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Verification Process for Web Design of UEWDM

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Abstract: Web applications is getting complex and full of interaction features. In order to deal with the design interaction process issues, a suitable design modelling approach has been developed and it is called UEWDM. To conform the design modelling comprehensiveness and realistically, web expert's verification need to be done towards the design modelling. Our contributions rely on the design modelling approach which would be able to support the interaction processes in the design development. Thus, in this study, we present the verification methods and the results indicate most of the experts agreed with the proposed design modelling.

Key words: Web design, UML, web application, verification, approach

INTRODUCTION

Web application is one of the best approaches in providing information to the users. Moreover, now a days, the functionality of web application is getting extensive such as in online banking transaction, academic institution, E-commerce and so forth. Hence, the efforts of designing and developing these types of web applications have raised a number of design modelling concerns as many practitioners believe that most of these web applications have been designed in ad hoc manner (Patel *et al*., 2013). Thus, it can lead to a web application that contains too much of information (Jantan, 2012), navigation confusion (Wakil *et al*., 2014) and poor user interface layout (Valderas *et al*., 2007).

Several web application design modelling concerns have been resolved by former researchers. Therefore, a number of web applications design models with different structures and concepts have been proposed such as Object-Oriented Hypermedia Design Method (OOHDM) (Mukhtar *et al*., 2013), Website Design Method (WSDM), W2000 (Valderas and Pelechano, 2011) and UML-based Web Engineering (UWE) (Elminir *et al*., 2011). However, more design efforts are needed in order to support different ways of dealing with these types of web applications, especially in interaction processes. We defined interaction processes as a time frame process, interrelated process and user dependent process (Mubin and Jantan, 2014).

We have proposed a web design modelling named UML Extension Web Design Model (UEWDM) and it deals with those interaction processes in its design process. In order to ensure the comprehensiveness and correctness of the design modelling, hence, in this study, our main concerns are to present the verification process of the proposed web design modelling among the web experts.

UEWDM in a nutshell: UML Extension Web Design Model (UEWDM) is a proposed modelling approach that utilizes Unified Modelling Language (UML) Profile in the design process. UEWDM supports design modelling in web application which consist of interaction processes flow. These interaction processes flow can be defined as time frame process, interrelated process and user dependent process. Our proposed UEWDM comprise of three main design phases called conceptual design, navigation design and user interface design.

The research motivation came from existing web design model called UML-based Web Engineering (UWE) (Mubin and Jantan, 2014) where we extend the design model with new ideas and notations. Conceptual design phase in UWE was not focused on interaction process design flow and the navigational design not comprehensive enough in terms of navigational elements activity. Additionally, the user interface design only focus on the logical design layout. Hence, we proposed UEWDM to deal with these issues as to improve the final results.

UEWDM is an object-oriented approach that emphasize on UML notation and stereotypes extension mechanisms. In the other words, we practice UML stereotypes for our modelling elements. Moreover, the separation of design phases allows designers to focus on difference phases one at a time. Figure 1 shown the UEWDM design modelling approach.

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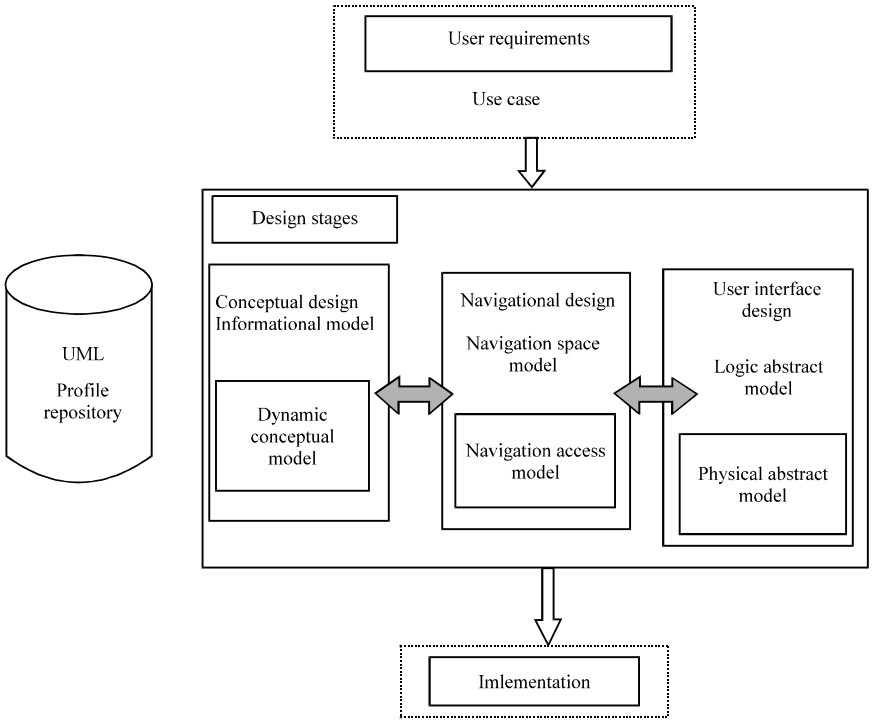

Fig. 1: UEWDM modelling approach

Table 1: Web expert's background information

Organizations	Designation	Year of experience	Knowledge of UML
Telekom Malaysia	System admin	>5	Advance
Universiti Putra Malaysia (UPM)	Software engineer	>5	Advance
Permodalan Nasional Berhad	Web designer	>5	Intermediate
Ambank	System analyst	>5	Beginner
Telekom Malaysia	Web designer	>5	Beginner
Independent contractor (freelancer)	Web developer	>10	Intermediate

Verification process: Our approach, in web development, verification is a well-known phase before the particular design or web application can be used by the end users. Verification is a process to check whether the results agree with the specification. The usual definition for verification is "Are we building the system right?" (Koch, 2001). Hence, to conform the proposed design model, UEWDM has been verified by collecting feedback from expert's.

Feedback instrument designs: Verification feedback questions are derived from Rational Unified Process (RUP) design model checklist (Kruchten, 2004). The checklist is designed for each sub design models in UEWDM named informational model, dynamic conceptual model, navigational space model, navigational access model, logical abstract model and physical abstract model. Set of question is using single Likert Items measurements such as strongly agree, agree, disagree and strongly disagree.

Experts: A total of six web experts from difference organizations were invited to participate in this study by Mason (2010). The experts are chosen based from their experience in web design and development. Additionally, the experts need to have a basic fundamental in Unified Modelling Language (UML). Four of them are selected individually from different organizations (Yin, 2013) and all of them have vast experiences in web designing and development. Background information of the web experts is shown in Table 1.

MATERIALS AND METHODS

The materials used for this study were comprised of verification feedback questions, a set

of documentation of UEWDM design models, UML stereotypes tables and design pattern guidelines.

Procedure: Face validation is done towards the set of question in order to ensure the validity and reliability of the instruments and measurements (Linaker *et al*., 2015). Three experts have validated and give feedbacks on the questions designed. Amendments have been made before the final set is given to the web experts.

For verification process, the experts were firstly, given a set of documentations such as the AMS design models and the guidelines. It included what the study was about and how the feedbacks would be performed. In order to ensure the experts understanding of the design models, we explained the particular design models one by one. Next, the experts were given the verification set of questions to be answered based on their knowledge and experience. Feedbacks are done by face-to-face session in order to ensure that the experts understand the design model very well.

RESULTS AND DISCUSSION

Table 2 shows the percentage of design verification for each design models in UEWDM named informational Model, dynamic conceptual model, navigational space model, navigational access elements model, logical abstract model and physical abstract model. The feedbacks have been measured using single likert item such as Strongly Agree (SA), Agree (A), Disagree (DA) and Strongly Disagree (SD). The results are shown in percentage of mode values.

Table 2 significantly shows all web experts are strongly agreed and agreed with all sub design models in UEWDM approach. Taken together the analyses presented above seem to demonstrate that UEWDM is comprehensive, appropriate and simple to be implementable in a web application. Specifically, in the other words, the UML extension stereotypes notation and functions are being used appropriately in the design modelling as to assist the interaction processes.

However, there is a methodological limitation of this study in measuring designing experience. In this sense, mixed research methodologies of quantitative and qualitative would be considered for future research.

Table 2: Experts design verification

	Percentages					
Statements	Informational model	Dynamic conceptual model	Navigational space model	Navigational access elements	Logical abstract model	Physical abstract model
The objectives of the model are clearly stated and visible	SA (66.67) A (33.33) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (33.33) A (66.67) DA (0) SD (0)	SA (66.67) A (33.33) DA (0) SD (0)	SA (83.33)A (16.67) DA (0) SD (0)
The model is at an appropriate level of detail given the model objectives	SA (16.67) A (83.33) DA (0) SD (0) SD (0)	SA (33.33) A (66.67) DA (0) SD (0)	SA (33.33) A (66.67) DA (0)	SA (33.33) A (66.67) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)
The model's use of modelling constructs is appropriate to the problem at hand	SA (33.33) A (66.67) DA (0) SD (0)	SA (33.33) A (66.67) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (16.67) A (83.33) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)
The model is as simple as possible while still achieving the goals of the model	SA (33.33) A (66.67) DA (0) SD (0)	SA (16.67) A (83.33) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (33.33) A (66.67) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (66.67) A (33.33) DA (0) SD (0)
The model appears to be able to accommodate reasonably expected future change	SA (50) A (50) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (16.67) A (83.33) DA (0) SD (0)	SA (33.33) A (66.67) DA (0) SD (0)	SA (33.33) A (66.67) DA (0) SD (0)	SA (83.33)A (16.67) DA (0) SD (0)
The design is appropriate to the task at hand (neither too complex nor too advanced)	SA (50) A (50) DA (0) SD (0)	SA (33.33) A (66.67) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (66.67) A (33.33) DA (0) SD (0)	SA (83.33)A (16.67) DA (0) SD (0)
The design appears to be understandable and maintainable	SA (33.33) A (66.67) DA (0) SD (0)	SA (50) A (50) DA (0) SD (0)	SA (83.33) A (16.67) DA (0) SD (0)	SA (83.33) A (16.67) DA (0) SD (0)	SA (100) A (0) DA (0) SD (0)	SA (100) A (0) DA (0) SD (0)
The design appears to be implementable	SA (50) A (50) DA (0) SD (0)	SA (83.33) A (16.67) DA (0)	SA (100) A (0) DA (0) SD (0)	SA (100) A (0) DA (0) SD (0)	SA (83.33) A (16.67) DA (0) SD (0)	SA (83.33)A (16.67) DA (0) SD (0)

CONCLUSION

UEWDM has been validated by applied it in a real design practices called Academic Management System (AMS). The AMS work as a case study in this research and it demonstrates the comprehensiveness yet easy approach on how to design a web application using Unified Modeling Language (UML). In order to conform the design model, UEWDM need to be verified by a number of web experts. We have selected six web experts from variety background and enormous experience to answer the feedback. The results indicate that most of the web experts agreed with the design model. To conclude our research in this study, UEWDM has signified an alternative approach for design modeling in web application. In the other words, the design model is practical to be implemented in real design practice of web application which consist interaction processes such as time frame process, interrelated process and user dependent process.

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