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Development of Textbook Loan Management System (TLMS)

Ainul Azila Che Fauzi [1]*, Afiq Haikal [2], Auni Fauzi [3] and Mohamad Syauqi Mohamad Arifin[4]

[1,2,4] Universiti Teknologi MARA Cawangan Kelantan, Machang Campus, 18500, Machang, Kelantan Malaysia
[3] Universiti Malaysia Terengganu, 21300, Kuala Terengganu, Terengganu, Malaysia

*ainulazila@uitm.edu.my

Abstract: Technology has played an essential influence in the development and expansion of education around the world. However, not all students will enjoy the benefits and gain equal access to knowledge through online learning. There is still limited internet access, limited number of devices causes them to share those devices with other family members, as well as devices that do not support the display of content on websites and smartphone applications. It is indeed impossible to ignore the value of textbooks because textbooks serve as a reference tool for students both at school and at home. However, even though it has been operating for a long time, textbook management system still operates manually. The biggest issues with the manual approach are the inefficiency of manually collecting students' data, storing the data securely and keeping track of lost textbooks. This manual data storing poses the risk of losing the forms because in a school, there are thousands of students who are involved in this process. It is impossible to ensure the data is kept safe because the same form must be marked and returned twice, during the borrowing and returning processes. As a result, it is difficult to determine the textbook inventory and miscalculation may occur as well as making mistakes when ordering textbooks. Teachers also might have difficulties in finding those who lost the textbooks. The aim of this research is to replace the existing manual system with a computerized Textbook Loan Management System (TLMS), also known as *Skim Pinjaman Buku Teks* (SPBT). This system will help teachers who oversee SPBT, also known as SPBT teachers, to manage the whole process and data involved during the borrowing and returning of textbooks. This project will use a barcode scanner to scan the International Standard Book Number (ISBN) barcode at the back cover of the textbooks to minimize the time consumed for the whole process.

Keywords: Mobile Application, SPBT, System Development

1 Introduction

As the entire planet went to a COVID-19 shift, so did the way of learning. Virtual education paved the way for many to continue learning while the battle against the virus raged on. New materials are introduced in the digital learning system, making it easy for people to access the new sources of knowledge. Books are highly valuable for professors, lecturers, students, and even the general public as it can be used for all intents and purposes as references for studies and theses, as well as to obtain the knowledge [1]. Unlike anything else in the world, books can contain and maintain all types of knowledge, stories, thoughts, and feelings [2]. A textbook is a learning book that is used in a certain field of study and is a standard book compiled by professionals in that field to teach a topic based on the learning process' aims and objectives [3].

The textbook primarily serves as a framework for managing lessons as a social interaction and a basis for negotiation among all parties involved, which is fairly significant [4]. Textbooks play a vital role in complementing instructors' knowledge gaps in the context of limited teacher context knowledge [5]. According to [6], textbooks have been a part of educators' knowledge base for centuries. It has an extremely lengthy lifespan, considerably longer than the average readers' lifespan. It is a low-tech tool. Anyone who can read the language in which it was written, can access it.

The Textbook Loan Scheme or well-known as *Skim Pinjaman Buku Teks* (SPBT) is a government program administered by the Malaysian Ministry of Education for school students. Every student in a school will receive a set of books provided by the government to aid them in the learning process.

However, even though it has been ongoing for decades, its management is nevertheless ineffective. SPBT management does not achieve maximum efficiency since it still has flaws in contract administration, program implementation, and monitoring [7]. SPBT continues to operate the management system manually, posing a risk of data loss and duplication. Keeping track of paper records, finding facts, and keeping details safe take more effort, time and physical space [8]. Numerous issues emerge during manual management process that SPBT teachers and members have to deal with when handling textbook borrowing and returning sessions. One of the difficulties that they face is keeping track of the books that students borrow and return. This commonly occurs during the textbook return session. Each student will receive a form listing the textbooks to be borrowed during the textbook borrowing and returning session. The form varies for each school. Since the form is completely done by each SPBT, the form is unlikely the same. Some schools require their students to check the books they borrow and return, meanwhile some schools prefer to require their students to fill in the date for each session. The aim of this project is to develop an automated book handling system in SPBT Management, as well as to increase the efficiency and effectiveness of SPBT system by reducing the manual works to be done. It can also track fines for students who lose the textbooks.

2 Existing Methods

A Library Management System

Husin's [9] project has been classified as one of the related projects to the SPBT system since it uses a few of the same functional requirements as the SPBT system. The system was submitted to the Federal University of Oye Ekiti's Department of Computer Science, Faculty of Science, in Ekiti State, Nigeria.

The goal of the project is to design and build a computerized library management system. HTML, CSS, PHP, and a MySQL database were used to develop and implement the system. The V-Model software development approach was also used to develop the system.

The project's primary objective is to create a computerized system that would manage library operations and provide quick access to library usage for librarians and library customers alike. It will also assist librarians in keeping track of library data, among other things. This solution will also provide digital recordkeeping and aid librarians in maintaining library records.

Digitalization of many operations has resulted from the desire to make life easier and processing faster. Digital technology has had a significant impact on a variety of industries, including education. A Library Management System was designed to manage all library operations such as borrowing, returning books, and so on, in order to promote technology-driven education.

The author concluded that the developed system is an efficient, useful, and stable Library Management System after doing thorough analysis and evaluation. The author also stated that the system was in good working order and that it met the minimum requirements set forth at the outset. In terms of efficiency in the use of the library system, the new system is projected to benefit both users and employees.

B UniSZA Book Borrowing System Using QR Code

UniSZA Book Borrowing System with QR Code [10] is a system that allows their students to lend books more conveniently by just scanning the QR code on the back of the book. Apart from saving time and simplifying operations, this method can also eliminate direct encounters between students and library personnel while also assisting them in adhering to government-mandated standard operating protocols in the occurrence of COVID-19 pandemic.

The author was using QR (Quick Response) code as a technology implemented for book borrowing system. QR codes may be retrieved faster and include more information. QR codes do not require complex technology to store data. Instead, it is shown as a little black and white box on a sheet of paper. This system's usage of QR codes is intended to speed up the book borrowing procedure and save student's time.

She stated that the use of the old method has produced complications since students had to wait in line to borrow the books. As a result, the likelihood of a broken self-check machine would occur. If the machine is broken, students must go and refer to the librarians to complete the borrowing procedure manually. This will extend the time it takes students to complete the book borrowing process.

C Textbook Loan Management System Using Simple Rule-Based Decision Tree

Farah Azlin carried out this project in Sekolah Menengah Kebangsaan (SMK) Tembila, Besut, Terengganu. The study's goal was to replace the former manual system with a computerised Textbook Loan Management System (TLMS) or *Skim Pinjaman Buku Teks* (SPBT) [11].

The biggest issues with the former approach, according to the teachers in charge, are the inefficiencies of manually recording student data and keeping track of lost textbooks. Teachers must also divide the number of textbooks they get from sources by the number of textbooks they deliver to students. When textbooks are damaged or misplaced, it might be difficult for teachers to track down the borrower. The application can also assist staff in more conveniently recording students' information and textbooks.

3 Methods

Waterfall Methodology

For this study, Waterfall methodology as shown in Figure 1 is adopted because it will proceed from one phase to the next. Waterfall methodology is chosen to use in the SPBT Management System because it is easy to comprehend and implement. There will be no overlap in the phases in a waterfall model because each phase must be completed before the next phase can begin. The phases consist of planning, requirements gathering, system design, implementation, testing, deployment and maintenance.

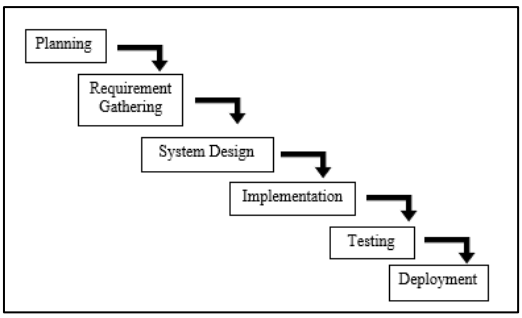

Figure 1: Waterfall Methodology

i. Requirements

The requirements phase defines the functionality, performance standards, and other criteria that the system must meet to be acceptable to the client, who is the SPBT teacher. Reading journals and previous studies, as well as using the internet to find information on the issue, are among techniques used for gathering data and information. Before using software development tools to set up the system, information will be acquired from the users and everyone involved regarding the needs of the system's users using qualitative gathering methodologies oral interviews (Adebesin, 2015b) and, in this context, information from SPBT teachers and members are acquired. User requirements and system requirements are detailed as follows:

User requirements:

a) The system shall allow SPBT members to login after account verification.
b) The system shall allow admin to login after account verification.
c) The system shall allow users to add, update and delete new members.
d) The system shall allow users to add, update and delete new students.
e) The system shall allow users to add, update and delete new textbooks.
f) The system shall allow users to borrow, view and return the textbooks.

Table 1: Software Requirements

Item	Description
Operating System	Microsoft Windows 7 Professional 64 Bit
Text Editor	Notepad ++
Server	Apache
Database Tool	MySQL
Designing Tool	Adobe Photoshop/Draw.io
Word Processing	Microsoft Word

Table 2: Hardware Requirements

Item	Description
Platform/OS	Microsoft Windows 7 Professional 64 Bit
Processor	Intel Core i5-4200U CPU @ 1.60GHz 2.3GHz
RAM	4 GB
Hard Disk	500 GB
Scanner Device	Barcode Scanner

Design

Entity relationship diagram (ERD) and use case diagram were designed to represent the project details. Based on Figure 2 below, there are eight entities. Entities are independent entities or concepts in the actual world. In a relational database, entities coexist with database tables, with each table entry representing an instance of that object.

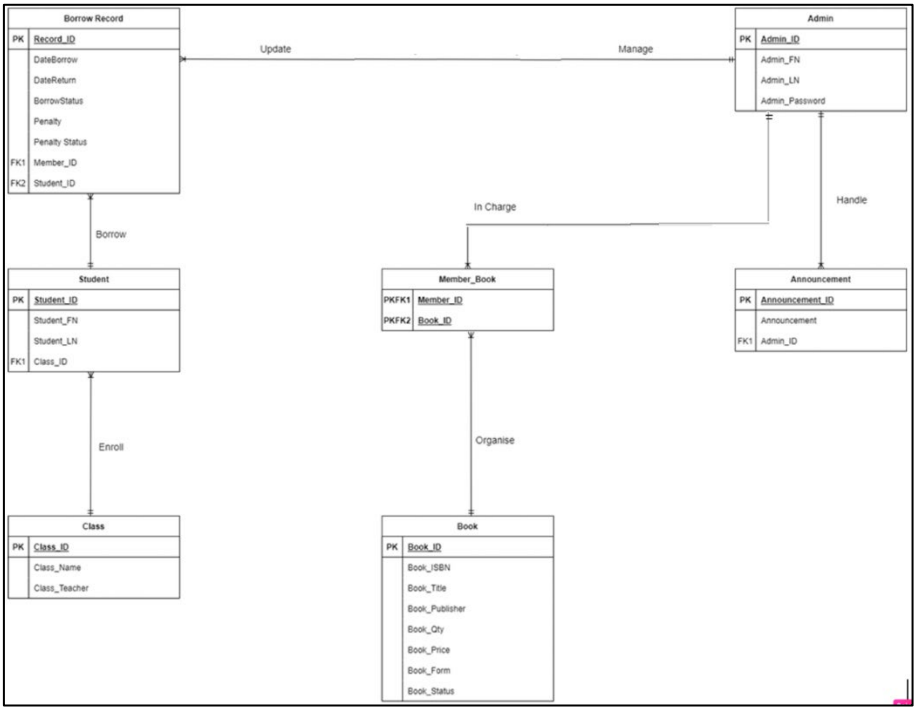

Figure 2: Entity Relationship Diagram

In the SPBT system, an admin is the SPBT member. Admin's data recorded in database are admin's identification (ID), admin's first name, admin's last name as well as admin's password. In th system, there are also announcements for the members from admin. Each announcement is mar one admin and an admin is eligible to handle many announcements. Information that is require announcement are announcement's ID and the announcement.

Each SPBT member is in charge of all textbooks, and each textbook can be organized by many SPBT members. SPBT members should record book's ID, title, publisher, quantity, the form, and book status whether it is available or not. Each SPBT member has their own ID, first name, last name, and also a password. An SPBT member can manage and update many students' records on textbook borrowing, and each student can be managed by many SPBT members. All the borrowing and returning must be recorded. SPBT members must record the record ID, date borrowed, date returned, borrowing status, the penalty, penalty status as well as SPBT member's ID and student ID.

A student must enroll in at least one class and each class can have many students. Students' data that must be stored are students' first name, last name and class ID while class will have its ID, name and class teacher.

Context Diagram is a level part of Data Flow Diagram (DFD) that is used to define context and system boundaries in a modeling. This includes relationships with entities outside the system itself, such as systems, organizational groups, and other external data stores. Context diagrams describe how a system interacts with other external factors with which it is supposed to engage. System context diagrams can aid in comprehending the context in which the system will operate. Figure 3 shows the Context Diagram of SPBT System.

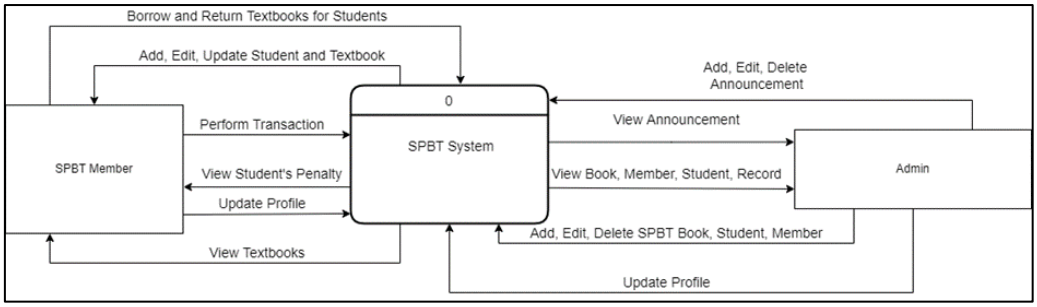

Figure 3: Context Diagram

SPBT members will access the database to borrow and return textbooks for each student. Then, the database will let the members manage the textbooks. The members can have access to view students' penalty and will then perform transactions and update the database. SPBT member can also view the textbooks information from the database. SPBT member can also update their profile.

Admin can manage the announcements like add, edit, and delete announcements. Database will let the admin view the announcements. Admin can also view textbooks, SPBT members, Students and Borrow and Return record information. The admin can add, edit and delete textbooks, students and SPBT members' data. Admin is also eligible to update their own profile.

Development and Testing

The development ends with the deployment phase, which puts the system into operation. The final deployment phase begins after the software testing phase is completed and there are no bugs or errors remaining in the system. The system is ready to proceed after the system has been tested and it has passed each testing phase. Two types of testing were used for this project to make sure it is working properly and does not have errors.

4 Results

This section displays the interfaces of SPBT Management System such as homepage (Figure 4), login page (Figure 5), dashboard (Figure 6), and borrowing options (Figure 7 – Figure 9)

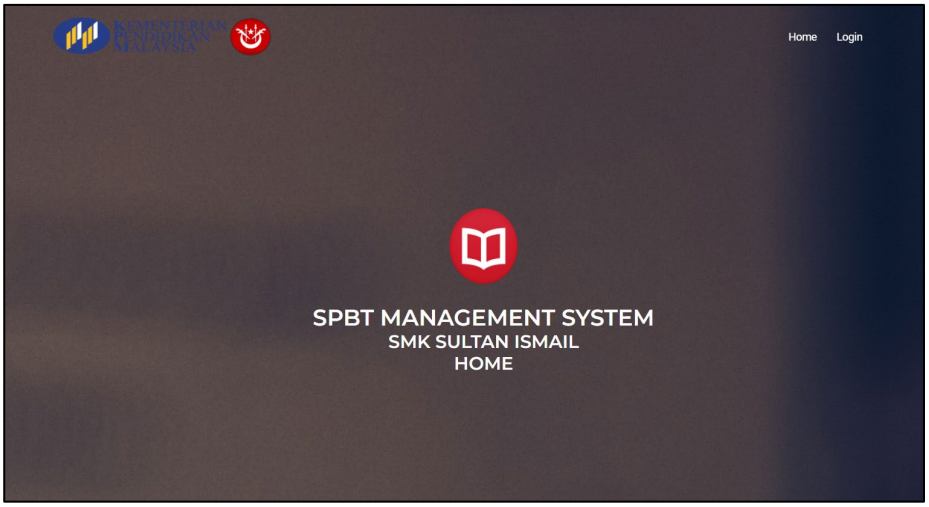

Figure 4: The homepage for SPBT Management System

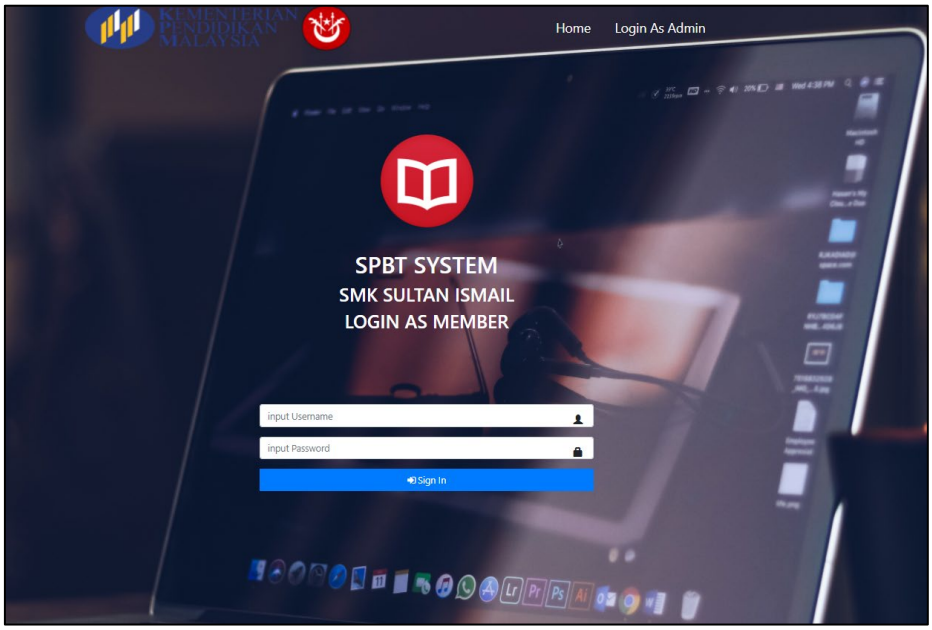

Figure 5: The login page for SPBT Management System

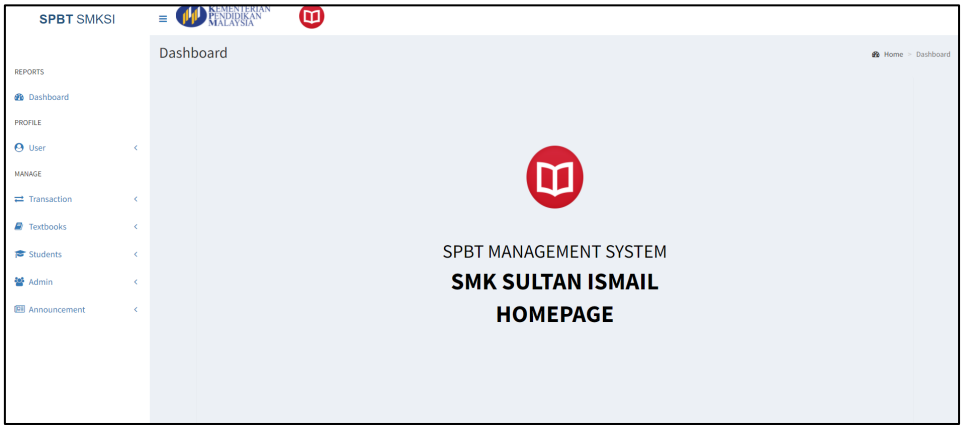

Figure 6: Dashboard for SPBT Management System. This page is for managing the transaction for the returned and borrowed textbooks

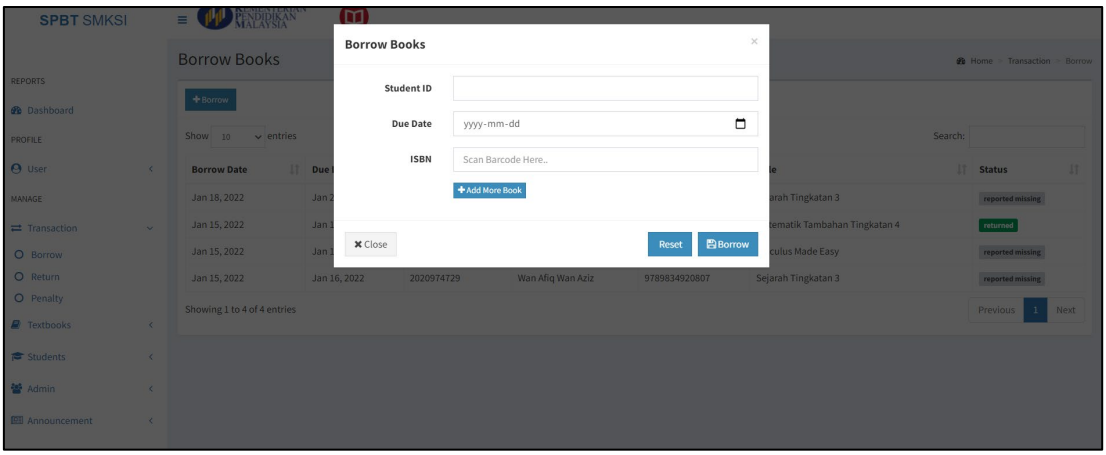

Figure 7: "Borrow Books" page is to add the textbooks that will be borrowed

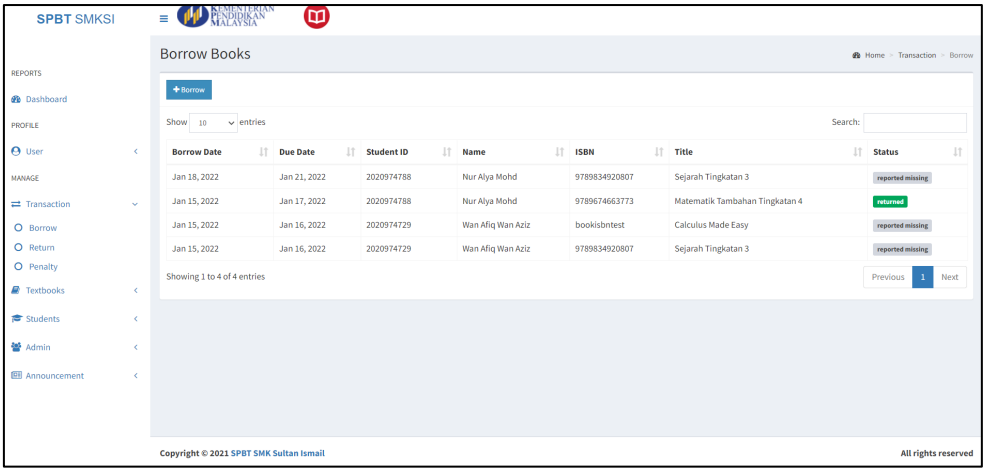

Figure 8: Users can view the details of the borrowed textbooks

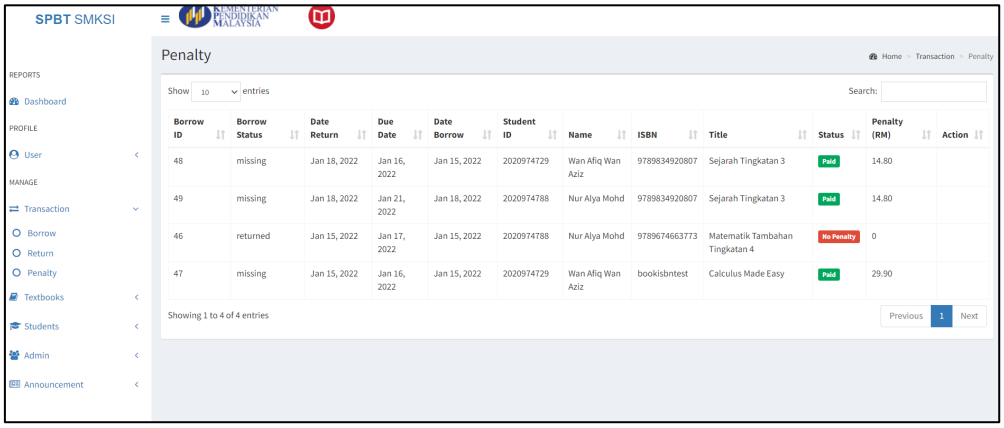

Figure 9: Users can view the details of the penalty for missing textbooks

5 Conclusion

In this present and modern era, with the enhancement of technology that keeps on evolving, it is disappointing to have an organization especially in schools to still use the manual system. Despite the fact that various technologies have been developed such as QR Codes and Barcodes, SPBT management is still using the outdated system which has remained constant at least for the past decade.

The current system is not only consuming a lot of costs from papers and physical file documents, but it also takes a lot of time to process. For example, the main process of SPBT, which is the borrowing and returning process, is wasting a huge amount of time by requiring students to queue to return and borrow the textbooks. The process includes filling in borrowing and returning forms which requires students to fill in their information and check the books they have borrowed. This form will again be given to students in one year gap, when they want to return the textbooks and check the textbooks they want to return. In a school, there are usually at least 1000 students. If the process for each and every student takes 5 minutes to be done, this simple process could take 1 week to be done completely.

Thus, a web-based system of SPBT management is proposed to give benefits to the organization in terms of its effectiveness and efficiency. SPBT Management System uses the barcode system to scan each of the textbook so that it will automatically check the borrowed and returned books. So, students would not have to check the textbooks one by one and consume a lot of time. There is no need to generate and print out the codes since in every textbook, there is an ISBN code which has been attached usually at the back cover of the textbook. The ISBN code will be stored in the system when users add new books, and the barcode scanner will only have to scan the barcode attached.

References

[1] N. N. B. M. J. Jalaluddin, *Book Inventory System Using RFID*. 2011.

[2] R.Temsen, *Why is Reading Important? The 11 benefits of books. Best Practice in HR.* https://www.bestpracticeinhr.com/why-is-reading-important-the-11-benefits-of-books/, 2019

[3] A. Sjahrony, M. A. Lubis and N. M. R. Nik Yusoff, Kepentingan Kebolehbacaan Buku Teks Dalam Dunia Pendidikan, *ASEAN Comparative Education Research Journal on Islam and Civilization (ACER-J),* pp. 25–40, 2017.

[4] E. Torres, and T. Hutchinson, *"The Textbook as Agent of Change"*. *ELT Journal*, vol 48, pp. 315–328, 1994.

[5] M. Ketchell, M. *Why textbooks are a crucial part of every child's learning journey. The Conversation.* https://theconversation.com/why-textbooks-are-a-crucial-part-of-every-childs-learning-journey-50252, 2021.

[6] K. Paterson, *"Constitutional adjudication on the right to basic education: are we asking the state to do the impossible?"*. *South African Journal on Human Rights*, vol 34(1), pp. 112-121, 2018.

[7] K. Tee. *Audit report: Textbook Loan Scheme Achieved Goal but Management Showed Weaknesses: Malay Mail.* Malaysia | Malay Mail. https://www.malaymail.com/news/malaysia/2019/12/02/audit-report-textbook-loan-scheme-achieved-goal-but-management-showed-weakn/1815283, 2019.

[8] R. Breitmeyer. *What Are The 7 Disadvantages to A Manual System?* LinkedIn. https://www.linkedin.com/pulse/what-7-disadvantages-manual-system-richard-breitmeyer/, 2015.

[9] T. Adebesin. *Library Management System*. Doctoral Dissertation, Federal University Oye Ekiti, 2015.

[10] A. A. B. Azmi, *Unisza Book Borrowing System Using QR Code*, CSF 35104 Final Year Project, Faculty Of Informatic and Computing, UniSZA, 2020.