



## COMPARATIVE STUDY OF MANUAL VS AUTOMATED LIBRARY MANAGEMENT SYSTEMS

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### **Abstract**

*This research intends to compare and contrast automated library management systems with their manual counterparts, looking specifically at how well each one performs in terms of accuracy, efficiency, user happiness, and overall operational effectiveness. Academic and public libraries rely on their management systems to keep running smoothly since libraries are important places for learning and information. Automated systems that use software solutions, barcodes, RFID, and digital cataloging techniques have replaced manual library management systems in recent years. These systems once handled cataloging, circulation, and record maintenance. The researchers in this study used a descriptive-comparative methodology to look at how well the two systems worked. Staff and patrons of participating libraries were surveyed using interviews, structured questionnaires, and observational methods. Book issuance and return times, record correctness, cataloging efficiency, retrieval speed, and user happiness are some of the key factors that are assessed. To understand the results, statisticians utilized methods including mean, percentage analysis, and comparative assessment. By speeding up processing, lowering mistake rates, and making materials more accessible, automated library management systems greatly improve operational efficiency, according to the study. Improved record accuracy, quicker service, and easier resource searching all contributed to increased user satisfaction. While manual methods were easier to develop and cost less, they were more labor-intensive, time-consuming, and error-prone. Library directors, lawmakers, and academic institutions can use the results to better understand the pros and cons of switching from manual to automated methods. Successful deployment of automated library management systems may enhance the overall quality of library services, but only if personnel is well-trained, there is sufficient technology, and strategic planning are in place.*

**keywords:** Manual, Automated, Library, Management, Systems

### **Introduction**

Academic and research organizations have long relied on libraries as vital resources for students, faculty, and researchers, housing vast amounts of information and making it easily accessible. Digital resources, online databases, and knowledge management systems are now integral parts of libraries' information services, which have evolved from the traditional storage of books and magazines. The management system that controls cataloging, circulation, record keeping, retrieval, and general resource administration greatly affects the efficacy and efficiency of a library. Manual management systems have long been the backbone of library operations, with cataloging, book issue, return, and record maintenance being handled by hand. Although manual library systems are simple and inexpensive, they frequently require a lot of time and effort from the users. Unfortunately, these methods are prone to human error, which can cause problems like incorrect records, lost books, and

trouble keeping track of resources. In addition, today's library patrons expect rapid information retrieval and easy access to a variety of resources, neither of which are possible with the manual approach.

Automation of library management systems (ALMS) is becoming more common as a result of developments in information and communication technology (ICT). Automated systems commonly incorporate elements like barcoding, RFID (Radio Frequency Identification), online public access catalogs (OPAC), and digital resource integration into their software for cataloging, circulation, inventory management, and resource retrieval. By streamlining processes and eliminating human error, automation frees up library employees to concentrate on providing better services and engaging with patrons. Customer happiness is influenced by the implementation of automated technologies in a direct manner. Users benefit from streamlined book issuing and return procedures, remote access to digital content, and speedier search and location capabilities in automated libraries. Statistical insights into resource consumption, tracking of overdue books, and real-time report generation are all features of the system. Manual methods, on the other hand, are notorious for falling short of what current users anticipate because of their clumsiness, slowness, and inability to incorporate digital resources. The advantages of automated library systems in educational institutions have been emphasized by several research. Automation, according to researchers, enhances record accuracy, decreases administrative workload, and raises service quality generally. Problems with infrastructure preparedness, technological upkeep, training needs, and significant initial investment are among the obstacles to automating formerly manual processes. Automation is an essential part of contemporary library administration despite these drawbacks because of the long-term advantages it provides in terms of operational efficiency, user happiness, and resource accessibility.

To fully grasp the merits and demerits of both automated and manual library systems, it is necessary to do a comparative study of the two. Despite the continued use of manual systems in smaller or less well-funded libraries, automated systems are now essential in public, academic, and research libraries that serve heavy user populations. Administrators may make better decisions on library improvements and resource management techniques based on insights gained from comparing different systems, which give light on the accuracy, efficiency, and user-friendliness of library operations. The purpose of this research is to compare and contrast automated library management systems with their manual counterparts. Efficient book issuance and return, accurate categorization, fast retrieval, user happiness, and staff burden are some of the important factors that the research focuses on. In order to guarantee a thorough evaluation, data were gathered from several libraries using a mix of structured surveys, interviews, and observational approaches. The study's overarching goal is to provide library administrators and legislators with evidence-based recommendations by comparing and contrasting the two systems.

The effects of technology adoption on the quality of library services as a whole are also investigated in this study, alongside operational efficiency. Staff and users are better able to become digitally literate, more learning materials are accessible, and data-driven decisions are made easier with automated processes. Contrarily, manual systems offer a less complicated alternative that necessitates less in the way of technological expertise and capital, making them potentially appropriate for smaller organizations that are strapped for cash. For efficient library administration and future upgrade planning, knowledge of these trade-offs is essential. The success of library management systems has a direct impact on patron happiness and productivity in academic and research settings, where libraries play an essential role. The advantages and disadvantages of human and automated library systems can be better understood by comparing them. While the research does recognize the contextual usefulness

of manual methods in specific circumstances, it stresses the need of embracing automation whenever practical. Library management methods may be better shaped by this study, which will lead to better services and an overall better experience for library patrons.

### **Review of Literature**

Academic, public, and research libraries rely heavily on library management systems to ensure their collections are well-organized and accessible. Several scholars have spent the last several decades studying the pros and cons of automated and manual library management methods. According to the research, in order to provide the best possible service, libraries must run smoothly, quickly, and accurately.

Most public and academic libraries have long relied on manual library management systems. Manual methods are labor-intensive and time-consuming, yet they are straightforward to adopt and cost-effective (Aggarwal, 2016). The system frequently falls short of the expectations of contemporary library patrons, who want dependable and speedy access to materials, due to errors including missing volumes, delayed issue, and incorrect record-keeping. In a similar vein, Kumar and Verma (2018) pointed out that manual methods, especially in big libraries with a lot of users, might cause cataloging, circulation, and inventory control inefficiencies.

These days, automated library management systems (ALMS) are all the rage because to technological advancements. Automation, according to Sharma (2019), greatly decreases the likelihood of human mistake, boosts operational efficiency, and makes resources more accessible. Online public access catalogs (OPACs), barcoding, and cataloging software are all part of automated systems that allow for quicker book issue, return, and retrieval. Additionally, unlike manual methods, ALMS can track overdue books, provide reports in real-time, and give statistical insights for library administration. In addition to physical resources, consumers also have complete access to digital resources, online databases, and e-books thanks to automation, as pointed out by Ahmed (2018). Manual and automatic methods have been compared in several research. An academic library research by Singh (2020) found that automated systems outperformed manual systems in terms of circulation speed (40-50% improvement) and record error rate (60%) reduction. The comfort, decreased waiting time, and simplicity of searching for resources in automated libraries greatly increase customer satisfaction, as highlighted by Rao (2020). However, research has also shown that there are obstacles to automation adoption at institutions with limited resources, such as the high initial cost, software maintenance, and staff training needs. Staff efficiency and workload have been the primary areas of attention for other researchers. When libraries switched to automated systems, staff members had more time to focus on patron interaction and new resource creation, according to Patel (2018). In contrast, manual systems forced staff to spend most of their time on mundane administrative and record-keeping duties. Automating formerly manual processes enables for more efficient inventory management, quicker decision-making, and better mistake monitoring (Mehta, 2018).

Manual methods may still have a place in smaller or more remote libraries, especially in areas with less funding and less advanced technology, according to some research, even if automated systems have several advantages. Manual systems, according to Baro (2019), are more feasible for libraries with smaller collections and fewer employees since they are simpler to install and need less technological expertise. There is increasing agreement in the surveyed literature that automated library management systems provide better results for users in terms of accuracy, efficiency, and overall happiness. However, while moving from manual to automated systems, it's important to think about things like institutional context, budget, human competency, and technical preparedness. To fill gaps in our

knowledge, this study systematically compares and contrasts the two systems, looking specifically at operational efficiency, mistake rates, cataloging and retrieval speed, and user satisfaction. We learn all about their advantages and disadvantages.

### Research Objectives

1. To evaluate the efficiency of manual and automated library management systems
2. To compare error rates and accuracy in record maintenance
3. To assess user satisfaction and ease of use in both systems
4. To examine the time taken for cataloging, book issuance, and retrieval
5. To identify advantages, limitations, and challenges of both systems

### Research Methodology

This study compares and contrasts automated library management systems with their manual counterparts using a descriptive-comparative research strategy. Staff and patrons of some public and academic libraries that use automated or manual management methods make up the study's population. In order to guarantee that the 120 participants were representative of various library types, user demographics, and staff levels of expertise, purposive and stratified sampling methods were used.

An organized survey and semi-structured interviews were used to gather the main data. Key metrics such as general user happiness, cataloging speed, retrieval efficiency, correctness of records, and efficiency of book issue and return were the focus of the questionnaire. Both human and automated library workflows and operational procedures were documented via the use of observational methodologies. Books, academic publications, and prior studies on library management systems and technology adoption were the sources of secondary data.

When comparing the two types of systems, manual and automated, quantitative tools including mean, percentage, standard deviation, and t-tests were utilized for data analysis. Thematic analysis was used to uncover commonalities, difficulties, and user perspectives in the qualitative data collected through interviews and observations. All participants gave their informed permission before taking part in the study, and it was conducted in a way that respected their right to privacy. The technique guarantees a thorough assessment of both systems, illuminating their strengths, weaknesses, and operational success with evidence-based insights. This will help library managers make well-informed judgments when choosing and implementing a management system.

### Data Analysis and Interpretation

Efficiency, accuracy, user happiness, and overall operational effectiveness are the metrics used to compare manual versus automated library management systems in this study. Surveys, interviews, and observation were used to gather data from library personnel and customers of chosen libraries. In order to fully grasp both systems, the study incorporates 10 critical parameters.

**Table 1: Respondent Distribution (Library Type)**

| Library Type | Number of Respondents | Percentage |
|--------------|-----------------------|------------|
| Manual       | 60                    | 50%        |
| Automated    | 60                    | 50%        |
| Total        | 120                   | 100%       |

The data shown in the table demonstrates that there is a comparable distribution of responders from both manual and automated libraries, which guarantees a fair and comparative comparison.

**Table 2: Average Time for Book Issuance (Minutes)**

| Library Type | Average Time (Minutes) |
|--------------|------------------------|
| Manual       | 7.5                    |
| Automated    | 2.3                    |

It is clear that the automated approach is significantly more efficient than the manual system in terms of operational efficiency because it is able to accomplish book issuing about 70 percent faster.

**Table 3: Average Monthly Record Errors**

| Library Type | Average Errors |
|--------------|----------------|
| Manual       | 12             |
| Automated    | 3              |

Systems that are manually operated have a greater rate of errors, but automated systems have a far lower rate of mistakes, which results in more accurate record-keeping.

**Table 4: User Satisfaction Level (%)**

| Satisfaction Level | Manual | Automated |
|--------------------|--------|-----------|
| High               | 30%    | 75%       |
| Medium             | 50%    | 20%       |
| Low                | 20%    | 5%        |

Because automated libraries provide faster service, more convenience, and greater accuracy, users report higher levels of satisfaction with these libraries.

**Table 5: Average Cataloging Time per Book (Minutes)**

| Library Type | Average Time |
|--------------|--------------|
| Manual       | 10           |
| Automated    | 3            |

The amount of time needed for cataloging is greatly cut down by automated methods, which in turn improves the overall efficiency of collection management and indexing services.

**Table 6: Average Book Retrieval Time (Minutes)**

| Library Type | Average Time |
|--------------|--------------|
| Manual       | 6            |
| Automated    | 1.5          |

Users are able to discover and get books considerably more quickly thanks to automated systems, which is in line with the present need for materials that can be accessed quickly and reliably.

**Table 7: Frequency of Catalog Updates (Monthly)**

| Library Type | Average Updates |
|--------------|-----------------|
| Manual       | 1–2 times       |
| Automated    | 5–6 times       |

In order to guarantee that library records are always up to date and correct, automated technologies make it possible to do updates in real time and on a more frequent basis.

**Table 8: Staff Workload (Hours/Week)**

| Library Type | Average Hours |
|--------------|---------------|
| Manual       | 45            |
| Automated    | 30            |

The burden of staff members is reduced as a result of automation, which enables them to concentrate more on providing user assistance and developing resources rather than doing administrative duties that are repetitive.'

**Table 9: Training Requirement**

| System Type | Training Requirement               |
|-------------|------------------------------------|
| Manual      | Minimal                            |
| Automated   | High (software and digital skills) |

There is a significant amount of technical training that is required for automated systems, whereas manual systems are simpler to run and require just a modest amount of technical expertise.

**Table 10: Overall Operational Efficiency (Composite Score / 100)**

| Library Type | Efficiency Score |
|--------------|------------------|
| Manual       | 55               |
| Automated    | 85               |

The overall operational efficiency of automated systems is significantly higher than manual systems. Automation enhances efficiency across time management, error reduction, user satisfaction, and staff productivity. The data clearly indicate that automated library management systems are more efficient, accurate, user-friendly, and effective than manual systems. While manual systems remain cost-effective and simple to implement, they are more time-consuming, prone to errors, and require greater human effort. The comparative study underscores the importance of technological adoption, staff training, and digital infrastructure to maximize the benefits of automated library management systems.

### Findings

The conclusions of this study give a complete knowledge of the differences between manual and automated library management systems by comparing them across a variety of factors. These parameters include efficiency, accuracy, user satisfaction, and operational effectiveness. The study of the data that was obtained makes it abundantly evident that automated library management systems perform noticeably better than manual methods in virtually every operational area.

First and foremost, automated methods significantly cut down on the amount of time needed to do regular operations like book issuing, return, categorization, and retrieval. This is a significant improvement in terms of efficiency. Compared to manual systems, automated libraries took between two and three minutes to issue and return books, whereas manual systems took between seven and eight minutes. It was also discovered that automated methods were around seventy percent faster when it came to cataloging and updating records. These discoveries highlight the significance of automation in the process of simplifying library operations and enabling staff members to concentrate on higher-order duties, such as providing assistance to users, developing resources, and managing digital resources of the library.

The second finding of the study is that automated libraries have experienced a considerable decrease in the number of mistakes. In manual systems, there was a greater likelihood of books being misplaced, records being inconsistent, and updates being delayed, which resulted in operational inefficiencies and a loss in user satisfaction. Automated systems, on the other hand, guarantee correct record-keeping by means of software validation, barcode scanning, and real-time updates. This results in an increase in dependability and a reduction in the load of administrative work.

In automated libraries, the level of customer satisfaction was significantly greater than in human libraries. According to surveys, seventy-five percent of consumers have expressed a high level of

satisfaction with automated systems. They cited the convenience of looking for books, the speed with which they received assistance, and the availability of digital resources. On the other hand, just thirty percent of users in manual libraries reported being extremely satisfied with their experience. Many of these users were concerned about delays, difficulties in identifying volumes, and restricted access to material that was recently updated.

Further, an examination of the workload of staff members reveals that automation decreases the amount of repetitive manual operations, which in turn enables staff members to devote more time to activities that provide greater value. The automated system personnel managed equal workloads in thirty hours, demonstrating a considerable gain in operational productivity. In contrast, the manual library staff spent an average of forty-five hours per week on administrative chores. In spite of this, automated systems need a significant amount of training and digital literacy, which highlights the significance of providing personnel with opportunities for professional development.

Last but not least, the research concludes that despite the benefits of automation, manual systems continue to be useful in institutions that are either small in scale or have limited resources. This is because manual systems need a little initial investment, are straightforward, and are easy to operate. The restrictions of cost and the need for training are, however, outweighed by the long-term benefits of automation, which include increased customer happiness, improved accuracy, and increased operational efficiency. Taking everything into consideration, the findings provide substantial backing for the use of automated library management systems as a method of modernizing library operations and enhancing the quality of service.

### **Discussion**

This study's results corroborate those of other works that have highlighted the revolutionary effect that automation has had on library administration. Automated solutions improve operational efficiency and decrease administrative delays, as seen by the drastically reduced processing time for book issuing, categorization, and retrieval. Singh (2020) and Sharma (2019) have demonstrated that digital library systems increase workflow efficiency, freeing up library personnel to concentrate on patron interaction rather than mundane, repetitive activities. This finding is in line with their conclusions.

One of the most important results of automation is the decrease in human error. Because of the inherent human error in manual systems, lost books, out-of-date records, and postponed updates are commonplace. These problems are efficiently handled by automated systems that use barcode scanning, digital cataloging, and real-time database management. Similarly, Rao (2020) and Patel (2018) found that automation greatly enhances the accuracy and dependability of library operations.

The effect of automation on end-user happiness is also brought to light in the research. Automated libraries have a lot of happy customers since their services are quick, their resources are easy to find, and they have digital content available. With automated systems, users can easily find books, see if they are in stock online, and enjoy precise record keeping. Manual libraries, on the other hand, have moderate to low user satisfaction due to delays and difficulties in finding materials. These findings corroborate those of Mehta (2018), who emphasized that system dependability and efficiency significantly impact user experience.

Also at the heart of the conversation are staff workload and professional growth. Automated systems do away with mundane administrative chores, but using them properly requires employees to have technical knowledge and training. This exemplifies the tension between digital competence and operational efficiency. To get the most out of their automation systems, institutions should put money into ongoing training and infrastructure upgrades.

Manual libraries still have their uses, even if automated methods have many advantages. Due to low setup costs and minimum technological requirements, manual methods may be more practicable for small-scale or rural institutions with restricted finances. To keep up with the needs of contemporary users and guarantee effective library administration, however, a move toward automation is unavoidable as academic institutions grow and digital literacy rises.

As this debate has shown, automated library management systems not only reduce staff effort but also greatly improve operational efficiency, accuracy, and user happiness. Nevertheless, preparation, training, and investment in technical infrastructure are necessary for a successful rollout. While there are benefits to manual methods, the comparative study shows that automation is necessary for effective, user-centric, modern library services.

### Conclusion

According to the results of this study, automated library management systems are far superior to manual ones. Book issue, return, categorization, and retrieval processing times are drastically cut using automated systems, and record-keeping mistakes are minimized as a result. As a result of the accessibility, speed, and ease offered by technology solutions, user satisfaction is significantly better in automated libraries. Library workers are free to focus on patron assistance and new resource creation now that their burden has been lightened. Human error, longer operational procedures, and worse user satisfaction are downsides of manual systems, which are nonetheless important for small-scale institutions due to their low cost, simplicity of operation, and relevance. Despite the difficulties of upfront costs and employee training, the study reveals that automation's long-term benefits—such as increased operational efficiency, higher accuracy, and a better customer experience—are worth it. The research highlights the need of investing in software, hardware, and infrastructure as part of a planned automation implementation plan, and of providing library employees with ongoing professional development opportunities. To bring operations up to date, service quality up, and fulfill the expectations of digitally savvy consumers, library administrators and policymakers should think about switching to automated library management systems. Finally, the research shows that automated systems are the best for modern library administration. It frees up staff time to concentrate on instructional and professional development activities while ensuring smooth operations, accurate records, and a pleasant user experience. Institutions can improve the quality of public and academic education and research by using automated library management systems to administer their libraries better.

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