The Development of a University Recycle Management System (ReMaS): The Experience of UPSI

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Abstract

The main aim of this study is to design and develop a recycling management system called ReMaS. An efficient recycling management system is important in assisting related activities in order to protect the environment, and furthermore, it also helps to educate the community, especially in universities, in practicing recycling activities in their daily lives. The development of this system is not only timely but necessary in view of the low awareness about recycling among many sections of the Malaysian community. ReMaS was built based on the prototype approach and was then appraised through a survey, in particular, to measure the system usability and user interface. The findings revealed that all the respondents agreed that the multimedia elements used in the system were appropriate and the system itself was easy to use. Thus, through a user friendly, easy to use recycling management system such as ReMaS, efforts to inculcate a high level of empathy toward keeping our environment clean and safe will be better facilitated. Overall, this study provides some useful insights in developing such a system that can pull in all parties to work together more efficiently in carrying out recycling activities in order to help preserve our environment.

Keywords recycling management system, awareness, environment

INTRODUCTION

Lately, recycling programs or initiatives have received attention from many parties, including the government, NGOs, and private sectors. For instance, the biggest recycling program called *Kempen Kitar Semua Kebangsaan* was launched by the Housing and Local Government Ministry, emphasizing the '*3R'* concept - *Reuse, Recycle and Reduce*. In addition, the government, through other agencies,

has also launched other supporting campaigns; for example, the '*No plastic bags day*' campaign, which takes effect on every Saturday, has received supports from most shopping outlets all over Malaysia, such as Giant, Tesco and Aeon hypermarkets. Nevertheless, these campaigns need more support, especially from the Malaysian communities themselves, to succeed in achieving the main objective – to preserve the earth. In Malaysia, every Malaysian produces an average of 0.8 kg of waste materials in one day. However, in Kuala Lumpur, the number is higher, in which up to 1.5 kg of waste materials is produced per person, resulting in as high as 15,000 tonne of solid waste produced per day. This problem is further compounded when only five percent of the total solid waste is recycled.

The housing minister Datuk Seri Ong Ka once lamented the prevailing awareness among our community with regard to environmental issues. In whole, the matter has reached an alarming level when our nation keep importing more than 25,000 tonne of paper every month, which could be avoided or minimized if the solid waste that we produce is converted into recycled paper. Partly, the failure to create a culture of people who sees recycling as an important activity to help preserve environment is because a majority of Malaysian are poorly educated to deal with issues that concern our environment, health, and hygiene. This is unfortunate given that our nation has, in fact, started recycling campaigns in Malaysia since the early nineties (*see* details at http://www.hba.org.my/ news/2000/1200/national_recycling.htm). Undoubtedly, the lack of empathy toward maintaining an environment that is clean can be associated with the low level of public awareness. The local population, in general, is not responding aggressively to the campaigns. On a positive note, the private sectors in Malaysia have started environmental campaigns to educate the public and to enhance awareness on recycling concepts. For example, Unilever Malaysia, a leading consumer goods company, has implemented a campaign to promote environmental sustainability among the tenants of Menara TM (Unilever Malaysia Launches Environmental Awareness Campaign, n.d.).

Recycling activities are very important to educate the community about the importance of keeping our environment clean. More importantly, educating the society must begin in earnest by targeting young children such as kindergarteners (Education.com, 2014). Children, whose thinking is easily moulded at this young age, can partake in recycling activities organized by the kindergarten to develop a sense of responsibility to upkeep their learning environment (Educationalworld.com, 2014). Likewise, the Sustainable Communities North East Initiative (SCNEI, n.d.) initiated in the UK encourages local communities to get involved in the recycling activities by focusing on a waste hierarchy, namely prevention, reduce, reuse, recycle, and composting. Similarly, the National Environment Agency of Singapore (2013) has initiated a 'clean and green' campaign that focuses on establishing close cooperation between the Singaporean government and its community. Despite all these benevolent efforts, a more critical aspect that needs attention is the management of recycling of waste materials. Of late, through the Information and Communication Technology (ICT), many online recycle

management systems have been developed to manage recycling activities of waste materials efficiently. Some of these online systems include the systems developed by the Recycling Management Resources (2014), Wilmington Paper Corporation (2014), and Recycle Management Limited (2014). Given the dearth of such a system in Malaysian campuses, the researchers propose a system called *Recycling Management System* (ReMaS). With this system in place in *Universiti Pendidikan Sultan Idris* (UPSI), academicians, supporting personnel, and administrators can readily take part in recycling programs as relevant information regarding scheduled activities, guidelines and best practices, and talks on environmental topics become more pervasive and accessible. The short term impact of such as a system is that an organization can start to produce a relative cleaner working environment; the long term impact is that the cost of environmental maintenance, which was higher before the implementation of the system, will be drastically reduced. Thus, gains from the initiative are two-fold: clean environment and better economy (Campaign for Recycling, n.d.).

METHODOLOGY

The researcher used the prototype approach to develop the proposed because this approach or model is highly reliable (Vliet, 2000). The model's reliability is realized through user involvement during the analysis and design stages, effectively capturing the essentially requirements in a more concrete form (Hoffer, *George*, & Valacich, 2005). More precisely, this model was also adopted because the prescribed analysis and design principles are robust that can effectively develop highly secure web based systems, which typically process vast amount of transactions on a daily basis (Crinnion, 1991). In this study, t*he* development of ReMaS started with the 'throwaway' prototype and then followed by the 'evolutionary' prototype. The evolutionary prototype was the second part of the modeling process when the new design based on throw away prototype was completed, the phases of which were the implementation phase, testing phase, and the maintenance phase (see Figure 1).

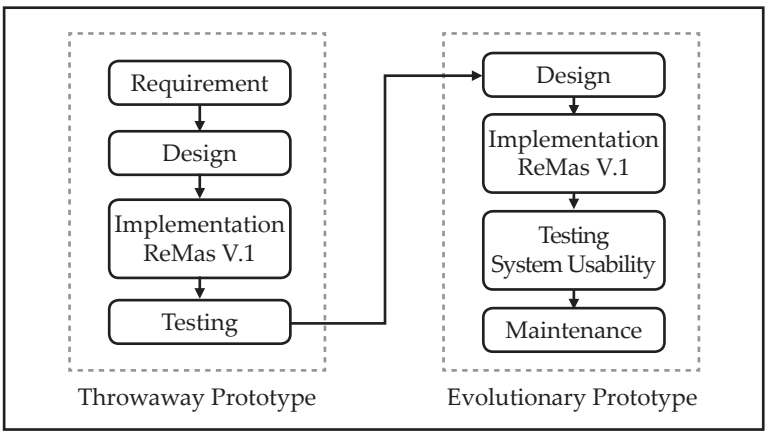

Figure 1 Prototype Approach

The system developed consists of five main modules: (a) the stock summary, (b) contribution/payment, (c) reservation/sales, (d), reports, and (e) administration. Figure 2 shows the use case diagram for the system.

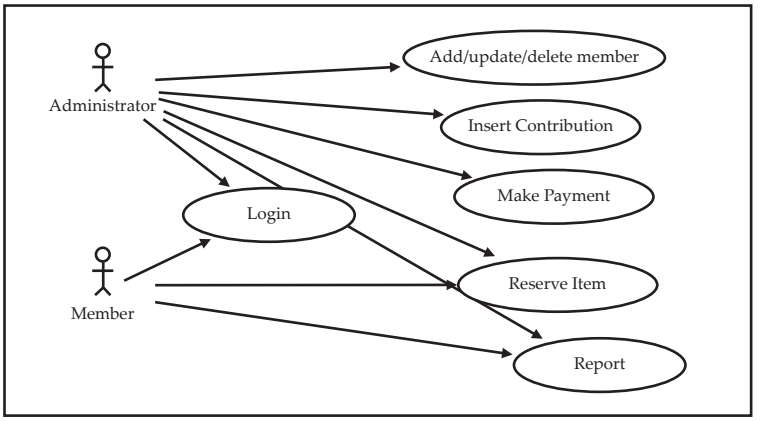

Figure 2 Use case diagram

Figure 3 shows the main page of the ReMaS system, indicating the user name and password interface through which the user has to feed in the correct data fields.

Figure 3 System Login

Figure 4 shows the home page of the system (once the login process is done), showing the current status of the user's contribution, reservation, payment, and sales.

Figure 4 Home

To assess the system performance, the researchers shortlisted 50 IT personnel working in UPSI based on the probabilistic random sampling procedure to establish a representative sample in the study (Johnson, 2001; Leedy & Ormord, 2005). However, the return rate was low because only 24 respondents sent the questionnaire forms back to the researchers. Nonetheless, this group of users had a diverse range of IT-related experiences that provided sufficient data for the ensuing analysis. In the survey, 11 items were appraised pertaining to the user interface: alternative controls, choice of colors, relevancy, multimedia elements, interface design, ease of use, navigation, screen design, information presentation, media integration, and overall functionality. Respondents were asked to provide their perceptions on these elements along four levels of opinions, ranging from strong agreement to strong disagreement. Data concerning these aspects were analyzed using the SPSS packages in terms of percentage.

RESULTS

Table 4.1 summarizes the percentages of the number of respondents who indicated their agreement and disagreement for the 11 features measured. Clearly, all respondents indicated moderate agreement that the features related to Easy to control, Choice of colours, Relevancy, Multimedia elements, Ease of use, Screen design, and Information presentation.

Table 1 Percentages of agreement and disagreement based on the respondents' opinions

Features measured:	Percentages (%)			
	Strongly agree	*Agree*	*Disagree*	*Strongly disagree*
Easy to control		100		
Choice of colours		100		
Relevancy		100		
Multimedia elements		100		
Interface design	90	10		
Ease of use		100		
Navigation	90	10		
Screen design		100		
Information presentation		100		
Overall functionality		100		

For features related to Interface design and Navigation, 90 percent of the respondents indicated strong agreement, whilst the remaining 10 percent indicated moderate agreement. From the perspective of overall functionality, all the respondents indicated moderate agreement. Surprisingly, none of the respondents indicated any disagreements for the all the features measured in terms of their functionalities, relevancy, and use.

DISCUSSION AND CONCLUSION

As highlighted in the preceding section, all the respondents moderately agreed that the user interface was easy to control, colours used for display were appropriate, information presented was relevant to intended them, and multimedia elements provided in the system were appropriate. From the user perspective, the user interface represents one of the critical features of any system because interactions between users and the computer are mostly carried out through graphical elements (e.g., icons). The proper design and configuration of these elements help users to perform their tasks smoothly. The interface design, in a nutshell, is the most important feature of any computer system that users will have to deal with when they start using the system. At this initial stage, if users were to perceive the interface design to be good (i.e., friendly), then they would be persuaded to continue working with the system. In contrast, the system would be deemed difficult to use if they were to perceive the interface design to be poorly designed. In addition to making an effective interface design based on the graphical elements and their configuration, colours also play an important role in engendering an environment that is not only appealing, but more discernible. Basically, the interface design should use proper colours of suitable intensity to create good contrast, thus enabling users to interact with the system with minimal effort. In this study, the respondents indicated that they found the multimedia elements and information were moderately relevant. Clearly, from the user perspective, their ultimate aim in using any information system is to have access to important, up-to-date information. Fortunately, ReMaS has been viewed to be moderately good in providing relevant, current information. However, this system needs to be further improved in terms of information currency by having dedicated personnel who, among their responsibilities, must continually update the system with latest information.

Another two elements or features which are directly linked to the interaction effort between the system and users were also appraised through the survey: ease of use and navigation. The first ease of use feature was highly regarded in that all the respondents unanimously indicated strong agreement. Similarly, the navigation feature was also highly regarded by the majority of the respondents. Arguably, the reason for the respondents to regard these two features of ReMaS to be good is because the interface design of the system was also perceived to be good. These two findings further underscore the importance of designing effective interface design. Likewise, all the respondents moderately agreed that the screen design was good based on the recommended screen design principles. These principles must be properly adopted in a proper context to ensure the area or space of the computer screen will be optimally utilized in terms spatial symmetry and contiguity. For the final feature, all the respondents moderately agreed that the presentation of information was clear and highly visible. In the same token, all of them expressed the opinions that the media used in the system were well integrated that enabled fluid presentation and

interaction. Finally, the overall functionality of the system was rated to be highly functional by all respondents, suggesting that the system is a sound and reliable system that can serve all levels of the UPSI community.

Overall, this study has highlighted the importance of providing a system that can help educate the society in paying greater emphasis on the prevailing environmental issues. Apparently, the majority of our society has a low level of awareness toward keeping a clean, hygienic environment. They seem oblivious to the short-term and long-term risks of poor environment. To date, many efforts have been implemented but their impacts have been miniscule. Probably, these low impacts can be attributed to a host of issues, namely poor or lack of recycling management systems. In light of this dire need, ReMaS was developed to provide the society, in particular UPSI community, with a system that help manage recycling activities. This system will provide all the necessary information pertaining planned recycling activities. They can register with the system to be active users. Besides providing relevant information, the system can keep track users' contributions in keeping their community clean by undertaking various recycling activities. More importantly, the system can determine the level of contributions of each user in the recycling activities – their efforts will be highlighted in terms of monetary tokens, which are redeemable to encourage greater participation. The effectiveness of the general and novel functionalities of the ReMas has been made possible through its design that was based on proper design guidelines and recommended principles. Synthesising these factors into a proper design elements and features helped the researcher to develop a system called ReMaS to better manage recycling activities in UPSI. In the long run, a community of strong awareness toward keeping and maintaining a clean environment can be nurtured. Thus, UPSI provides the test bed of such a novel effort through ReMaS in which the experience gained can be further exploited at the national level.

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