PAPER • **OPEN ACCESS**

Parcel Tracking System Using Barcode Scanner with Verified Notification

To cite this article: Juanita Zainudin *et al* 2021 *IOP Conf. Ser.: Mater. Sci. Eng.* **1062** 012039

Parcel Tracking System Using Barcode Scanner with Verified Notification

Juanita Zainudin[1*], **Hafiza Samad**[1], **Faizah Miserom**[1] **and Shima Sabri**[1]
[1]Faculty of Computing and Multimedia Kolej University Poly-Tech MARA, 56100 Cheras, Kuala Lumpur, Malaysia

*Corresponding e-mail: anis_juanita@kuptm.edu.my

Abstract. The emergence of electronic commerce online shopping has significantly increased the use of mail-order within Kolej University Poly-Tech Mara (KUPTM) communities. The tracking system provided by the courier services offers the status of delivery for each parcel until it reaches the designated destination. However, inefficiencies of managing the parcels at KUTPM may causing lost or misplaced. Therefore, the study offers an innovative approach where the study intended to invent a parcel tracking delivery and management systems for KUPTM communities. In particular, this invention relates to computerized tracking of delivered parcels using the barcode or tracking number that will notify recipients via Short Message Service (SMS) notification. The primary purpose of this study is to develop an efficient and secured system called the Parcel Tracking System. The system used a web-based service for managing and tracking the parcel. The development method of this system uses PHP and JavaScript programming languages in Adobe Dreamweaver platform with MySQL programme as the backend of the system. This paper focuses on the development process of the Parcel Tracking System. The findings found that the efficiencies of parcel tracking and security management are significantly improved. The application of Parcel Tracking System is promising and efficient for KUPTM communities. It is evidently that the proposed system was found successful and beneficial for KUPTM communities in tracking and managing parcels efficiently.

Keywords: parcel tracking, barcode scanner, short message services

1. Introduction

A parcel tracking system commonly accompanied by a unique parcel identification which only detected from the central hub to the delivery of the item to the designated address. In Malaysia, Poslaju, GDex or DHL are some of the service providers who offer this kind of services to the customers. However, in some cases, the item may send to the office addresses instead of home address. The present study investigates the efficiencies of parcel tracking system KUPTM. The parcels usually will be received by the office administration department whereby the items will be in stationery for a temporary. However, due to lack of monitoring or managing the parcels, may cause inefficient where it can be potentially lost or unable to track effectively. Therefore, the current study suggesting more systematically approach by designing a system that can benefit the receiver once the item received by the administration office.

Several studies show that the tracking systems require notifications to the receivers to ensure the arrival of the parcel, but this is not the case. In this study, the items managed manually. Thus, these have significant impacts of the parcel's distributions at KUPTM. Also, there are other difficulties experienced by the office administration. These include a lack of monitoring system and the needs to have frequent monitoring of the parcels once it received by the administration office. Thus, notification characteristics

need to impose on the tracking system in managing ingoing and outgoing items adequately and proficiently.

Therefore, this research seeks to explain the development of Parcel Tracking System for KUPTM in assisting the staffs and administrators to manage the parcels. In this study, technical features were added such as the tracking procedure and the parcels update collecting status will be provided. Additionally, the system will provide notification through SMS to notify recipients on the arrival of parcel immediately.

The main purpose of this study is to develop an efficient and secured web-based system called the Parcel Tracking System at KUPTM for managing and tracking the parcel. In order to develop the Parcel Tracking System, the Spiral Methodology is used for the software development process while for the programming language, the current study utilised PHP programming. For the server backend, XAMPP, Apache and MyPHP is used and Adobe Dream Weaver serves as IDEs at the development stage. In addition, the present study intended to propose a QR code scanner and verified notification through SMS to the receiver.

The development of the Parcels Tracking System also includes a framework. The suggested framework is to overview the process of an online system which explain steps for the users to access using their portable gadget. Inevitable, the framework as fruitful in improving the efficiency of tracking parcel and security of the items in KUPTM with success. Thus, the study intended to propose a barcode scanner and verified notification through SMS to the receiver. With efficient Parcels Tracking Systems, this study demonstrates the need for better strategies for developing an efficient tracking system at KUPTM

This section has overviewed the significant of tracking system from manually to computerised system where the present study identified key component of developing a Parcels Tracking System.

The next part of this paper will address the main issues of the study following the methodology, developing process of the tracking system, findings and finally the conclusion.

2. Research Problem

The advent of electronic commerce and online business has increased the number of online shoppers yearly [1-5]. Thus, courier services sector such as Poslaju, GDex or DHL has simultaneously expanded their services significantly. Packages are delivered to designated destination via courier services and it has become a major necessity for companies that requires courier services on a regular basis to deliver parcels from different places [6-10].

The KUPTM's communities also requires the usage of courier services to deliver their online purchased goods or items and have them delivered to KUPTM as most of them spend more time at the establishment rather than at home. The deliveries make the transitions or process easier for both parties, i.e; the courier company and the receiver. The motivation of this study was initiated when there were too many parcels delivered at the administration department and some of it was stranded for long time.

The administration department of KUPTM is responsible in accepting letters and parcels addressed to KUPTM's staff and understudies. However, it is not the responsibility of the administration department personnel to oversee individual's parcel, as they are just required to deal with formal letters and parcels. Majority of them feel obliged to receive and deal with the parcels for other staff as well since all works were carried out manually using logbook. Manual work may lead to time-consuming and are prone to human errors [11-13]. Due to this, their remaining task at hand has some way or another expanded definitely as they require additional time in taking care of and dealing with the parcels, in which, now and again the things will take up some of their workspace and disrupts their movements.

The receivers made numerous complaints, as most of them did not get any updates from the administration department in regard to their parcel arrival status. They need to check regularly at the administration office, which some finds it inefficient and cumbersome. Meanwhile, for students, the Student's Council will make an announcement through the social media platforms such as Facebook and Twitter to update on the arrival of their parcel. However, this is not proven efficient as not all students are active on social media platforms and they might not have Facebook or Twitter account.

Considering keeping the items for quite some time may cause distress for the administrative staffs. is due to handling personal belongings which create discomfort among administrative personnel. With limited staff and space contributes to the unorganized parcel management. Ample space also required to store parcels due to limiting the office space and contribute to the inefficiencies of storing the items. On the other hand, information about the parcel's received was recorded manually. Consequently, there is a potential for having misplaced information and increase human errors. By understanding factors that should consider, proposing a Parcel Tracking System is an opportunity to widen the efficiencies of managing the items.

Based on feedback received from administration department (*Bahagian Penyelenggaraan, Pentadbiran & Pengurusan Aset*), regularly, there are an average of 30 parcels delivered and may increase up to 50 packages during the seasonal and promotional month. There were some cases where several items lost due to poorly managed collection records. Based on these feedbacks, the idea of the insecure nature of the traditional method is not reliable. Overall, there are more than five items were not collected by the purchases since October 2018 and is believed the number may increase for the following year. Table 1 shows the analysis of parcels at KUPTM for the year 2019.

Table 1. Analysis of parcel records at KUPTM for year 2019

Category	Number of Parcel
Average delivered parcel per day	30
Uncollected parcel	5
Lost parcel reported	2

3. Methodology

For developing the Parcel Tracking System, the system is using the Spiral Model. The spiral model (Figure 1) has four phases, which is identifying, development, evolution and risk analysis. A software project repeatedly passes through these phases. The baseline spiral, starting in the planning phase, requirements are collected and continuously assessing the risk. Each subsequent spiral build on the baseline spiral. Several advantages are using the spiral model. The spiral model enables to control a high amount of risk analysis thus, avoidance of risk is enhanced. Also, the spiral model suits for large and mission-critical projects. The spiral model is also approval and documentation control. Furthermore, an initial stage of developing the software through a spiral model enables to identifying an additional functionality which can create more efficiencies at an early stage. Therefore, it is suitable to be adopted as their prime development approach for the maintaining, designing, planning and programming of this parcel tracking system.

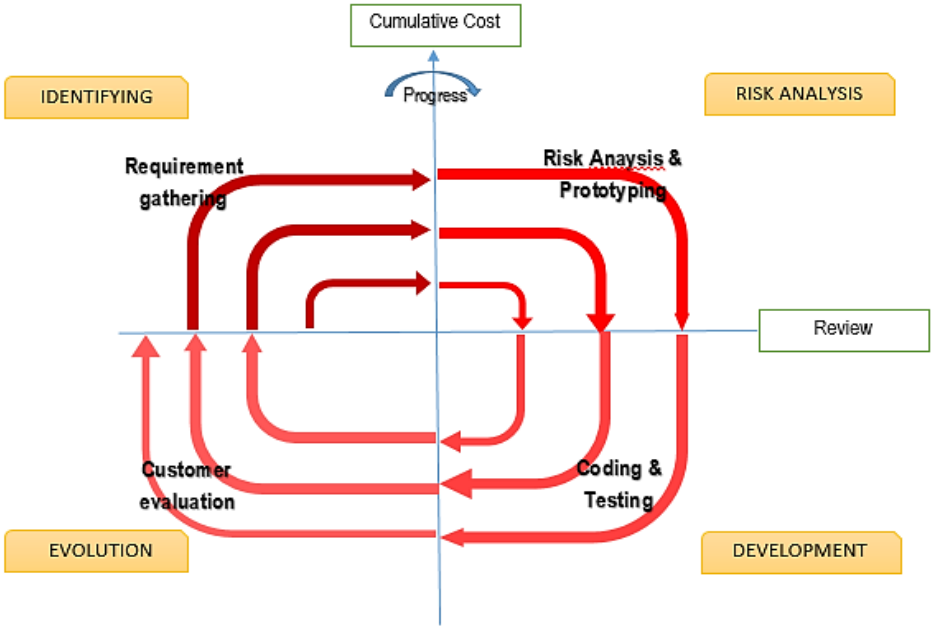

Figure 1. Spiral model

The programming language used for the implementation includes PHP programming was employed for the development of the users' application. XAMPP, Apache, MyPHP were used as server backends and Adobe Dream Weaver served as IDEs at the development stage. Table 2 defines the tasks that were conducted at each phase.

Table 2. List of tasks

Phase	Task
Requirement gathering	Generating a requirement of functional, system, technical and user expectation. Literature analyses form the previous studies was conducted and interview with the KUPTM lecturer and staff of Human Resource Department.
Risk analysis and prototyping	Cultivates creditable outcomes for any issues arise that is confronted during investigation such as previous and current problems, limitation of the system, and KUPTM infrastructure.
Coding and testing	Transform the design of the system to coding by using high-level language application; PHP programming, XAMPP, Apache, and MyPHP. Outcome of the system was tested by providing the program with a set of test inputs and observing the behave of the tracking system.
Customer evaluation	Beta testing by the user and gathering their feedbacks to meet their needs

As illustrated in figure 1, this model is a combination of waterfall and iterative model that supports risk management and is best used when software developers plan to handle the risks at each point. Consequently, failure can be minimized until the user can use it completely.

4. System Design

This section describes the process of system design by describing the necessary modules, architecture, stakeholders, components, interface and data. All relevant variables are indicated and specified to meet their requirements. There are two types of design styles which are use case diagram and flow chart design. Use case diagram is used to visualize the user's practical requirement while flow chart design is to display the steps and decision making during the process.

4.1. Use Case Design

Actors involved in this system are administrator and users. Administrator is the administration department's staff while users are staffs and students of KUPTM. In the use case diagram depicted in Figure 2, users need to register first to enable the email notification with Quick Response Code (QR) code. The parcels can be collected using this verified QR code. There is a tracking activity where Users can enter tracking number and find out the status of parcel. Administrator will add the newly arrived parcels to the system and system will notify the Users through SMS notification. The Update Collector task allows Administrator to update collector information when parcel is collected. All parcel information is manageable by Administrator. Report will be generated providing parcel and collector information for future references. Super Administrator can add and manage all Administrator of the system.

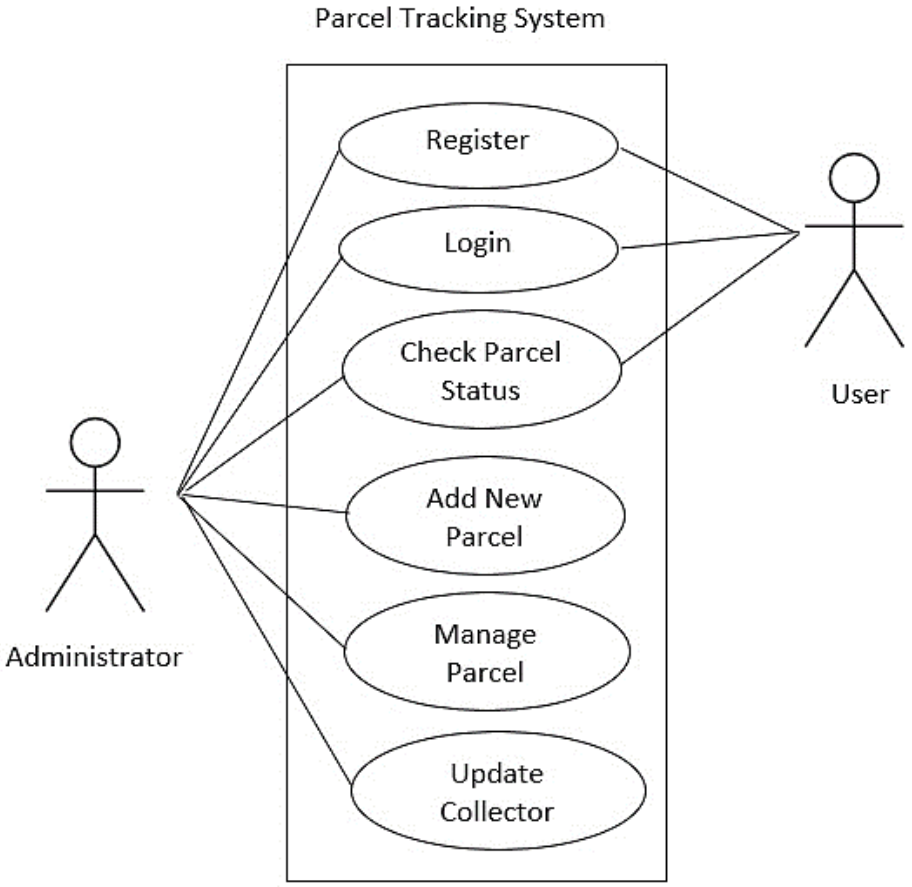

Figure 2. Use case diagram of parcel tracking system

4.2. Flow Chart Design

The proposed program removes all manual works by offering valuable features do not present in current practice. The purpose of this project is to make it easier for users to track and trace parcels that arrived at KUPTM. The flow chart of the proposed system is shown in Figure 3. Administrator will add new parcel information into the system by scanning the barcode number and enter recipient's phone number. Then, the system will automatically send an SMS notification to the parcel's receiver. Users need to register for the first time using the connection given in the SMS notification. The QR code for collecting parcels will be delivered via email. Recipient will be received email providing QR code for collecting purpose. This to ensure the verified recipient would come and collect the respective parcel.

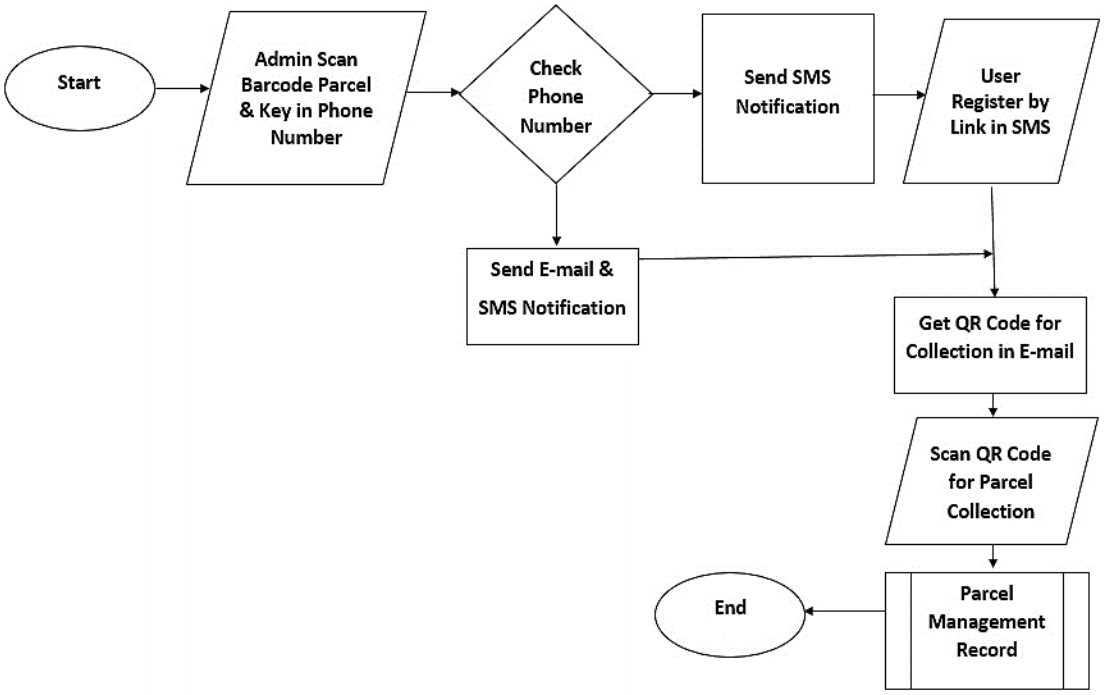

Figure 3. Flow chart diagram of parcel tracking system

5. Results and Discussion

The aim of this study is to develop an efficient and secured Parcel Tracking System using verified notification and barcode technology. In this system, tracking number will be scanned using barcode scanner and receiver information will be recorded into the system. Once recorded, users can trace parcel and the update the parcel collecting status as required. In addition, the system will also provide SMS notifications that will alert users the arrival time without any delay. Verified QR code for collections will also be sent to the email. This to ensure parcels are collected by the owner of the parcel only. According to a research done by University of Nigeria, proper courier service will ensure that customers easily participate effectively and will also build trust in the courier service system [14 - 15].

Figure 4 shows the user's main page. The main features for the main page are the users can track and trace their parcel. The system introduces a simple step by using the barcode scanner to read tracking number or enter manually the tracking number into the text box and clicks the submit button. Users can go to other pages by clicking on Location & Contact or FAQ button.

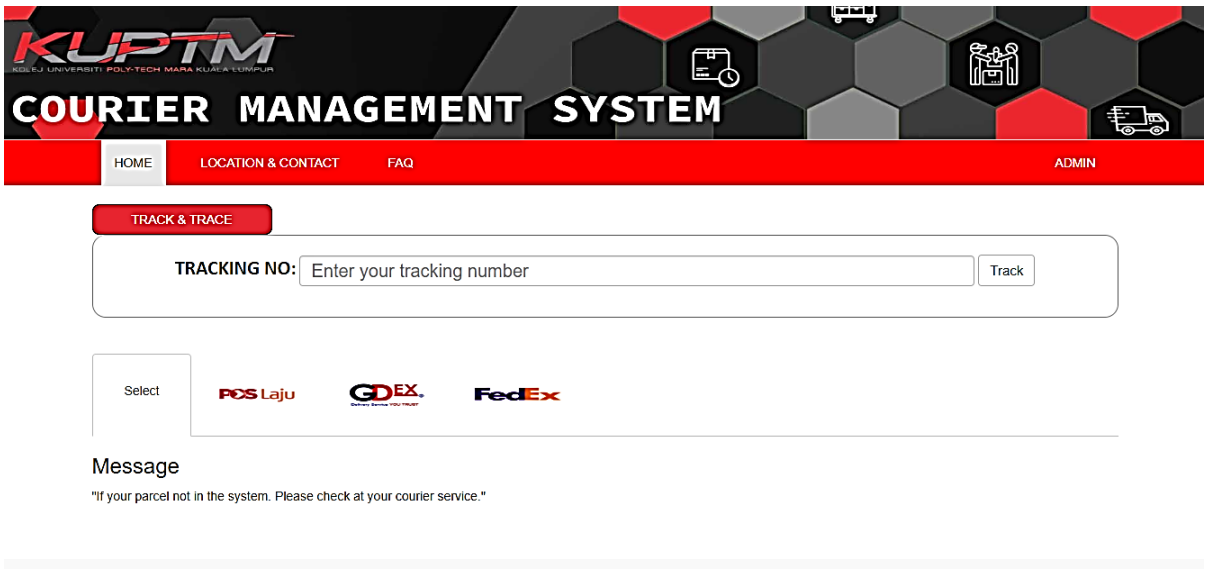

Figure 4. Sample of main page

The security administration page has authentication password and username to login into the system. This to ensure only authorized person can access and control the system. Administration main page provides searching engine for administrators to trace the parcel with a tracking number. Figure 5 shows the main page for system administrator.

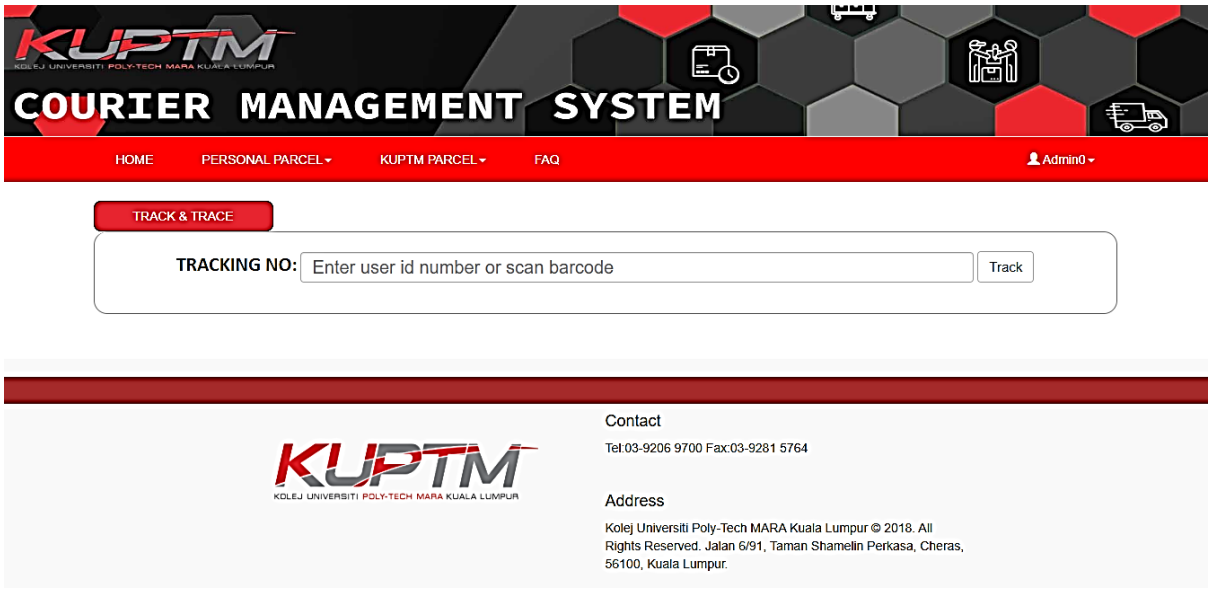

Figure 5. Sample administrator page

The system administrator can insert new received parcel using barcode scanner in Add New Parcel Page as shown in Figure 6. System administrator needs to key in all data provided in the form. System will automatically send notification through SMS to the phone number entered.

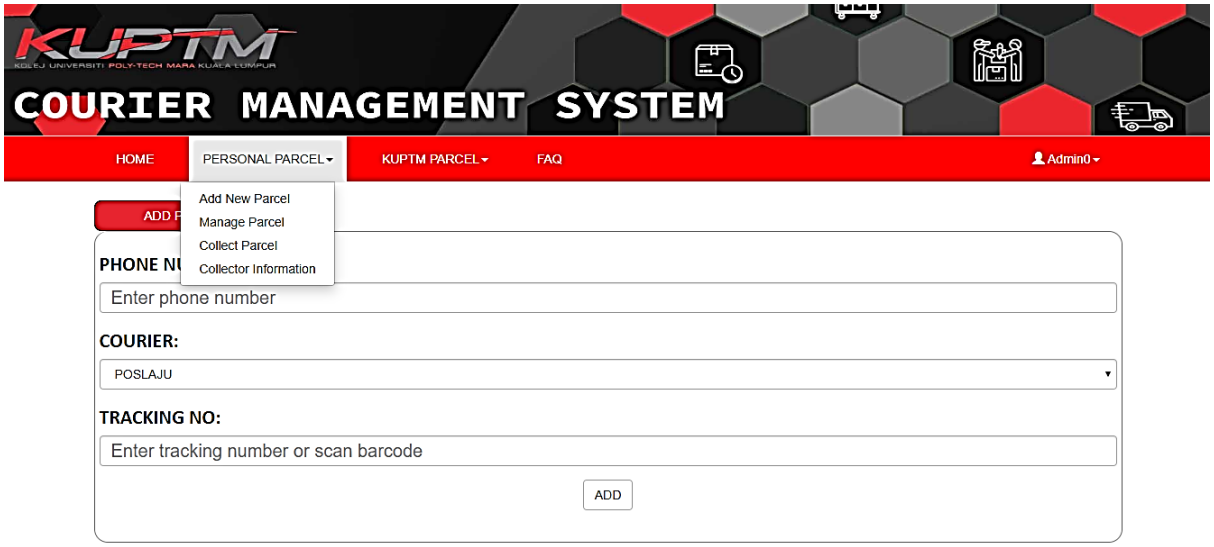

Figure 6. Sample page to add new parcel

On the other hand, the Manage Parcel's Page provides search and filter mechanism that can list data according to the status. System administrator can update or delete the information by clicking the action at the right of the table as shown in Figure 7. Password is required to update or delete information. This to ensure that data is not updated or deleted by unauthorized individuals.

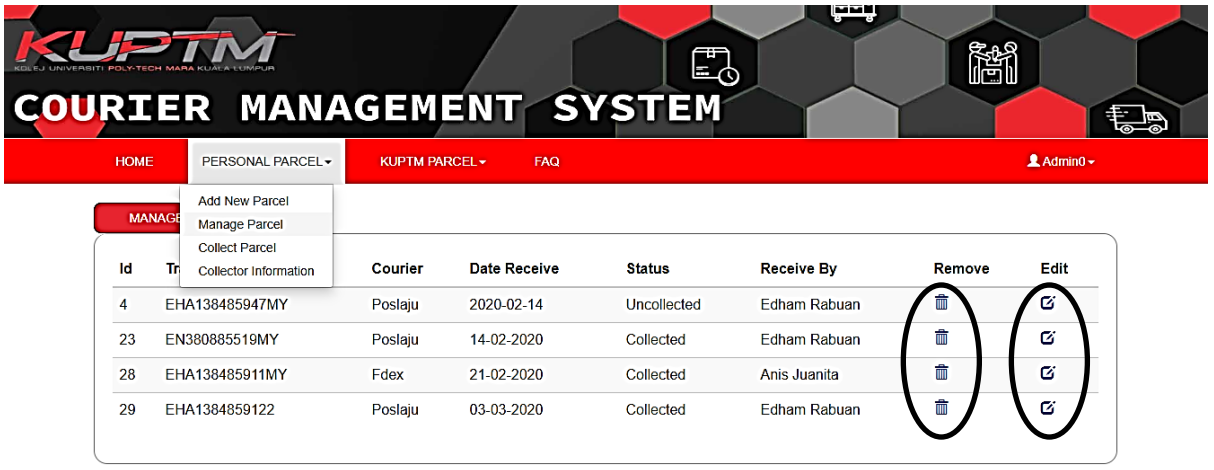

Figure 7. Sample page to manage parcel

Findings from survey has proven that 92.6% of respondents agreed that the proposed system has improved the tracking and management of parcel at KUPTM. The comparison from user feedback in the range of strongly disagree to strongly agree was analysed and measured results is tabulated in Table 3. This comparison of results show that the tracking and management process has been improved and successful. The results also revealed that the proposed system has contributed significantly towards improving management and tracking parcel at KUPTM.

Table 3. Respondent feedback on proposed system can improve parcel data management

Range	Frequency	Percent	Valid Percent	Cumulative Percent	Range Description
1	0	0	0	0	Strongly Disagree
2	0	0	0	0	Disagree
3	9	7.4	7.4	7.4	Neutral
4	18	14.9	14.9	22.3	Agree
5	94	77.7	77.7	100.0	Strongly Agree
Total	121	100.0	100.0		

6. Conclusion

The research undertakes to develop a Parcel Tracking System and implement at KUPTM. It has shown that there are significantly essential in managing items delivered to the administration office. Overall, the Parcel Tracking System enable to increase efficiencies in terms of information storing, provide notification messages, and more importantly, handling and managing the parcels can be achieved successfully. This study has demonstrated the needs of computerized system that enable the users to manage the items. Furthermore, the application of Parcel Tracking System at KUPTM enable eliminate human errors, create a new opportunity for the administration staffs to locate and storing data. In addition, the system demonstrates the capability to transmit the information to the receiver in timely manner. Although the propose system enable to eliminate human errors, several improvements can be suggested to increase the system capabilities. It is recommended that further research be undertaken in the following areas:

1) Additional features for mobile application capabilities: The current project focus on application usage using personal computers. Future works can be done by offering better access to users using mobile phones. The needs of having a mobile app are very much needed for this study. However, adjusting the systems into mobile apps requires added specification such as system interfaces, mobile views and others. It is believed if by offering these additional features to the users, there are more likely the system can be implemented elsewhere.
2) Integrating Parcel Tracking System into KUPTM Main System: The KUPTM Parcel Tracking System is an independent system which designed for notifying parcel status to the receivers. However, it is recommended that the future study enable to integrate with KUPTM system where it is more centralized and accessible by both users, staffs and students. Integrating a system is not new. However, considering a further requirement is very much needed. These include but not limited to the software requirements, designing the compatibility of the system to emerge with the existing system and migrating the database. In addition, the integrative system allows the users to benefiting the functions and notifying the receivers efficiently. Another important practical implication of having the integrated system is to ensure the stability and efficiencies of parcel data to the administration office.

Acknowledgments

The authors gratefully acknowledge the URG/1018/SCTS/01324(16) for providing financial support.

References

[1] Hajli N, Shanmugam M, Papagiannidis S, Zahay D and Richard M O 2017 *J. Bus. Res.* **70** 136-44
[2] Shuen A 2018 Web 2.0: A Strategy Guide: Business thinking and strategies behind successful Web 2.0 implementations: O'Reilly Media.
[3] Mahajan M D and Rane K 2015 *Int. J. Sci. Eng. Res.* **6(10)** 437-439
[4] Ming-Shen W, Chih-Chung C, Su-Chao C and Yung-Her Y 2007 *Int. J. Manag*. **24(2)** 296

[5] Rosqvist L S and Hiselius L W 2016 *J. Clean. Prod*. **131** 163-169
[6] Le T V and Ukkusuri S V 2019 *TRIP* **1** 100008
[7] Rai H B, Verlinde S and Macharis C 2018 *IFAC-PapersOnLine* **51(11)** 588-593
[8] Rajendran S D, Wahab S N, Ling Y W and Yun L S 2018 *Int. J. Sup. Chain. Manag.* **7(5)** 461
[9] Atletiko F J 2017 *Procedia Computer Science* **124** 759-766
[10] Wang Y, Jin M, Chen G, Cui X, Zhang Y and Li M 2019 *J. Adv. Res*. **20** 23-32
[11] Aravind T, Kumar P D and Saketh D 2019 *Int. J. Sci. Res. Comput. Sci. Eng. Inf. Technol.* **5(2)** 420-423
[12] Zhou M, Zhao L, Kong N, Campy K S, Xu G and Zhu G 2020 *J. Retail. Consum. Serv*. **52** 101911
[13] Wu C, Wang X, Chen M and Kim M J 2019 *Adv. Eng. Inform.* **42** 100960
[14] Agu M, Nwoye C and Ogbuokiri B 2015 *IOSR J. Mobile. Comput. Appl.* **2(2)** 56-61
[15] Tyler D P and Subramaniam B 2020 Location tracking using beacons. Google Patents.