Asset Management Based on RFID Card

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Abstract. Asset is valuable properties belonging to company. To support daily activities, usually companies lend their assets to the employees. Lending and borrowing assets can be problematic if the company does not have good asset management tool. We studied one of the ISP company in Jakarta that need help to create asset management tool for their daily activities. Human error and untraceable historical data were the main problems of the company’s old system. The objective of this project is to help providing solution by designing a prototype system of an asset management tool, especially for lending process to the employees. The system is using RFID-card, barcode, camera, and web-based client server architecture. By using this architecture, the asset lending process can save both paper and time consuming for borrowing process. After going through several stages of an experiment and data collection, it can be concluded that this design succeeded in helping the asset lending process to be better, which can be proven by the results of user satisfactory surveys that have been done.

Keywords: RFID, Asset management, web-based, client server, barcode

1. Introduction

Asset management is an act of managing assets, so these assets can provide enormous benefits with the smallest possible cost and these assets should not be broken or destroyed, unless it is intended to be destroyed or abolished [1]. Assets can also be defined as all the properties belonging to a company. Property is a resource in the form of objects or power of attorney where it is obtained from purchases, receipt of inheritance rights and grants from the previous owner.

These assets can also be used by many parties and are not always used by one party only, in a company the assets can be used by several users and change responsibilities in a short time, often as a result of frequent transfers of responsibility for these assets in relatively short time, assets become damaged, lost or unrecorded.

It is important to manage assets accurately to reduce asset losses. Yet managing large amounts of assets and accurately is a difficult and time-consuming task. Both for individuals and institutions. Inventory of assets can be maintained by checking manually or by using RFID technology. However, checking manually will be very costly in terms of human labor and the results may sometimes be wrong.
RFID (Radio Frequency Identification) technology is a technology that can perform many-to-many communication (many readers can read one tag, or one reader can read many tags), transmitting data wirelessly compared to conventional barcodes that use optics. With these advantages, RFID technology can also be implemented as a supporting medium in the smooth process of lectures [2]. RFID system utilizes radio frequency media as the carrier of all data to the reader, known as the RFID reader. All data resides on one IC chip (called tag) which is attached to the target (person or item), and through radio waves, the data is read by the RFID reader [3][4].

Currently service provider company has thousands of employees who work every day using laptops or desktop PCs that lent by company. The division that is responsible for the procurement and lending of these assets usually is IT infrastructure.

The assets are lent to the user by request to the procurement, so the IT infrastructure division can prepare the laptop or PC. Furthermore, the device is prepared through a series of physical checks and software checks whether it is still feasible or not. After completion, the staff makes an asset loan letter that is useful as a reference for evidence of assets transactions going out or entering the IT infrastructuredivision. Letter out for laptop is called FPA (Asset Borrowing Form), incoming letter for laptop is called Exit Clearance. The FPA and Exit Clearance include the identity of the borrower as well as the identity of the assets, such as: Device Type, S / N Device, device specifications and so on. After that the IT infrastructure division manually entry the data base of assets that are not shared online. And when the user returns a laptop with specifications that do not match, IT Infra must open and search for FPA again when the user borrows the laptop. Of course this raises a problem, namely: spending time in search. And also it often happens that the FPA that has been in the file is lost so that it is difficult for the staff to get evidence that the specifications of the laptop or PC are less or different than when it was lent.

Based on this incident, the solution is to replace the conventional paper borrowing scheme with RFID as a data storage medium, the RFID is planted in the device and sealed. When a user borrows a laptop, the staff can save the loan data in the database and copy it on the RFID Tag as a substitute for the FPA form, when returning assets the IT staff only need to scan the RFID to find asset lending data that may have been carried out since 2 or 3 years ago. With this method, IT Infra can save paperless paper more and save time and have certainty about the accuracy of the asset lending data.

This research focuses on creating system that can support company in loaning process, returning process, and monitoring company assets. If there is an asset that has been returned in an unfavorable condition, it will be categorized as an unfinished return and the borrower must be responsible for the asset. With this system company also can generate loaning assets reports, the reports records employee and assets identity for traceability purposes.

2. Methods

2.1. Hardware Design

Figure 1 is Asset Management Based on RFID Card block diagram, this system is a client-server and web-based application. This system requires a web server, database server, and client computer equipped with a barcode scanner, RFID scanner, camera. The barcode scanner is used to read the asset’s serial number which attach to assets. The RFID scanner is used to read RFID tag in the RFID card which attached to the assets. This serial number and RFID tag will be paired and sent to the database server. This paired data will be used as unique identity in asset registration process, asset lending process, asset retrieval process using web-based application. In addition, the client computer is also equipped with a camera to take photos of the latest asset condition. These photos are used by the staff to validate any damage to assets.
3. Results and Discussion
During this project, two kind of interview is carried out. First interview was held before the implementation to identify the need of the company. Second interview was held after the implementation to assess how company satisfied by the system. Below is the system web interface that created based on user requirement, the web interface is including assets stock registration, assets loaning process, assets returning process, and asset loan history report.

3.1. Assets Stock registration page
Figure 2 shows the assets stock registration web interface for admin user, in this page user can add new assets by clicking Add New button. After the button clicked, user must scan the barcode to get the asset serial number. New assets must be attached with RFID card, and then user must scan the RFID card to get the RFID tag. On this page, user must entry the assets name, the assets date, the assets price, the assets specification, take the assets photos, and the assets status. After these data saved on database server, these data are used for other process (such as in assets borrowing process, assets returning process, and assets loan history process) only by scanning the RFID card using RFID scanner. On this page, user can remove or edit the assets information by clicking the trash icon or pencil icon.

![Figure 2. Assets Stock Registration Web Interface](image)

3.2. Assets Borrowing process page
Figure 3 shows the assets borrowing list page. On this page, users can view data lending assets in table form. As shown in Figure 3, user can view information related to the lending process such as assets ID, employee ID, employee name, assets name, assets serial number, borrowing date, last asset photo, borrowing status, and notes.

![Figure 3. AssetsBorrowing List Page](image)

Figure 4. is Asset Borrowing process page, this process goes through 3 stages. First, users must scan the employee RFID using RFID scanner. The web server will search employee database on database server to get the employee’s name. If the employee exists on the database, employee name will appear on the employee name column. Second, user must scan the assets RFID using RFID scanner. The web server will search assets database on database server to get the assets name. If the asset exists, asset name will appear on the asset name column. Third, user must take a photo of the asset and then click the submit button. This photo can be used by user for physical checking during returning process. If necessary, user can write down about current asset physical condition on note column for detail information.

![Figure 4. Asset Borrowing Process Page](image)
3.3. Assets Returning process page

Figure 5 is assets returning list page, in this page user can see the list of returned assets. On this page user can see the borrowed assets, the borrower, the last photo taken on the borrowing process. If the returning asset occurs, the user must check and compare the last photo with the current condition. After asset physical checking and the assets in good condition, user must click the checklist button, this will change the status to ready state. To proceed the returning process user must click the add new button, below is the returning process page.

Figure 6 is assets returning process page, in this page user can return the assets. The process of returning assets goes through 3 stages. First, user must scan employeeRFID using RFID scanner. The web server will search borrowing database on database server to get the employee (borrower) name. If
the data exists, employee (borrower) name will be shown on the column. Second, user must scan asset RFID using RFID scanner. The web server will search borrowing database on database server to get the borrowed asset name. If the asset exist, the asset name will be shown in asset name column. Third, user must check the asset photo for physical checking. If the asset in good condition the status will change to ready state, if not, user must not click the checklist for pending state. The employee must take responsibility of the asset by repairing or replace the borrowed assets if pending state still exists.

3.4. Assets Loan history report

![Assets Loan History User Interface](image)

**Figure 7.** Assets Loan History User Interface
Figure 7 shows the assets loan history page, on this page user can search borrowed assets based on RFID assets and serial number assets. User can view the loan history by scan RFID tag assets or by typing the asset serial number in search textbox. On this page user can view the last assets photo before assets borrowed and after assets returned.

![Figure 7](image7.png)

**Figure 7.** Assets Loan History Page

Figure 8 is assets loan history report, by clicking Report Assets the server will generate accumulative lending report. The report is presented in table form which contain RFID tag, Employee ID, Employee Name, Assets serial number, borrowing date, and borrowing status. The report can be printed and archive in hardcopy or softcopy for internal company purposes.

**Figure 8.** Assets Loan History Report

![Figure 8](image8.png)

4. Conclusions

Based on all the problems that have been explained in introduction, IT team has problems to record and track the assets that has been borrowed by employee. This problem happened because the company still rely on conventional manual registration. This conventional manual registration still relies on human performance, which can be many human error and negligence. By this project, Asset Management Based on RFID Card is created to solve existing problems. This system using client-server model, the client is a special configured computer which equipped with Barcode scanner, RFID scanner, and camera, while the servers are web server and database server. After the system is implemented, and satisfaction survey was conducted, the users give the system positive responses.

References

[1] Aryani Soemitro, R. A., & Suprayitno, H. “Pemikiran Awal tentang Konsep Dasar Manajemen Aset Fasilitas.” *Jurnal Manajemen Aset Infrastruktur & Fasilitas*, 2018.

[2] Coreit, J., Setiawan, E. B., Kurniawan, B., Studi, P., Informatika, T., Indonesia, U. K., Studi, P., Elektro, T., & Indonesia, U. K. “Perancangan Sistem Absensi Kehadiran Perkuliahan dengan Menggunakan Radio Frequency Identification (RFId ).” *Jurnal CoreIT*, 1(2), 2015.

[3] Djamal, H. “Radio Frequency Identification (RFID) Dan Aplikasinya.” *TESLA*, 16(1), 2014.

[4] Syaffi, R. M., Ikhwanus, M., & Jannah, M. “Desain Dan Implementasi Sistem Keamanan Locker Menggunakan E-Ktp Berbasis Arduino Pro Mini.” *Jurnal Energi Elektrik*, 7(2), 2015.

[5] Palit, R. V, Rindengan, Y. D. Y., & Lumenta, A. S. M. “Rancangan Sistem Informasi Keuangan Gereja Berbasis Web Di Jemaat GMIM Bukit Moria Malalayang.” *E-Journal Teknik Elektro Dan Komputer*, 4(7), 2015.

[6] Haryono, A. T., Rahmawati, D., & Fitriastuti, T. “Aplikasi Program PHP & Mysql.” *Mulawarman University Press*, 2016.

[7] Kadek Wibowo. “Analisa Konsep Object Oriented Programming Pada Bahasa Pemrograman Php.” *Khatulistiwa Informatikaw*, 3(2), 2015

[8] Oustad, M., & Chanrasekaram, S. Securing Assets with RFID. In 85.University of Agder, 2008.

[9] Schuetze, W. P. “What is an asset?” *American Accounting Association*, 1993.