Design of Competency Certification Assessment Management System at LSP Polytechnic Piksi Ganesha

Rina Kurniawati[1], Hasbi Basith Sukarno[2]
Polytechnic Piksi Ganesha
rina.kurniawati.g@gmail.com[1], itsmehasbi.basith@gmail.com [2]

Abstract: *Competency certification is an important effort to ensure that graduates possess the skills that meet industry and workforce standards. The Professional Certification Institute (LSP) at Politeknik Piksi Ganesha requires an integrated and efficient competency assessment management system to support an effective certification process. This study aims to design and develop a competency assessment management system that facilitates participant registration, exam scheduling, assessor evaluations, and certificate issuance for successful participants.*
The system uses an object-oriented approach and implements the Waterfall methodology for software development, which includes requirement analysis, system design, implementation, testing, and maintenance phases. Certification participants can register for exams online, view evaluation results, and download certificates if they pass. Assessors are provided with access to evaluate participants through an easy-to-use interface, while admins manage exam schedules and verify participant eligibility.
Implementing this system results in a more structured and transparent competency certification process at LSP Politeknik Piksi Ganesha. The findings indicate that the system reduces manual administrative tasks and improves the efficiency of managing participant data and certification outcomes.

Keywords: *Competency certification, LSP, participants, assessment management system, waterfall, object-oriented.*

Introduction

In the era of globalization and rapid technological development, competency certification has become an urgent need to improve workforce competitiveness, especially in the field of vocational and vocational education. The Professional Certification Agency (LSP) plays an important role in measuring and assessing individual competence by predetermined standards. At Politeknik Piksi Ganesha, the LSP functions to manage the competency certification process for students who have completed their education program. This process includes participant registration, schedule management, exam implementation, result assessment, and competency certificate issuance.

However, the management of the certification process at LSP Politeknik Piksi Ganesha is still done manually. This results in several problems, such as inefficiencies in participant data management, errors in scheduling exams, delays in scoring, and slow certificate issuance. In addition, the scattered and non-centralized management of participant data complicates the evaluation and verification of data by the admin. Therefore, a digital-based competency certification assessment management system is needed to overcome these problems.

This digital-based management system is expected to facilitate all parties involved, including participants, assessors, and administrators in carrying out the certification process more efficiently and accurately. With the implementation of this system, the certification process can be carried out in an integrated and more transparent manner, thereby improving the quality of service of LSP Politeknik Piksi Ganesha.

This research aims to design and build a Competency Certification Assessment Management System at LSP Politeknik Piksi Ganesha that can automate and integrate the competency certification process. The main objectives of this system development are:

1. Simplify the Exam Registration Process: Participants can register for competency certification exams online through the system with a faster and more transparent process.
2. Integrate Scheduling Management: Exam scheduling will be centrally managed in the system, reducing potential clashes and scheduling errors.
3. Facilitate the Assessment Process by Assessors: Assessors can provide assessments digitally through an integrated system, reducing the possibility of scoring errors and speeding up the assessment process.
4. Increase Transparency in Certificate Issuance: The system will allow participants to monitor their certification status, as well as receive digital certificates more quickly once the assessment results are verified.
5. Improve Data Management Efficiency: Admins can manage participant data, schedules, assessments, and certificates in an integrated manner in one platform that can be accessed anytime and anywhere.

Along with the increasing need for competency certification in various sectors, various web-based competency certification management systems have been developed in various institutions. These systems enable more efficient and organized management of the certification process, especially in terms of participant registration, scheduling, and assessment.

1. Web-based Competency Certification Management System: Some educational institutions have started to implement a web-based certification management system to overcome the problems that arise in manual management. The system allows participants to register online and submit assessments digitally. This reduces the risk of human error and speeds up the assessment process. The system also offers advantages in terms of flexibility, where participants can access information about the exam and certification results from any device, at any time.
2. Use of Software Development Methodology: In the development of the certification management system, several software development methodologies such as Waterfall and Agile have been applied. The Waterfall approach allows systematic and sequential development, while Agile offers flexibility in more adaptive development. Both methods are applied according to the scale and complexity of the system being built.
3. Application of Latest Technologies: The latest technologies such as PHP, MySQL, and CSS frameworks have been used to build web-based systems that are fast, secure, and easily accessible. In addition, some certification management systems have also used data encryption and HTTPS protocols to ensure the security of participant data and certification results.
4. Certificate Digitization: Some LSPs have also started implementing digital certificates that are generated automatically after the assessment process is completed. These digital certificates can be downloaded and printed by participants, and also facilitate verification by third parties through QR codes or digital signatures.

Concerning the development of these systems, this research will develop a Competency Certification Management System that focuses on improving the efficiency and transparency of the certification process at LSP Politeknik Piksi Ganesha. The system will implement the latest technology to ensure secure data management, as well as offer a better user experience

for participants, assessors, and admins.

Literature Review

The Literature review is an important step in the process of designing a competency certification assessment management system to ensure that the solution built is based on existing research and best practices. Some relevant literature sources to support the design of the Competency Certification Assessment Management System at LSP Polytechnic Piksi Ganesha include the concept of competency certification, information systems, and LSP standards. The following are some of the literature that underlies the development of this system:

1. Concept of Competency Certification
   Competency certification is the process of formal recognition given by authorized institutions to a person's abilities and expertise in a particular field. According to the National Professional Certification Agency (BNSP), competency certification aims to ensure that the workforce or learners have skills that are by industry standards. This certification includes several stages, including verification, assessment, and evaluation. The system must be able to support all these stages in a digital and integrated manner.
2. Management Information System
   The management of competency certification assessment requires a structured and effective information system. According to information systems literature, as described by Laudon & Laudon (2020), management information systems are technological devices that assist organizations in collecting, storing, processing, and disseminating information to support the decision-making process. In this context, the system should be able to support functions such as participant data management, scheduling, assessment, and certificate issuance.
3. LSP Standards and Competency Certification
   Every LSP must meet the standards set by BNSP and SKKNI (Indonesian National Work Competency Standards). According to these standards, every certification process must be conducted in a transparent and well-documented manner. The system must comply with this standard, ensuring that all stages of the assessment, from registration to certificate issuance, are fully documented.
4. Web-based Assessment Management System
   Many studies have been conducted related to the development of web-based assessment management systems, especially for education and certification. The study of Tarmizi et al. (2019) on the development of a web-based system for competency certification showed that this system can improve efficiency and reduce human error in data management. In addition, the web-based system allows wider and more flexible access, which is very important for participants who are scattered in various locations.
5. Data and Information System Security
   One important aspect of certification data management is information security. According to the literature on information system security, as described by Stallings & Brown (2018), the system must be equipped with strong security mechanisms to protect sensitive data, such as participants' personal data and assessment results. This includes encryption, user authentication, and protection against cyberattacks. Implementing best practices in data security will ensure that the certification management system can be trusted by all stakeholders.
6. Waterfall-based System Development
   In the software development process, the waterfall method is a sequential and linear software development model. This model consists of several phases, where each phase must be completed before proceeding to the next phase. The following are the stages of the Waterfall methodology applied in the development of a competency certification assessment management system at LSP Politeknik Piksi Ganesha
7. User Experience (UX) in Certification Systems

User experience is very important in certification systems that involve many stakeholders. According to Garrett (2010), good design should consider ease of navigation, accessibility, and clear functionality. The development of a competency certification assessment management system must prioritize UX to make it easier for users to undergo the certification process, from registration to getting a certificate.

From the various literature above, it can be concluded that the development of a competency certification assessment management system at LSP Politeknik Piksi Ganesha requires a structured approach, which includes the application of management information systems, LSP standards, data security, and object-based development. This system is expected to increase efficiency, transparency, and ease of access in the certification process, and support the achievement of nationally and internationally recognized competency standards.

Methodology

Waterfall Methodology The design of the Competency Certification Assessment Management System at LSP Politeknik Piksi Ganesha using the Waterfall methodology aims to automate the process of registration, scheduling, assessment, and certificate issuance for participants. Waterfall methodology was chosen because of its systematic and sequential approach, where each stage must be completed before proceeding to the next stage. The following are the stages of the Waterfall methodology applied in the development of a competency certification assessment management system at LSP Politeknik Piksi Ganesha:

1. Requirement Analysis Stage
   At this stage, system requirements are collected and analyzed in depth. This process involves discussions with end-users (LSP administrators, examiners, and certification participants) to understand their requirements for the system. A system requirement specification (SRS) document is created to define in detail the functionality of the system, such as:
   - Online participant registration.
   - Exam scheduling and schedule management.
   - System-based assessment process.
   - Digital certificate issuance.
   - Automatic notification system for participants and examiners.
2. System Design Stage
   Once the system requirements are understood, the next stage is to design the system architecture. This design covers the overall system design, including user interface design (UI/UX), database design, and technical architecture. Some of the important elements designed include:
   - Interface design Designing frontend views for participants, admins, and examiners.
   - Database design A data structure that includes participant, examiner, assessment, schedule, and certificate tables.
   - Backend design Determines how the system handles data flow, security, and component integration.
3. Implementation Stage
   At this stage, system development begins based on the previously designed specifications. Developers start writing code for the frontend (e.g. with React or Angular) and backend (using Laravel or Django) as well as integrating the database (e.g. MySQL or PostgreSQL). This process also includes:
   - Creation of modules for enrolment, scheduling, assessment, certificate issuance, and notification.
   - Unit testing to ensure each module functions properly separately.
4. Testing Stage

After the implementation is complete, the system is tested to ensure there are no errors and that the functionality complies with the requirements specification. This stage includes several types of testing:

- Functional testing: Testing each feature of the system according to the requirements.
- Integration testing: Ensuring that different modules function together correctly.
- Security testing: Ensure that participant data, exam results, and certificates are secure from unauthorized access.

5. Deployment Stage
   Once the system has passed all tests, it is implemented or deployed to the production environment. This means the system is ready to be used by LSP admins, examiners, and participants. At this stage, training is also conducted for users (admin, examiners, and participants) so that they understand how to use the system correctly.
6. Maintenance Stage
   After the system is implemented, the maintenance stage begins to handle problems that arise during the use of the system. In addition, if there are any changes or feature additions, the developers will update the system as needed. At this stage, continuous monitoring is conducted to ensure the system remains stable and in line with the operational needs of the LSP.

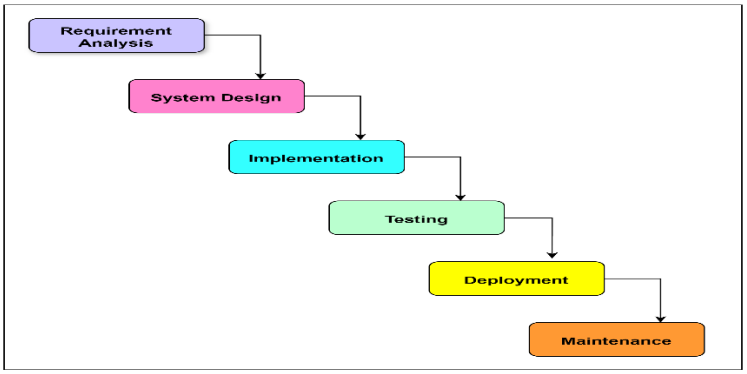

Figure 1. Waterfall Method

Results & Discussion

In developing a competency certification assessment management system at LSP Polytechnic Piksi Ganesha, several key stages have been carried out, ranging from needs analysis to system testing. The following is a discussion of the results of each stage:

1. **Requirements Analysis**
   At this stage, the functional and non-functional requirements of the system were identified. The results of the analysis show that this system must be able to support various user roles, such as participants, assessors, and admins. The functional requirements identified include:
   - Participants can register for the certification exam, view the exam schedule, and view the assessment results.
   - Assessors can evaluate participants after the exam.
   - The admin is responsible for managing the exam schedule, verifying registrations, and issuing certificates to passing participants.
2. **System Design**
   The system is designed with an object-oriented approach. This design includes the creation of use case diagrams, class diagrams, and sequence diagrams to illustrate the flow of interactions between objects in the system. For example, the use case diagram that has been created shows the interaction between participants, assessors, and admins with the system in scenarios such

as exam registration, assessment, and schedule management.

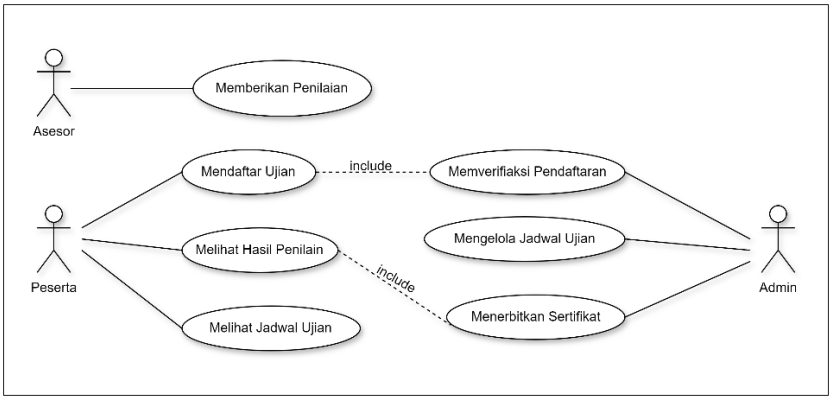

Figure 2. Usecase Diagram

Class diagrams describe the entities in the system, such as participants, assessors, exam schedules, and assessment results, as well as the relationships between these entities.

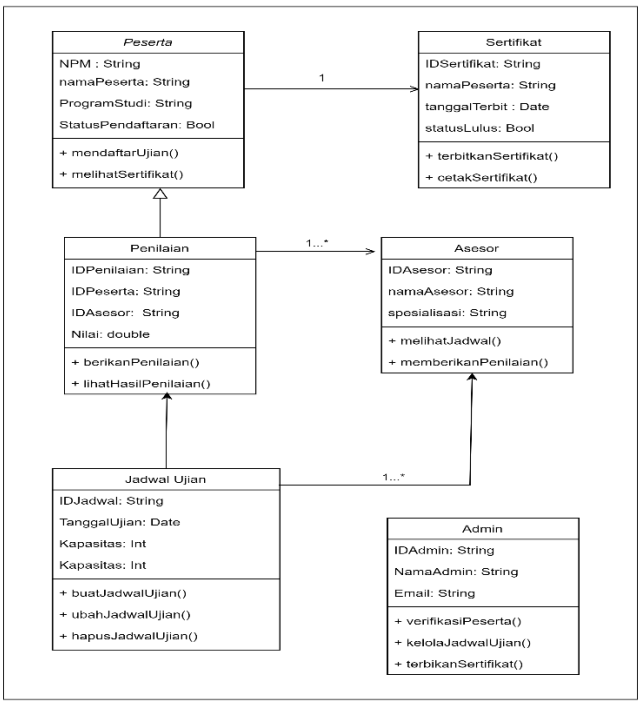

Figure 3. Class Diagram

Sequence diagrams for participants and assessors describe the sequence of interactions between actors and the system during the exam registration process, conducting exams, and giving assessments. This design helps in understanding the logical flow of the system and ensures that no stage is missed.

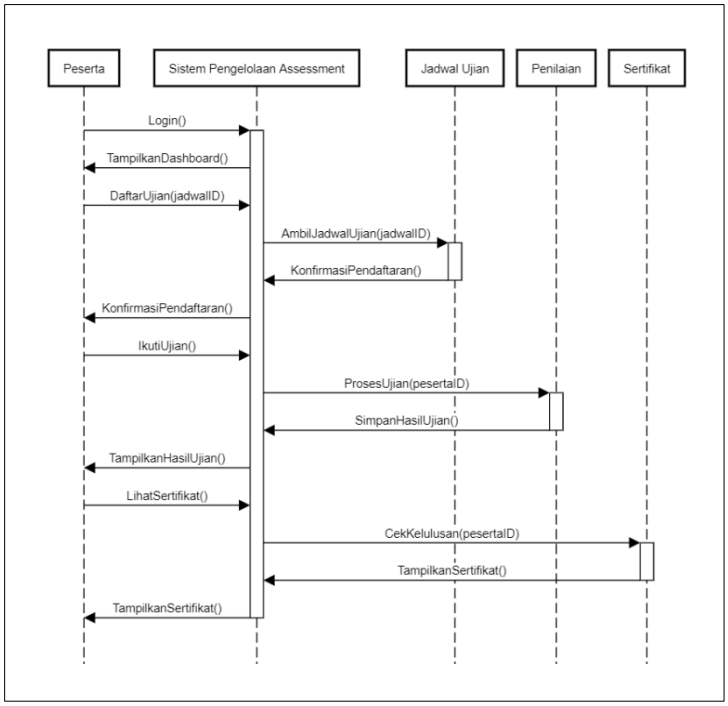

Figure 4. Sequence Diagram for participant

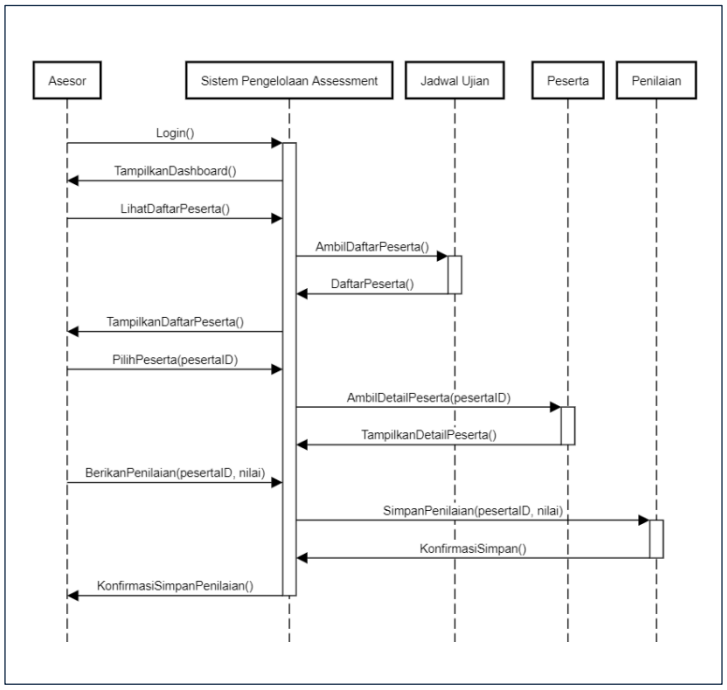

Figure 5. Sequence Diagram for Asesor

3. Implementation

The system was implemented using web-based technology that allows easy accessibility for participants, assessors, and admins from anywhere. The technologies used include:

- Backend: Data management and business logic using PHP and MySQL.
- Frontend: Intuitive and easy-to-use user interface, built with HTML, CSS, and

JavaScript.

- Database: Design an efficient database to store participant data, exam schedules, assessment results, and certificates.

In implementing the User Interface (UI) for the Competency Certification Assessment Management System at LSP Politeknik Piksi Ganesha, several key principles were adopted, such as ease of use, intuitive appearance, and optimal accessibility. The UI was developed for various actors in the system, including participants, assessors, and admins, with a responsive design so that it can be accessed from both mobile and desktop devices. The following are details of the UI implementation in each of the main modules of the system:

1. Participant Dashboard

   The participant dashboard is the main center for participants to access the various features they need in following the certification process.

   Home view: Participants can view basic information such as upcoming exam schedules, registration status, as well as previous assessment results. The UI concisely displays this data with an easy-to-read table interface.

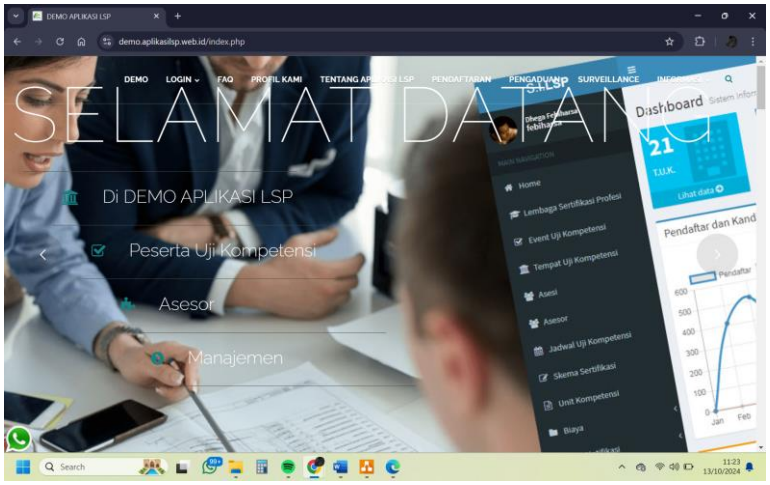

Figure 6. Home View

Exam Registration: The exam registration form is designed to be simple with minimal input, such as selecting an available schedule and filling in some personal details. There is an automatic notification after successful registration.

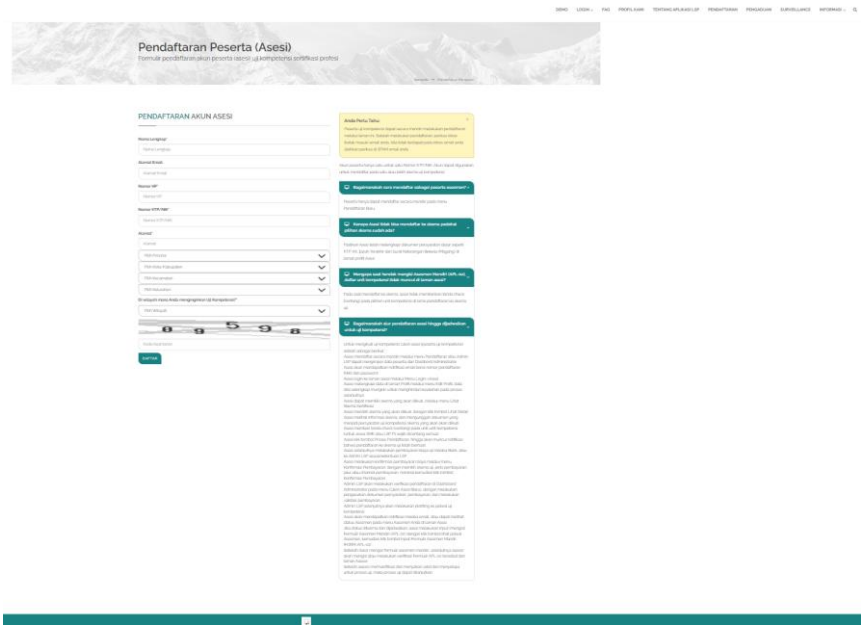

Figure 7. Exam Registration

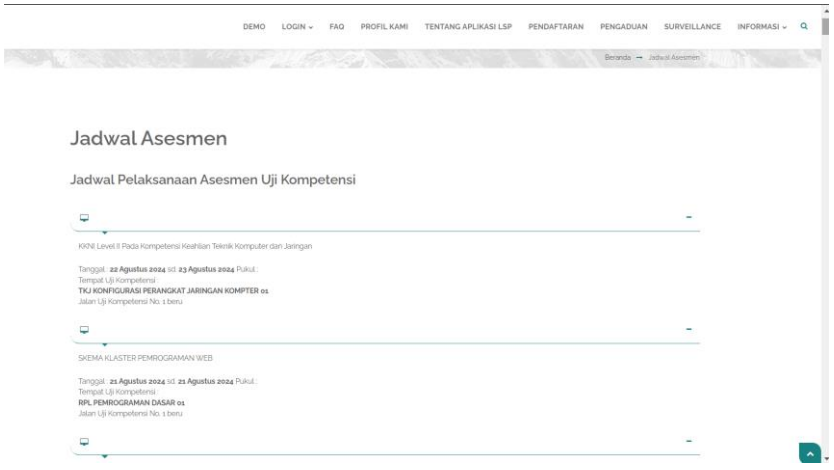

Figure 8. Assessment schedule

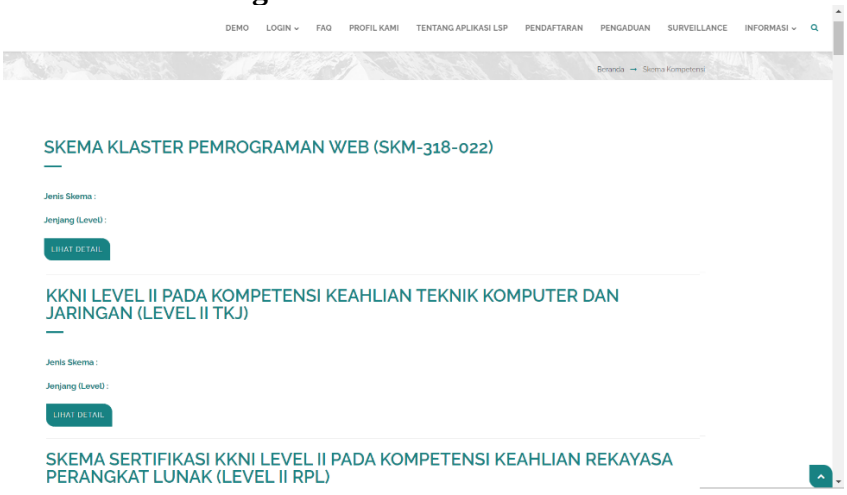

Figure 9. Certification cluster scheme

2. Assessor Dashboard
   The UI for assessors was implemented with a focus on easy access to the participant list and digital scoring.
   Assessor Home View: Assessors can view a list of participants registered for the exam they are supervising. Each participant has a direct link to the assessment page that the assessor can access.

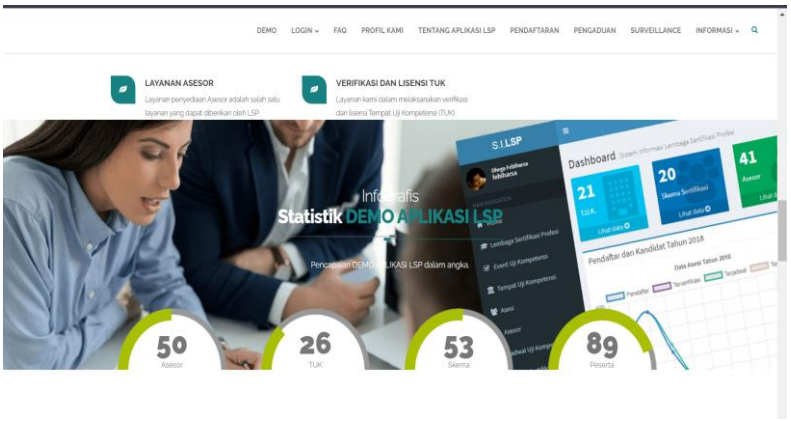

Figure 10. Home view of assessor

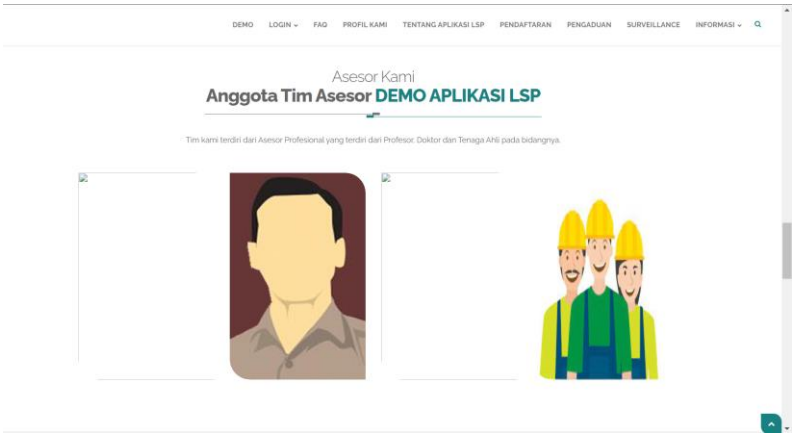

Figure 11. View Data Assessors

3. Admin Dashboard
   Admins have full access to all system features through their dashboard, including managing participants, assessors, schedules, and certificates.
   Participant Management: The participant management UI allows admins to view complete participant data, verify registration, and edit data if needed. The participant table is dynamic with search and sorting features.
   - Schedule Management: To add or update exam schedules, admins can use an intuitive UI with a visual calendar. Admins can select the date, time, and assessor in one compact form.
   - Certificate Issuance: Once the assessment results are verified, the admin can easily issue certificates with the click of a button. The system will generate a digital certificate that can be accessed by participants.

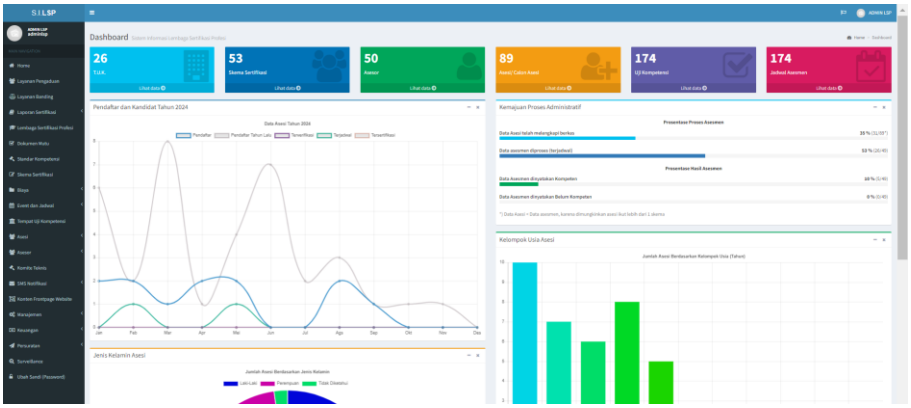

Figure 12. Admin Dashboard

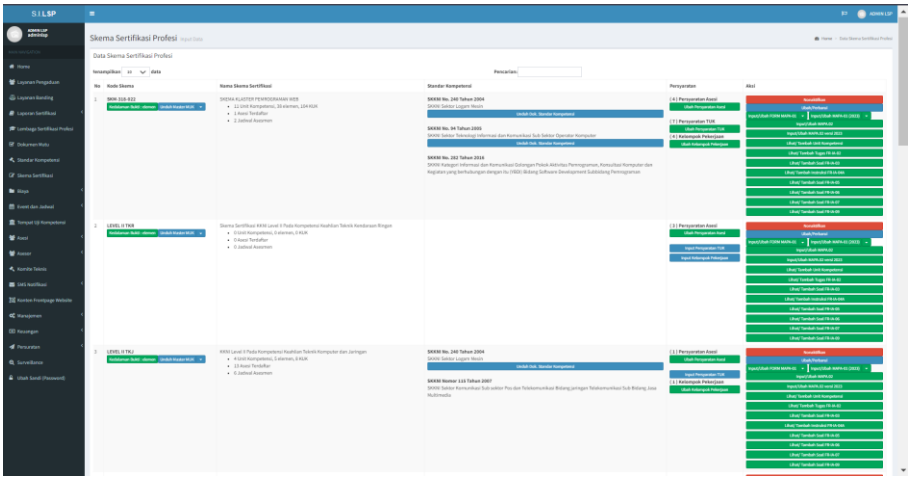

Figure 13. Schema View

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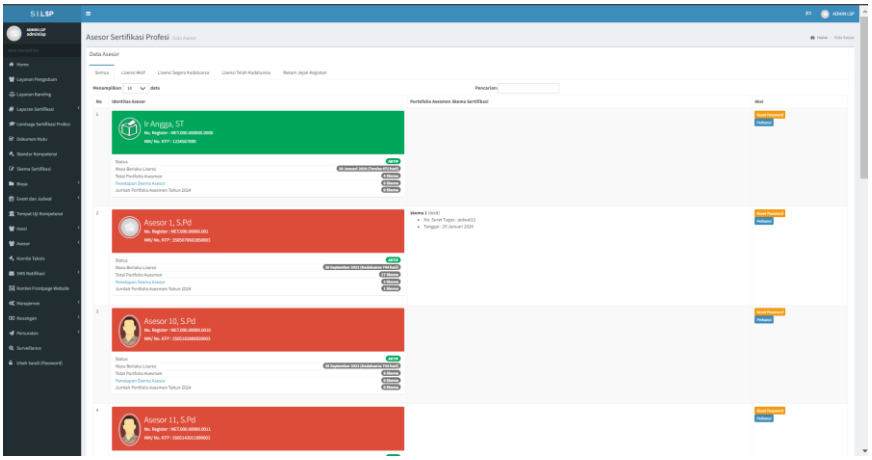

Figure 14. Assessor View

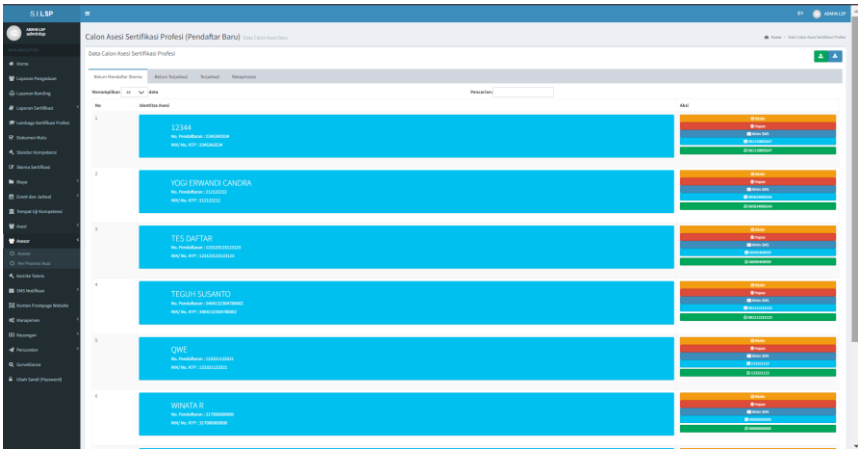

Figure 15. New Applicant

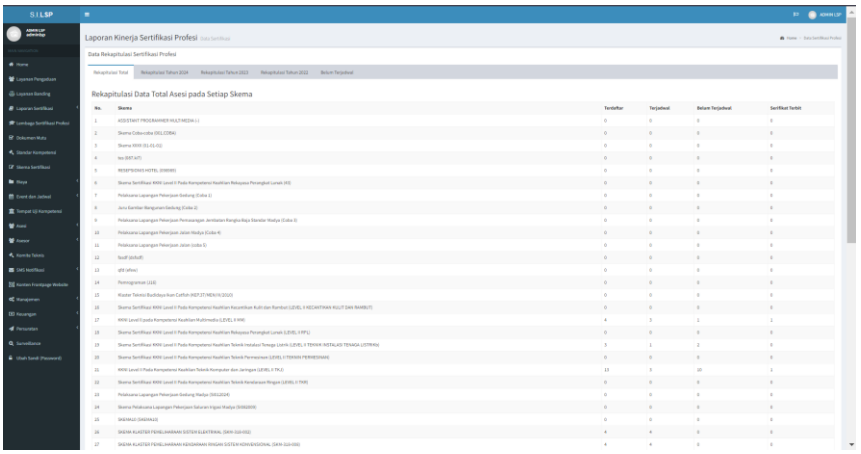

Figure 16. Certificat Performance Report

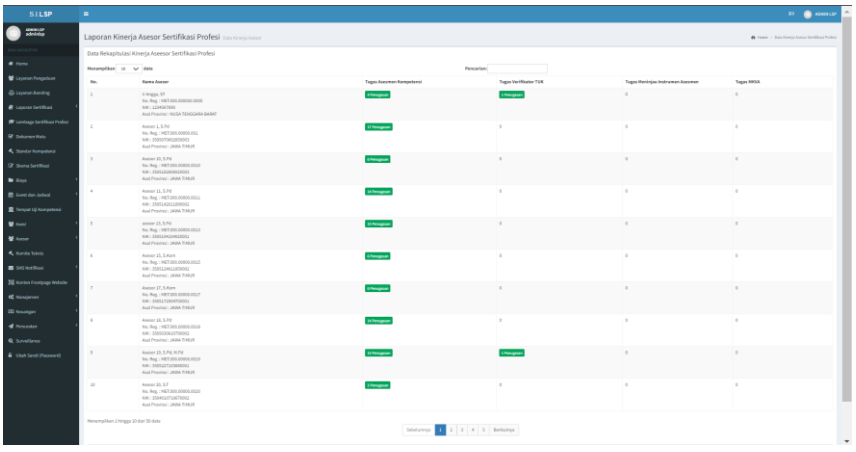

Figure 17. Assessor Performance Report

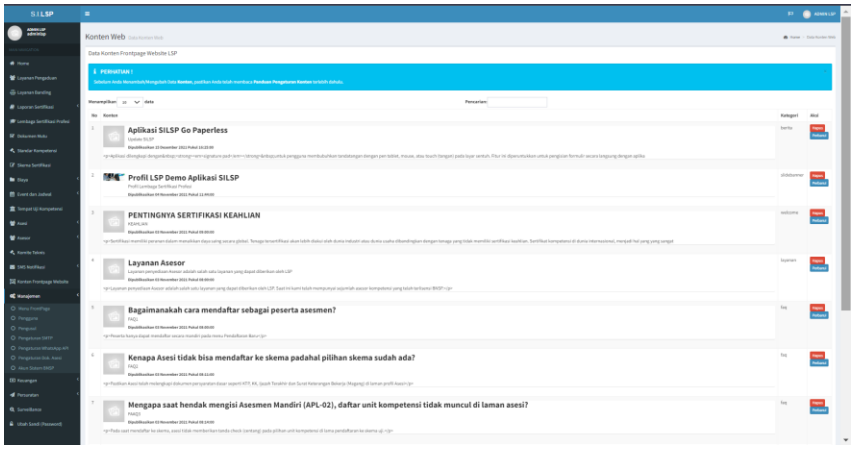

Figure 18. Web Content

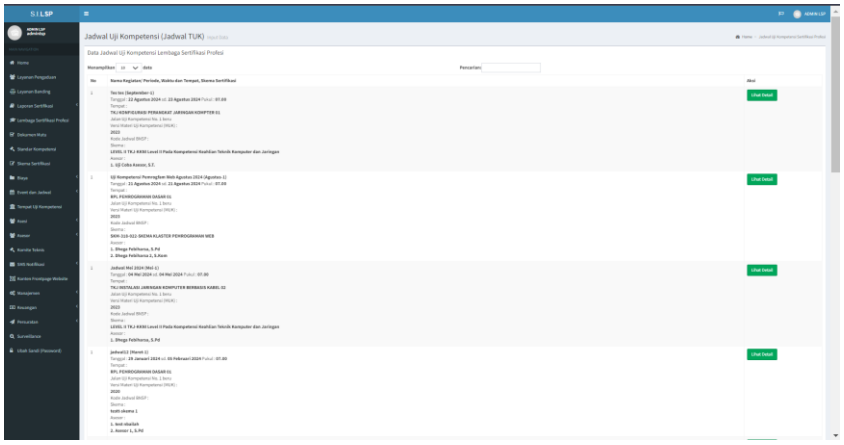

Figure 19. Schedule exam competency

4. Testing

The testing phase is carried out to ensure that the system functions as expected. Testing is done using the Black Box Testing method, where the focus of testing is on system functionality. Several test scenarios were carried out:

- Participant Registration: Tests to ensure participants can register and data is stored correctly.
- Assessor Assessment: Ensuring that assessors can give assessments without errors, and that assessment results can be displayed to participants.
- Certificate Issuance: Tested whether certificates could be generated automatically and accurately for passing participants.

The test results show that the system functions according to specification, with all key features working without any significant issues.

Conclusion

In this research, a Competency Certification Assessment Management System has been designed and built to automate and integrate the entire certification process at the Professional Certification Institute (LSP) of Ganesha Piksi Polytechnic. Some conclusion points that can be drawn from the results of this research are as follows:

1. Efficiency of Certification Process Management: The system has succeeded in improving efficiency in managing certification, starting from participant registration, scheduling exams,

and conducting assessments, to issuing certificates. With this system, manual processes that have been carried out can be minimized so that the time and costs required are reduced.

2. Ease of Access for Participants and Assessors: The developed system makes it easy for participants to access information related to certification, register for exams, and view assessment results. Assessors also find it easier to provide assessments through digital forms that have been integrated into the system. This contributes to an overall improved user experience.
3. Centralized Data Integration: With a digital-based management system, all data related to participants, assessors, assessments, and certifications can be managed centrally. This allows the admin to control and supervise all processes in real-time, reduce the risk of data errors, and facilitate decision-making based on accurate data.
4. Transparency and Accountability: The system increases transparency in every stage of the certification process. Participants can monitor the progress of their certification process, while admins and assessors can verify data more easily. This increases participants' trust in the system implemented by the LSP.
5. Digital Certificate Issuance: With the digital certificate issuance feature, the system allows participants to download their certificate in digital format after passing. This digital certificate facilitates the verification process by third parties and minimizes the use of physical documents.

Overall, the system built has succeeded in overcoming various obstacles faced in managing certification manually at LSP Polytechnic Piksi Ganesha. The development of this system also has a positive impact on improving the quality of LSP services, both in terms of efficiency, transparency, and accuracy of data management. Further implementation and continuous evaluation are required to continue improving the system to optimally meet user needs.

References

Here are some references that can be used to support research on Designing a Competency Certification Assessment Management System at LSP Politeknik Piksi Ganesha:

Ashmore, C., & Flavell, J., Vocational Qualification and Certification Systems (2006). ***(Edited book)***

Badan Nasional Sertifikasi Profesi (BNSP), Pedoman Sistem Sertifikasi Kompetensi. ***(E-book reader book)***

Garrett, J. J. (2010). The Elements of User Experience: User-Centered Design for the Web and Beyond ***(E-book reader book)***

Gunawan, D. (2020). Sistem Informasi Manajemen Sertifikasi Kompetensi Berbasis Web pada LSP XYZ. Jurnal Sistem Informasi, 15(2), 145-155 ***(Journal Article)***

Laudon, K. C., & Laudon, J. P. (2020). Management Information Systems: Managing the Digital Firm. ***(E-book reader book)***

Lembaga Sertifikasi Profesi Indonesia (2018). Panduan Pelaksanaan Sertifikasi Kompetensi. LSP ***(E-book reader book)***

Indonesia.

Nasrulloh, A. (2020). Keamanan Data pada Sistem Sertifikasi Kompetensi Berbasis Web: Studi Kasus LSP. Jurnal Keamanan Siber, 7(1), 88-97. ***(Journal Article)***

Prasetyo, A. (2019). Pengembangan Sistem Pengelolaan Sertifikasi Kompetensi Berbasis Web pada Lembaga Sertifikasi Profesi . Jurnal Teknologi Informasi dan Komputer, 12(3), 205-220 ***(Journal Article)***

Pressman, R. S. (2010). Software Engineering: A Practitioner's Approach. McGraw-Hill. ***(Book later edition)***

Rahman, F. (2021). Implementasi Sistem Pengelolaan Sertifikasi Kompetensi Menggunakan PHP dan MySQL. Seminar Nasional Teknologi Informasi, 8(1), 102-108. ***(Journal Article)***

Tarmizi, R. A., & Kusumawati, A. (2019). Development of Web-based Certification Assessment Systems for Educational Institutions. ***(E-book reader book)***

Stallings, W., & Brown, L. (2018). Computer Security: Principles and Practice. ***(E-book reader book)***