Jurnal Kajian Informasi & Perpustakaan Vol. 12, No. 2 (December 2024) 237-250
ISSN 2303-2677 (Print) ISSN 2540-9239 (Online)

Design and construction of a website-based librarian application system in Bali

I Putu Suhartika[1], Ni Putu Premierita Haryanti[2*]
[1,2]Library Study Program, Universitas Udayana
Jl. PB. Sudirman, Denpasar Selatan, Denpasar, Bali, 80232
)* Corresponding Author, Email: premierita@unud.ac.id

Received: April 2024; Revised: December 2024; Accepted: December 2024; Published: December 2024

Abstract

This study focuses on the development of a web-based application system related to the functional positions of librarians in Bali. This web-based application is designed as a one-stop service to provide essential functional position information for librarians. The primary research question asked is how to design and construct a web-based librarian application system in Bali. The objective of this study is to design, develop, and evaluate a system that supports librarians in managing their activities and credit scores. The development method used is the linear sequential (waterfall) method, which includes the stages of analysis, design, coding, implementation, testing, and maintenance. This system features a user interface with functions such as Home, Activity Details, Forms, and a List of Librarians, enabling librarians to manage various activities organized into categories of Expert Librarians and Skilled Librarians. Each activity comprises a menu for librarian type, education, library management, services, librarian system development, professional development, and task support, which are further broken down into sub-activities according to their categories. Application testing was carried out using the Black Box Testing method to ensure that all functions operated according to user needs. This system was implemented as a web-based application using PHP and MySQL databases, allowing librarians to access it online. The implementation results show that this application has run well and is able to meet the needs of librarians in managing their functional positions efficiently, simplifying the credit score submission process, and enhancing accuracy and efficiency in reporting.

Keywords: System design; System development; Librarian application system; Librarian functional position; Credit score

Rancang bangun sistem aplikasi pustakawan berbasis web di Bali

Abstrak

Penelitian ini berfokus pada pengembangan sistem aplikasi terkait jabatan fungsional pustakawan di Bali. Aplikasi berbasis web ini dirancang sebagai layanan terpadu (one-stop service) untuk menyediakan informasi jabatan fungsional yang diperlukan pustakawan. Permasalahan yang diangkat adalah bagaimana merancang dan membangun sistem aplikasi pustakawan berbasis web di Bali. Tujuan penelitian ini adalah untuk merancang, membangun, dan mengevaluasi sistem yang mendukung kebutuhan pustakawan dalam mengelola aktivitas dan angka kredit mereka. Metode pengembangan yang digunakan adalah metode sekuensial linier (waterfall), yang mencakup tahapan analisis, desain, pengkodean, implementasi, pengujian, dan pemeliharaan. Sistem ini memiliki antarmuka pengguna dengan fitur-fitur seperti Beranda, Detail Aktivitas, Formulir, dan Daftar Pustakawan, yang memudahkan pustakawan untuk mengelola berbagai aktivitas yang terbagi dalam kategori Pustakawan Ahli dan Pustakawan Terampil. Setiap aktivitas terdiri atas menu jenis pustakawan, pendidikan, pengelolaan perpustakaan, pelayanan, pengembangan sistem pustakawan, pengembangan profesi, dan penunjang tugas, yang selanjutnya dipecah menjadi sub-kegiatan sesuai kelompoknya. Pengujian aplikasi dilakukan menggunakan metode Black Box Testing untuk memastikan bahwa seluruh fungsi berjalan sesuai kebutuhan pengguna. Sistem ini diimplementasikan berbasis web dengan bahasa pemrograman PHP dan database MySQL, memungkinkan pustakawan mengaksesnya secara daring. Hasil implementasi menunjukkan bahwa aplikasi ini telah berjalan dengan baik dan mampu memenuhi kebutuhan pustakawan dalam mengelola jabatan fungsional secara efisien, menyederhanakan proses pengajuan angka kredit, serta meningkatkan akurasi dan efisiensi dalam pelaporan.

Keywords: Perancangan sistem; Pembangunan sistem; Sistem aplikasi pustakawan; Jabatan fungsional pustakawan; Angka kredit

doi: http://dx.doi.org/10.24198/jkip.v12i2.54441

Website: http://jurnal.unpad.ac.id/jkip

INTRODUCTION

Information technology transformation in libraries has a significant impact on library progress. Technology is gradually changing the lives of library users who have been largely excluded from using traditional library materials, for example the visually impaired (Eje & Dushu, 2018). Innovation in library technology services involves implementing new services and reassessing current services for improvement (Farney, 2020).

The rapid development of information technology has caused libraries to develop modern libraries, and therefore, numerous libraries can build up their applications (Hiremath et al., 2019). The library of the future will be more of a portal through which students and faculty access the world's vast information resources (Mondal & Maity, 2016). Libraries of the future will continue to evolve and adapt to new trends in technology and community needs (Naik & Naik, 2023).

Information technology is related to computers that people use to process information and to support the information needs of an organization (Rainer & Cegielski, 2014). One form of information technology utilization in libraries that can assist librarians is the librarian application system, which is a web-based information system that provides information sources and services that can be accessed by librarians using various communication devices. A web-based information system is an information system featuring a user interface with library functions. In this case, an information system (IS) is a set of interrelated components to collect, manipulate, store and disseminate information and provide feedback mechanisms to achieve goals (Zemmouchi-Ghomari, 2022). Information systems consist of several components as resources that must be met. All of these components have an important role in building an information system. These components include technology (hardware, software and data), communication networks, people and processes (Bourgeois et al., 2019). In addition, Pham et al. (2021) stated that information systems can have six main components: hardware, software, network communications, data, people, and processes. Kalankesh et al. (2020) stated that the factors that influence information system user satisfaction are categorized into seven dimensions, including information quality, system quality, vendor service or support quality, system usage, perceived usefulness, user characteristics, organizational structure, and management style. The information system produces various data that can be displayed easily and quickly to users. Liu and Ma (2018) stated that through system development, several contradictions in library data management can be solved, and data management can be carried out efficiently.

Web-based librarian information is usually provided in the library profile included on the library website. Anna (2018) states that many public library websites include a profile about the library, the types of services offered, the collections available, operating hours, organizational structure, and events and news related to the library.

The Library System provides detailed information about students, staff, and books (Samuel et al., 2018). Basically, library automation is the use of personal computers (PCs) and organizations to carry out various library activities and limitations (Ngozi, 2020). Library automation is the use

of automatic and semi-automatic data processing machines to carry out traditional library activities such as acquisition, cataloging, and circulation (Tripathi, 2023).

The Librarian application system is a system intended for librarians to carry out their duties by using applications so that the management process in the library becomes more efficient and effective. The librarian application system is designed to find out the activities that have been carried out by librarians based on predetermined credit scores. In this regard, the librarian application system is a part of the library information system to assist librarians' needs in knowing activities that have been carried out or providing reports when the task has been completed. The librarian application system is expected to be in accordance with the applicable system design model.

System design is the activity of designing new systems and developing previous systems to overcome system problems faced. The construction of the designed system often accompanies system design. Design and construction are terms related to analysis to create a system or improve an existing system in an agency (Maulani & Nursolihah, 2022). In the initial stage, the design will be carried out according to the user's wishes, and in the next stage, it will be constructed through an application program related to the design. In this regard, design is an activity of translating analysis results into software packages and then creating a system or improving an existing system (Rahmat et al., 2021). Designing a system needs to consider several factors. The design must represent aspects of the system that are created based on user needs (Anggoro & Hidayat, 2020).

The design product itself is an application or system that can integrate various activities. Designing a system must follow the rules of the System Development Life Cycle (SDLC), namely a software development life cycle consisting of several important stages in the process of designing and constructing a system. SDLC is a framework for planning, analyzing, designing, developing, testing, and implementing software (Hossain, 2023). SDLC is a structured framework that contains sequential processes in which information systems are developed. The SDLC has six cycle stages based on the waterfall model. The SDLC stages based on the waterfall model are: 1) requirements gathering and analysis. 2) system development. 3) system implementation and coding. 4) trial (testing). 5) user guide (deployment). 6) systems operation and maintenance. Each step of the system design can be seen in Figure 1.

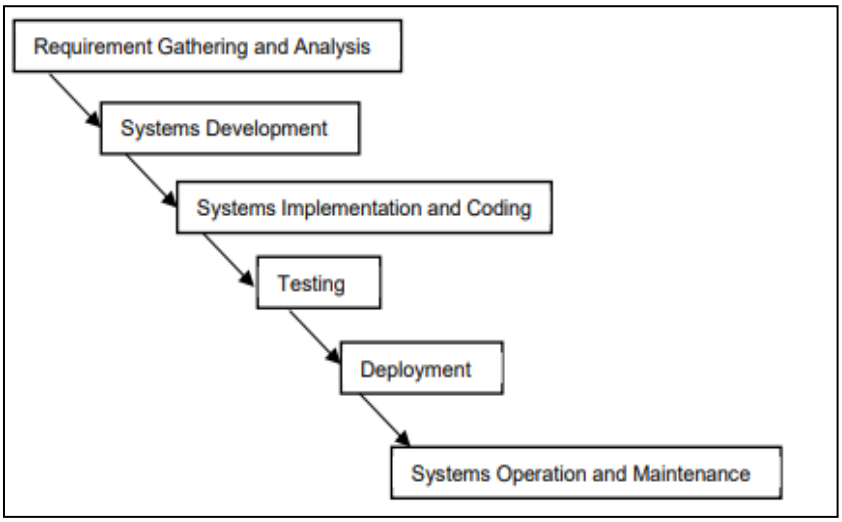

Figure 1. Waterfall Model: A System Design Cycle
Source: (Komalasari & Ramdan, 2020)

All of the above phases refer to one theme, namely quality assurance, in this case, providing quality software to users (Lemke, 2018). All requirements in one stage must be completed before proceeding to the next stage, and ensuring all approvals are received from all stakeholders (Kramer, 2018).

Research has been conducted on the design of library information systems, such as the Design of Library and Archives Information Systems (Saputro et al., 2022), Design of Library Information Systems at the Tangerang City Library and Archives Agency (Haris et al., 2020), Library Management Systems (Palanigounder & Arunachalam, 2020), Rapid Application Development in Designing Library Information Systems in Higher Education (Hamzah et al., 2019), all of these information systems do not provide librarian features. Therefore, all of the above studies can be distinguished from this study, as this study discusses the librarian position and its credit scores. The currentness of this study can be seen from the features in the system, which contain information on the librarian functional positions and their credit scores in accordance with Regulation of the Ministry of State Apparatus Empowerment and Bureaucratic Reform No. 9 of the year 2014 (Kementerian Pendayagunaan Aparatur Negara dan Reformasi Birokrasi, 2014). This application is expected to assist librarians in Bali in managing functional position requirements online. This application is represented using a system that is integrated with the library information system. The problem in this study is "How is the design and construction technique of a web-based library application system in Bali?" By knowing the design and construction techniques, it is expected that the library application system can run optimally.

RESEARCH METHODS

Data collection methods in this study included interviews, observations, and documentation. Interviews were conducted with librarians at various libraries in Bali, such as university libraries, regional libraries, and special libraries that have functional positions. Five librarians were interviewed regarding the needs related to their functional positions, credit score calculations, and career development

aspects that web-based applications could support. Observations were conducted by directly observing the librarian application system available on various institutional websites to determine the design components and features that can be implemented in this application. Documentation data was collected from details of librarian activities and credit scores as regulated in the Head of the National Library Regulation No. 11 of 2015 concerning Technical Guidelines for Librarian Functional Positions and Credit Scores, as well as Permenpan No. 9 of 2014, both of which are essential references in designing librarian activity management features and credit scores in the application.

The application system design uses the Unified Modelling Language (UML) model, which is a widely adopted industry standard for defining requirements, analyzing, designing, and describing architecture in object-oriented programming. The UML used includes use case diagrams, which graphically depict the main functions with Operator and User actors; entity relationship diagrams (ERD) illustrating the data structure in the database; and class diagrams to model the librarian activity reporting system. The flowchart describes the system workflow from librarian activities to configuration and reporting. The Data Flow Diagram (DFD) in this study includes librarians, their activities, settings, and reporting, ensuring that all processes run according to system requirements. The system testing uses the Black Box Testing method, which is a test based on input-output logic to ensure that each process operates according to the librarians' needs. This approach ensures that the input entered by librarians yields accurate and expected output and is in accordance with system specifications, enabling the application to effectively and efficiently support librarians in managing their functional positions (Wijaya & Astuti, 2021).

RESULTS AND DISCUSSION

This system is designed to support the needs of librarians in managing their functional positions effectively and efficiently. Table 1 shows the system requirements based on the interview results.

Table 1
Functional and Non-Functional Requirements

No	Functional Requirements
1	The system must provide a librarian activity module that can be accessed.
2	The system must record, store, and display librarian activity data.
3	The system must allow the admin to manage librarian activities and librarian.
4	The system must support the login process via Single Sign-On (SSO).
5	The system must enable librarians to input activity data.
6	The system must generate credit score reports for analysis and decision-making.
No	**Non-Functional Requirements**
1	The system must be secure with authentication to protect user data.
2	The system must have a user-friendly and intuitive interface.
3	The system must be fast and stable without significant delays.
4	The system must be compatible with various devices and browsers.
5	The system must handle large amounts of data without performance issues.

Source: Research Results, 2023

The ERD diagram designed in this study involves three main entities, namely: Admin, Activity Items, and Librarian, as seen in Figure 2.

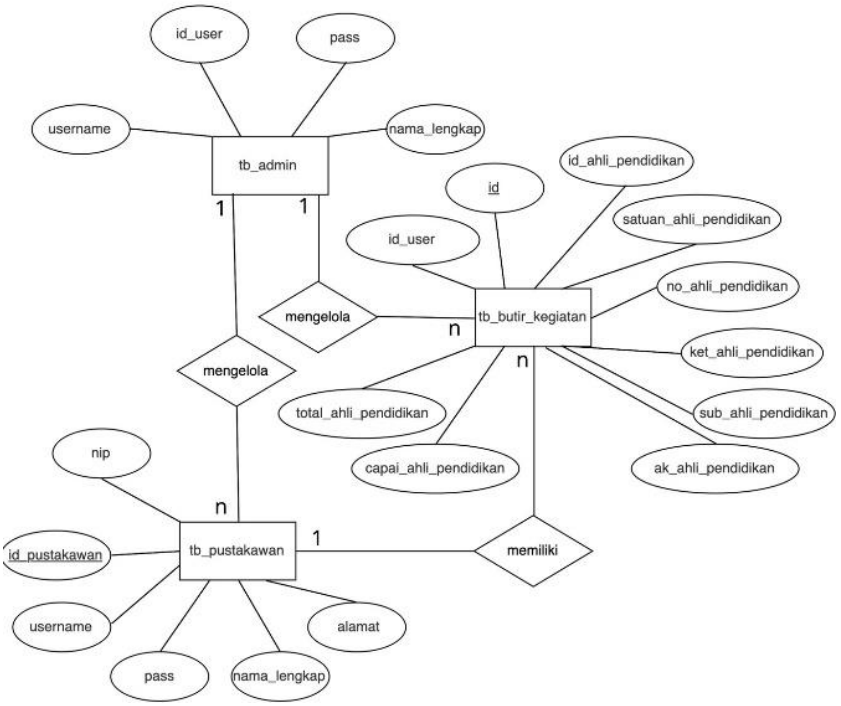

Figure 2. ERD Diagram
Source: Research Results, 2023

The fields shown in Figure 2 can be described as follows:

tb_admin, id_user: primary key, unique identifier for the admin; username: the admin's username; pass: the admin's password; *nama_lengkap*: the admin's full name.

***tb*_user,** id_user: primary key, a unique identifier for the user; np: participant number (possibly related to education entities or other activities); username: the user's username; pass: the user's password; *nama_lengkap*: the user's full name.

tb*_unit_pendidikan,* id_*unit_pendidikan*: primary key, unique identifier for the educational unit; *nama_unit_pendidikan*: the name of the educational unit; *alamat*: the address of the educational unit.

tb*_kegiatan,* id_*kegiatan*: primary key, unique identifier for the activity; *nama_kegiatan*: the name of the activity; *tanggal_kegiatan*: the date of the activity; *waktu_kegiatan*: the time of the activity; *deskripsi_kegiatan*: a brief description of the activity.

tb*_pustakawan,* id_*pustakawan*: primary key, unique identifier for the librarian; *nama_lengkap*: the librarian's full name; email: the librarian's email address.

The relationships that occur between these entities are as follows:

1:N relationship between the admin entity and activity item: Each admin can manage many activity items. This means that an admin can create, change, or delete several activity items.

1:N relationship between the librarian entity and activity items: Each librarian can have many activity items. This relationship shows that each librarian can be associated with several activity items.

1:N relationship between the admin entity and librarian: Each admin can manage many librarians. This means that an admin

can create, change, or delete librarian data. The DFD diagram depicts the data flow between various components in the system, as shown in Figure 3.

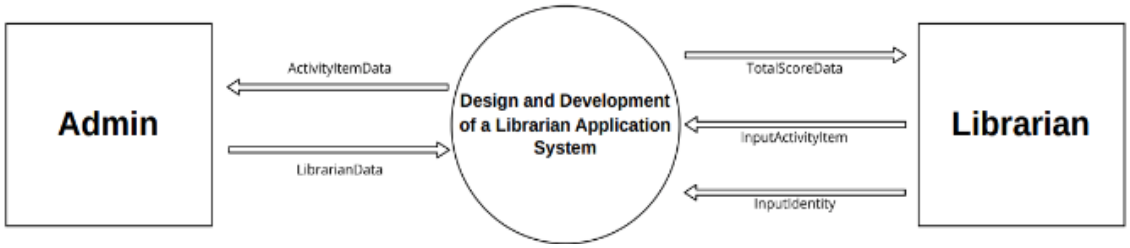

Figure 3. DFD Diagram
Source: Research Results, 2023

This system involves two main actors, namely Admin and Librarian. Admin has full access to manage data in the system, such as activity item data and librarian data. Meanwhile, Librarians interact with the system to input data related to activity items and user identities. This library application system functions as a data management center, receiving input from the Admin and Librarian and producing output in the form of total value data that can be used for analysis and decision-making.

The system design in this study includes the design of the login form, the menu form on the sidebar, the credit number proposal form, and the download and print form. The login form is the first step to access the user or administrator page. The login form is vital in the system, considering that through this form, the user can interact with the system as a whole. Usually, the login form requires a username and password before entering other system pages. This study designs Single Sign On (SSO), which is a single authentication mechanism used by users to access connected applications without having to log in to access other applications. The login form is created using HTML or PHP and CSS. HTML is used to create web pages and form structures. CSS is used to design the appearance of the login form. The login form design in this study is shown in Figure 4.

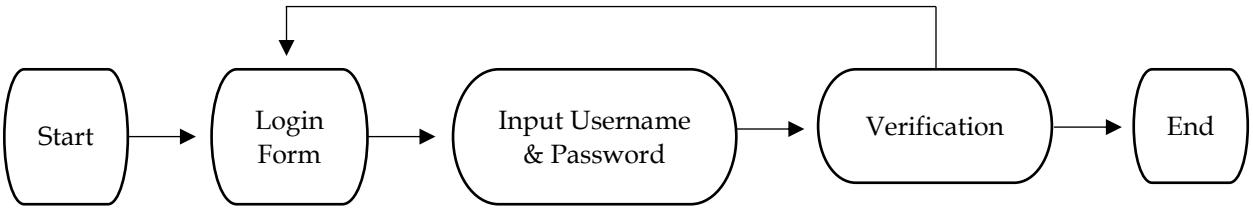

Figure 4. Login Form Design
Source: Research Results, 2023

Figure 4 shows that the program starts with the user entering a username and password on the login form. If the password is incorrect, the user will be prompted to enter his/her username and password again. If correct, the user will be redirected to the main page. This login form only inputs the Username and Password.

The system checks the username and password to see if the user is authenticated when the Login button is pressed.

The homepage is often called Home. The home page consists of a sidebar, which is a side area occupied by various widgets. The sidebar can be filled with the main or complementary menu used to go to a specific page on the website. The sidebar is usually placed on the right or left side of the side menu. The main function of the sidebar is to provide important information for website users. In addition, the sidebar can be used as a promotional space by installing social media buttons. The design of the homepage in this study begins with a user visit to the home page. After that, the user can see the contents of the homepage.

The activity item form is a credit number proposal form used by librarians to enter librarian activity items and calculate them in the form of credit numbers. This form will be directly related to the download and print forms; in this case, the calculation results are presented by the system automatically, and the proposer (librarian) no longer calculates them manually. Designing the credit score proposal form includes several stages, namely the selection of the type of librarian (expert or skilled librarian), selection of librarian activities, selection of menus on the sidebar, and inputting achievements. The librarian activity form consists of an expert or skilled librarian menu and sub-menus for education, library management, services, librarian system development, professional development, and task support sub-menu. Each form is further divided into several forms according to the activity group. The input and calculating results of this form can be seen in the download and print form.

The application settings menu is a menu used by administrators to edit available features according to user needs. In addition, this menu provides system update facilities to accommodate future system needs. The stages of designing the application settings menu start from the settings menu, application sub-menu, and editing application properties. The design of this menu is expected to provide facilities for administrators to edit the application system according to user needs.

The librarian profile settings menu is a menu used by librarians as system operators to edit the available features according to their needs. Apart from that, this menu provides system update facilities related to librarian needs so that the continuity of the system is in accordance with the librarian's needs. The design stages of the librarian profile settings menu begin with the settings menu, librarian sub-menu, and librarian profile editing. It is expected that this menu design can provide convenience for librarians to edit the application system according to their needs.

Designing download forms and print forms is needed in the information system to obtain results from the input that has been done. The system user downloads the form before printing it. This form is the last in the librarian application system.

The development of this librarian system uses the PHP programming language with a relational database, and the DBMS used is MySQL. This system is developed web-based, which can be accessed by librarians online. This application is developed in accordance with the Ministerial Regulation Number 9 of 2014, and in its implementation, each section is divided into web modules. It is

expected that the division per module will facilitate the implementation and maintenance of the system in the future.

The construction of the login form is made using HTML or PHP and CSS. The result of the login construction is shown in Figure 5.

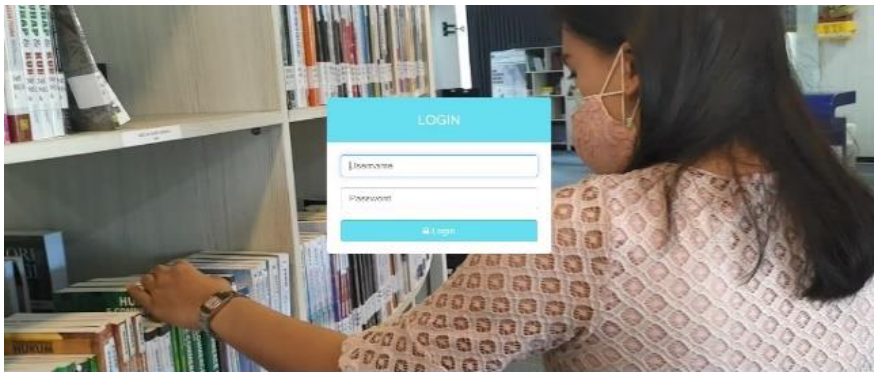

Figure 5. Login
Source: Research Results, 2023

The construction of a homepage includes the construction of sidebars placed on the left and right sides. Creating a homepage is accompanied by a page that can be filled with information as needed. On this page, the librarian can see several menus and sub-menus in the sidebar and several links in the middle. On the sidebar, there is also the personal identity of the Librarian or user system, and right below it, there is a sub-menu, which is an important function in using this system. In the middle of the page are the references used in calculating credit numbers in the system, as currently used, namely the Regulation of the Head of the National Library of the Republic of Indonesia, number 11 of 2015, concerning technical instructions for functional positions of librarians and their credit scores.

The development of the activity item form includes the construction of a main menu and sub-menu used to input librarian activity items. The development of this form is automatically linked to the report form used to propose credit scores. The results of the development of the activity item form or module appear in Figure 6.

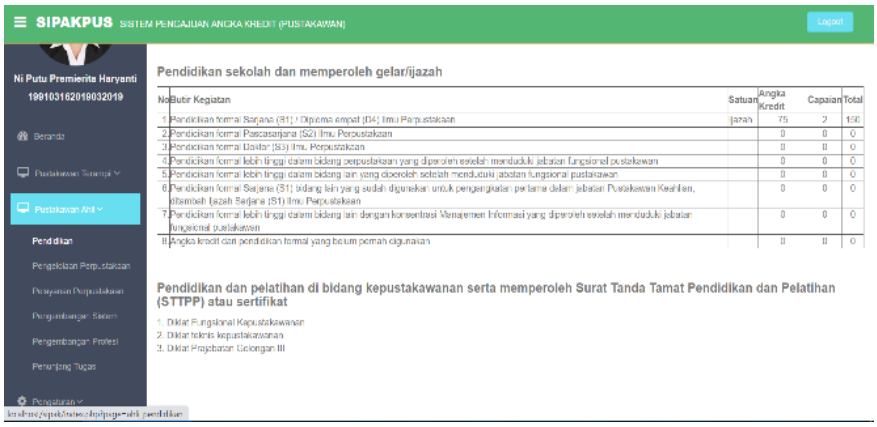

Figure 6. Display of Activity Items
Source: Application Design, 2023

This page is an example of a librarian activity item module, namely for Expert Librarians with educational activity sub-items. After clicking the activity sub-menu, a table of activity details will appear on the middle page. The librarian only needs to fill in the achievement value in the achievement column on the activity item to be filled in, and then the total achievement value in the total column will be automatically calculated. The total calculation result is obtained by multiplying the credit score value by the achievement value. The achievement value entered in the activity item table is stored in the database.

The construction of the librarian profile setting menu includes creating features needed by the librarian. This feature provides system update facilities according to the librarian's needs. The results of the construction of a librarian profile setting menu are shown in Figure 7.

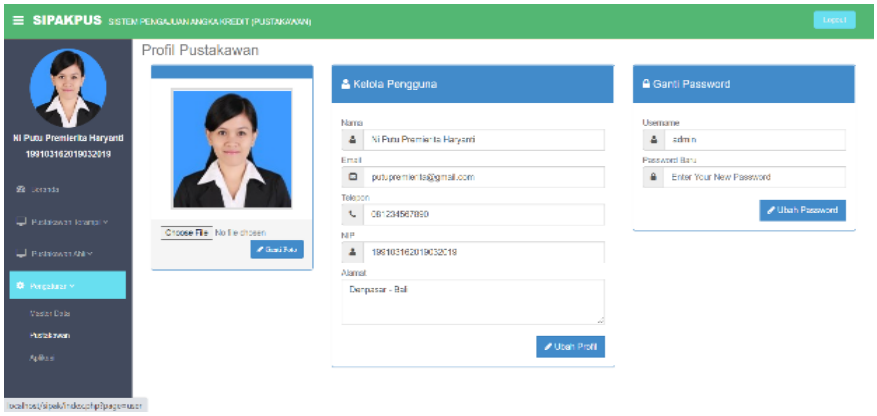

Figure 7. Application Settings Menu Page
Source: Application Design, 2023

In this view, the librarian can change his/her identity as desired. Starting from photo, name, email, telephone, NIP, and address to changing the password. This data will later be read when someone wants to see the total credit score achieved.

Developing the application settings menu includes providing features according to user needs. This feature is expected to provide system update facilities to accommodate future system needs. On this page, the librarian can change the name of the application in the system.

The credit proposal print page is intended to print the final report to be used in managing credit scores. All data entered by the user will be compiled, calculated and arranged to comply with applicable provisions. The hope is that librarians will no longer have difficulty in calculating points, formatting pages and completing files. The appearance of the credit proposal printed page is shown in Figure 8.

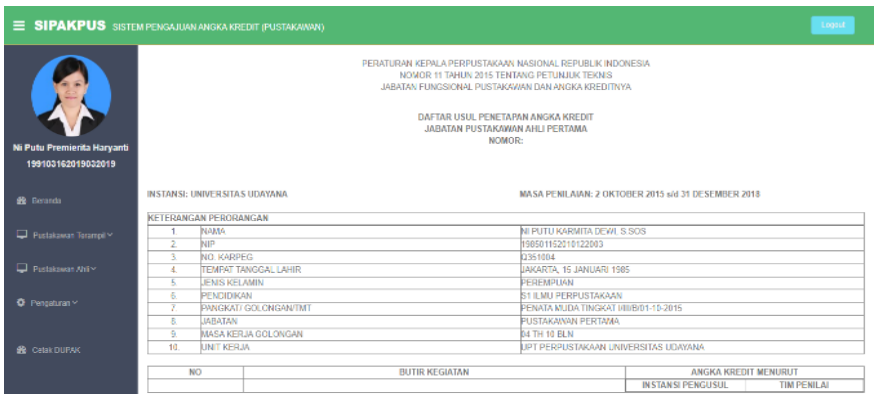

Figure 8. Credit Proposal Print Page Interface
Source: Application Design, 2023

This page does not have a special table in the database like the other modules; however, it uses data from existing tables to be displayed as a report.

From the description above, it can be said that this application system can match librarian needs with librarian information precisely. Therefore, this system can be used as a means of interaction between librarians and the Regulation of the Minister of State Apparatus Empowerment and Bureaucratic Reform on librarian functional positions of librarians and their credit scores.

The design of the Library Collection Development System has been running well, as the design is in accordance with the waterfall method and the UML (Unified Modeling Language) model. The features available in this system are in accordance with library needs, considering that this system uses the SDLC (Software Development Life Cycle), namely a software development method related to a structured framework containing sequential processes in which the information system is developed. The implementation of this librarian application includes the implementation of databases and interfaces. The implementation database schemas refer to the ERD (Entity Relationship Diagram) design. Interface implementation is carried out to ensure that the software system and its results are in accordance with both the user and system needs. Librarians and admins can utilize this interface. Users who log in as admins are given access rights to all menus available in the system. These access rights allow users to use the system.

The results of this application system design have been tested using black box testing, namely the system functionality testing. The test results show that the system functionality has run well. In this case, all system functions, such as data structures, interfaces and other functions, are correct.

CONCLUSION

In this study, the Web-Based Librarian Application System in Bali has run optimally according to its design. This system has been tested on librarians in several libraries in Bali. Librarians feel that this system can manage credit scores and matters related to the librarian's position. Similar research should be conducted in the future by adding several features to this application, such as calculating librarian performance, attendance, and system evaluation through the user

perspective, so that this system will be more optimal in the future.

REFERENCES

Anggoro, D., & Hidayat, A. (2020). Rancang bangun sistem informasi perpustakaan sekolah berbasis web guna meningkatkan efektivitas layanan pustakawan. *Edumatic: Jurnal Pendidikan Informatika*, *4*(1), 151–160. https://doi.org/10.29408/edumatic.v4i1.2130

Anna, N. E. V. (2018). Transformation of public library websites in Indonesia. *Library Hi Tech News*, *35*(8), 10–14. https://doi.org/10.1108/LHTN-02-2018-0011

Bourgeois, D. T., Smith, J. L., Wang, S., & Mortati, J. (2019). *Information systems for business and beyond*. Open Textbooks. https://digitalcommons.biola.edu/cgi/viewcontent.cgi?article=1000&context=open-textbooks

Eje, O. C., & Dushu, T. Y. (2018). Transforming library and information services delivery using innovation technologies. *Library Philosophy and Practice (e-Journal)*, *2036*. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=5400&context=libphilprac

Farney, T. (2020). Library technology: Innovating technologies, services, and practices. *College & Undergraduate Libraries*, *27*(2–4), 51–55. https://doi.org/10.1080/10691316.2020.1952776

Hamzah, M. L., Purwati, A. A., Rusilawati, E., & Hamzah. (2019). Rapid application development in design of library information system in higher education. *International Journal of Scientific & Technology Research*, *8*(11), 153–156. https://www.ijstr.org/final-print/nov2019/Rapid-Application-Development-In-Design-Of-Library-Information-System-In-Higher-Education.pdf

Haris, H., Permatasari, S., & Saputro, R. B. (2020). Library information system design at library and the archives agency of Tangerang City. *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, *2*(2), 179–191. https://doi.org/10.34306/itsdi.v2i2.136

Hiremath, S. S., Acharya, S., & Lalasangi, S. (2019). Technological trends in modern libraries. *IP Indian Journal of Library Science and Information Technology*, *4*(2), 63–65. https://doi.org/10.18231/j.ijlsit.2019.018

Hossain, M. I. (2023). Software Development Life Cycle (SDLC) methodologies for information systems project management. *International Journal for Multidisciplinary Research*, *5*(5), 1–36. https://doi.org/10.36948/ijfmr.2023.v05i05.6223

Kalankesh, L. R., Nasiry, Z., Fein, R., & Damanabi, S. (2020). Factors influencing user satisfaction with information systems: A systematic review. *Galen Medical Journal*, *9*, 1–9. https://doi.org/10.31661/gmj.v9i0.1686

Kementerian Pendayagunaan Aparatur

Negara dan Reformasi Birokrasi (2014). Peraturan Menteri Pendayagunaan Aparatur Negara dan Reformasi Birokrasi Nomor 55 Tahun 2022 tentang Jabatan Fungsional Pustakawan. https://peraturan.bpk.go.id/Details/240813/permen-pan-rb-no-55-tahun-2022

Komalasari, R., & Ramdan, A. (2020). Perancangan aplikasi form penilaian kinerja karyawan PT. Daya Adicipta Motora. *Jurnal Sistem Informasi*, *2*(1), 42–49. https://ejournal.unibba.ac.id/index.php/j-sika/article/view/282/243

Kramer, M. (2018). Best practices in systems development lifecycle: An analyses based on the waterfall Model. *Review of Business & Finance Studies*, *9*(1), 77–84. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3131958

Lemke, G. (2018). *The softwar The software development lif elopment life cycle and its application*. https://commons.emich.edu/cgi/viewcontent.cgi?article=1588&context=honors

Liu, C., & Ma, S. (2018). Design of library management system. *OALib*, *05*(12), 1–8. https://doi.org/10.4236/oalib.1104974

Maulani, M. R., & Nursolihah, R. (2022). Rancang bangun sistem informasi inventori furniture menggunakan metode mark up pricing pada toko XYZ. *Jurnal Teknik Informatika*, *14*(1), 24–31. https://ejurnal.ulbi.ac.id/index.php/informatika/article/view/1942/926

Mondal, D., & Maity, A. (2016). Selection and acquisition of e-resource collection in selected libraries of R&D institutions in Kolkata city: A survey of current practices. *International Research: Journal of Library & Information Science*, *6*(3), 540–553. https://microblogging.infodocs.eu/wp-content/uploads/2016/11/15-IR-369-62.pdf

Naik, L., & Naik, N. M. (2023). Transforming libraries: Innovations in technology and community services. *Mukt Shabd Journal*, *12*(5), 1052–1061. https://www.researchgate.net/publication/371102845_Transforming_Libraries_Innovations_in_Technology_and_Community_Services

Ngozi, A. S. (2020). Library automation in university: A literature review. *Predestinasi*, *13*(2), 115–134. https://doi.org/10.26858/predestinasi.v12i2.21934

Palanigounder, S. A., & Arunachalam, R. (2020). Library management system. *Journal of Xi'an University of Architecture & Technology*, *12*(9), 743–753. https://doi.org/10.37896/JXAT12.11/29777

Pham, L.-H. T., Desai-Naik, T., Hammond, L., & Abdeljabbar, W. (2021). *Information systems for business*. LibreTexts. https://oeri.commons.libretexts.org/book/workforce-9741

Rahmat, G., Yusuf, A. M., & Nopitasari, L. (2021). Rancang bangun sistem presensi mahasiswa dengan menggunakan QR code berbasis

android. *Elkom: Jurnal Elektronika Dan Komputer*, *14*(1), 47–58. https://doi.org/10.51903/elkom.v14i1.369

Rainer, R. K., & Cegielski, C. G. (2014). *Introduction to information systems: Supporting and transforming business* (5th ed.). Wiley.

Samuel, A., Godfred, A., & He, X. (2018). Design and implementation of library management system. *International Journal of Computer Applications*, *182*(13), 18–25. https://doi.org/10.5120/ijca2018917766

Saputro, M. W., Basir, A., Permatasari, E. K., Muhammadiyah, S., & Brebes, P. (2022). Perancangan sistem informasi perpustakaan berbasis web di SMA Negeri 1 Sirampog. *Jurnal Teknik Informatika Dan Sistem Informasi (JURTISI)*, *2*(2), 36–43. https://jurtisi.stmikmpb.ac.id/index.php/jurtisi/article/view/43

Tripathi, A. (2023). Role of library automation system (ICT) in library's routine role operations. *Library Philosophy and Practice (e-Journal)*, *7690*. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=14845&context=libphilprac

Wijaya, Y. D., & Astuti, M. W. (2021). Pengujian blackbox sistem informasi penilaian kinerja karyawan PT Inka (persero) berbasis equivalence partitions. *Jurnal Digital Teknologi Informasi*, *4*(1), 22–26. https://doi.org/10.32502/digital.v4i1.3163

Zemmouchi-Ghomari, L. (2022). Basic concepts of information systems. In *Contemporary Issues in Information Systems - A Global Perspective*. IntechOpen. https://doi.org/10.5772/intechopen.97644