Procedure Automation with Immediate User Notification: A Case Study

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Abstract—**There are various procedures in a university that can be automated with Information and Communication Technology (ICT) such as leave application, room reservation, facility booking and, laboratory or library material application. Adding such "inventory based systems" with an immediate feedback notification loop to the user will enhance the application process and increase user satisfaction. In this paper, we present automation of a stationary request procedure with Short Message Service (SMS) notification. As a case study, we designed and implemented the system at the Faculty of Computer Science and Information Technology (FCSIT), Universiti Tun Hussein Onn Malaysia. The descriptions of the system development process are presented. Essentially, the principle idea of the system can be used as a framework to effectively automate any university or business procedures that requires notification.**

Keywords- ICT; automation; online stationary system; SMS

I. INTRODUCTION

ICT can be utilized to automate various daily procedures at a university. Examples of such system include leave application, room reservation, facility booking and laboratory or library material application. In this paper, we focus on automating stationary request procedures at University Tun Hussein Onn Malaysia (UTHM). The university gives the right to the university staffs to request for stationary from general office at their respective faculty. The existing procedure consists of the following manual steps:

- Filling up stationary request form – A staff is required to state his/her details and list the stationary that he/she would like to request.

- Submit stationary request form – The completed form is to be submitted to Assistant Registrar of the faculty.

- Approval of request – The Assistant Registrar is to approve the request.

- Pass approved request to Administrative Assistant – The Administrative Assistant is to prepare the approved stationary, update inventory file, calls staff to pick-up the stationary from the office.

- Sign 'pick-up' form as a proof that the requested stationary has been received.

Consequently, these tasks which are carried out without computerized system exhibit the following problems:

- Insufficient stationary details - Staffs face difficulties to specify the name of the stationary that they want when filling up the request form because the information is not made available. The staffs have to query the names of the stationary from the Assistant Registrar and Administrative Assistant. For some stationary, the staffs have no idea about its physical appearance such as size, measurements, color etc. Thus, staffs may mistakenly request stationary item that do not meet their needs.

- Consumption of physical storage - Keeping the records of the requests in paper forms will eventually consume storage space as these forms need loads of physical files and cabinets.

- Difficulty of information retrieval – The information stored in paper forms are difficult to be retrieved for future reference.

- Prone to human negligence - Submission and passing of forms by hand are prone to human negligence. The paper based forms can be lost or damaged, thus difficult to track them.

These problems can possibly be reduced or eliminated by automating the procedures into an online system. Online stationary request is an example of "inventory systems," in which the service provider needs to keep track of available resources to be "rented" or "given" to a customer. However, tracking resources is important for the service provider, not for the customer. From the customer point of view, they only care to submit application and expect "answer" immediately. Therefore, adding notification service into the proposed online system will immediately satisfy both parties. In this paper, we present automation of a stationary request procedure with SMS notification (OSRS). Such implementation can be used to effectively automate any university or business procedures that require notification.

II. RELATED WORK

The automation of the manual system in this paper utilised online technology and SMS notification. A case study of automating stationary request management procedure is

presented to demonstrate the feasibility of integrating both ICT facilities into a usable system.

Online system is primarily about using Internet as a convenient platform for carrying out activities. There are various online applications developed for e-commerce applications. Online application such as online tender bidding system [1] enables better information management and improves transparency of the tender. Eventually the online bidding system helps to save time, manpower, and material resources for tendering management procedure. Online shopping system for digital works have also been developed to enable customers to purchase multimedia works in the form of images, text, audio and [2]. Online stock trading system in [3] accomplishes a three-tier architecture online system that achieves accuracy, simple and safe operation in displaying stock quotes and trading commission.

Online technology has also drawn researchers attention to explore new way of delivering educational materials to learners. The design of online classroom such as in [4] promotes efficiency in classroom materials preparation and encourages learning with interactive facilities such as toolbars. Online learning is also desired by learners as the technology overcomes problems of distance and time limit. Other than enabling flexibility to learners, learning anywhere and anytime, student-centered online learning system model is capable to encourage active learning of the students [5]. Such system in [5] has been evaluated in an e-commerce course and manage to engage students in developing their skills rather than limiting themselves to listening skills only. Another online based learning system was also developed by a group of physicists to conduct evaluation on physics course [6]. The simple to use, computerized system is used to supply personalized exercises and provide immediate grading to the students. As students devoted more time for self study than they would have otherwise with conventional system, eventually the availability of the system manage to prove improvement in the students' examinations results. Such online system also encouraged collaboration and discussions among the students, and essentially increased interactions between instructors and students as both obtained real-time feedback on the assimilation and understanding of the study matter [6]. Online scoring system is an example of efficient and convenient method of examination evaluation [7]. The system consist of primarily marking subsystem and arbitration subsystem [7]. An online laboratory management system such as NETLab [8] has also been designed and installed at the Indian Institute of Technology (IIT), India for microelectronics and VLSI engineering laboratory. The Internet-based online laboratory is a solution that enable learners to conduct and manage experiments in such a geographically dispersed institutions [8].

Online systems are considerably practical approach in automating management related tasks such as in web-based document management systems [9]. The system in [9] can be customized as it is designed to serve the need of an international organization. The original paper-based document management system confronts an unmanageable increasingly large volume of texts and the need to distribute the documents to geographically remote locations. Thus, features of the new web-based systems enables online recording of forms, e-mail notifications, electronic authorizations, database query, and records accessibility for future references [9]. Online monitoring system also facilitates maintenance procedure such as diagnosing status of power utilities at urban transit substations in real-time manner [10].

On the other hand, Short Message Service (SMS) technology has enabled a new way of communication. Although SMS was designed originally to support person-to-person text-based simple communication, now SMS is used to accommodate alerting systems. SMS based alert system is used in monitoring critical parameters which influence tissue culture growth [11]. The system is useful in improving efficiency and reliability of the monitoring process [11]. SMS based notification has also been utilized in electricity billing system [12]. The system utilizes GSM network to send power usage reading using SMS to energy provider. The e-Billing system used to manage all received SMS meter reading, compute the billing cost, update the database, and to publish billing notification to its respective consumer through SMS. Consequently the system as a whole improves efficiency of meter reading and billing notification [12]. A notified credit card payment system (NCCPS) has also been designed to handle notification and confirmation. In NCCPS, messages are sent through SMS to notify the cardholder as an alert in order to get the confirmation for completing payment transaction. Thus, such SMS based double confirmation system maximize security of transactions [13]. In agro-environmental remote monitoring system, SMS is used to alert workers on the changes of atmosphere quality in a greenhouse such as humidity, temperature level and air quality [14]. These are the factors contribute to quantities and qualities of crops. In remote monitoring and servicing of manufacturing equipments in factory SMS based notification is used to enable efficient maintenance [15]. In business, a SMS based notification has been proposed to an airline to inform passengers about flight status notification such as delays, cancellations, change the date of flights[16]. The SMS based notification promotes effective communication with the airline customers. In summary, there exists a wide variety of online systems and SMS based notifications applications. Our primary goal is to develop an online system to manage stationary request procedure with SMS based notification on the status of the request. In the next section, we will present the description of the proposed system, OSRS.

III. THE OSRS FRAMEWORK

Figure 1 shows the implementation framework of OSRS. The staff of FCSIT will request stationary via a web browser on any office PC in the university. Once the request has been completed and sent to the OSRS server, an SMS alert will be sent to an Application Administrator who evaluates and approves the request. The Inventory Administrator will then login into the OSRS and send a message via the SMS server to alert the staff that his/her request has been approved. In addition to this, the OSRS will automatically deduct the number of available item in the inventory.
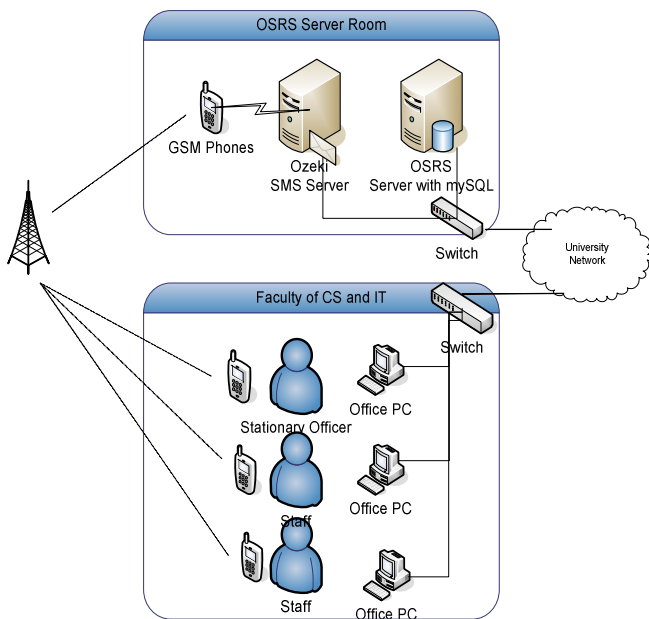
Figure 1: OSRS Implementation Framework

IV. REQUIREMENT ANALYSIS AND DESIGN

We identify requirement specification from interviews and observation of the manual practices. We interviewed the administrator and the staffs who regularly apply for stationary. We also looked into the old strationary request system (known as SPAT) and other similar system at other organisations. The procedures and processes were understood and put into data flowchart as shown in Figure 2 and Figure 3, for staffs and adminitrator, respectively. We also put them into Context Diagram (CD), Data Flow Diagram (DFD) and also Entity Relationship Diagram (ERD) to predict on the flow of the system and later use them in designing the database. The CD is the most general representation of the system flow. It is used to produce the DFD Level 0 and then further detailed into DFD Level 1. To help designing the database, we use ERD.

In the following section, we present the CD, DFD Level 0 and also the ERD of the proposed system.

Figure 4 shows the Context Diagram for OSRS. It shows in general how information flows between different users of the systems. There are two entitites involved, namely the staffs and also the administrator. The administrator enter input, which creates inventory record and also approve application. The administrator also creates accounts to allow them to login into the system, update inventory information and view report. Only faculty members can login into the system.

Figure 5 shows the three main processes. Process 1.0 is user login which is essential to allow only registered staff to use the system. Process 2.0 is an information management system where staff can apply and administrator can approve or disapprove application and also update inventory. Process 3.0 is used for report generation.
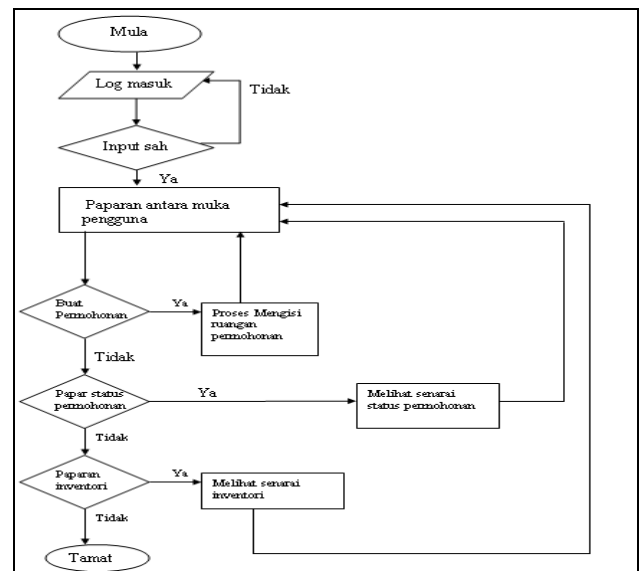

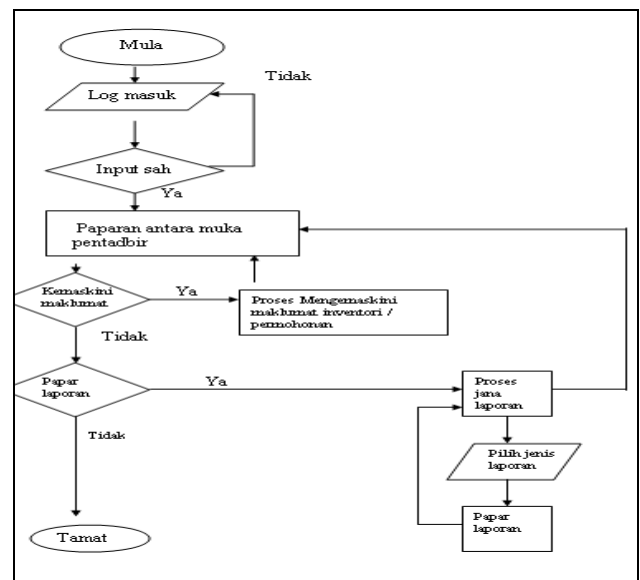
Figure 2: Flowchart for the staff

Figure 3: Flowchart for the administrator

Entity Relationship Diagram is a data model that link all entities in the system and it shall clearly shows explicit relationship between one entity to another entity. It is important to analyse the data requirement and also to determine the flow of the system. Among the elements in the diagram are entity, properties and relationship between entities. Figure 6 shows the ERD of OSRS. It shows one to one and also one to many and many to many relationships. For example, an administrator can manage many applications, therefore it has one to many relationship. An application can request many stationary items and a stationary item can be used for an application one at a time. Therefore, application entity and stationary items has many to many relationship. A stationary item can be applied by many staffs and a staff may take many items. Therefore, the

196

entity relationship between stationary items and staffs is many to many.

Figure 4: Context Diagram

Figure 5: The DFD Level 0 of OSRS

V. RESULTS AND DISCUSSION

A. Results

We have implemented the OSRS for Faculty of Computer Science and Information Technology using Adobe Dreamweaver MX 2004, PHP, Java script, mySQL database, a robust Apache web server and an SMS server that work with any GSM phone.

1) Staffs

Figure 7 shows the login interface of OSRS. We put the login/password textboxes, university logo to appear formal/legitimate, pen and pencil image to remind the function

of the system and an invitation to login. Once authenticated, the staff may choose to see all available stationeries provided by the faculty by clicking on List of Stationary as shown in Figure 8. If the item is listed in the inventory, the staff clicks on Order Form to order the item as shown in Figure 9. By clicking on Bin Card hyperlink, the user is brought to an interface (Figure 10) to specify the quantity they needed.

Figure 6: The ERD of OSRS

Figure 7: Login interface

2) Application Administrator(Assistant Registrar)

The most important function for an administrator is the list of recent stationary requests. Figure 11 shows the list of recent requests. It shows the name of the requester, the requested item(s), current stock available in the inventory, the quantity requested, the date and current status of the request (which is defaulted to "in process"). The administrator simply clicks on Update to approve or disapprove the request and optionally give comment (see Figure 12). Similar to staff, application administrator can view all current stocks for all items. The application administrator can also view application reports, staff reports and stock quantity report by month.

Due to bureaucracy and separation of duties policy, the university has decided to separate the task of inventory management from application management. We describe in the

197

following section, the functions provided to the inventory administrator.
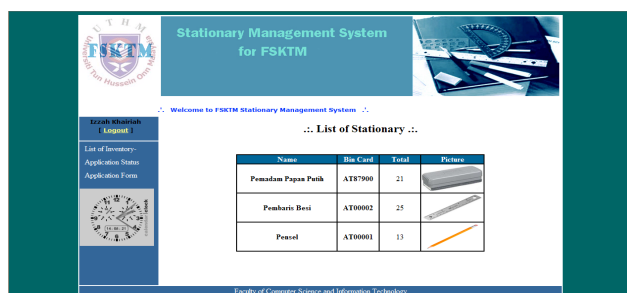

Figure 8: List of Stationary

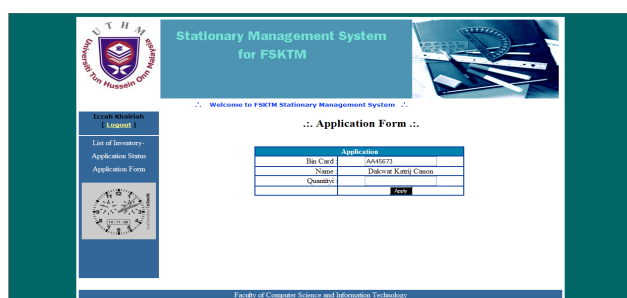Figure 9: The application form

Figure 10: Specifying quantity of the requested stationary

3) Inventory Administrator/Stationary Officer

Inventory administrator can add new items and remove any item from the inventory database. The administrator can also update item's name, quantity or category (see Figure 13). The inventory staff is given the task and authority to look into list of approved application (see Figure 14) and then send SMS notification to the approved staff (Figure 15). The OSRS server will communicate through the SMS server to send the notification.

4) Database

We designed and created a suitable database for the stationary request management module. The database involved in the stationary request management procedure includes:

Stationary – contains stationary id, stationary name, category, quantity and picture.

Application – contains application id, application status, application date, date of approval, and application comments.

SMS log – contains SMS id, receiver's phone number, the message, and sending time.
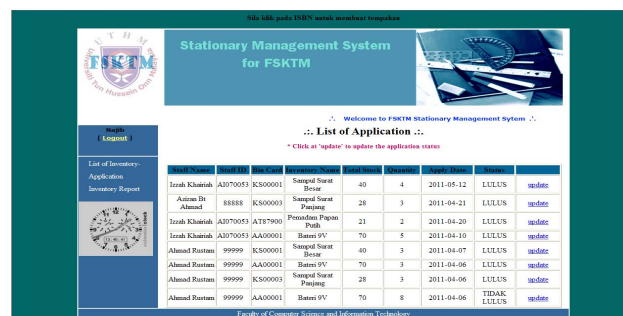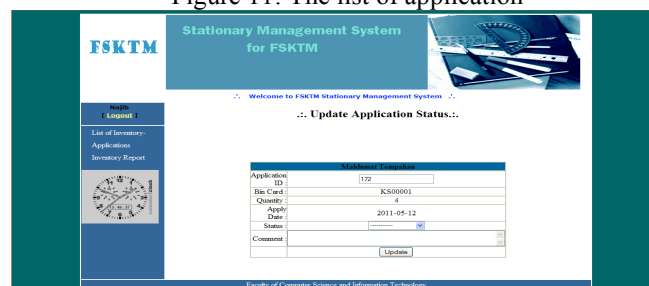

Figure 11: The list of application

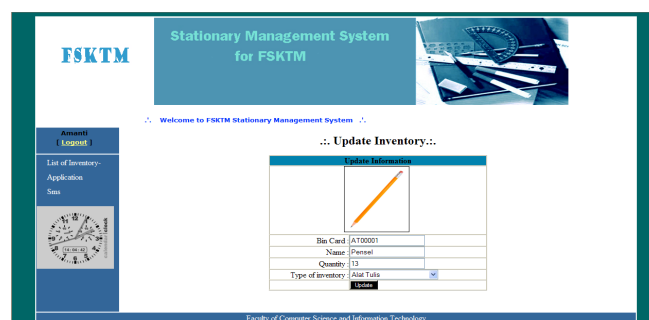Figure 12: Approval/Disapproval interface

Figure 13: Update interface of the inventory items

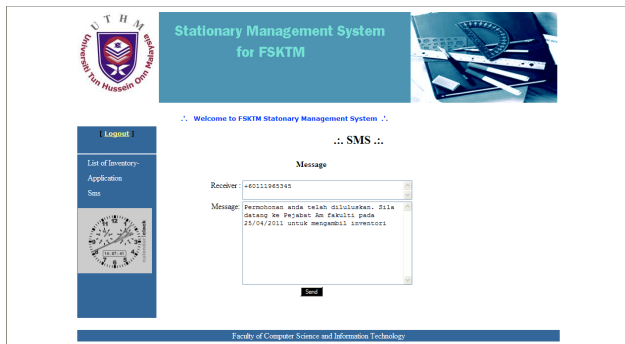Figure 14: List of approved / disapproved application

198

Figure 15: SMS notification to the approved staff

5) Discussion

We have succesfully automate the process of stationary request at the faculty. We learnt several things from the development work:

- Most tasks can be automated easily. The ability to integrate information from the inventory, the staff and the availability of SMS technology makes it easy for staff to get informed of the readiness of needed stationaries in relatively shorter time frame.

- Although developer can automate many things in the system, but due to bureaucracy and policy, the developer has to reduce the capability of the system to suits current policy. We think the application and inventory administrator can be merged into one.

- Futhermore, the SMS notification can be sent immediately to the staff once approved. Coding wise, this is trivial.

In previous system, the stationary request procedure took a week or more to complete its cycle. However, with the automated system, the procedure completes its cycle in one to two days. Furthermore, the system reduces physical storage requirements, such as paper, files, and cabinets. It also facilitates information retrieval, application tracking, and immediate user notification.

VI. CONCLUSION

In this paper, we present the development of an online stationary application management system with notification. We succesfully automate the current manual process with additional features like pictorial representation of the stationary items, SMS notification of an approved or disapproved applications and also integration of stationary application-inventory system. Essentially, the principle idea of the system can be used as a framework to effectively automate any university or business procedures that requires notification.

In the future, we suggest the merging of the application administrator and the inventory administrator. Furthermore, the SMS should be immediately sent to the staff once approved and inform them about the collection date and time. Finally, the inventory system should provide a threshold quantity for each item so that when it reaches this point, an SMS alert will be immediately sent to the administrator to increase back the number of available items.

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