Student matric card payment system using RFID technology

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Article Info

ABSTRACT

The Student Matric Card Payment System (SMaCPay) using RFID is an application which utilizes RFID scanner from matric card to record and track the student expenditure at PSMZA cooperative mart. This application is designed specifically to monitor the polytechnic student expenditure record once they purchase at cooperative mart. RFID SMaCPay uses Rapid Application Development (RAD) methodology. The RAD model is an effective methodology to provide much quicker development and higher-quality results than those achieved with the other software development methodologies. It is designed in such a way that, it easily takes the maximum advantages of the software development. This application has been developed using HTML and PHP as it language programming, Javascript as it scripting and MySQL as it database platform. This application enables student to make a payment via RFID tag using their matric card and check the balance amount through the application. Student's tendency for SMaCPay has been evaluated with min score of 1.61 for technical, 2.02 for user interface, 1.75 for data accuracy and 1.71 for accessibility aspect. Nevertheless, usage of current material for the matric card is quite unsecured due to low quality and result the embedded RFID chip within the card easy to damage which will cause to data loss.

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Introduction

In this era, the uses of mobiles application are more advance. Nowadays, smartphone is a multifunctional device in addition to make a call and send message and recognized as an important tool in human daily lives. With the rises of new technology mechanisms such as RFID, NFC, IOT and biometrics, latest smartphones becomes more reliable than its predecessor. Many applications can be installed and embedded in smartphone for any type of users such as an employer, worker, lecturer, student, seller and buyer. Sometimes, these applications can be as a support platform for the other physical item to function as per bankcard, identification card and also student's matric card. With the advent of new technology, data entry, storage and processing is experiencing unprecedented new waves giving ways to improve traditional manual systems

. We are motivated to explore the use of IT to develop application system using RFID for educational institutions, because of its overarching imperatives on improving comfortability (Qaiser & Khan, 2006). This application is involved the uses of student matric card that has contains unique ID such as matric number. The project's aim is to develop an application to help students in simplifying their purchasing activity. Privileges

section available in this application is an admin can activate student using the matric card and enable student to top up money and also make it available to reload. This application also facilitates student by knowing how much of their spending and enable them to review their expenses record for the previous of time at cooperative mart. This system is not intended to fully replace the uses of notes or coins in this mart but to avoid students from bring a lot of money every time and everywhere they be. It gives more safer environment for the student and makes them to be more responsible and discipline person by bring up their matric card all the time especially when they go to purchase at PSMZA's cooperative mart where this is recognized place that offer student needs and services.

Literature Review

Information systems and technologies are a major enabling tool for firms to create new products and services, as well as entirely new business models. As successful as Apple Inc, NetFlix, and Wal-Mart were in their traditional brick-and-mortar existence, they have all introduced new products, services, and business models that have made them both competitive and profitable. Dependencies of these types of giant profit-based company to the IT-related services and products show that IT is a crucial element of organization management. This makes neither people's time nor their energy to waste (Wang, Wang, & Hao, 2009). In purchasing activity, online payment is a common transaction process. Usage of a medium like a smart card, smartphone and apps improve the effectiveness in implementing the online transaction. An application like a *DayBook- Expenses Manager* is the application that will record the transaction, view the expenses in simplest and fastest way. User can record their daily expenses and also can views all transactions that have been done in simple format, with credit and debit information. Users also can view the total credit, debit and balance. This application also have custom category of transaction and it is just like a manual daybook for user to keep in touch about their daily expenses. In fact, an automated systems is considered to be the most efficient and trustworthy invention and has a noteworthy impact on large and small scale industries (Jain & et-al., 2012). However, no security features adapted in this application while record of previous expenses come without any particular details.
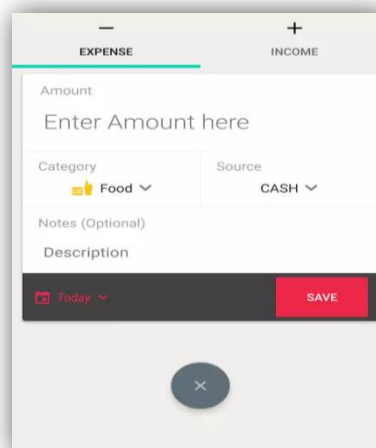

Figure 1 <Daybook Expenses Manager>

Radio Frequency Identification (RFID)

Radio Frequency Identification (RFID) is the remote non-contact utilization of radio recurrence waves to transfer information. Labeling things with RFID labels permits clients to naturally and particularly recognize and track stock and resources. RFID takes auto-ID innovation to the following level by permitting labels to be read without view and, contingent upon the kind of RFID, having a reader extend between a couple of centimeters to more than 20 meters. RFID has a place with a gathering of advances referred to as Automatic Identification and Data Capture (AIDC).

AIDC strategies naturally recognize objects, gather information about them, and enter that information legitimately into PC with almost no human intervention. RFID strategies use radio waves. Hence, RFID frameworks comprise of three segments; an RFID tag or smart label, an RFID reader, and an antenna. RFID labels contain an integrated circuit and a receiver wire, which are utilized to transmit information to the RFID reader. The reader then proselytes the radio waves to an increasingly usable type of information. Data gathered from the labels is then moved through an interface to a PC host, where the information stored in a database and broke down sometime in the future. As expressed over, a RFID label comprises of an incorporated circuit and a reception antenna. The tag is additionally made out of a defensive material that

holds the pieces together and shields them from any unnatural conditions. RFID tags come in a variety of shapes and sizes and are either passive or active. Passive tags are the most widely used, as they are smaller and less expensive to implement. Passive tags must be "powered up" by the RFID reader before they can transmit data. Unlike passive tags, active RFID tags have an onboard power supply (e.g., a battery), thereby enabling them to transmit data at all times.
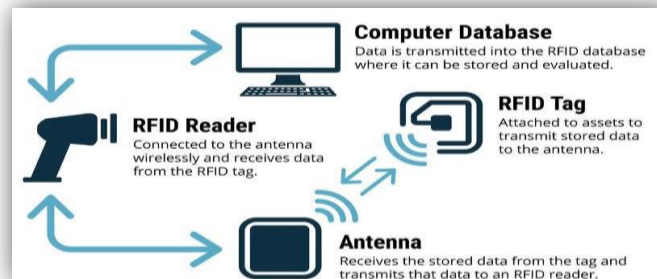

Figure 2 <Basic concept of RFID>

Reference [1] proposed an online mobile application using RFID and Object Counter. The system operates by capturing student id from their matric cards, check total balance amount of their account, perform transaction and stores in the RFID reader the details for later sending to the main server.

Problem Statement

PSMZA cooperative mart offering services like print, photocopy and many more but competitor such as other seller that existed in campus makes it less encouraged by the students. Sometimes, balance of payments cannot be calculated accurately, when the payment will be carried out as an addition or return the remaining money is wrongly given. Other than that, student also underestimates the matric card function, where feel like an existence of that card is does not have any privilege for them. Thinking that matric card is just for their identity recognizer only and not realize what kind of features that they can adapt and use with their matric card instead. Meanwhile, campus life demands student to spend more in term of to buy academic and non-academic materials. Here, they will bring a lot of money amount in their wallet. This is likely to endanger their safety where there will be a chance for money loss, wallet misplaced or stolen and may even be robbed by strangers. Other than that, higher learning management party should impress more in encouraging student to use and wear their matric card all the time. Student identity card is an indispensable means of identification for every student (Kadri, 2016) and if student's matric card able to replace the wallet function as proposed, and can be used to purchase items, it have a possibility that the card will always to be used and enables any strangers to be recognized.

Figure 3 <Basic Element of Student Card>

Objective

This research aim to identified an RFID technology which is been applied in Student Matric Card Payment System. Here, the stated objectives as follows:

1. To develop a Student Matric Card Payment System (SMaCPay).
2. To applied an RFID technology in authorizing the payment using student matric card

Method

Aimed at providing quick results, rapid application development is selected as research methodology as meant to give excellent development processes with the assistance of other development approaches. It is created to take the maximum advantage from the development software. Undoubtedly, it is designed to

augment the workability of the whole software development procedure for highlighting the participation of an active user.
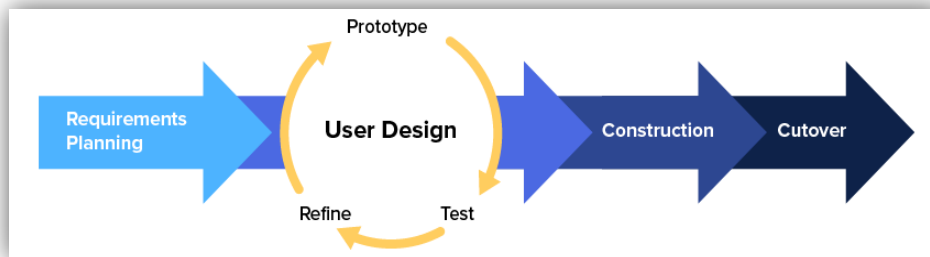

Figure 4 <Rapid Application Development>

The main objective of this development model is to design the new application with recognizing of an RFID chip that has been embedded within the matric card and the credit data to maintain the student expenditure record. RAD is a software development life cycle that permits organization to develop product faster while reducing cost and time. They also added about RAD is focuses on developing prototype model faster to get feedback from customer (Daud, Bakar, & Rusli, 2010). Phases involved in developing application using RAD such as requirement planning, user design, construction and cutover (Ahmad, Muddin, & Shafie, 2014). RAD methodology is time driven rather than requirements driven. Analysis is refer to the phase where all the needed information be gathered from the potential users such as student and cooperative mart's staff. Here, any related information that gathered is used to design the actual application including in conceptual and physical level. Next is the phase whereas any process to be done repeatedly until it is successfully functioned. Repeated process ensures that every problem is detected and resolved quickly and efficiently. This also includes the communication from the user, so any improvement can be made from their suggestion or complaints. This circle involves methods as refine, build and demonstrate until the actual aim is achieved. Testing phase is to ensure the system still on track before it implementation can be done.

Results and Discussions

This application of Student Matric Card Payment System (SMaCPay) was designed and dedicated to enhance the payment process in student purchasing activity in PSMZA cooperative mart. It is structured to the use of RFID concept. In constructing the modules, the language used is PHP merge with HTML and JQuery while Notepad++ was used as the development editor to ease the development of the system modules. The result has been taken from two types of finding as:

1. Actual system process which focus on how the system is operated and,
2. Tendency evaluation which has been evaluated using questionnaire sheet.

Below are screenshots of some of the modules and the services that offered by the application.
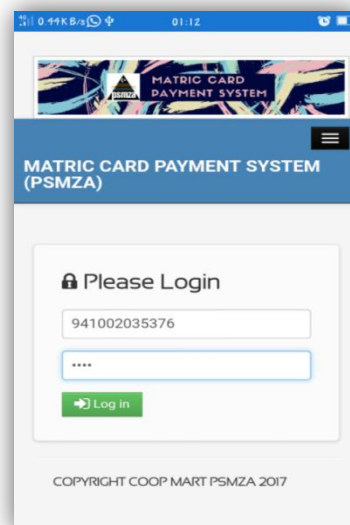

Figure 6 <Login p%age for Cooperative Mart Staff before Scanning the Student's Purchased Item>

When staff log into the system, they are linked to the page that will record the purchased item from the student. Here, each item scanned using barcode scanner to recognize the item's price before the system automatically sum up to get the total amount of the purchased items.

Figure 7 <Item Purchased List>

The item that have purchased by student will be scanned through system in order to detect the price and name for confirmation process. Each item will be scanned one per item at once; later users can get the total amount of purchase at the end of the list.
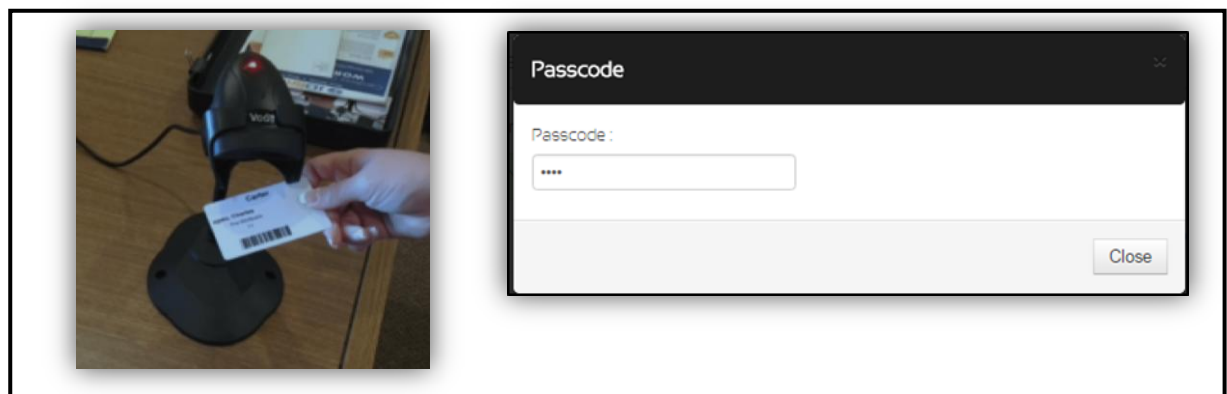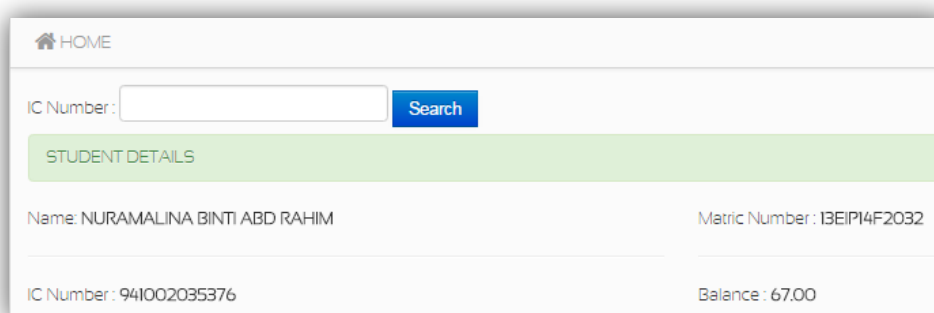

Figure 8 <Student Scan Card with RFID Reader and Input Passcode for Authorization Process>

Figure 9 <Balance Amount with Student Detail>

The student is required to scan their matric card using RFID reader. Next, they need to input the passcode as an authorization step for the payment process. After that, they will be linked to the student detail and balance information page. The balance value is the updated of credit amount after the deduction has been made by the system. We also have collects the data based on questionnaire to emphasis for user experience in using this application. Technical, user interface, data accuracy and accessibility aspects have been evaluated to get the result as follow.

Table 1 <Min Score Table of User Experience Evaluation>

Item	Min Score	Tendency
Technical Aspect		
1. Matric card can be used to purchase an item at cooperative mart	1.55	Low
2. The period of time taken to make a payment is too long	1.7	Low
3. Feel burden is carrying lot of money at the campus	2.6	Medium
MIN SCORE FOR TECHNICAL ASPECT	**1.61**	**Low**
User Interface Aspect		
4. the system layout arranged to ease of user usage	2.75	Medium
5. The colour of the application bother the user	1.3	Low
MIN SCORE FOR USER INTERFACE ASPECT	**2.02**	**Low**
Data Accuracy Aspect		
5. Payment receipt is printed and given to student	1.45	Low
6. Purchasing data is accurate and wrong calculation never been happen	1.95	Low
7. Student will be able to know their weekly or mothnly expenses.	1.85	Low
MIN SCORE FOR DATA ACCURACY ASPECT	**1.75**	**Low**
Accessibility Aspect		
8. Student can control their expenses with fiat note and coins.	1.3	Low
9. Student knows about the existence of offered promotion.	2.45	Low
10. There are cummulative point for each purchase that has been made.	1.4	Low
MIN SCORE FOR ACCESSIBILITY ASPECT	**1.71**	**Low**
Overall Min Score	**1.75**	**Low**

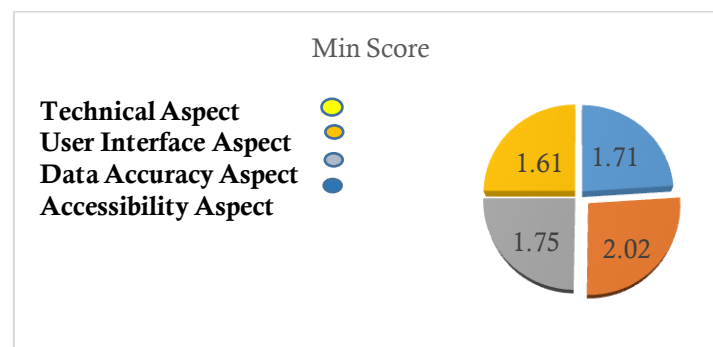**Figure 11 <Summarize of Tendency for User Experience Aspects>**

Conclusions

Thus, the use of student matric cards as a medium of payment is very significant where cashless purchase methods are applied that can encourage the use of student cards as access to perform the transaction process. This can reduce students' dependence on cash and since every expense can be recorded and reviewed, it can prevent the occurrence of impulse buying behavior among students which it can be influenced by the shopping environment, shopper's personal traits, product itself and the diverse demographic and socio-cultural aspects (Muruganantham & Bhakat, 2013). From the findings of the study, student tendency indicate the ability of the existing system does not meet the interests of students other than the accuracy of doubtful data, difficulty to get promotion information instead of evaluation of the system interface recorded a relatively good. Reference (Ghoshal, 2019), technology should be able to remove the physical distance barrier and made it very quick and easy to connect with people. While a study made on the system itself found that the purchase data that occurred were accurately recorded, purchases via cards that are easy to apply and expense record can be reached and reviewed. However, the use of low quality material in the manufacture of matric cards causes the card simply to be broken which will affect the embedded RFID chip and may lead to data loss due to damage on the chip.

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