

Web-Based Information and Management System for International Collaboration in Higher Education

I Komang Sugiarta, Nur Fajar Apriyanto

Abstract—International partnerships illustrate the commitment of higher education institutions to elevate their standing on the global scale. However, many university stakeholders faced challenges in accessing information on partnership opportunities due to the fragmented nature of information reporting. This study created an International Collaboration Management Information System to assist higher education institutions in reporting and managing information about international partnerships. The Waterfall model was selected for the Software Development Life Cycle, with distinct phases for requirement gathering, system design, execution, verification, and distribution. The implementation for the application was performed using Laravel, in conjunction with Model-View-Controller design patterns and MySQL as the data storage system. The results show that the system was successfully implemented and functionally tested using Black Box Testing, indicating that all core features operate according to the specified requirements. The system is expected to support improved accessibility and management of international collaboration information for administrators, staff, and general users.

Index Terms—higher education, international collaboration, laravel framework, web application.

I. INTRODUCTION

IN the era of higher education globalization, international collaboration has become an important indicator for improving the quality, academic reputation, and global competitiveness of universities. International collaboration can be realized through various activities such as student and lecturer exchange programs, joint research, double degree programs, international conferences, and other academic and non-academic cooperation initiatives. These activities not only expand academic networks but also contribute to improving research quality, innovation, and human

resource development within higher education institutions [1].

Many universities actively establish partnerships with international institutions and organizations to support academic development and global engagement. These collaboration activities are typically coordinated by dedicated units responsible for managing international partnerships, including information related to partner universities, collaboration programs, and global academic activities. However, the dissemination of information related to international collaboration programs is often not optimally integrated. Information is frequently distributed across different media platforms, which limits access for students and academic staff to obtain accurate, structured, and up-to-date information.

The absence of a centralized information system may result in low participation among academic communities in international programs. Furthermore, the lack of integrated information management systems can hinder the administration of international collaboration data, such as managing partner university records, exchange programs, and documentation of international activities. Therefore, a system capable of managing and presenting international collaboration information in a structured, integrated, and accessible manner is required.

Several previous studies have developed web-based information systems to support organizational data management and academic activities. Web-based systems have been shown to improve data management efficiency, expand access to information, and facilitate communication among users [11]. In addition, modern web application frameworks have been widely used to accelerate the development process and improve system scalability and security. One of the most popular frameworks for web development is Laravel, which implements the Model-View-Controller (MVC) architecture that separates application logic, user interface, and database management in a systematic manner [3].

Laravel provides various features that support modern application development, including routing systems, templating engines, object relational mapping, and integrated authentication and authorization mechanisms. These features enable developers to build applications that are structured, maintainable, and

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secure. As a result, Laravel has become one of the preferred frameworks for developing web-based information systems that require complex data management and multi-user access.

Despite the development of several web-based information systems in higher education institutions, many existing systems are primarily designed for general academic administration or institutional information management. Only a limited number of systems specifically focus on managing international collaboration activities, such as partner institution management, international program dissemination, and documentation of collaborative activities. Furthermore, many existing platforms lack centralized access and structured information management, which may reduce their effectiveness in supporting international collaboration initiatives.

Although several web-based information systems have been developed to support academic administration and institutional information management, most existing systems are not specifically designed to manage international collaboration activities in a structured and integrated manner. Many systems primarily focus on general academic services and do not provide comprehensive features for managing collaboration data, such as partner institution records, program tracking, and centralized dissemination of international opportunities. Previous studies have explored the development of academic information systems and collaboration platforms to improve data accessibility and institutional coordination [16], [17]. However, these systems are often limited to general academic management and do not specifically address integrated international collaboration management [18]. As a result, the lack of integration and specialization reduces the effectiveness of these systems in supporting international collaboration initiatives.

Based on these challenges, this study aims to develop a web-based system that supports both the management and dissemination of international collaboration information in higher education institutions. The system is designed to provide centralized access to collaboration data, structured management of partnership records, and improved accessibility for different user groups. The developed system provides integrated features such as management of international partner universities, exchange program information, international event schedules, and documentation of collaboration activities.

The main contribution of this study is the development of a web-based system that integrates information dissemination and collaboration data management into a single platform. Unlike conventional web-based information systems that mainly focus on general academic services, the proposed system provides structured management of international collaboration data, centralized access to partnership information, and role-based features for administrators, staff, and public users. The system adopts the Model–View–Controller architecture to ensure efficient data

management, improved system scalability, and better user accessibility [2]. This integration supports more effective coordination, accessibility, and management of international collaboration activities in higher education institutions.

II. METHODS

This study applied a software engineering research approach to develop a web-based International Collaboration Management Information System for higher education institutions. The research methodology followed the Software Development Life Cycle (SDLC) using the Waterfall model, which provides a structured and sequential process for system development [4]. The Waterfall model consists of several stages, including requirements analysis, system design, implementation, testing, and deployment [5].

A. Research Design

The research design focused on developing a web-based information system that supports the management and dissemination of international collaboration information in universities. The system was designed to provide centralized access to data related to international partner institutions, exchange programs, international academic activities, and documentation of collaboration initiatives.

The system architecture adopted the Model–View–Controller (MVC) design pattern implemented through the Laravel framework. This architecture separates the application logic, user interface, and database management, enabling efficient system development and maintenance.

The system supports three types of users:

- Administrator: responsible for managing all system data, including partner institutions, collaboration programs, and user management.
- Staff: responsible for updating information related to international collaboration activities.
- Visitor: general users who access information about international collaboration programs.

To illustrate the development process used in this research, the Waterfall model stages are presented in Figure 1.

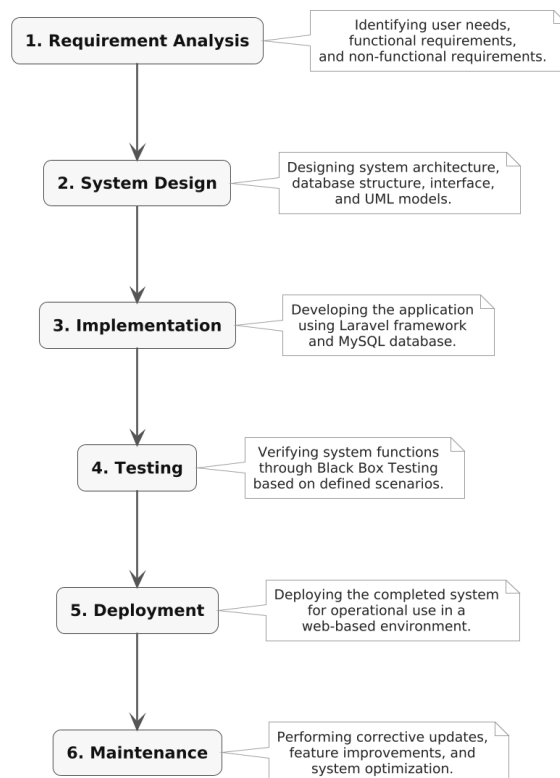


Figure 1. Waterfall Model for System Development

B. Research Procedure

The research procedure followed the stages of the Waterfall model as described below.

1) Requirements Analysis

The requirement analysis was conducted through direct observation and informal interviews with stakeholders involved in managing international collaboration activities in higher education institutions. These stakeholders included administrative staff responsible for managing partnership data and collaboration programs.

The observation focused on identifying existing workflows, data management processes, and challenges related to accessing and disseminating international collaboration information. Based on these activities, the system requirements were defined and categorized into functional and non-functional requirements.

Functional requirements included:

- management of international partner institutions
- management of exchange programs
- management of international event schedules
- dissemination of collaboration information

Non-functional requirements included system security, usability, and performance.

2) System Design

The system design stage involved designing the system architecture, database structure, and user interface. Unified Modeling Language (UML) diagrams were used to describe system interactions and processes [7].

The following diagrams were designed in this stage:

- Use Case Diagram describing interactions between users and the system
- Activity Diagram illustrating system workflow
- Class Diagram describing system structure

The use case model was divided into two diagrams to improve readability and to clearly distinguish between public access functions and administrative functions. The public access diagram describes how visitors interact with information services provided by the system, while the administration diagram explains how staff and administrators manage content, users, and website operations.

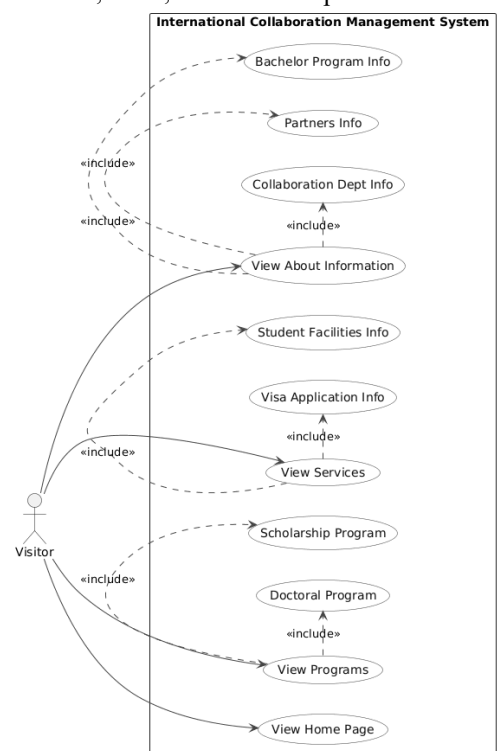


Figure 2. Public Access Use Case Diagram.

This diagram illustrates the interactions between visitors and the public information services of the international collaboration management system, including access to institutional information, services, academic programs, and activity documentation.

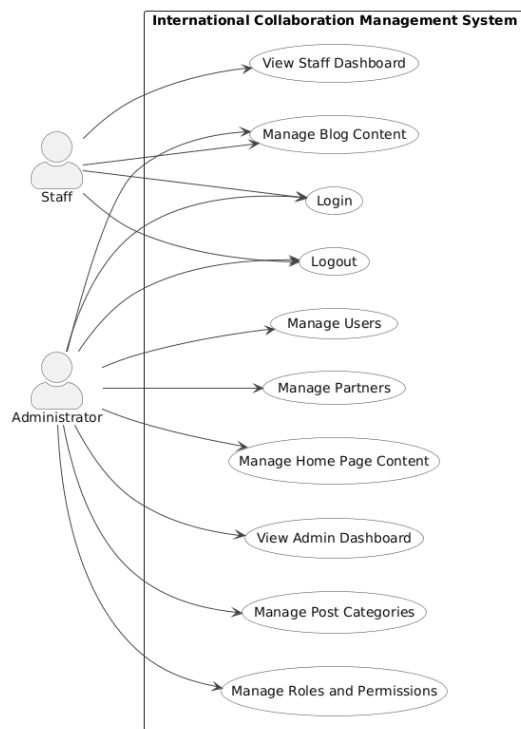


Figure 3. Administration Use Case Diagram.

This diagram illustrates the interactions between staff and administrators with the internal management functions of the system, including content management, user administration, website settings, and communication services.

UML modeling techniques are commonly used to represent system structure and interactions in software development [8]. Database design was also developed to support system functionality. The database structure includes several main entities such as partner institutions, collaboration programs, international activities, and users.

The UML diagrams were used as a reference for system development. The use case diagrams defined user interactions and system functionalities, which were translated into system modules during implementation. The activity diagrams described the workflow of system processes, guiding the development of application logic. The class diagrams were used to design the database structure and relationships between system entities.

C. System Implementation

The implementation stage involved translating the system design into a functional web-based application. The system was developed using the PHP programming language with the Laravel framework and MySQL as the database management system.

Laravel was selected due to its support for MVC architecture, built-in authentication mechanisms, routing systems, and object relational mapping features, which

facilitate efficient application development [3].

The system interface was developed to ensure ease of use for different types of users. Key system modules include:

- international partner institution management module
- collaboration program management module
- international activity information module
- system user management module

Examples of the implemented system interface can be shown in Figure 4.

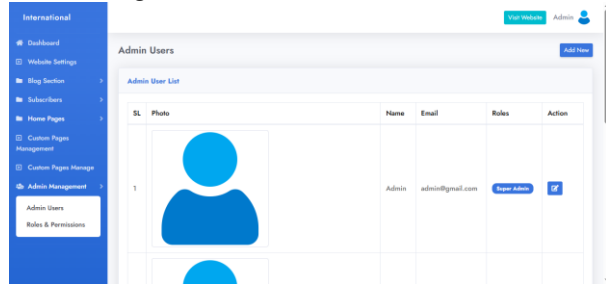


Figure 4. Interface of the International Collaboration Information System

D. Algorithm Design

The core process of the system was described using pseudocode to illustrate the interaction between users and the application.

Algorithm International Collaboration Information System

START

User accesses the web application

IF user is not authenticated THEN

Display login page

User enters username and password

System validates user credentials

IF credentials are valid THEN

Redirect user to dashboard

ELSE

Display login error message

ENDIF

ENDIF

IF user role = Administrator THEN

Manage partner institution data

Manage collaboration programs

Manage system users

ENDIF

IF user role = Staff THEN

Update collaboration information

Manage international activity schedules

ENDIF

IF user role = Visitor THEN

View collaboration program information

View international event information

ENDIF

END

The pseudocode above describes the main workflow of the system, including authentication, role-based access control, and information management.

E. Data Acquisition

Data acquisition in this study was conducted using several methods.

- 1) Observation
Observation was conducted to understand how international collaboration activities are managed within higher education institutions.
- 2) Literature Study
A literature review was conducted to analyze previous studies related to web-based information systems, international collaboration management, and web application development frameworks.
- 3) Documentation
Documentation techniques were used to collect information related to international partner institutions, collaboration programs, and international academic activities.

F. System Testing Method

System testing was conducted to ensure that all system functionalities operated according to the specified requirements. The testing method used in this research was Black Box Testing, which focuses on verifying system functionality based on input and output without examining the internal code structure [2].

The evaluation in this study focused on functional testing to verify that the system operates according to the specified requirements. Performance testing and usability evaluation were not included in this study and may be considered in future work.

Several testing scenarios were designed to evaluate the system performance. The testing scenarios are presented in Table 1.

Table 1. Testing Scenario

No	Feature	Test Scenario	Expected Result
1	Login	User inputs credentials	System validates user
2	Add Partner	Admin inputs data	Data stored successfully
3	Update Collaboration Program	Administrator updates collaboration data	Data updated successfully
4	View Collaboration Information	Administrator views collaboration data	Data view successfully

The testing scenarios describe the functional verification process of the system.

III. RESULTS AND DISCUSSION

This section presents the results of the development and implementation of the International Collaboration Management Information System as well as a comprehensive discussion of the system performance

and functionality. The system was developed as a web-based application using the Laravel framework with the Model–View–Controller (MVC) architecture and MySQL database management system.

The developed system aims to facilitate the management and dissemination of international collaboration information in higher education institutions. The system provides centralized access to information related to international partner institutions, collaboration programs, international academic activities, and documentation of collaboration initiatives.

A. System Architecture

The system architecture was designed using a three-layer architecture consisting of the presentation layer, application layer, and database layer. The presentation layer is responsible for displaying the user interface through a web browser, the application layer processes business logic using the Laravel framework, and the database layer stores system data using MySQL and supports service-based system architecture [9].

The overall system architecture is illustrated in Figure 5.

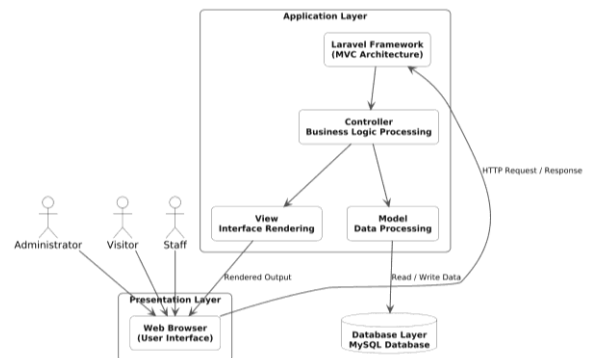


Figure 5. Architecture of the International Collaboration Information System

This architecture enables efficient data processing and ensures that the system can be accessed by multiple users simultaneously. The MVC architecture improves system maintainability by separating application logic, presentation, and data layers [2]. Enterprise application architecture supports scalable and maintainable system design for complex applications. Modern enterprise application architectures emphasize modular system design to improve scalability and maintainability [6].

B. System Interface Implementation

Web-based applications allow users to access system services through internet-based platforms without requiring additional software installation [11]. The developed system provides several main interfaces designed to support the management of international collaboration activities in higher education institutions. These interfaces include login pages, system

dashboards, collaboration program management pages, and international partner institution management pages. Modern web applications emphasize interactive user interfaces to improve usability and accessibility of web systems [12].

a. Login Interface

The login interface is the entry point for system users. This interface allows administrators and staff members to access the system using their credentials. The system implements authentication mechanisms to ensure that only authorized users can access the system. An example of the login interface is shown in Figure 6.

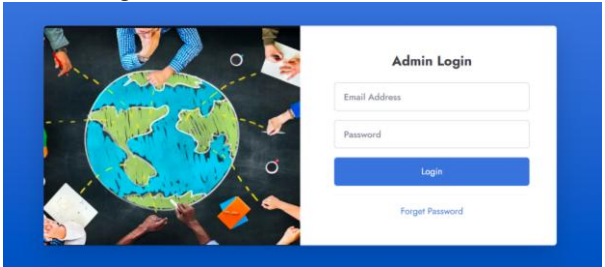


Figure 6. Login Interface of the International Collaboration Information System

b. Dashboard Interface

The dashboard interface provides an overview of international collaboration activities within the institution. The dashboard displays information such as the number of partner institutions, active collaboration programs, and upcoming international events. The dashboard interface is illustrated in Figure 7.

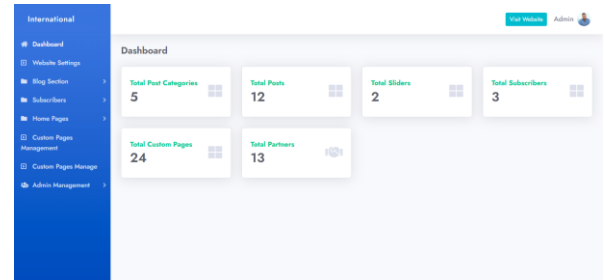


Figure 7. System Dashboard Display

The dashboard enables administrators and staff to quickly monitor the status of international collaboration activities and access relevant information.

c. International Collaboration Management Module

The system includes a module for managing collaboration programs and partner institutions. This module allows administrators to add, update, and delete information related to international collaboration activities. The collaboration management interface is shown in Figure 8.

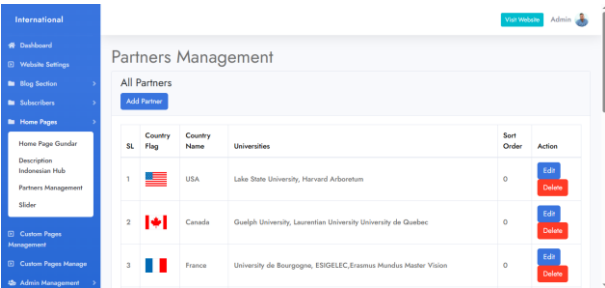


Figure 8. Collaboration Program Management Interface

This module enables institutions to manage and maintain records of international collaboration activities in a structured manner.

C. Database Structure

The database structure was designed to store and manage data related to international collaboration activities. The main entities included in the database are users, partner institutions, collaboration programs, and international activities.

The relationship between database entities is illustrated in Figure 9.

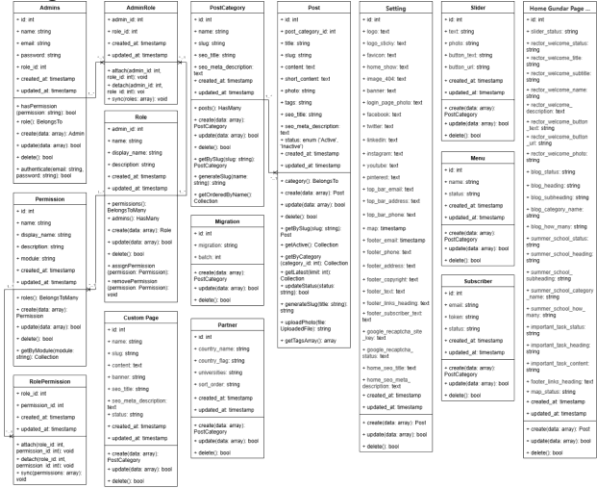


Figure 9. Entity Relationship Diagram of the System

The database design ensures efficient storage and retrieval of information, enabling the system to handle multiple collaboration records effectively. Modern web systems frequently adopt REST-based data communication to improve interoperability between application components [13].

D. System Operational Workflow

The operational workflow of the system involves several steps performed by different user roles. Administrators are responsible for managing partner institution data, defining collaboration programs, and maintaining system configurations. Staff members update collaboration information, including program details, schedules, and documentation of activities.

In practice, collaboration data is first entered or updated by administrators or staff. The system allows structured storage of partner institution information, including collaboration type, program category, and activity records. Visitors can access this information through the web interface to view available international programs and collaboration opportunities.

The workflow ensures that collaboration data is organized systematically and can be accessed efficiently by different users according to their roles.

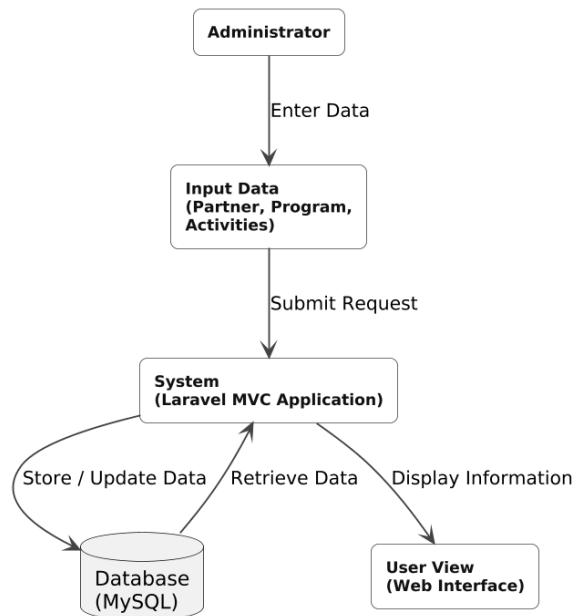


Figure 10. System Workflow Diagram

Figure 10 presents the workflow of the system in a vertical layout. The administrator inputs collaboration data, which is processed by the system and stored in the database. The system then retrieves the data and presents it through the user interface, allowing users to access information efficiently.

In daily use, administrators access the system dashboard to monitor collaboration activities and manage institutional data. Staff members regularly update program information and upload documentation related to international activities. Visitors use the system to explore available collaboration opportunities, access program details, and view institutional partnerships.

This role-based interaction ensures that the system supports both internal management and external information dissemination effectively.

E. System Testing Results

System testing was conducted to ensure that all features of the developed system operate according to the defined requirements. The testing method used in this research was Black Box Testing, which evaluates system functionality based on input and output without examining the internal structure of the application [5].

Several testing scenarios were designed to evaluate the system performance. The testing results are presented in Table 2.

Table 2. Functional Testing Results

No	System Feature	Test Scenario	Expected Result	Test Result
1	User Login	User enters valid credentials	User successfully accesses dashboard	Successful
2	Add Partner Institution	Administrator adds new partner institution	Data stored in database	Successful
3	Update Collaboration Program	Administrator updates program information	Data updated successfully	Successful
4	View Collaboration Information	Visitor accesses collaboration page	Information displayed correctly	Successful

The testing results indicate that all core system functionalities operate correctly and meet the system requirements.

F. User Evaluation

To complement the functional testing results, a simple user evaluation was conducted to assess the usability and perceived usefulness of the system. The evaluation involved 10 participants consisting of administrative staff and academic users who were familiar with international collaboration activities.

The participants were asked to use the system and complete several basic tasks, such as logging in, accessing collaboration information, and viewing partner institutions. After using the system, participants provided feedback using a Likert-scale questionnaire focusing on usability, accessibility, and overall satisfaction.

The evaluation results are summarized in Table 3.

Table 3. User Evaluation Results

No	Aspect	Mean Score (1–5)
1	Ease of Use	4.3
2	Information Accessibility	4.5
3	Interface Clarity	4.2
4	Overall Satisfaction	4.4

The results indicate that users perceived the system as easy to use and effective in providing access to international collaboration information. The relatively high scores suggest that the system has the potential to improve accessibility and support collaboration management activities in higher education institutions.

F. Discussion

The results of this research demonstrate that the developed system can effectively support the

management and dissemination of international collaboration information in higher education institutions. The implementation of a web-based information system enables centralized access to collaboration data and facilitates communication between administrators, staff members, and general users.

The use of the Laravel framework provides several advantages, including improved development efficiency, structured code organization, and built-in security features. Modern software development practices emphasize continuous improvement and iterative system enhancement to improve software quality [14]. The MVC architecture implemented in Laravel also improves system maintainability and scalability, allowing future system expansion if additional modules are required. Modern application architectures often adopt modular and service-based approaches to support scalability and system flexibility [15].

From the user perspective, the system improves accessibility to information related to international collaboration programs. Students and academic staff can easily obtain information about exchange programs, international events, and partnership opportunities. This improvement is expected to increase participation in international academic activities and enhance institutional internationalization efforts.

IV. CONCLUSION

This study aimed to develop a prototype of a web-based International Collaboration Management Information System to support the management and dissemination of international collaboration information in higher education institutions. The system was designed to provide a centralized and structured platform for storing, retrieving, and managing data related to partner institutions, collaboration programs, and international academic activities.

The results of system development and testing indicate that the proposed system was successfully implemented and that its core functionalities operate according to the specified requirements. The use of the Laravel framework with the Model-View-Controller architecture supports structured data management and enables multi-user access within the system.

The developed system provides a platform that can facilitate improved accessibility and organization of international collaboration information for administrators, staff, and general users. However, the evaluation conducted in this study was limited to functional testing. Therefore, the impact of the system on transparency, user participation, and institutional performance has not been empirically measured and remains an area for future investigation.

For future work, the system can be further enhanced by integrating additional features such as online registration for international programs, integration with institutional academic information systems, and the development of analytical dashboards for monitoring

collaboration activities. Further improvements may also include the integration of application programming interfaces to enable interoperability with external systems and international partner institutions.

REFERENCES

- [1] J. Knight, "Internationalization of Higher Education: New Directions and Challenges," *International Journal of Educational Development*, vol. 31, no. 2, pp. 123–139, 2023.
- [2] E. Gamma, R. Helm, R. Johnson, and J. Vlissides, *Design Patterns: Elements of Reusable Object-Oriented Software*. Boston, MA, USA: Addison-Wesley, 2018.
- [3] S. Yadav, R. Mishra, and P. Sharma, "Web Application Development Using Laravel Framework," *International Journal of Computer Applications*, vol. 182, no. 45, pp. 1–6, 2019.
- [4] R. S. Pressman and B. R. Maxim, *Software Engineering: A Practitioner's Approach*, 9th ed. New York, NY, USA: McGraw-Hill Education, 2020.
- [5] I. Sommerville, *Software Engineering*, 10th ed. Boston, MA, USA: Pearson Education, 2016.
- [6] M. Fowler, *Patterns of Enterprise Application Architecture*. Boston, MA, USA: Addison-Wesley, 2019.
- [7] M. P. Papazoglou and W. J. Van Den Heuvel, "Service-Oriented Architectures: Approaches, Technologies and Research Issues," *The VLDB Journal*, vol. 16, no. 3, pp. 389–415, 2018.
- [8] A. Dennis, B. H. Wixom, and D. Tegarden, *Systems Analysis and Design: An Object-Oriented Approach with UML*, 6th ed. Hoboken, NJ, USA: Wiley, 2018.
- [9] T. Erl, *Service-Oriented Architecture: Concepts, Technology, and Design*. Upper Saddle River, NJ, USA: Prentice Hall, 2017.
- [10] M. Fowler and K. Scott, *UML Distilled: A Brief Guide to the Standard Object Modeling Language*, 3rd ed. Boston, MA, USA: Addison-Wesley, 2018.
- [11] P. Deitel and H. Deitel, *Internet and World Wide Web: How to Program*, 5th ed. Boston, MA, USA: Pearson, 2017.
- [12] T. Mikowski and J. Powell, *Single Page Web Applications: JavaScript End-to-End*. Shelter Island, NY, USA: Manning Publications, 2018.
- [13] N. Pautasso, O. Zimmermann, and F. Leymann, "RESTful Web Services vs. Big Web Services: Making the Right Architectural Decision," *IEEE Internet Computing*, vol. 12, no. 3, pp. 75–78, 2018.
- [14] B. Fitzgerald and K. Stol, "Continuous Software Engineering: A Roadmap and Agenda," *Journal of Systems and Software*, vol. 123, pp. 176–189, 2019.
- [15] S. Newman, *Building Microservices: Designing Fine-Grained Systems*. Sebastopol, CA, USA: O'Reilly Media, 2021.
- [16] Alfitri, L. A., & Khaerunnisa, Z. Development of Web-Based Academic Information System Using Django and R&D for Student Achievement Records with Integrated Supervision Module. *Jurnal Guru Komputer*, 6(1), 1-12.
- [17] Ikhsan, M., Kurniawan, H., & Kurniasih, E. T. (2026). Web-Based University Partnership Monitoring Information System With Workflow Automation. *Journal of Electrical Engineering and Computer Science (JEECS)* | E-ISSN: 3089-5952, 2(1), 20-27.
- [18] Permana, R., Supandy, M. R., Nusantara, R., & Haryono, W. (2026). Design and Implementation of an Integrated Internal Collaboration and Communication Platform Using the SDLC Waterfall Method. *Tech-E*, 9(2), 114-131.