

WEB-BASED REWARD AND REDEMPTION SYSTEM FOR SMART RECYCLE SYSTEM

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ABSTRACT. The Recycling rate among developing nation is very low and the number of waste is increasing every day. Although many steps have been taken such as through national campaign, yet the recycle rate remains unchanged especially in Malaysia. Thus, the smart recycle bin is proposed to give a reward to public user who thrown the recyclable waste into the innovated smart recycle bin by giving points (later can be converted to money). This paper discussed the development of reward-based smart recycle system. The system has been implemented in a web-based environment and it supports for public user and waste authority. The system is then to be integrated with the desktop-based applications for waste authority to manage the point and transaction from the innovated recycle bin to the reward system.

Keywords: smart recycle bin, web based portal, reward-based system

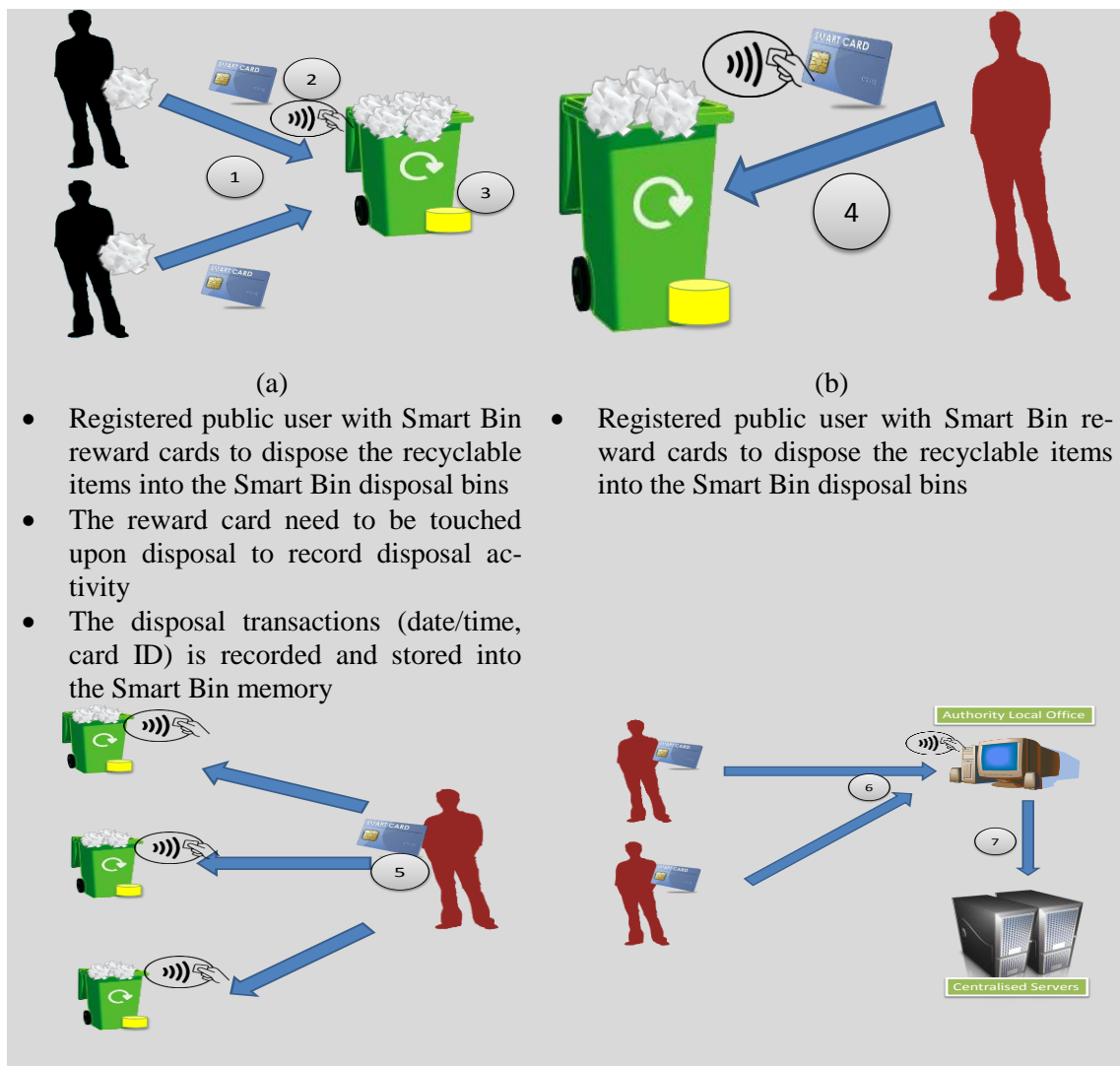
INTRODUCTION

The growth of the information technology, the trend is clear that the use technology in managing waste has getting an attention nowadays. In early stage, recycling was the preserve of a hard-core minority to help protect the environment, the band of recycling pioneers gradually grew and little-by-little official targets followed them. In line with campaign introduced by the Malaysian government towards green country, recycle program began to improve. Alongside increased awareness, most of the progress can be seen came from measures that made it easier to recycle, for example special purposed bin with color for collection schemes (Ministry of Housing and Local Government, 2002). Furthermore, as the concept of rewarding has taken place to encourage the people to contribute and support and has successfully demonstrated the implementation in many corporate for example in fuels (e.g: Mesra card for petronas) and smart tolls (Plusmiles card), this approach is selected to increase the recycling rate by providing a reward point to the contributors. In addition, experience worldwide has proven that rewarding is the most effective way to preserve high participation level in recycling process (Mourgos & Krystallidis, 2013).

Many countries such as China (Xinwen et. al., 2011), India (Joseph, 2007), South Africa (Gupta & Shekar, 2009), Switzerland, and Malaysia (Tarmudi et. al., 2009) concern on providing systematic techniques in managing waste. In Malaysia, the campaign on recycling started in 1993 and these campaign has not meet the objectives due to less commitment from the top management and no serious awareness program has been done (Greenredeem, 2013).

At present, the recycling rate in Malaysia is very low (5%) compared to other countries. The Ministry of Housing and Local Government aims to achieve a recycling rate of 22% by the year 2020. In ensuring that the desired goals of the recycling program are achieved, an effective implementation of the 3R (reduces, reuse, recycle) concepts and practices in solid waste management is therefore crucial. Efforts to promote the 3R (reduce, reuse and recycle) program are increasing to encourage the reduction of waste going into landfills for protecting and conserving natural resources, environment and energy.

This paper described the design and development of a web-based reward system to manage the reward point collected on both public as well as administrators to reduce cost and efficiency saving through the streamlined collection and reporting data as well as eliminating the duplication of data. It also could mitigate the risk through online tracking and automatic following up and immediate action. The system is aim to ease the authority to increase the utilization of the particular bin for waste disposal, to assist the waste management authority to effectively and efficiently improve the collection of recyclable waste, to civilized the recycling process to the user by rewarding points who contribute to waste recycling ‘Waste to Wealth’, and increase the awareness among citizens. The system context of the proposed innovation is illustrated in Fig. 1 (a) – (f).



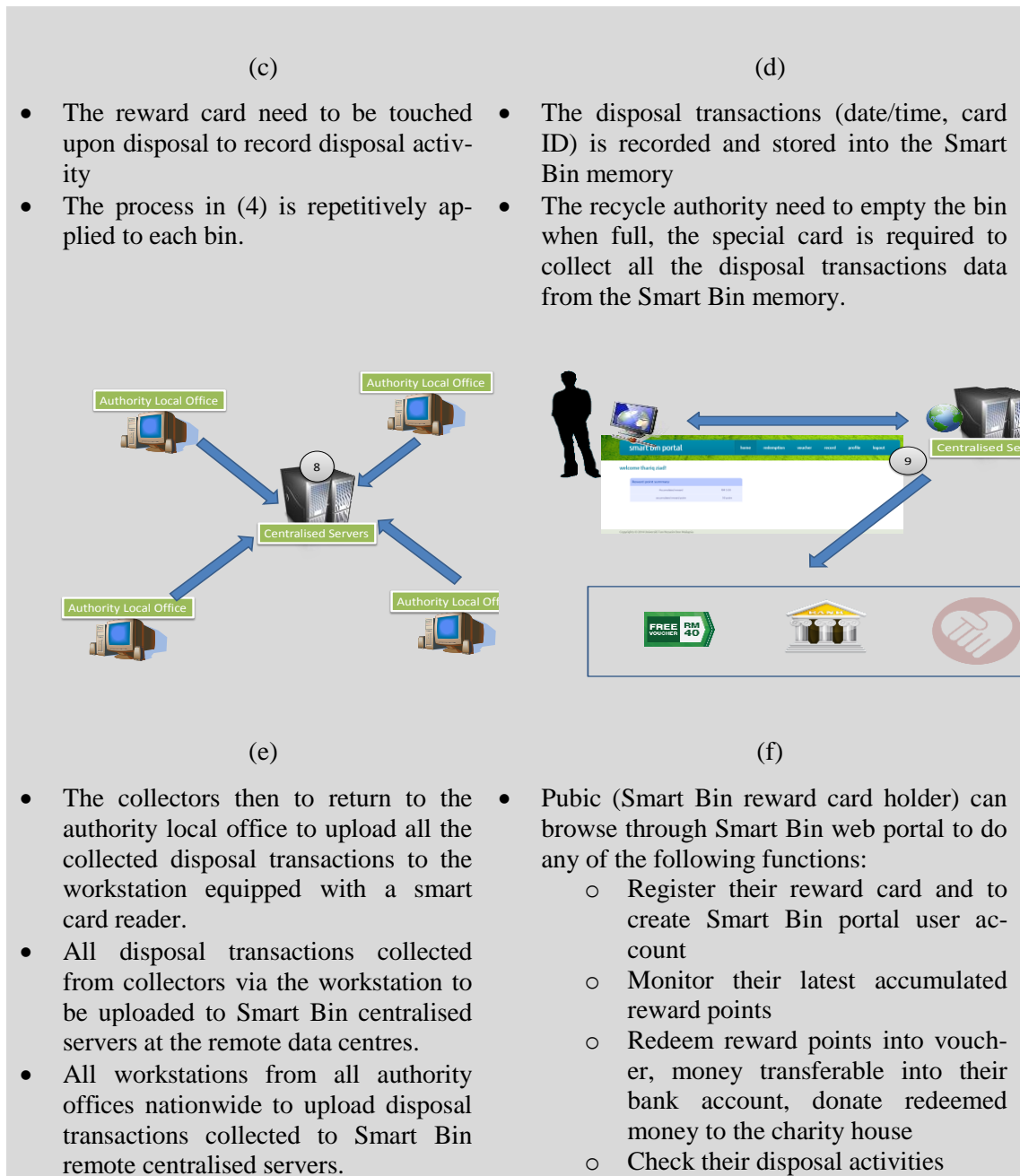


Figure 1 (a) – (f). The process of the proposed innovation of smart recycle bin

METHODOLOGY

This section describes the development methodology of web-based reward system. The methodology consists of six standard processes as illustrated in Fig. 2 (Ginige, 2002).

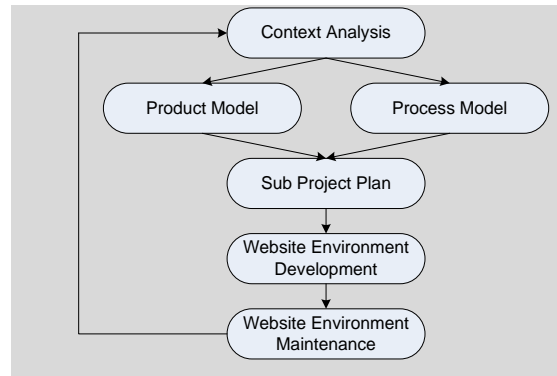


Figure 2. Web-based system development process

The web-based reward system initiate with the context analysis which in another word is preliminary phase of the development. At this stage, we identify the objectives of the system. The system is aimed to east both public and administrators to easily access registration with online account, managing reward points including redemption and uploading data from device.

The web-based reward system development is based on the following product model (Fig. 3) and process model (Fig. 4).

Fig.3 depicts the scripting chaining of a web-based reward system for administrators and public users. Currently, the development of this system has been completed the redemption module, voucher transaction module, user transaction module and profile display and editing module. All these modules have been written using PHP script which located at the web server. The system also communicates with database to retrieve and store public data. The process of database connection with the scripts is shown in Fig. 4.

WEBSITE AND USER INTERFACE DESIGN

This section discussed the web site development consists of designing the web site and constructing the web site to deliver the content and the required functionality. The web-based reward system is developed to be used for two parties the public and administrators. The most challenge is the design the website which is friendly user and easy to navigate. Web development activities were mainly focused on development of content, its presentation and navigation. The design and development of the website are based on the two stage approach to website development i) design the website ii) construct the website (Fig. 5). The two-step approaches ensures the design and the information provided easy to read and the function of the website is easy to operate by public user. Sample of snapshots of user interface are shown in Fig 6.

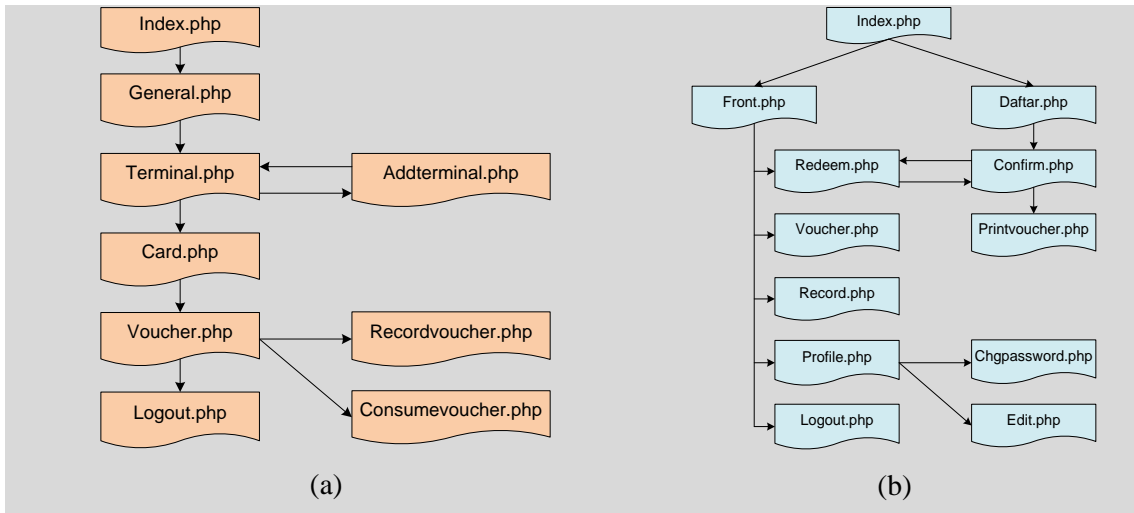


Figure 3. Web-based reward scripting chaining (product model) (a) for administrators, (b) for public users

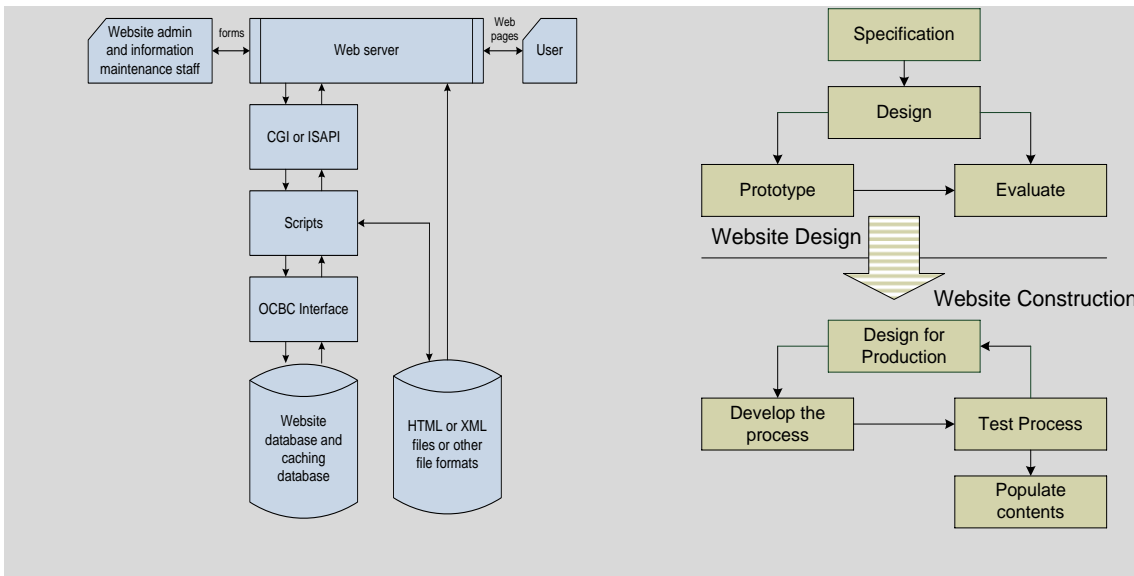


Figure 4. Web database connection (process model)

Figure 5. Two-step approach on website design and development

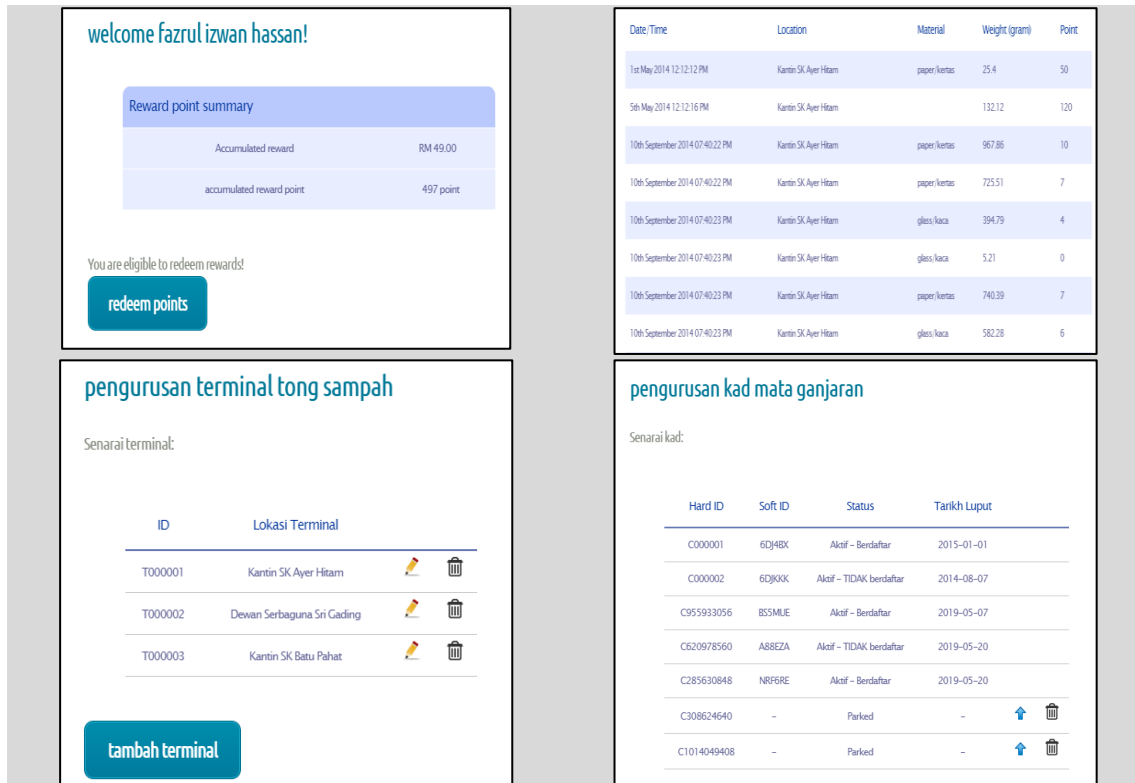


Figure 6. Snapshots of the user interface

DATABASE DESIGN

This section described the database design which involves the design of entity relationship diagram for the web-based reward system. Each entity represent Tables and properties and these tables must be examined in any module structure during the analyzing and designing process. The entity relationship diagram model should have an integrated structure. In every phase of the analyzing process, features and functions of a typical relational database must also be considered (Deperlioglu, et. al., 2011). Figure 7 illustrate the entity relationship diagram for Web-based Reward System.

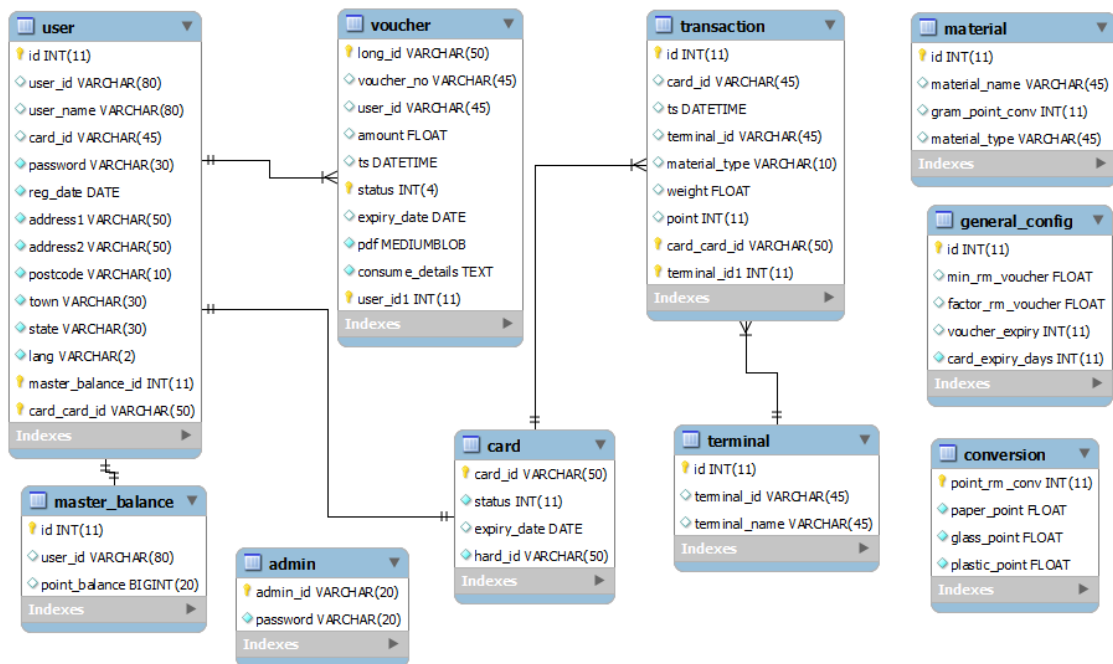


Figure 7. Database modeling using Entity Relationship Diagram for Web-based Reward System

CONCLUSION

This paper has discussed the design and development of web-based reward system for innovative smart recycle bin. The development of the system using the standard web engineering approach which consist of six phases. The detailed design on the scripting and product and process model described with the use of diagrams. The system supports both for public user as well as waste management authority allowing user friendly interface and efficient waste management.

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