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Loaning System for Consumables in Telecommunication Laboratory of Malang State Polytechnic

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***Abstract*- This research is an answer to overcome deficiencies in the system for borrowing consumables in laboratories which is still done manually. What is meant by manual borrowing is that students write down their name, code and number of items to be borrowed and submit their Student Identity Card (KTM) as collateral. This kind of lending procedure causes the service system to become less effective. To overcome this problem, a loan database program was created in the laboratory using QR-code technology, using MS Access 2003 software for the database. The main function of this application is to record the process of borrowing and returning consumable materials which previously was still done manually. The borrowing process is carried out by scanning the QR code on the member card (KTM) and consumables using a QR code scanner. After the application is used, the service process becomes faster and the data is stored in the database to be used as proof of borrowing. In this application, officers can easily enter, edit and save data or new members easily.**

Keywords: Borrow, Identity Card, Loaning System, Laboratory, QR-code.

I. INTRODUCTION

With the development of society, information is an important tool today. Information forces every individual or group, both private and government, to take into account the information system that will be implemented in order to remain competitive in the era of globalization. In this case, the application of the right strategy allows each government agency to further improve services. In addition, the rapid advancement of information technology, but the lack of proper utilization.

In general, the problem faced in the Telecommunication Laboratory of Malang State Polytechnic is that the service of the consumable loan system is not yet optimal where the loan is still manual, resulting in a queue during the loan process. This kind of borrowing procedure makes a lack of effectiveness in the service system.

Auto-ID technology makes it easier for humans to carry out the identification process. One example of this technology is QR-code. The advantages of QR-code technology are that QR-code scanners can read information with a much higher speed and accuracy than typing data manually, with a higher level of accuracy making the error rate smaller.

An information system is a man-made system that generally consists of a collection of computer-based and manual components designed to collect, store, and manage data and provide output information to users.

According to Sutedjo (2002), a system is a collection of interconnected elements that form a unified whole in an effort to achieve a goal. Information is the result of processing data obtained from each element of the system into a form that is easily understood and constitutes relevant knowledge needed by people to increase their understanding of existing facts.

Information technology is a form of modern technology that describes the combination of computer technology (both hardware and software) with telecommunications technology (such as data, image, and voice networks).

A Management Information System (MIS), often referred to as a Management Information System (MIS), is an information system that provides management-oriented reports based on transaction processes and operations within an organization.

1) Database

A database is a collection of data organized in such a way as to form highly useful information. A database is formed from a group of data of the same type/characteristics. As data develops, it can take various forms, such as programs, data entry sheets, and reports. All of this can be collected into a single entity called a database.

Data can generally be defined as anything that can be collected. This, of course, turns everything in the world into data, and each data type can be collected according to its type. Any record of this data can actually be considered a database

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(a place where data is collected). Typically, this record-keeping is relatively simple and done manually (recorded on sheets of paper, or at least typed using a specific application program). Once the data is collected, it is usually needed for reporting, decision-making, or any other form of processing related to the data.

If the data is recorded manually, all processing is also done manually (compiled, calculated, or reported manually). This method, of course, requires extra effort and time. More often than not, it requires collecting similar data repeatedly, processing, and producing reports repeatedly. It's easy to imagine this is a very tedious task.

Based on this reality, it would be easier to create a system to store this data in a more organized manner. With the help of certain application programs, this data can be processed and reports generated more quickly and easily. This is what makes a database system necessary.

Although the purpose of all databases is the same: to simplify data processing, there are various methods. The type of database can be determined by the system configuration or the form/content of the database.

There are several types of databases, ranging from plain text, Excel, Lotus, FoxPro, DBASE, Paradoc, Access, Oracle, SQL, and many more. Each can differ in its data format, the features provided, and the database processing technique (database engine).

2) Microsoft Access 2003

Microsoft Access (or Microsoft Office Access) is a database application program. This application is a member of several Microsoft Office applications, along with Microsoft Word, Microsoft Excel, and Microsoft PowerPoint. This application uses the Microsoft Jet Database Engine and also utilizes an intuitive graphical interface for easy user interaction.

A database in Access 2003 consists of one or more tables, queries, forms, reports, pages, macros, and modules, all of which are interconnected.

1. Tables: Used to store data.
2. Queries: Used to manipulate data.
3. Forms: Used to display data, enter data, and modify data contained in tables.
4. Reports: Used for reports, which can also be created with graphs or data labels.
5. Pages: Used to create Web pages (data access pages) that can be hosted on a server, intranet, or internet network.
6. Macros: Used to automate frequently used commands in data processing.
7. Modules: Used to design various advanced database processing application modules according to needs.

3) Barcode

A barcode is an instrument that operates based on digital principles. In the digital concept, there are only two recognized data signals, each of which is Boolean: 0 or 1. It indicates whether an electric current is present or absent (with a specific voltage, for example, 5 volts or 0 volts). Barcodes are represented by rows of black and white bars. Black represents 1, and white represents 0.

Each bar on a barcode has a different thickness. This thickness is translated into a value. This is because the thickness of the barcode bar determines the travel time of the light beam emitted by the reader. Therefore, the barcode bars must be designed to provide high contrast against the gap between them (which determines the light). The sides of the barcode bars must be perpendicular and straight, and there must be no holes or spots in the center of the surface. The size of the light beam must not exceed the gap between the bars.

A QR code is a type of two-dimensional matrix barcode invented in 1994 by the Japanese company Denso Wave for labeling automotive components. The code consists of black squares on a white background with fiducial markers that can be read by an imaging device such as a camera and processed using Reed–Solomon error correction until the image can be correctly interpreted. The necessary data is then extracted from the patterns present in the horizontal and vertical components of the QR code image.

Figure 1. QR Code

While a barcode is a machine-readable optical image containing information specific to the item being labeled, a QR code contains data for locating, identifying, and web tracking. To store data efficiently, QR codes use four standard encoding modes: numeric, alphanumeric, byte or binary, and kanji. Compared to standard UPC barcodes, QR labeling systems are applied outside the automotive industry due to their faster optical image reading and larger data storage capacity in applications such as product tracking, item identification, time tracking, document management, and general marketing.

4) QR4Office

To create QR codes, we use QR4office, an add-in for Microsoft Office (Word, Excel, PowerPoint) that allows users to create QR codes directly within Office documents. With QR4Office, you can add QR codes that store various information such as URLs, text, or email addresses, and customize their design. This add-in makes it easy to create QR codes without the need for external applications, directly within Microsoft Office, and can be used offline after installation.

Easy to Use: QR4Office allows QR code creation with just a few clicks within Office applications, without requiring technical knowledge.
Customization: Users can change the color, size, and design of the QR code to suit their document's needs.
Data Type: The created QR code can store various types of information, such as URLs, text, email addresses, or contact information.
Integration with Office: You can add QR codes directly into documents, spreadsheets, or PowerPoint presentations.
Works Offline: After installing the add-in, QR4Office can be used without an internet connection, although a connection is required when first downloading the add-in.
How to Use QR4Office:
Installation: Download QR4Office from the Microsoft Store or as an add-in in your Microsoft Office application.
Open an Office application: Select the Word, Excel, or PowerPoint document where you want to add the QR Code.
Select QR4Office: Once the add-in is installed, you'll find the QR4Office option in the "Insert" tab of the toolbar.
Create a QR Code: Enter the information you want to store in the QR Code (e.g., a URL or text) in the panel provided by QR4Office.
Customize the QR Code: You can customize the size, color, and style of the QR Code before adding it to the document.
Insert into Document: Once the QR Code is created, simply click the "Insert" button to add it to your document.

II. METHOD

The methodology used in this research so that the writing process is more directed is as follows: (1) Literature study is studying literature on barcode technology applications and ms access 2003, (2) Planning and program creation is discussing how to store, process, search data and reports in the Telecommunications Engineering Study Program, (3) Testing and Analysis, this test aims to determine whether the system that has been made is functioning properly, especially in the process of storing, processing, searching data and reports. If there is an error, the cause must be found so that this program can function properly.

A. Research Design

The system for borrowing consumables in the Telecommunication Laboratory of Malang State Polytechnic is an application for borrowing consumables. This application will make it easier for borrowers than manually. In this system, the borrower only submits KTM which already has a QR-code. The creation of this system uses the ms access 2003 programming language.

B. System block diagram

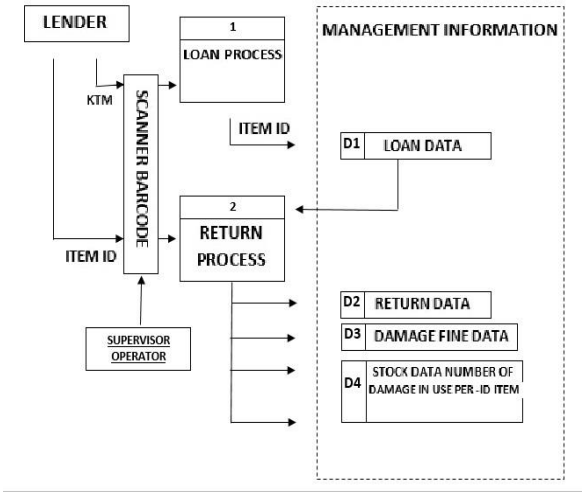


Figure 2. System Block Diagram

Borrowers here are students, lecturers, and administrative employees, who have registered as members. For students, the QR code is on the KTM, lecturers and employees based on NIP or employee number. Borrowers only submit KTM and are submitted to the officer for the scanning process using a barcode scanner, then are invited to fill in the consumables code, the officer will get the borrowed items. To return the officer only clicks the return time column.

III. RESULTS AND DISCUSSION

A. Manual borrowing

The manual borrowing process is shown in Figure 3.1, namely:

Borrowing instructions, the teacher provides borrowing instructions that must be confirmed to the officer before the practicum. KTM QRcode, the borrower submits the KTM card to the officer for data entry. Stock is available, the officer checks the borrowing form according to the teacher's instructions, scans the barcode of the required item and takes the item that has been scanned by the officer. Testing the item, the borrower re-checks the equipment that has been checked and tests it if possible in front of the officer before using it for the practicum, if there is any damage the officer will search for the previous borrower's data. 15-minute grace period that does not allow checking in front of the officer and to exchange problematic equipment. If it has been 15 minutes, the equipment is considered ready and will not be replaced again, unless the teacher confirms this to the technician. During the loan, the KTM is held as collateral for the loan. Reports during the practicum will be reported to the head of the laboratory.

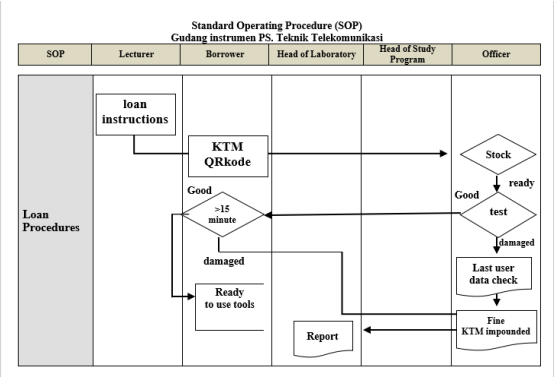


Figure 3.1 Manual loan process

Lending with software

To test a barcode scanner whether it can work properly, the following test steps will be carried out:

1) Connecting the two barcode scanner connectors, one to the computer port while the other is connected to the keyboard connector. So that the keyboard and barcode scanner can be used simultaneously and the keyboard is not directly connected to the computer but through the barcode scanner.

2) Open the NotePad program to see the results of scanning barcodes. if the barcode scanner is in good condition, the NotePad will show the numbers / data from scanning the barcode.

The software made in this application is divided into two parts for each different user, namely applications for officers and applications for administrators.

In the application program that has been made there are units and forms that contain several procedures that make up the application, including: The main menu provides information on application services that can be accessed by users, To run each application the user can select the application menu according to the login, namely administrator or user. On the main menu before login can only see the dependents borrowed menu, damaged dependents, return lecturers and history.

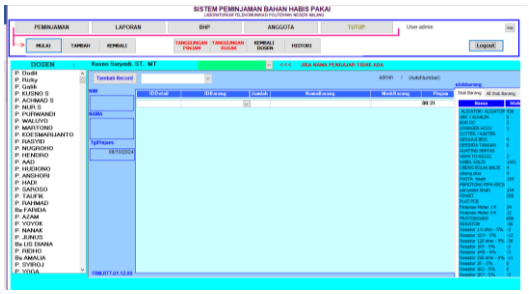


Figure 3.2 Main Menu Display

Before entering the main menu, the user must enter the user-ID and password that appears when opening the main menu application. If the password is correct, the user data will be displayed on the application form according to the user access granted by the administrator. Conversely, if an error occurs, an error message will be displayed and the application cannot be run.

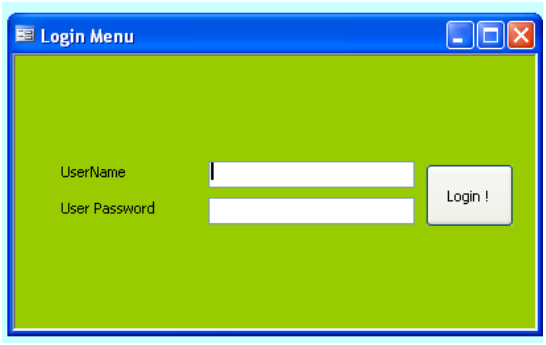


Figure 3.4 Login menu

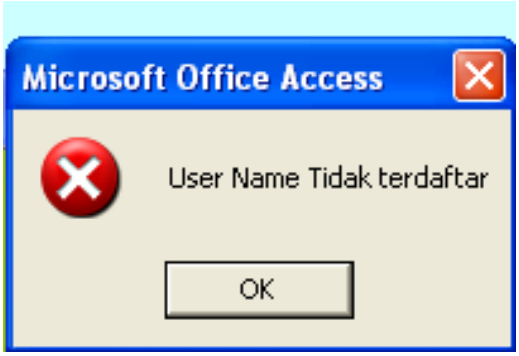


Figure 3.5 Login Error Message

Enter the menu bhp data entry process click consumables then click data, edits can be made to the data form. The entry process is done by entering the material code and other data, the data is automatically stored in the database. To add data again, you can press the add record button.

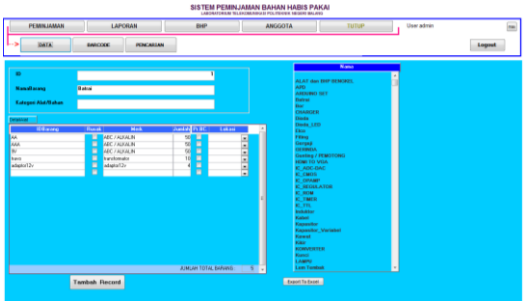


Figure 3.6 Consumables Data Form

The entry and member process is the same as the entry and edit process for consumables data. The member entry process is done by entering NIM/NIP, and is automatically stored in the database.

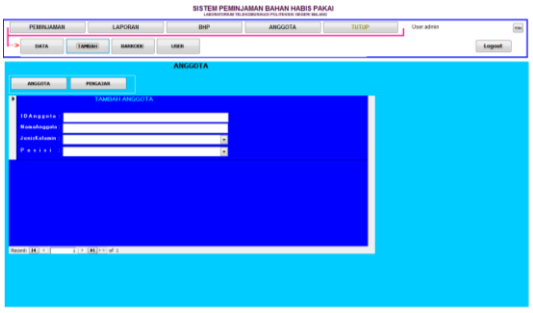


Figure 3.7 Member form menu

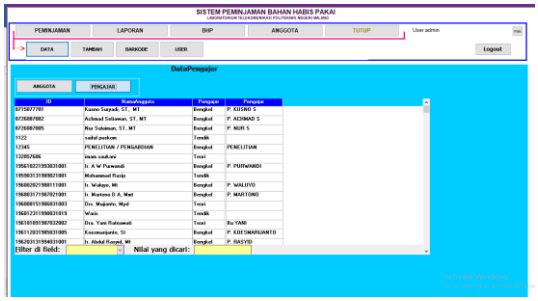


Figure 3.8 Teacher form menu

This facility can only be used by administrators and officers. Administrators can use all available facilities, namely the borrower menu, report menu, BHP menu, member menu.

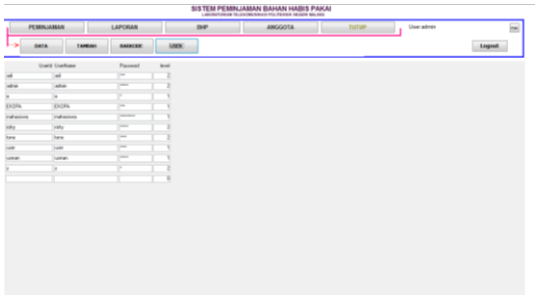


Figure 3.9 Form Administrator

Officer facilities can only access the loan menu and report menu including the borrow sub menu, return of damage fines and report facilities.

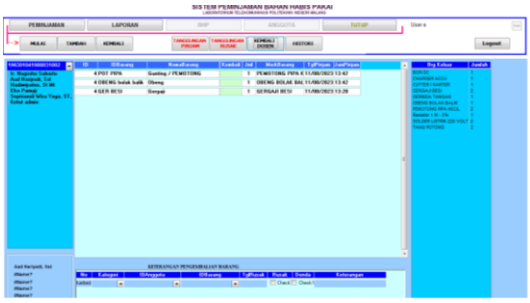


Figure 3.10 Menu user

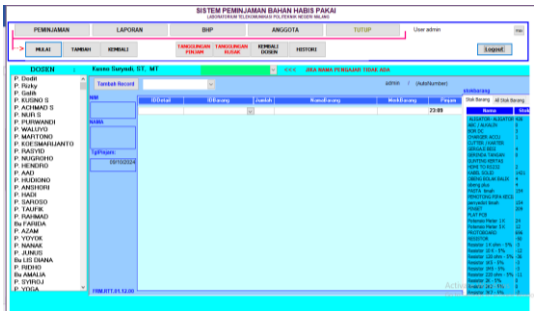


Figure 3.11 Menu Administrator

After the password identification process is complete, the main menu form is active and the user (officer) can select the loan simulation application. The borrowing simulation process is carried out by scanning KTM which already has a QR-code through barcode scanning. After that the borrower fills in the material borrowing data and each practicum with the same class which is divided into several groups using the same material and amount, in this application can copy the loan list that has been stored as long as it is clicked on the back menu by clicking the add menu, clicking the name of the student with the same loan, clicking copy and paste the borrowing of goods, then scanning the QR-code on the KTM in the member column, it will automatically be saved.

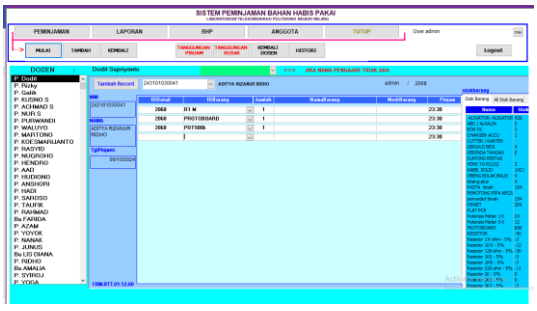


Figure 3.12 Form Simulasi Peminjaman

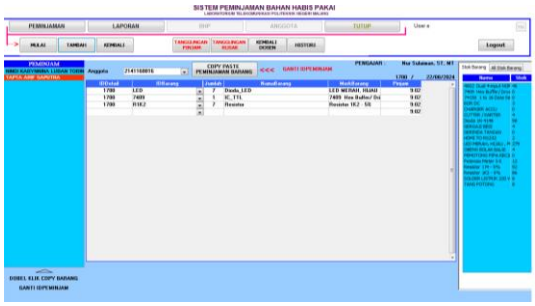


Figure 3.13 Loan Copy Paste Simulation Form

Figure 3.14 Borrowed dependents menu simulation form

The form on the loan dependents menu in Figure 3.14 is based on borrowing that has not returned the day before. The return simulation application is used when a member returns a borrowed tool. The return simulation process is done by pressing the left mouse button, then the return clock form is filled with return hours as shown in Figure 3.15.

Figure 3.15 Simulation back menu

This damage application is found on the return menu, namely by entering the consumable code through scanning the barcode, it automatically fills in the damage date form. In this form there are two categories of damage, namely errors and reports, errors if the borrower damages consumables during borrowing. Reports if the borrower reports that the consumables have not been used, so the possibility of damage is used by the previous borrower.

Figure 3.16 Damage form menu

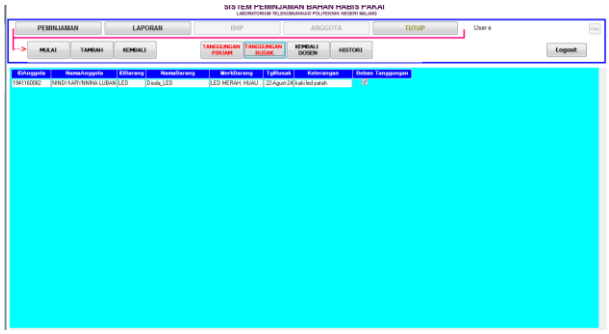
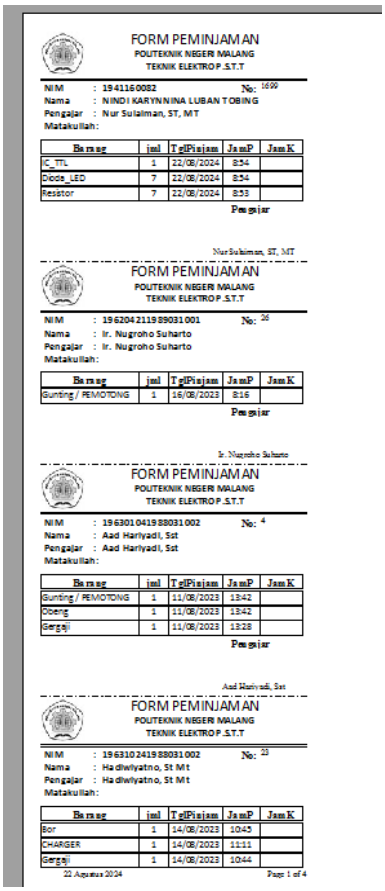


Figure 3.17 Damage report menu

Borrowing history is used to search for consumables and members, making it easier for users to find out consumables data or members who have borrowed.

Figure 3.18 loan history form

The loan report application is used to find out borrower data and consumables that have not been returned. Borrower data and consumables that have not been returned will be retrieved in the database and appear in the list view as shown in the figure.



FORM PEMINJAMAN
POLITEKNIK NEGERI MALANG
TEKNIK ELEKTRO P.S.T.T

NIM : 1941160082 No: 1699
Nama : NINDI KARYNNINA LUBAN TOBING
Pengajar : Nur Sulaiman, ST, MT
Matakuliah :

Barang	jml	TglPinjam	JamP	JamK
IC_TTL	1	22/08/2024	8:54	
Dioda_LED	7	22/08/2024	8:54	
Resistor	7	22/08/2024	8:53	

Pengajar

Nur Sulaiman, ST, MT

FORM PEMINJAMAN
POLITEKNIK NEGERI MALANG
TEKNIK ELEKTRO P.S.T.T

NIM : 196204211989031001 No: 26
Nama : Ir. Nugroho Suharto
Pengajar : Ir. Nugroho Suharto
Matakuliah :

Barang	jml	TglPinjam	JamP	JamK
Gunting / PEMOTONG	1	16/08/2023	8:16	

Pengajar

Ir. Nugroho Suharto

FORM PEMINJAMAN
POLITEKNIK NEGERI MALANG
TEKNIK ELEKTRO P.S.T.T

NIM : 196301041988031002 No: 4
Nama : Aad Hariyadi, Sst
Pengajar : Aad Hariyadi, Sst
Matakuliah :

Barang	jml	TglPinjam	JamP	JamK
Gunting / PEMOTONG	1	11/08/2023	13:42	
Obeng	1	11/08/2023	13:42	
Gergaji	1	11/08/2023	13:28	

Pengajar

Aad Hariyadi, Sst

FORM PEMINJAMAN
POLITEKNIK NEGERI MALANG
TEKNIK ELEKTRO P.S.T.T

NIM : 196310241988031002 No: 23
Nama : Hadiwiyatno, St Mt
Pengajar : Hadiwiyatno, St Mt
Matakuliah :

Barang	jml	TglPinjam	JamP	JamK
Bor	1	14/08/2023	10:45	
CHARGER	1	14/08/2023	11:11	
Gergaji	1	14/08/2023	10:44	

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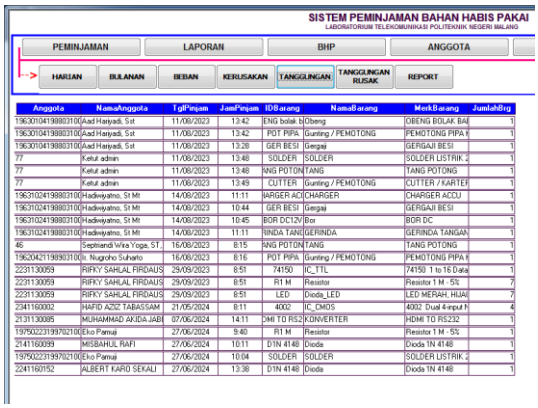
Figure 3.19 Loan report form



SISTEM PEMINJAMAN BAHAN HABIS PAKAI
LABORATORIUM TELEKOMUNIKASI POLITEKNIK NEGERI MALANG

PEMINJAMAN | LAPORAN | BHP | ANGGOTA

HARIAN | BULANAN | BEBAN | KERUSAKAN | TANGGUNGAN | TANGGUNGAN RUSAK | REPORT

Anggota	NamaAnggota	TglPinjam	JamPinjam	IDBarang	NamaBarang	MerkBarang	JumlahBrg
196301041988031002	Aad Hariyadi, Sst	11/08/2023	13:42	ENG bolak b	Obeng	OBENG BOLAK BAI	1
196301041988031002	Aad Hariyadi, Sst	11/08/2023	13:42	POT PIPA	Gunting / PEMOTONG	PEMOTONG PIPA K	1
196301041988031002	Aad Hariyadi, Sst	11/08/2023	13:28	GER BESI	Gergaji	GERGAJI BESI	1
77	Ketut admin	11/08/2023	13:48	SOLDER	SOLDER	SOLDER LISTRIK 2	1
77	Ketut admin	11/08/2023	13:48	KNG POTON	TANG	TANG POTONG	1
77	Ketut admin	11/08/2023	13:49	CUTTER	Gunting / PEMOTONG	CUTTER / KARTER	1
196310241988031002	Hadiwiyatno, St Mt	14/08/2023	11:11	ARGER ACI	CHARGER	CHARGER ACCU	1
196310241988031002	Hadiwiyatno, St Mt	14/08/2023	10:44	GER BESI	Gergaji	GERGAJI BESI	1
196310241988031002	Hadiwiyatno, St Mt	14/08/2023	10:45	BOR DC12V	Bor	BOR DC	1
196310241988031002	Hadiwiyatno, St Mt	14/08/2023	11:11	NINDA TANG	GERINDA	GERINDA TANGAN	1
46	Septiandi Virra Yoga, ST,	16/08/2023	8:15	KNG POTON	TANG	TANG POTONG	1
196204211989031001	Ir. Nugroho Suharto	16/08/2023	8:16	POT PIPA	Gunting / PEMOTONG	PEMOTONG PIPA K	1
2231130059	RIFKY SAHLAL FIRDAUS	29/09/2023	8:51	74150	IC_TTL	74150 1 to 16 Data	1
2231130059	RIFKY SAHLAL FIRDAUS	29/09/2023	8:51	R1 M	Resistor	Resistor 1 M - 5%	7
2231130059	RIFKY SAHLAL FIRDAUS	29/09/2023	8:51	LED	Dioda_LED	LED MERAH, HIJAI	7
2341160002	HAFID AZIZ TABASSAM	21/05/2024	8:11	4002	IC_CMOS	4002 Dual 4-input N	4
2131130095	MUHAMMAD AKIDA JABI	07/06/2024	14:11	DMI TO RS2	KONVERTER	HDMI TO RS232	1
197502231997021001	Eko Pamuji	27/06/2024	9:40	R1 M	Resistor	Resistor 1 M - 5%	1
2141160091	MISBAHUL RAFI	27/06/2024	10:13	DIN 4148	Dioda	Dioda IN 4148	1
197502231997021001	Eko Pamuji	27/06/2024	10:04	SOLDER	SOLDER	SOLDER LISTRIK 2	1
2241160152	ALBERT KARO SEKALI	27/06/2024	13:38	DIN 4148	Dioda	Dioda IN 4148	1

Figure 3.20 Report Tanggungan Peminjaman

Dependent report data is data on borrowers who have not returned the borrowed items.

The manual borrowing process is shown in Figure 3.21, namely:

1. The teacher gives prior confirmation to the technician before the practicum, in the form of what materials will be used for practicum.
2. The teacher instructs students to borrow.
3. Students take the loan form from the clerk, students fill out the loan form based on confirmation from the teacher to the technician in accordance with the job sit.
4. Filling out the form may not be represented by another group, and must leave KTM as proof of borrower identity.
5. The technician rechecks the loan form that has been filled in by the student to match the borrowed item.
6. Students check the materials that have been checked by the technician before being used for practicum.

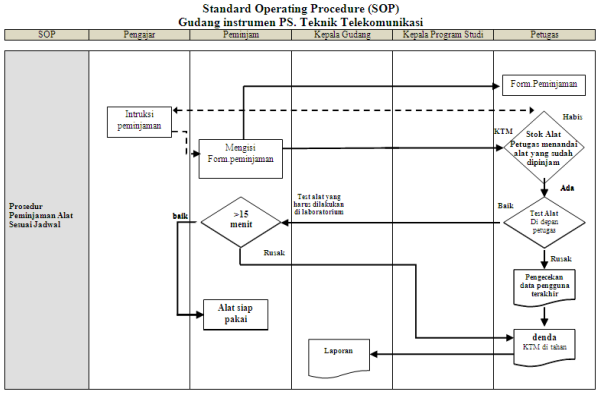


Figure 3.21 Manual loan process

The software lending process, namely:

1. Teachers provide prior confirmation to the technician before the practicum, in the form of what materials will be used for practicum.
2. The technician prepares the materials according to the instructor's instructions.
2. The teacher instructs students to borrow.
3. Students submit KTM to the clerk
4. The clerk scans the lecturer's barcode and the barcode on the KTM.
5. Students fill in material data
6. Officer submits materials according to the loan form
7. The next borrower with the same subject and instructor, can copy the previous borrower's form.

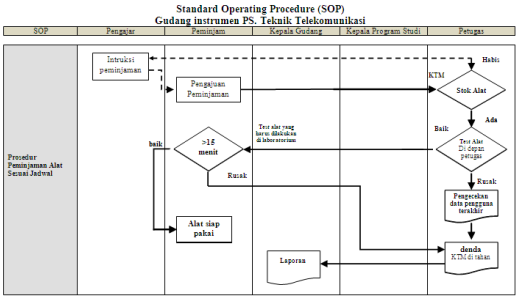


Figure 3.22 proses peminjaman dengan software

The manual and software return process is the same, as shown in Figure 322. The manual process is that the technician crosses out the list of material form entries that have been returned by students. After the practicum students must return the borrowed material.

The software process, the technician fills out the form on the return record by clicking on the mouse so that the return time will automatically appear.

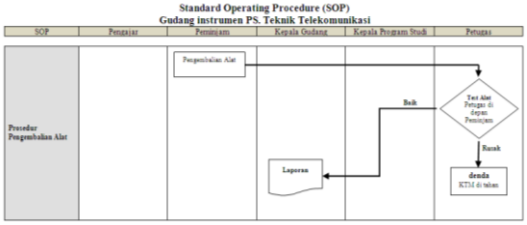


Figure 3.23 Return Process

QR Code Creation

The result of the barcode creation process using QR4Office is a QR Code for the item ID. This QR Code can be scanned using a barcode scanner and displays information based on the entered data.

Figure 3.24 Qrcode Barang

The resulting QR Code has good display quality, is easy to scan, and can be customized to fit any document format.

IV. CONCLUSION

From the design, construction, and testing of the "Consumable Equipment Lending System" tool in the Malang State Polytechnic Telecommunications Laboratory, it can be concluded that a CCD QR code scanner is used to encode QR code data in the form of wide and narrow lines into a data format readable by a PC (computer). Using Microsoft Access 2003 software, an instrument lending application system can be built in the laboratory automatically to address the issue of effectiveness in the service system. This efficiency allows borrowing time to be used for other activities

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