Original Article

# Automation of Library Resources Utilization

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## Abstract

The library is one of the University's front-line services. Managing a large number of students and faculty is difficult, especially when it comes to tracking their attendance each time they visit the library. The librarian's goal is to provide excellent service to its clients. Thus, the Automation of Library Resources Utilization at the San Mateo Campus was created using the Agile Development Process, which included several stages: Design, Build, Configure, Test, and Release. Descriptive statistics, particularly mean, were also used to analyze the data in terms of student feedback and the validity of the developed application as judged by the clients. During this process, problems in the manual operation were identified and addressed by the automation. As a result, in terms of functional adequacy, system quality, adaptability, usefulness, stability, safety, maintainability, and portability, Automation of Library Utilization has been designed and is in compliance with ISO 25010. Furthermore, respondents identified challenges to the automation of library utilization as part of the development process that follows a continuous improvement of system life cycle to maintain being a Positive Aspect when it comes to ISO 9001:2015.

**Keywords** - Library Management System, Automated Library System, Automation, Library Automation, ISO 9001:2015, ISO 25010

## INTRODUCTION

One of the University's front-line services is the library. The goal of the librarian is to provide excellent service to its clients. Creating a system that eventually makes every student responsible for their transactions while offloading some of the librarian's duties and responsibilities is one method of providing prompt and high-quality service to students. As a result, the researcher developed an Automated Library Resources Utilization to automate library services at ISU San Mateo.

Handling a large number of students and faculty may be a problem specially to get their attendance every time they enter and went out from the library. The manual process means that whenever a student/faculty will utilize the library resources, he will sign in the logbook. This manual process has some flaws because in a case where a student/faculty bribes the student's assistant/library staff or is familiar with him, the student assistant/library staff may just let him in the library. This would be a big problem because it might affect the performance and management of the library.

Currently, there are library systems for creating and maintaining multiple procedures, it comprises the following steps for: a) identifying and generating reports for the clientele of the library; b) automated searching of materials; c) automated library circulation process; and d) establishing library financial reports on fines or penalties (PERU, 2014). However, this does not address the minimization/elimination of additional work of the librarian to monitor the students utilizing the library resources.

The utilization of library resources at ISU San Mateo is not automated. Students must sign the logbook. Librarian encountered problems with manual operations of Library Resources Utilization, such as: librarian needs to logbook every book borrowed in the library; it is a burden for the librarian to count the number of books every month in order to generate a monthly report; additional work for the librarian to monitor the students utilizing the library resources; and it consumes too much time in searching for books if they are out or on the library shelves. As a result, the researcher automates library services to address the following problems encountered by students and librarians by using a barcode reader and Kiosk to automate the transaction through students/faculty self-service without the librarian's supervision when borrowing and returning books.

## OBJECTIVES OF THE STUDY

1. To determine the problems encountered in the existing system.
2. To identify the significant difference for both manual and automated operations on the extent of compliance to ISO 25010 Quality Standards in terms of:

a. Functional Suitability
b. Performance Efficiency
c. Maintainability
d. Security

e. Portability
f. Compatibility
g. Usability
h. Reliability
3. To determine the challenges on the automation of library utilization

## SYSTEM ARCHITECTURE

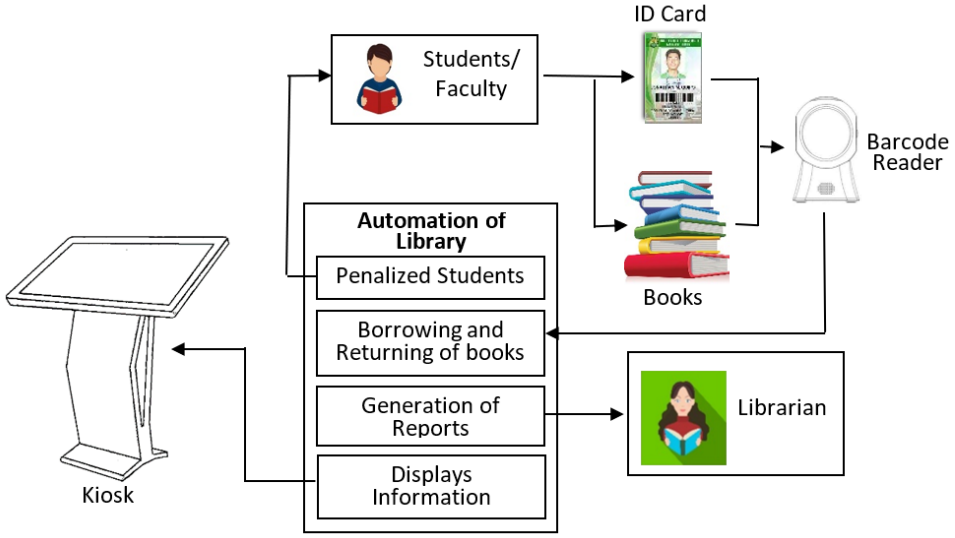


**Figure 1.** System Architecture

The system architecture illustrates the various interactions between the students/faculty, Barcode Reader, Kiosk and the Librarian which are extremely important in the Automation of the Library Resources Utilization. In using the Automation of the Library, the students/faculty have to tap their ID Card and borrowed Books in the barcode reader then it will display the information of the students/faculty in the kiosk who borrowed or returned the books in the library. Duration of dates of the borrowed books are detected by the system and it will automatically penalize the students who will exceed from the due date. The data collected by the system everyday will be stored in a database for future purposes like generating of reports such as Annual Report, Monthly Report, Statistical Report, Top Borrower of the Month, and Best Library User.

## SYSTEM FEATURES

The Automation of Library Resources Utilization is an automated application that automates the transaction process in the library. The system is composed of four modules such as 1). Penalizing Students, 2.) Borrowing and Returning of books, 3.) Generating of Reports, and 4.) Displaying of Information

### A. Penalizing Students Module

The Penalizing Student Module allows the system to automatically penalized the students from exceeding on the duration date of the books from the time it was borrowed. The system will penalize the students a 40 pesos per day until such time that the book was returned to the library. Through this module, the librarian will no longer have a hard time on counting the days that the book wasn't returned in the library because it was the system will be the one to do it for her.

### B. Borrowing and Returning of Books Module

The Borrowing and Returning of Books Module is a self-service transaction that allows the students/faculty tap their ID Card and borrowed Books in the barcode reader in able for the system to store the data from the server without the supervision and assistance of the librarian. With these, it will minimize/eliminate the additional work of the librarian in monitoring the students on utilizing the library resources.

### C. Generating of Reports Module

The Generating of Reports Module allows the librarian to print all the generated reports by the system from the collected data. Through this module, the librarian will no longer be worried about the reports to be prepared such as Annual Report, Monthly Report, Statistical Report, Top borrower of the month and Best Library User because it was auto-generated by the system from the data collection.

### *D. Displaying Information Module*

The Displaying Information Module allows the kiosk to display the information gathered from the students/faculty in which it displays the number of books borrowed by a certain students/faculty; fines of the students that has not yet been paid; and Information of the students/faculty who borrowed and returned the books in the library.

## SCREENSHOTS

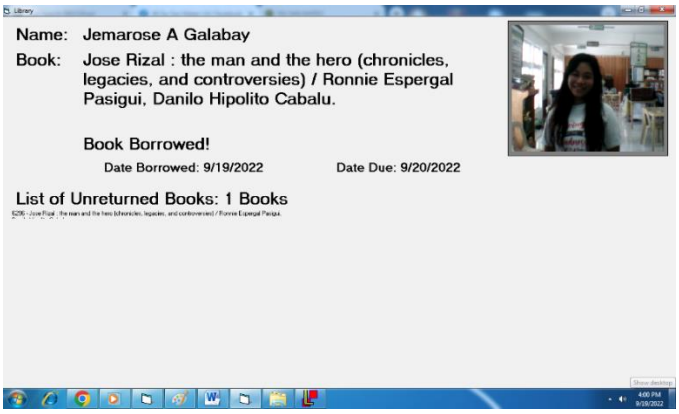


**Figure 2.** Borrowing of Books

Figure 2 shows the Borrowing Module that allows student/faculty to tap their ID card and the books into the barcode reader. It is a self-serving transaction for the student/faculty to borrow a book in the library thru kiosk without the supervision and assistance of the librarian. After tapping the book, the student/faculty will be informed about the information of the borrower such as Title of the Books borrowed, Date Borrowed, Due Date and List of Unreturned books of the borrower thru Kiosk.

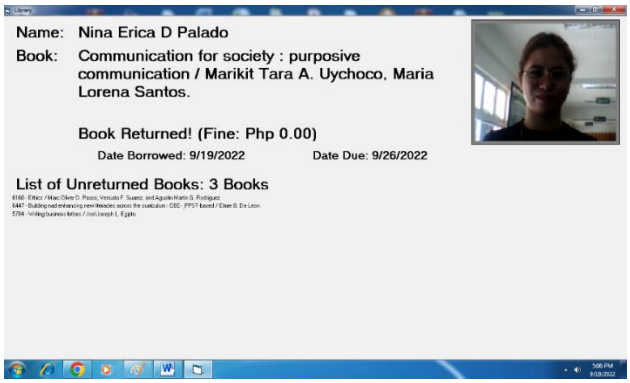


**Figure 3.** Returning of Books

Figure 3 shows the Returning Module that allows student/faculty to tap the borrowed books into the barcode reader. It is a self-serving transaction for the student/faculty to return a book in the library thru kiosk without the supervision and assistance of the librarian. After tapping the books, the system will automatically detect the borrower of the returned books and displays the information of the borrower into the kiosk such as Title of the Returned borrowed, Date Borrowed, Due Date and List of Unreturned books of the borrower.

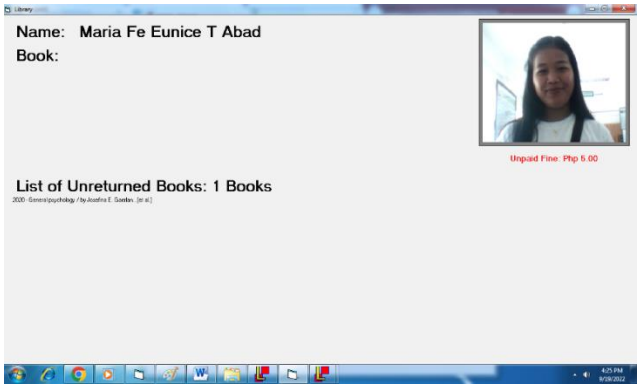


**Figure 4.** Penalizing Student

Figure 4 shows the Penalizing Student Module that allows the system to automatically penalized the students from exceeding on the duration date of the books from the time it was borrowed. The system will penalize the students a 40 pesos per day until such time that the book was returned to the library. Unpaid Balances/Fine by the student will display into the Kiosk after tapping their ID Card into the barcode reader. Through this module, the librarian will no longer have a hard time on counting the days that the book wasn't returned into the library including the unpaid balances of the students because the system will be the one to do it for her.

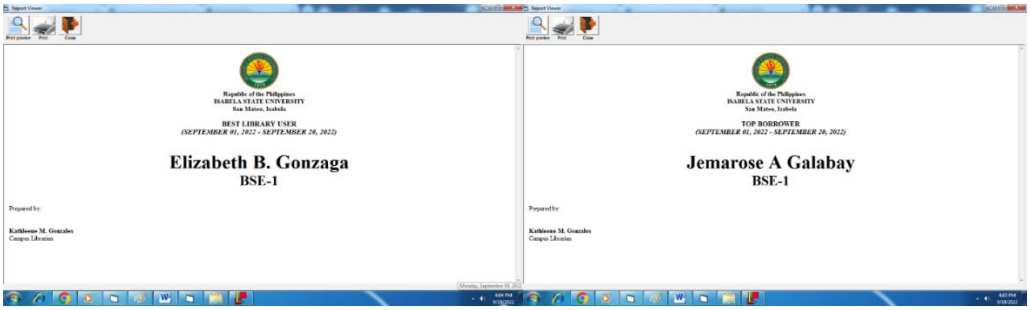


**Figure 5.** Best and Top Borrower

Figure 5 shows the Best and Top Borrower Module allows the librarian to print the Certificate generated by the system from the auto-tallied result in the collected data. Through this module, the librarian will no longer be worried about the tabulation of reports to be prepared for the Top borrower of the month and Best Library User because it was auto-generated by the system from the data collection.

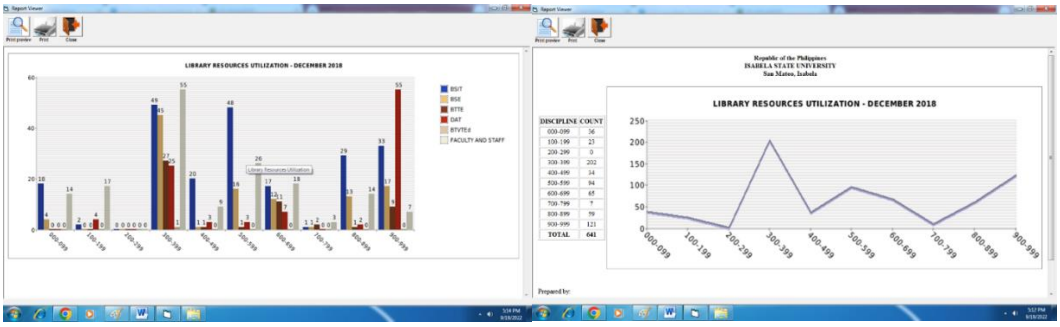


**Figure 6.** Generating Reports

Figure 6 shows the Generating Reports Module allows the librarian to print all the generated reports by the system from the collected data. Through this module, the librarian will no longer be worried about the reports to be prepared in a lesser time such as Annual Report, Monthly Report, and Statistical Report because it was auto-generated by the system from the data collection.

## METHODOLOGY

The Development Model Process that was used by the researcher is adapted from Gabriel (2001).

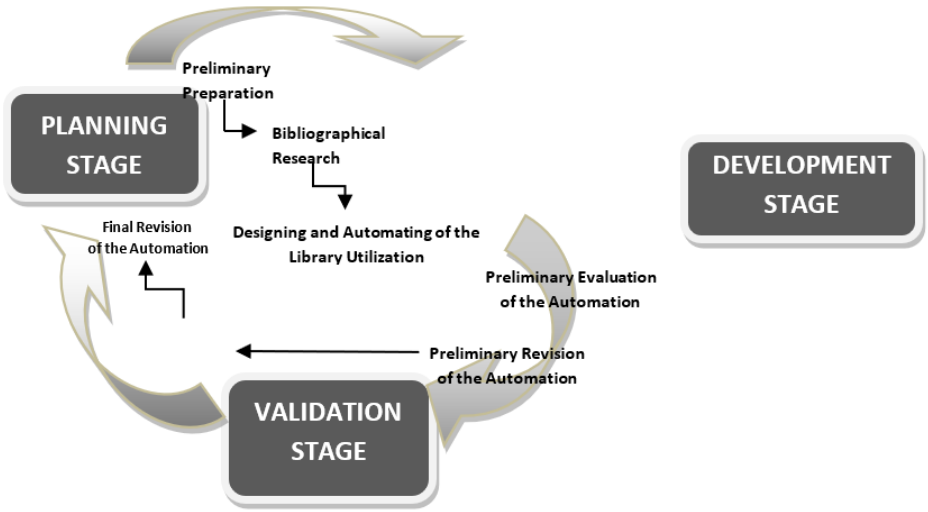


**Figure 7.** Development and validation of Automation of Library Utilization following the R&D Methodology

There were 60 students responded to the evaluation and assessment of the Library's Automation and Manual Operation. 30 students at random used the manual operation, while another 30 students used the library through automation. Similarly, the checklist for ISO 25010, the Automated System, and the Interview Guide Questionnaire were used as data collection instruments by the researchers.

In order to analyze the data regarding the extent of compliance of the Automation to ISO 25010, descriptive statistics were used, specifically mean and standard deviation. To determine the significant difference between Manual Operation Compliance and Automation to ISO 25010 Standards, the t-test for correlated samples was used.

## RESULT AND DISCUSSION

**Table 1.** Means and descriptive ratings of the problems encountered in Utilizing the Library

| Problems | Mean | Descriptive rating |
|---|---|---|
| 1. Faculty/Students forgot to signed in the logbook. | 4.83 | Strongly Agree |
| 2. Some student forgot to bring their borrower's card. | 4.55 | Strongly Agree |
| 3. Faculty/Students consumed too much time in borrowing and returning of books due to signing in the different logbooks (Attendance Logbook, Resource Utilization Logbook, etc.). | 4.55 | Strongly Agree |
| 4. Librarian consumed to much time in doing monthly report | 4.08 | Agree |
| 5. Additional work for the librarian to monitor/supervise the students utilizing the library resources | 4.45 | Strongly Agree |
| 6. Students consumed too much time in searching of books if it is out or in the shelves of the library | 4.43 | Strongly Agree |
| 7. Unorganized Files and Records in the Library | 4.60 | Strongly Agree |
| **Grand Mean** | **4.50** | **Strongly Agree** |

Table 1 reveals the problem encountered with a grand mean of 4.50 with a descriptive rating of Strongly Agree. This means that the faculty and students have encountered problems in utilizing the library. This further means that handling a large number of students and faculty be a problem and might affect the performance and management of the library.
In accordance to the study of Richard Breitmeyer (2015), that manual systems put pressure on people to be correct in all details of work at all times. It takes more effort and physical space to keep track on paper documents, to find information and keeps details secure.

**Table 2.** Means and descriptive ratings on the challenges on the Automation of the Library Utilization

| Challenges | Mean | Descriptive rating |
|---|---|---|
| 1. Lack of Budget | 4.10 | Agree |
| 2. Inadequate Facilities | 3.40 | Agree |
| 3. Low level skills of Students, Faculty and Staff | 4.08 | Agree |
| 4. Lack of commitment by institutional management | 3.80 | Agree |
| 5. Reluctance among the students, faculty and staff to use ICT | 4.10 | Agree |
| **Grand Mean** | **3.90** | **Agree** |

Table 2 shows the difficulties with a grand mean of 3.90 and a descriptive rating of Agree. This means that faculty and students have encountered difficulties in automating library usage. According to (Chisenga, 2004), the challenges facing library automation projects include a lack of budgets, inadequate ICT facilities, low client skill levels, a lack of commitment by institutional management, and a reluctance among clients to use ICT.

According to the research of (Silaeva et al, 2018), successful institutions must maintain a continuous focus on improvement. Improvement is the process by which a system changes or upgrades its state to be better than it was before, usually by taking some action to achieve that better state. All Educational Organizations, as well as individuals, value the concept of improvement.
Successful educational organizations are always striving for improvement. Every organization must improve in order to maintain its level of performance, respond to changes in its environment, and create new opportunities. Improvement is required for the growth and success of an educational organization, and the ISU-San Mateo Library is constantly monitoring and improving its performance in order to maintain its status as a Positive Aspect in terms of ISO 9001:2015 by taking into account the principles of ISO 21001:2018.

**Table 3.** The t-test of difference between Manual Operation and Automation Compliance to ISO 25010

| ISO 25010 | Automation | Manual Operation | Auto SD | MO SD | Concerning Means of Independent Samples | Remarks |
|---|---|---|---|---|---|---|
| Functional Sustainability | 4.70 | 4.41 | 0.06 | 0.14 | 3.584877488 | Rejected |
| Performance Efficiency | 4.70 | 4.3 | 0.06 | 0.15 | 4.823341576 | Rejected |
| Compatibility | 4.70 | 4.35 | 0.11 | 0.28 | 3.05488326 | Rejected |
| Usability | 4.67 | 4.3 | 0.01 | 0.07 | 7.035072323 | Rejected |
| Reliability | 4.80 | 4.3 | 0.01 | 0.09 | 8.645361071 | Rejected |
| Security | 4.72 | 4.3 | 0.04 | 0.06 | 7.166690016 | Rejected |
| Maintainability | 4.66 | 4.3 | 0.03 | 0.071 | 6.099147817 | Rejected |
| Portability | 4.73 | 4.3 | 0.06 | 0.13 | 5.38357227 | Rejected |
| **Degree of Freedom** | **58** | | | | | |
| **Critical Value (two-tailed)** | **2** | | | | | |

N1=30
N2=30
*p < 0.05

The t-test of difference between Manual Operation and Automation Compliance to ISO 25010 is shown in Table 3. The computed t-values show a significant difference between the mean of Manual Operation and the mean of Automation Compliance to ISO 25010 at the.05 level of significance for a two-tailed test. This means that compliance with ISO 25010 is improved through automation. This also implies that automation of library utilization is more efficient than manual operation.

According to experts, manual production is slow and difficult to achieve consistent product quality (Tsai, 1999), and automation is an important feature today, especially in this age of rapid production with high precision. Automation enables industries to achieve levels of speed and quality unattainable by labor at a low cost (Tan & Putra, 2010), as innovations have already established a new trend of replacing manual operations with automation (Kumar et. al, 2019).

## CONCLUSION

In the light of the findings, the following conclusions were drawn;

1. Automation of Library Utilization of ISU San Mateo is evident through the problems encountered in the existing process in the library.
2. Automation in the Library decreases the burden of the librarian in handling the large number of students and faculty in the Campus
3. Regarding compatibility issues, usability, dependability, security, maintainability, and portability as well as functional adequacy, the library's automation adheres to ISO 25010 standards.
4. Automation in the library faced challenges such as a lack of budgets, insufficient ICT facilities, low client skill levels, a lack of commitment by institutional management, and client reluctance to use ICT.
5. Automation of Library Utilization is more effective than the Manual Operation in accordance to ISO 25010.

## RECOMMENDATION

1. Continuously monitoring and improving the performance of the automation in the library to maintain of being a Positive Aspect when it comes to ISO 9001:2015 by considering the principles of ISO 21001:2018.

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