Implementation of Library Automation in an Information Retrieving System Using the Apriori Algorithm

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Abstract

Library automation is the process of converting manual systems into digital or electronic ones; it can also be interpreted as the use of machines that act on their own or with self-control without human intervention in the process as a form of application of information technology for the benefit of the library, starting from the acquisition of collections to the enjoyment and access of these collections by users. Library automation is in the form of an information system, where this web-based library information system is expected to provide convenience to both staff and all parties who obtain information about the library without having to go to the library directly, can access it anytime and anywhere, and can answer all the problems that arise. appear. The approach used in this study uses a descriptive qualitative research approach, with the research design using the case study method. In contrast, the case raised is "Implementation of Library Automation Systems at SMK Negeri 1 Batusangkar". At the final stage of the research, it can be concluded that the information system created can help the administrator arrange books on a special shelf for books produced through an a priori calculation process. The information system created can provide recommendations to students for books produced through an a priori calculation process based on book categories that are interrelated with other categories.

INTRODUCTION

The convenience brought about by advances in information technology and digitization has led to changes in the perceptions and expectations of the user community regarding the activities of seeking and obtaining information (Abdillah et al., 2021). Information technology, such as a library, is widely used for work management to be more effective and efficient perceptions and expectations of the user community regarding the activities of seeking and obtaining

information (Febryanto & Lisnawita, 2022). Information technology, such as a library, is widely used for work management to be more effective and efficient. Information technology is a benchmark for the progress and modernization of a library, be it a public library, a special library, a school library, or a college library (Yoliadi et al., 2023). This is in line with the demands of the public regarding the need to seek information because the public now understands all forms of information technology. The library is one of the facilities for providing knowledge and information, and

the library is also a place for the process of teaching and learning activities for users to get the desired information (Yoga, 2019). The role of the library is very important in providing scientific books for students, teachers, and lecturers (Anas, 2016).

Libraries that use automation will transfer library materials such as books, images, and sounds as electronic files. This process is called the digitization process (Syah & Siagian, 2021). Digital libraries can be achieved through library automation through an ILS (integrated library system) or integrated networks (Muttaqin et al., 2022). Digital libraries focus on electronic access, where collections are stored in digital format and accessed via PC (Personal Computer) media (Irfiani, 2020).

The advantages of library automation include: a) no physical boundaries; b) access at any time; c) multiple access; and d) an easier retrieval system (Yoliadi, 2022). With the application and utilization of technology, librarians will work efficiently and can facilitate their work in processing various library materials and improving services. In addition, users must also be able to use technology to search for the information they are looking for.

A digital library is a library that already uses an internal automation system for its operations and has a collection of library materials mostly in digital format, which are stored on and accessed via a computer (Irfiani, 2020). The collection of a digital library generally consists of five types of media: text, images, sound, motion pictures or videos, and graphics. Furthermore, the library automation system is a system of library management that utilizes information technology (Saefudin & Fernando, 2020). With the existence of a library automation system, data processing from collections of library materials becomes more accurate, and searches or retrievals will be faster. Library automation activities take the form of various library service activities and transactions, such as procurement, processing, inventory, cataloging, circulation of library materials, member management, statistics, and so on (Mutaki, 2017).

The library at SMK Negeri 1 Batusangkar is a forum for various information and knowledge aimed at developing community

insights, especially for the people of Tanah Datar Regency. This library has started implementing an automation system, namely by using a desktop-based Visual Basic information system installed on the circulation section computer to serve members' lending and returning activities. As for accessing information in the form of book collections (catalogs), other information about the library, and online member registration services, none have been provided.

This web-based library information system is expected to provide convenience to both staff and all parties who obtain information about the library without having to go to the library directly, can access it anytime, anywhere, and can answer all problems that arise. This research is a development of an existing information system, namely by developing several solutions in the form of online services that provide collection tracking facilities, online member registration, loan ordering, and other information about the library for users (Buwana, 2022).

METHOD

The descriptive qualitative research method was used in this study to describe and describe the implementation of the library automation system at the Library of SMK Negeri 1 Batusangkar. Reveals that qualitative research is about understanding the phenomenon of what is experienced by the research subject. For example, behavior, perception, motivation, and action can be understood holistically and by means of descriptions in the form of words and language, in a special natural context, and by utilizing various scientific methods (Nurhadi, 2018).

The design of this research is to use the case study method, while the case raised by the researcher is about "Implementation of the Library Automation System at SMK Negeri 1 Batusangkar." According to Sukmadinata, (2006), a "case study" is a study conducted on an integrated system. This unit can take the form of programs, activities, events, or a group of people who are linked by a common location, time, or bond. A case occurs because of a problem, difficulty, or obstacle, but what is used as a case is its superiority or success. Case

studies are directed at examining conditions, activities, and important factors related to and supporting these developmental conditions.

In this study, a web-based information system was built using the waterfall method. The waterfall method is a waterfall method that provides a sequential or sequential software life-flow approach starting from analysis, design, coding, and testing (Effendi et al., 2023). The stages in the waterfall method are carried out as shown in Figure 1.
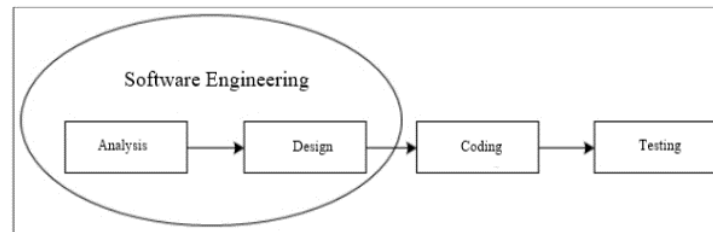

Figure 1. The Waterfall Method

Analysis System

The analysis is carried out to study the algorithm of the application process flow that is made. System analysis consists of several analyses, namely: system process flow, analysis of user needs, analysis of illustrations of how the system works, analysis of data requirements, and analysis of system requirements.

Application Development Process Flow

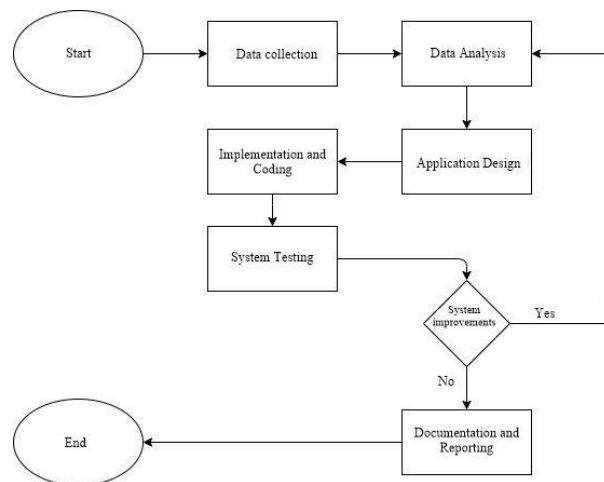The development process of this research showed by Figure 2.

Figure 2. Process flow for creating a Library

Automation System
a. Data collection
   Before creating an application or software, first look for reference materials in libraries, articles, journals and papers online and offline.

b. Data analysis
   Data analysis in making this application where the data processing process aims to find information about the system that will be made.

c. Application Design
   The design of this application consists of designing coding and designing program logic that will be applied to the system to be created

d. Implementation and Coding
   Applying the results of the design that has been made, whether it is still in the form of a sketch or already in the form of a design. At

this stage, the coding program that will be made has also been carried out.

e. System Testing.

After the application is made, it is tested on the four variables tested.

f. Programming coding

Coding is an act of programming steps by writing code or scripts in a programming language. So that the script can be understood by the computer, during the coding process it follows the applicable syntax rules. Syntax rules really depend on the programming language used when writing scripts.

g. Implementation

The library automation system that has been created is directly implemented at the Library of SMK Negeri 1 Batusangkar.

h. Testing

One way to assess the quality of a computer system is to look for program discrepancies with user expectations in the requirements document. Testing like this can measure program quality in broad outline in terms of accuracy, completeness, usability, performance, and also other functional or non-functional aspects.

i. Documentation and Reporting

The final process of an application is where the application can be used in general.

RESULT AND DISCUSSION

The system design stage described is the stage for building a system and configuring software and hardware components to produce a good information system. The designed information system is one component. The stages of designing this procedure will be explained using a structured design method with tools, namely flowcharts, context diagrams, data flow charts (DAD), entity relationship diagrams (ERD), data dictionaries, and relationship tables. The a priori algorithm used in this study is to find the hidden item frequency in the lending transaction database. The frequency of the itemset is then used to generate association rules, provided they meet the minimum support and confidence limits.
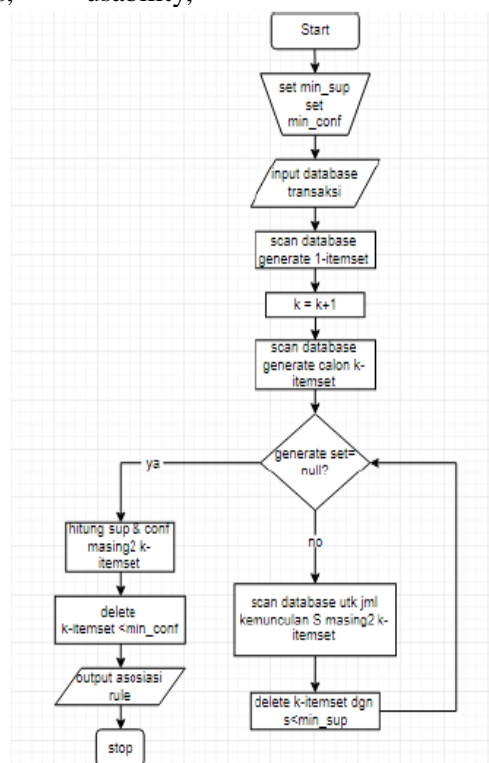

Figure 3. Flowchart of Apriori Algorithm Association Rules

System Flowcharts

The flowchart of the a priori algorithm implemented in the transaction database to find the frequency of the itemset is shown in Figure 3.

1. A priori uses an iterative approach where k-itemset is used to explore (k+1)-itemset.
2. Candidate (k+1)-itemsets with a frequency that occurs rarely or below the threshold (min_support = 3) and (min_confidence = 75%) will be trimmed and not used in determining association rules.
3. The first step is to find the 1-item set by scanning the database to accumulate the number of each item category and its appearance in the item items.
4. Then 1-itemset is used to find a 2-itemset. Prospective 2-item candidates are found by pairing one item with another item so that a possible combination of two items is obtained.
5. The two-item set then calculates the value of its occurrence in each transaction. The threshold value (min_support) was found to cut out potential candidates who are considered infrequent or non-frequent.
6. Two-item sets that meet the threshold value will be calculated for support and confidence values. As an association rule, a 2-item set that meets min_support and min_confidence will be used.
7. A 2-item set is used to find a 3-item set, and so on until no more frequency (k+1)-items can be found.
8. After the rules of the frequency (k+1)-item is formed, the support and confidence values are calculated. The result of the multiplication of the highest support and

confidence values is the best association rule for all transactions in the database.

The flow process of the a priori method is used to find and determine the books that are most frequently borrowed simultaneously. An example table of book lending transactions using fictitious data provides an overview of how to do data mining to produce association rules with the following steps:

1. Determine the size of the minimum support (3), and the minimum confidence (75%). Minimum support is the minimum value determined from itemized transactions, and minimum confidence is the minimum value determined from the results of all transactions as a form of confidence level.
2. Arrange all frequent itemsets, namely itemsets that have a minimum support of
3. Select the association rule that meets the minimum support and minimum confidence from the table of candidate association rules.

Display Program
Home page

This page contains library rules and menus contained in the library automation system, including Home, Book Catalog, Visitor Book, Member Login, and other features. The following display of the home page can be seen in Figure 4.
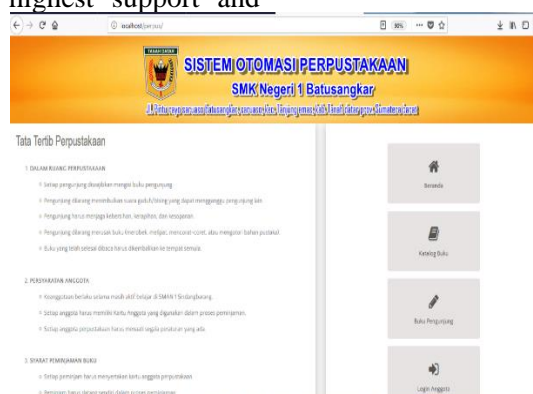

Figure 4. Home Page

Login Display

On the login page here, all users must log in first before carrying out the borrowing process; if the user does not have an account, he or she must first register on the list menu. After the user has successfully logged in, he or she will enter the home menu. The login page display can be seen in Figure 5.

Loan Data Page

On the user lending data page, this feature informs the user of each book that is still being borrowed or that has been returned. The service page can be seen in Figure 6.

Apriori Calculation Page

On the calculation page, borrowing data will be sorted in ascending order based on the calculation results of the Apriori algorithm. can be seen in Figure 7.

Display of A Priori Method Development

On the development method admin page to explain the calculation of the a priori method on the system. The image below explains the number of transactions made to users or students where there were 10 book lending transactions. can be seen in Figure 8.
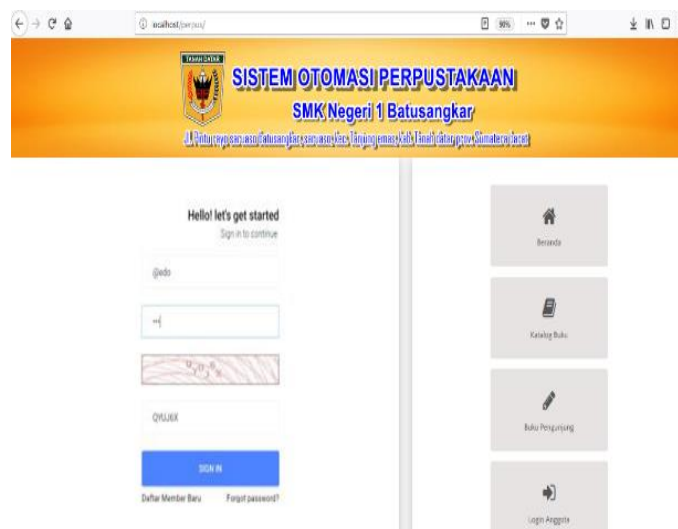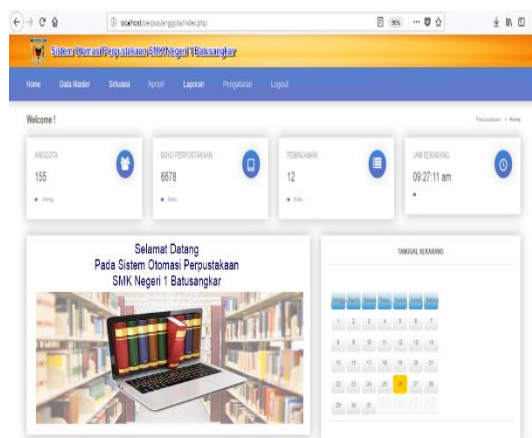

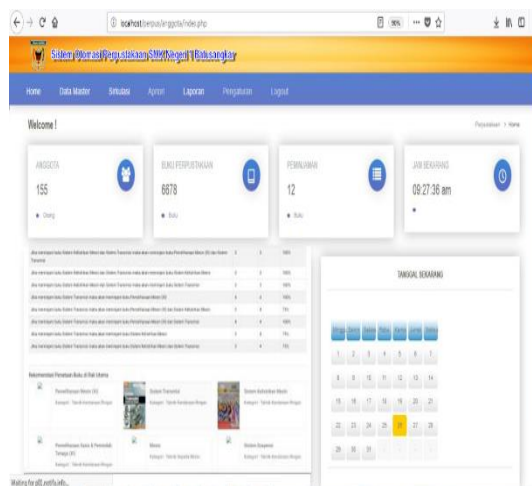Figure 5. Login Page

Figure 6. Loan Data Page
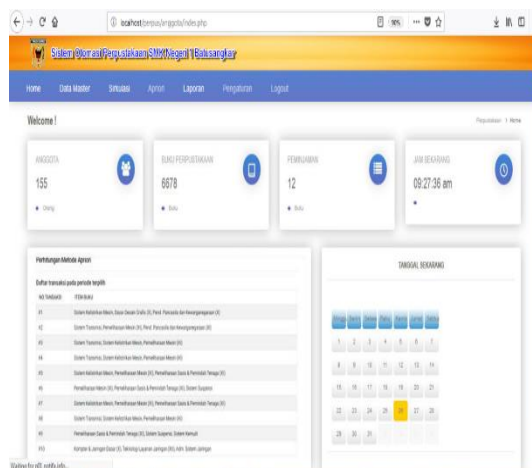
Figure 7. Apriori Calculation

Figure 8. Development of the Apriori Method

The impact of this automation system can ease the librarian's task of providing services to users because it is faster at its work than manual methods. For example, if visitors come and have difficulty finding library materials, librarians can help users browse for the information and library materials they need to operate the Online Public Access Catalog (OPAC) and track the information needed so that their information needs are met. Likewise, users are helped by this library automation; library automation is very helpful, and usually having to queue now can be faster. For example, in the guest book service, visitors who are already members can quickly fill in visitor data by simply scanning a member card, so the user's data will be immediately detected without having to write in a book, which of course will take longer. With a fast-paced library automation service, of course, users come to the library more often because the time to read books can be longer without having to spend too much time looking for information.

CONCLUSION

The results of the research analysis that has been carried out on the library automation system in the information retrieval system using the a priori algorithm allow it to be concluded that the information system created can help the admin organize books on a special shelf for books produced through an a priori calculation process. The information system created can provide recommendations to students for books produced through an a priori calculation process based on book categories that are interrelated with other categories. Implementation of a

library automation system at SMK Negeri 1 Batusangkar provides many benefits for library managers and users, as follows: a) Improving the quality of library services and assisting librarians in meeting the information needs of library users, b) Making it easier for library managers to input book data, c) Able to streamline manpower and time, d) Simplify the process of checking and supervising the information technology section, e) Make it easier for users to browse information on library materials through OPAC, f) Improving the image or quality of the library. Obstacles in the implementation of the library automation system are the occurrence of power outages and an unstable internet network that can hamper the searching process, errors occur when inputting data, and there is a discrepancy in book data information between the system and the conditions encountered by the user.

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