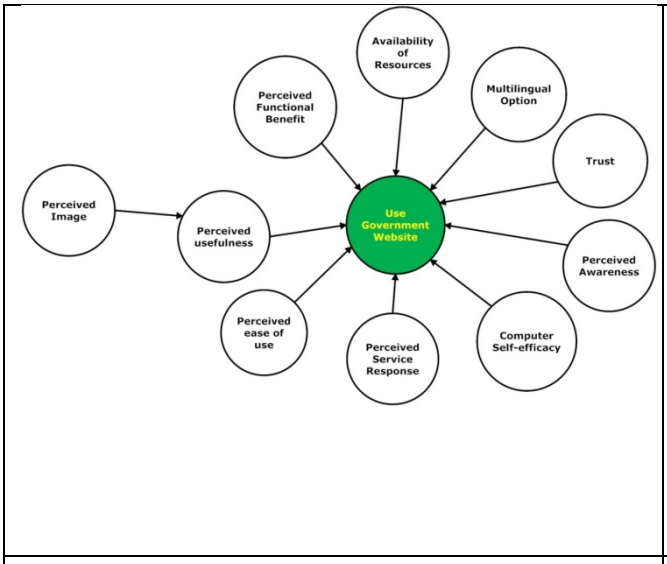

Figure 1: Evaluation Model before analysis

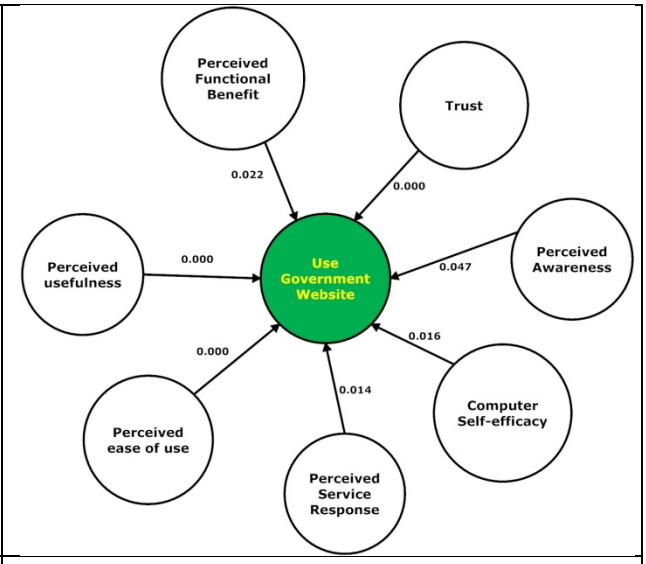

Figure 2: Evaluation Model after analysis

5. Results

From data analysis, the results (Table 1: Analysis Results of Factors) show that out of 10 factors , there are only 7 factors **(**Computer Self-efficacy, Perceived Awareness, Perceived Functional Benefit, Perceived Ease of Use, Trust, Perceived Usefulness and Perceived Service Response) that have impact on the use of government' website (see Figure 2).

The remaining three factors (Multilingual Option, Available of Resources and Perceived of Image) are not significant factors with indication of high p value above p>0.05***. Later, experts are requested to rank all 7 variables from 1 being most important to 7 least important based their own opinion and experience working in their area.

From Table 2: Ranking Results, the variables that were being ranked lowest, that is closest to 1 or the most important are PEU, PU and PFB with a mean of 2.86, TR has 3.43, while PA, PSR and CSE have a mean of 5.00, 5.29 and 5.71 respectively. From this result, it has indicated that most experts considered PEU, PU, PFB and TR to be the most important factors, while PA, PSR and CSE were the least important factors.

From Table 3: Mean of "Significance" Score, a summary of significance score was given as mean score or average from all 6 evaluators. As indicated in Table 3, variables with high "significance" score that require attention are: Trust, Ease of Use, Service Response, Awareness, Usefulness, Style, Navigation and Flexibility; with score of 18.33 for Trust, 16.00, 15.33, 13.33, 12.83, 10.67, 9.33 and 9.17 respectively. While for the lowest significance score are Visibility, Familiarity, Recovery, Constraints, Benefits, Conviviality, Feedback, Affordance, Consistency and Control; with score of 1.33 for Visibility, 3.0, 3.0, 3.0, 3.0, 4.33, 5.00, 6.00, 7.50 and 8.00 respectively.

Variables	P<0.05	Mean	STD	B
Perceived Usefulness (PU)	.000	5.71	1.092	2.560
Trust (TR)	.000	5.78	0.901	2.574
Perceived Service Response (PSR)	.014	5.60	0.958	1.055
Perceived Awareness (PA)	.047	5.07	1.329	0.272
Computer Self-Efficacy (CSE)	.016	5.33	1.311	0.391
Perceived Functional Benefits (PFB)	.022	5.42	0.978	0.352
Perceived Ease of Use (PEU)	.000	5.33	0.959	2.034

Table 1: Analysis Results of Factors

Variables / Experts	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Sum	Mean
Computer Self-Efficacy	5	6	5	7	3	7	7	40	**5.71**
Perceived Awareness	7	1	6	6	5	6	4	35	**5.00**
Perceived Functional Benefit	3	5	2	2	6	1	1	20	**2.86**
Perceived Ease of Use	2	2	1	5	4	3	3	20	**2.86**
Perceived Usefulness	1	4	7	3	1	2	2	20	**2.86**
Perceived Service Response	4	7	4	4	7	5	6	37	**5.29**
Trust	6	3	3	1	2	4	5	24	**3.43**

Table 2: Expert Ranking of Variables

Experts / Variables	MAF	MOE	MOF	MOFA	MOH	MPWT	Total All Variables
1. Visibility	0.33	0.33	0.17	0.00	0.00	0.50	1.33
2. Consistency	1.67	1.83	0.83	1.17	0.50	1.50	7.50
3. Familiarity	0.33	0.50	0.33	0.50	0.33	1.00	3.00
4. Affordance	1.00	1.00	1.00	0.67	0.83	1.50	6.00
5. Navigation	1.83	1.17	1.83	1.83	1.33	1.33	9.33
6. Control	1.50	1.50	1.17	1.17	1.33	1.33	8.00
7. Feedback	0.83	0.50	0.50	1.00	0.67	1.50	5.00
8. Recovery	0.33	0.17	0.33	0.83	0.33	1.00	3.00
9. Constraints	0.50	0.50	0.50	0.50	0.50	0.50	3.00
10. Flexibility	1.17	0.50	2.33	2.33	0.17	2.67	9.17
11. Style	2.00	2.33	1.83	1.83	1.00	1.67	10.67
12. Conviviality	0.33	0.50	1.50	1.00	0.50	0.50	4.33
13. Usefulness	2.83	1.83	1.83	2.00	1.83	2.50	12.83
14. Ease of Use	2.67	2.67	2.33	2.83	2.67	2.83	16.00
15. Awareness	1.50	1.67	3.00	3.00	1.17	3.00	13.33
16. Benefits	0.50	0.50	0.50	0.50	0.50	0.50	3.00
17. Service Response	2.83	2.67	1.50	2.83	2.67	2.83	15.33
18. Trust	2.50	2.50	3.50	3.33	3.00	3.50	18.33

Table 3: Mean of “Significance” Score

6. Conclusion

The results of the finding show that 7 heuristic rules were being ignored and required attention namely: Trust, Ease of Use, Service Response, Awareness, Usefulness, Style, Navigation and Flexibility. In contrast, principles/variables that received attention are Visibility, Familiarity, Recovery, Constraints, Benefits, Conviviality, Feedback, Affordance, Consistency and Control.

The suggested set of heuristic variables was successfully produced; however, some principles of the original twelve heuristic principles were rather somewhat redundant according to Benyon et al. [23] which also have shown during experts’ interview. Three out of seven experts believe that not all principles should be included.

Up to present there is no research work related to E-government in Lao PDR in term of readiness of its citizens or law and policies towards E-government development in Lao PDR. In addition, there is a need to research of how much and/or what type of information is needed by citizens or how to publish or how to guarantee that information being published is effective and efficient enough to meet citizens’ need. According to Sang et al. [17] regardless of how the knowledge and experience that citizens may have toward using E-government, the type and style of web display should be paid attention.

This research realized a small sample, involving 40 respondents and 7 experts. For further improve-

ment of this research work, it should be extended to a larger sample, spreading out to the whole country.

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