Design and Integration of Information Systems for the Halal Inspection Institute (LPH) UIN Syarif Hidayatullah Jakarta with SiHalal Ministry of Religion of the Republic of Indonesia

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Abstract—**In the context of the globalization of the halal industry, the Halal Inspection Institute (LPH) UIN Syarif Hidayatullah Jakarta faces challenges in improving halal certification services. This research develops a web-based information system with the integration of the Indonesian Ministry of Religion's SiHalal using the REST API and Prototype model. The main goal is to increase LPH credibility, integrate the LPH system with SiHalal, and improve LPH operational management performance. The system development method used is the Prototype Model, involving data collection through observation, interviews, and literature study to understand user needs. The first stage focuses on communication to understand needs, followed by rapid planning and prototype design. System implementation using JavaScript, NodeJs, and ReactJs. After a series of tests, the system resulted in effective integration with SiHalal and more efficient operational management. The research results include three prototypes. The first prototype focused on building an LPH profile website to increase credibility and access to information. The second prototype successfully integrated the LPH system with SiHalal, ensuring the efficiency and validity of audit reports. The third prototype adds report management, income/expenditure recording, and information updates, increasing LPH's operational efficiency.**

Index Terms— **Halal inspection agency, prototype model, REST API, integration information system.**

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I. INTRODUCTION

Indonesia's Halal industry is ranked 5th among 73 countries according to the 2020/2021 Global Islamic Economy and the Indonesian Halal Food Industry itself is ranked 4th [1]. This indicates that Indonesia has great potential in the halal sector. To increase work effectiveness and efficiency and reduce potential problems, implementing a computerized system is an important need [2]. Even though many Micro, Small, and Medium Enterprises (MSMEs) are turning to e-commerce platforms as a means of sales, their implementation is still faced with several obstacles [3]. These obstacles are influenced, among other things, by the importance of halal certification in consumer purchasing decisions [4].
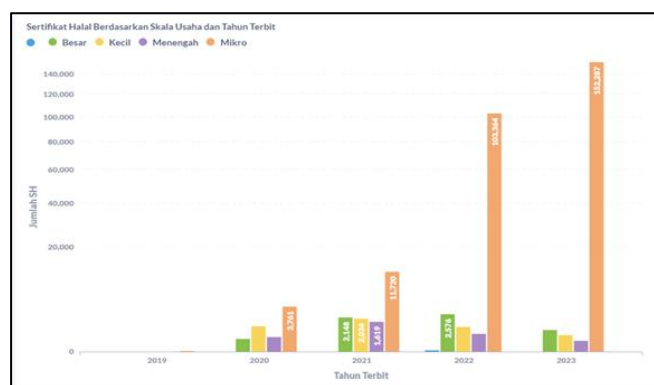

Fig. 1. Halal certificate based on business scale and year of issue (BPJPH report on 24 May 2023)

Figure 1 illustrates an interesting trend regarding the increasing demand for halal certification in Indonesia, as revealed in the latest report from the Halal Product Guarantee Agency (BPJPH). The report reflects significant growth in demand for halal certification in the country, reflecting the

public's increasing awareness of the importance of halal products.

UIN Syarif Hidayatullah Jakarta established the Center for the Study and Development of Halal Product Assurance (P3JPH) with the main aim of providing maximum contribution to the development of halal products in Indonesia. One of the superior programs carried out by P3JPH is its preparation to become a Halal Inspection Institution (LPH). The result of this effort is an important achievement where LPH UIN Jakarta was officially registered with the Halal Product Guarantee Organizing Agency (BPJPH) in March 2023 as depicted in Fig. 2.

Fig. 2. Officially registered LPH UIN syarif hidayatullah jakarta (BPJPH website).

At the initial stage, information about LPH UIN Syarif Hidayatullah Jakarta was still not optimal. Prospective business actors find it difficult to obtain the required information and LPH credibility and this slows down the potential for prospective business actors to register with LPH UIN Syarif Hidayatullah Jakarta. LPH UIN Syarif Hidayatullah Jakarta needs to build a profile website that provides clear and comprehensive information about services, flow, scope, and contacts to help prospective business actors obtain the information needed so that it can influence LPH's trust and credibility in halal certification services.

Fig. 3. LPH's obligation to integrate with SiHalal (indonesian ministry of religion website)

Then, the Halal Product Guarantee Organizing Agency (BPJPH) as listed in Fig. 3 requires every Halal Inspection Agency (LPH) to integrate with the Indonesian Ministry of Religion's SiHalal system. BPJPH has provided integration documentation via the REST API as in Fig. 4. This step signals BPJPH's commitment to increasing transparency and efficiency in the halal certification process in Indonesia. Integration with SiHalal will enable smoother data exchange between LPH and BPJPH.

Fig. 4. Documentation of SiHalal integration with the LPH system.

However, there has been no follow-up to the request for SiHalal integration using the REST API provided by the BPJPH Ministry of Religion of the Republic of Indonesia. This lack of action raises concerns about the potential for biased reporting of halal audit results from LPH UIN Syarif Hidayatullah Jakarta. It is crucial to address this issue to ensure that these results are accurately recognized and processed according to established procedures.
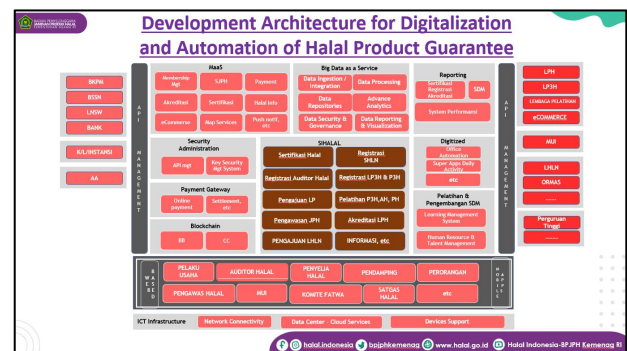
Fig. 5. Development architecture for digitalization and automation of halal product guarantees.

The importance of internal information systems to support halal certification is emphasized in the BPJPH digitization document. Figure 5 explains the development architecture for digitalization and automation of halal product guarantees, that is an overview of the MaaS architecture, Security Administration, Reporting, API management, and others are included [5]. The roadmap steps, including the implementation of blockchain technology, demonstrate BPJPH's commitment to the technological innovation of the Halal Information System. Furthermore, Figure 6 illustrates the evolution of an Integrated Electronic-based Halal Information System, showcasing the integration of various digital components and technologies outlined in the BPJPH's digitization roadmap, underscoring its dedication to modernizing the Halal Information System through electronic means
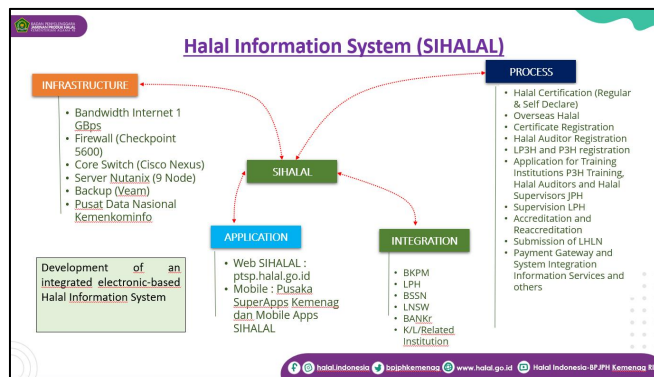
Fig. 6. Development of an integrated electronic-based halal information system.

Apart from that, the Halal Inspection Institute (LPH) UIN Syarif Hidayatullah Jakarta still does not have its information system. This condition can hamper the productivity and work efficiency of an LPH. There is no independent system that can assist in internal business processes within LPH in carrying out its business processes to help productivity and work efficiency with various halal audit management functions and better information transfer. Information System Development is considered an effective solution to simplify, speed up, and increase accuracy in producing data reports for companies [6].

Based on the explanation above, it is important to face problems in the current halal certification process at LPH UIN Syarif Hidayatullah Jakarta. These challenges can include the difficulties prospective business actors face in obtaining comprehensive information about LPH UIN Syarif Hidayatullah Jakarta services and the certification process, thereby impacting their trust and willingness to get involved. In addition, gaps in technology adoption in LPH, especially the lack of an integrated information system, hinder the productivity and efficiency of the halal certification process. Emphasizing these gaps will provide a clearer understanding of the areas that require improvement and innovation to optimize halal certification services.

The design and integration of information systems for the LPH UIN Syarif Hidayatullah Jakarta are imperative for enhancing efficiency and productivity in halal certification processes. By implementing a dedicated information system, LPHs can streamline internal operations, reducing manual effort and time spent on administrative tasks related to certification [5]. This integration also ensures accurate and secure data management, promoting transparency, and accountability in certification processes [7]. Furthermore, compliance with regulatory requirements, such as integrating with SiHalal, becomes more feasible, facilitating smoother data exchange and reporting to regulatory bodies. Ultimately, a well-designed information system not only enhances operational efficiency within LPHs but also fosters trust among stakeholders by providing reliable and accessible information about halal certification processes [2].

This research is a proposal and implementation of an innovative solution to overcome the gaps identified in the halal certification process at LPH UIN Syarif Hidayatullah Jakarta. This may involve developing a dedicated information system designed specifically for LPH, integrating features that improve efficiency, transparency, and compliance with regulatory standards. A user-focused approach to designing information systems, taking into account the needs and challenges of businesses and stakeholders interacting with LPH, can also contribute to the novelty of your research. By considering new strategies and initiatives, this research can make a significant contribution to improving the effectiveness and efficiency of the halal certification process, which ultimately benefits the halal industry in Indonesia as a whole.

II. RELATED WORK

A. Certificate

A certificate is a sign or statement issued by an authorized body and can be used as evidence. Halal certification is a written fatwa from the MUI stating that a product is halal after inspection by LPH and issued by BPJPH [8].

B. Related Institutions

The following section on Table 1 presents a list of key institutions involved in this process, along with their respective roles in ensuring the halalness of products. These institutions include the Halal Product Guarantee Organizing Agency (BPJPH), the Indonesian Ulema Council (MUI), and the Halal Inspection Institute (LPH).

Table 1.
Institutions Related to The Halal Certification Process

Halal Product Guarantee Organizing Agency (BPJPH)	Formulate policies, establish norms, standards, procedures, and criteria for Halal Product Guarantee
Indonesian Ulema Council (MUI)	Deciding on the halalness of products in a Halal Fatwa Session involving experts, elements of ministries/institutions, and/or related agencies
Halal Inspection Institute (LPH)	Carrying out inspection and/or testing activities on product halalness

C. Information Systems

In helping organizations manage and use information effectively and efficiently, information systems are a combination of procedures, information, people, and information technology that are controlled to achieve organizational goals [9].

D. Design and Integration

Design-build refers to the process of drawing up a design plan for a project from start to finish [10] while system integration is the process of combining several different modules into one program unit [11].

E. REST *and* API

Application Programming Interface (API) is an interface that allows users to access applications or services from a program. By using APIs, a developer can leverage existing functionality from other applications, without needing to build them from scratch [13]. Representational State Transfer (REST) is a set of architectural principles that enable the transmission of data over standardized interfaces such as HTTP. RESTful API works like a regular web application where the client can send a request to the server via HTTP protocol and the server responds to the client [14] as a Fig. 7.
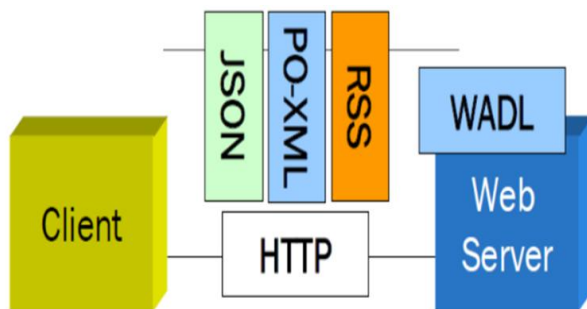

Fig. 7. REST web services client-server scheme [12].

F. Prototype Model

The prototype model in Figure 8 proposed by Pressman and Maxim includes 5 steps. The first step is communication which involves communicating with customers and collecting data from various sources. Next, the quick plan stage is carried out to detail user needs in the user requirements document. The quick design modeling process produces data structure designs, software architecture, and interfaces. The next stage is the construction of prototype in creating program code and testing the system using a programming language. Finally, the delivery & feedback deployment stage in the system is implemented and routine maintenance is carried out [15].
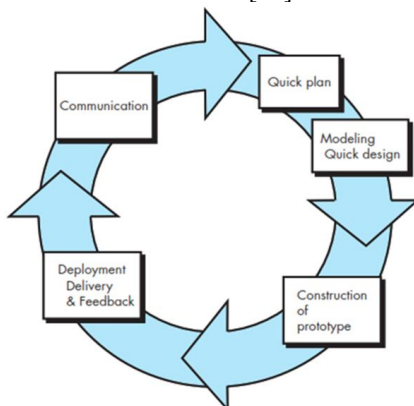

Fig. 8. Prototype model [15].

III. RESEARCH METHOD

Applying effective system development methods aims to ensure that the system under development achieves the predetermined targets or objectives [16]. A prototype is an early version of software that is used to demonstrate concepts, test various design options, and identify more problems and solutions [17]. The data and information required in preparing this report were obtained through direct observation at LPH UIN Syarif Hidayatullah Jakarta, interviews with related parties, and literature studies which include references from various sources such as books, journals, and other relevant sources of information.

This research uses a prototype model in the system development method which the researcher uses to design the framework of thinking. Developers and customers can interact during the system creation process. This prototype model can help developers and users in creating systems that comply with plans because users often face difficulties in conveying detailed requirements [9].
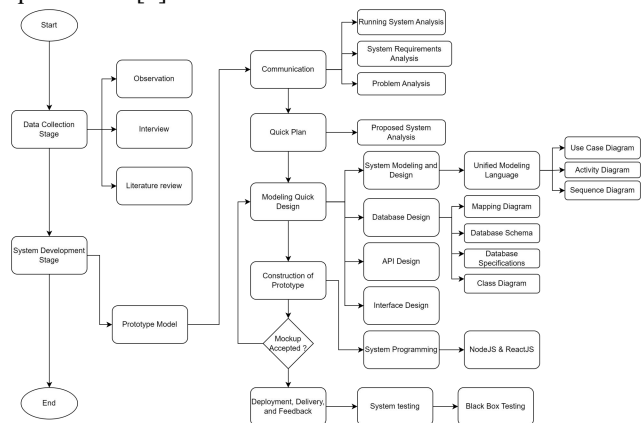

Fig. 9. Framework of thinking.

This research is based on the framework of thinking depicted in Fig. 9. The main stages include communication, quick plan, quick design modeling, construction of prototype, and deployment delivery & feedback. The communication stage involves data collection, organizational structure analysis, business process analysis, problem identification, and system information needs. Then, a quick plan is carried out to determine the technology, design the proposed system, and determine the users. quick design modeling includes process design, database design, API, and interface design. The construction of prototype stage involves coding the program using the JavaScript programming language with NodeJs as the server and ReactJs as the client. Finally, deployment delivery & feedback is carried out to ensure the software functions according to user expectations through system functionality testing.

IV. RESULT

This research implements three different prototyping stages. The first stage is the initial step in developing the LPH UIN Syarif Hidayatullah Jakarta information system, with a focus on creating an informative system. The second stage emphasizes the development of an integration module between SiHalal BPJPH and the UIN Syarif Hidayatullah Jakarta LPH

Information System according to the integration documentation. Meanwhile, the third stage focuses on developing internal feature modules for LPH UIN Syarif Hidayatullah Jakarta which are not covered in the integration documentation.

1) Prototype 1 – Communication

Currently, there is no website available that provides information that at UIN Syarif Hidayatullah Jakarta there is a Halal Inspection Institute (LPH). The existing information is still directed at university public relations which has too broad a coverage of the services offered by LPH itself. LPH UIN Syarif Hidayatullah Jakarta is still in the initiation stage and fulfilling the requirements for halal inspection agency accreditation from BPJPH. This process is what makes LPH UIN Syarif Hidayatullah Jakarta not yet known to many people, especially business actors. The results of the problem analysis are regarding the accreditation criteria, the limited time available, and the urgency of media promotion of LPH services.

2) Prototype 1 – Quick Plan

Researchers propose using WordPress as a platform to build a halal inspection agency landing page website in the first prototype as depicted in Figure 10. The advantages of using WordPress include ease of use with an intuitive interface, flexibility in updating content, responsive themes and views, and expandable plugins to add additional functionality. With this consideration, using WordPress as a solution for a halal inspection agency's landing page website is the right choice to meet the functional and non-functional needs of the agency.
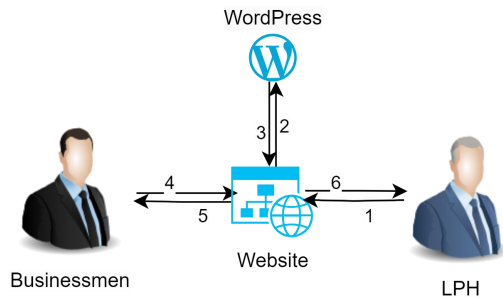

Fig. 10. Rich picture proposed prototype 1.

3) Prototype 1 – Modelling Quick Design

The use case diagram analysis delineates a variety of essential functionalities pivotal to the system's operations. The use case diagram in Fig. 11 lists including login, managing users, editing design appearance, managing posts, and logging out. Each use case is meticulously described to outline its specific functionalities and the roles of different actors involved. Notably, the roles of Super Admin and Admin are highlighted, underscoring their pivotal responsibilities in system governance and management. This comprehensive understanding of the use cases lays a solid foundation for the development and implementation phases, ensuring alignment with user needs and efficient system functionality.

Fig. 11. Use case diagram prototype 1.

4) Prototype 1 – Construction Of Prototype

At this stage, using WordPress includes several key steps that need to be considered. This stage involves selecting a theme, using plugins, and customizing the appearance. First of all, choosing a theme is the first step in managing the appearance of a WordPress website. After that, the use of plugins is used to expand the functionality of the site by adding certain features. Finally, appearance adjustments are made to make the website suit your needs and desired aesthetic. The results of this implementation are shown in Fig. 12. This entire process was an important part of building Prototype 1 using WordPress.
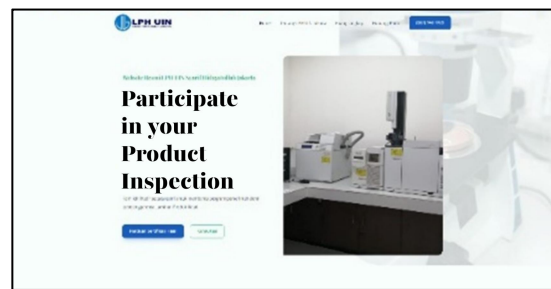

Fig. 12. Prototype 1 implementation results.

5) Prototype 1 – Deployment Delivery & Feedback

Test results and feedback from the director are written in handwriting in Fig. 13. In general, the results of prototype 1 are acceptable. However, in the future, it needs a little readjustment for a more attractive appearance.
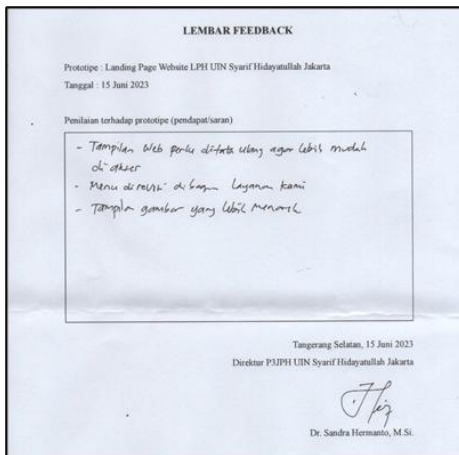
Fig. 13. Feedback results on prototype 1.

Fig. 14. Rich picture proposed prototype 2.

6) Prototype 2 – Communication

Prototype 2 focuses on BPJPH's SiHalal integration with the UIN Syarif Hidayatullah Jakarta LPH Information System. The results of communication on prototype 2, several problems were found:

- The request for integration from BPJPH has been around since 2022, marked by socialization and sending of integration documentation, but no follow-up has been carried out from LPH UIN Syarif Hidayatullah Jakarta.
- To ensure the recognition and validity of halal inspection agency audit reports, integration with the SiHalal system is a requirement that cannot be ignored because halal inspection agency reports will not be recognized unless integration occurs with the SiHalal system.
- One indication of the professionalism of a halal inspection agency is its integration with its internal system
- Integration between the institution's internal information system and BPJPH's halal system will overcome the problem of data redundancy between the two.

7) Prototype 2 – Quick Plan

The proposed system is aimed at integrating LPH's information system with BPJPH's SiHalal as depicted in Figure 14. Based on the documentation, to integrate the system with SiHalal the following requirements are required:

- The API protocol must use the JSON data format
- The communication protocol used is REST API

The endpoint/URL address can be connected to the SiHalal server:

1. Development server: https://103.7.14.55/ used for testing
2. Production server: https://lph-api.halal.go.id used for live production
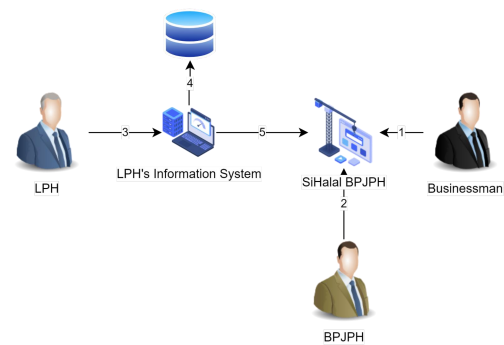
Based on the flow on Fig. 15, the LPH plays a role in the Login, Logout, DataList, UpdateStatus, DataPlease, CostList, CostAdd, KonfirmasiList, ScheduleAuditList, ScheduleAuditAdd, ScheduleAuditUpdate, ScheduleAuditDelete, CheckListAuditor, CheckAuditorAdd, CheckAuditorDel, and getDataRef modules. LPH participates in verifying cost requirements, checking invoices after halal certification permits, and carrying out auditor checks according to a predetermined schedule, as well as reporting audit results. This takes the system to the next step in rapidly advancing the proposed system to the design modeling stage by integrating it.

Fig. 15 Regular halal certification process flow for actors.

8) Prototype 2 – Modelling Quick Design

The use case diagram in Figure 16 outlines such as login and logout authentication integration, managing certification request statuses, viewing request details, handling audit scheduling and assignments, managing audit costs, tracking payment statuses, sending audit reports to the SiHalal server, and accessing reference/master data, each involving specific users like Chair/Vice Chair of LPH, Auditor, Treasurer, and HR Development.
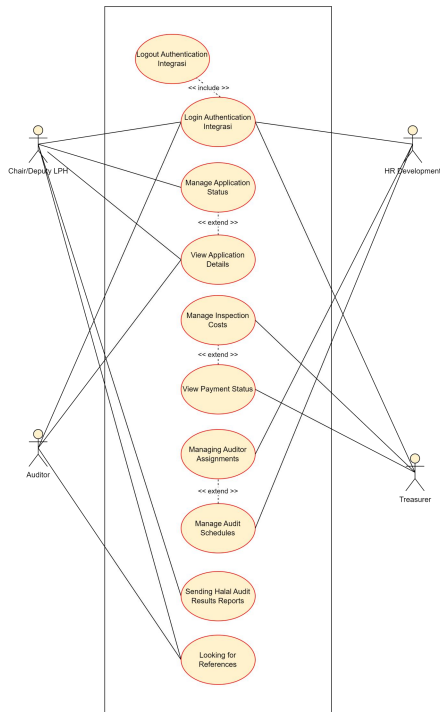
Fig. 16. Use case diagram prototype 2.

system demonstrates functionality and reliability, ensuring robust security protocols is crucial to safeguard sensitive information and maintain user trust. Therefore, alongside ongoing development efforts, continuous evaluation and enhancement of data security practices must remain a focal point to uphold the integrity and confidentiality of the system.
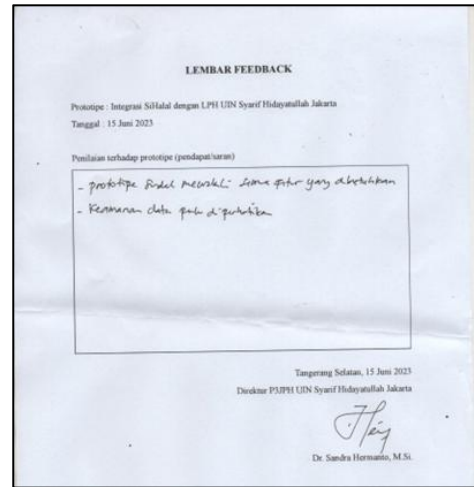

Fig. 18. Feedback results on prototype 2.

9) Prototype 2 – Construction Of Prototype

Creation was carried out using the Javascript programming language and using Axios as a client for the REST API. The development was carried out using a development server so as not to interfere with the original data from LPH UIN Syarif Hidayatullah Jakarta operations. An illustration of the results of this implementation is shown in Fig. 17. Additionally, the use of Axios as a client for the REST API facilitated seamless communication between the frontend and backend components, ensuring efficient data retrieval and manipulation processes.
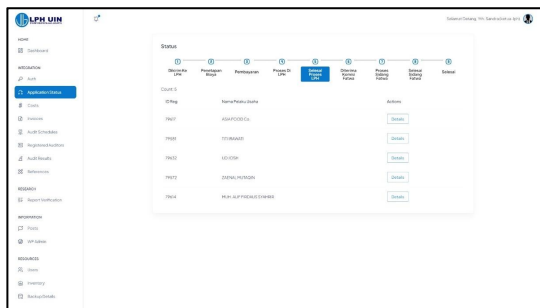

Fig. 17. Prototype 2 implementation results.

10) Prototype 2 – Deployment Delivery & Feedback

The results of prototype 2 feedback from the director are written in handwriting in Fig. 18. After conducting a comprehensive series of tests, it can be inferred that the progress of system development on prototype 2 is proceeding satisfactorily. However, amidst this progress, it remains imperative to prioritize data security measures. While the

11) Prototype 3 – Communication

Prototype 3 focuses on the needs of the Internal Module of LPH UIN Syarif Hidayatullah Jakarta. As for the results of the communication stage, several problems were found:

- Currently, there is only one LPH account that can log in to SiHalal so other structural parties in the LPH organization cannot obtain appropriate authorization according to their roles and duties
- There is no internal review meeting system for reports made by auditors, making it possible for errors to occur in reports without the approval of those responsible for the LPH
- There are no facilities to record income or expenses specifically, which is because LPH is also a business unit within the university that can play an active role in halal certification and can also add additional profits
- There needs to be additional features in the system to update information with the system that was created in prototype 1
- LPH requires its internal database to update or retrieve data from the SiHalal server to be processed by itself for operational purposes or reports
- There is no feature for internal SOP management which is very useful for guidance in carrying out LPH operations
- There is no monitoring feature from an impartial or Sharia committee to evaluate LPH when there are findings that can be a lesson for the future.

12) Prototype 3 – Quick Plan

The proposed system is aimed at creating an information system belonging to LPH UIN Syarif Hidayatullah Jakarta that addresses the results of problem analysis in the previous communication stage as depicted in Fig. 19.
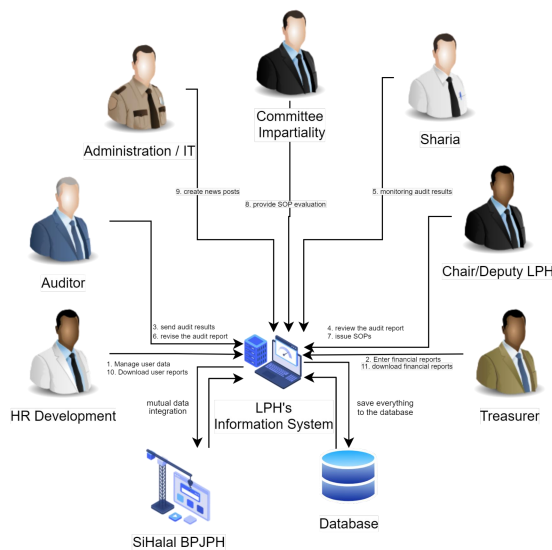
Fig. 19. Rich picture proposed prototype 3.

13) Prototype 3 – Modelling Quick Design

The use case diagram in Fig. 20 presents activities such as system login and logout, user data management including addition, modification, and deletion, updating personal information and passwords, managing cash flow records, verifying audit reports, managing SOP files and evaluations, viewing backup data, handling article management, receiving notifications, and downloading reports in CSV format, with user roles specified for each task.
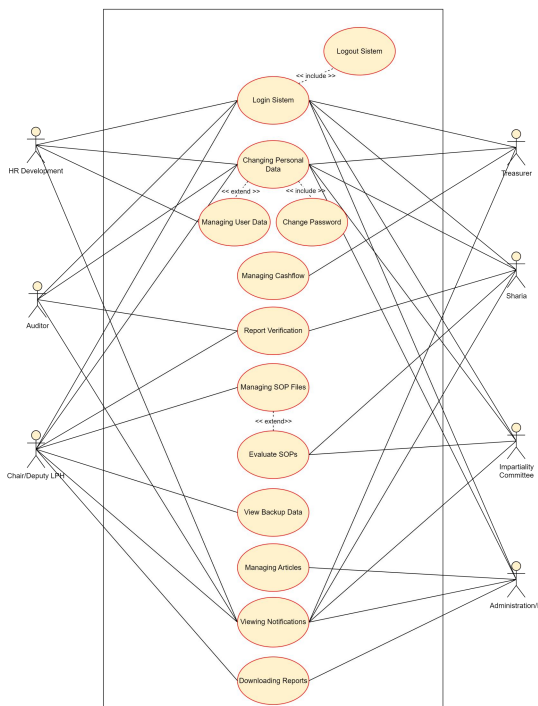

Fig. 20. Use case diagram prototype 3.

14) Prototype 3 – Construction Of Prototype

The researcher employed the JavaScript programming language, leveraging its versatility and widespread use in web development. Additionally, the researcher utilized the Node.js

runtime environment, which offers a powerful platform for building scalable and efficient server-side applications. To enhance the user interface and interactivity of the system, the React.js library was incorporated, known for its component-based architecture and ease of use in creating dynamic web applications. Moreover, the React Material UI framework was chosen to ensure a modern and visually appealing design for the user interface. In tandem with these frontend technologies, meticulous attention was given to backend data management. A MySQL database was meticulously designed and implemented to provide a robust foundation for storing and retrieving data for the LPH UIN Syarif Hidayatullah Jakarta information system. This integrated approach not only ensures the system's functionality but also emphasizes usability, performance, and scalability, aligning with the highest standards of modern web development practices. The results of this implementation are shown in Fig. 21.
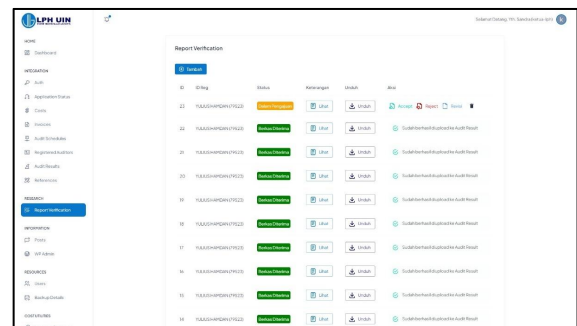
Fig. 21. Prototype 3 implementation results.

15) Prototype 3 – Deployment Delivery & Feedback

Based on the results of system testing on prototype 3 using the black box testing method, the results obtained were that the LPH UIN Syarif Hidayatullah Jakarta information system passed, which means that all functions in the system had run according to the desired expectations. The feedback received from Mr. Sandra Hermanto as Director has also given a positive response to prototype 3 which has been built, as seen in the handwritten note in Fig. 22.

Fig. 22. Feedback results on prototype 3.

This study has several limitations that must be considered. First, this research focuses specifically on LPH UIN Syarif Hidayatullah Jakarta, which may limit the generalizability of the findings to other LPH institutions or contexts. The specific technologies used such as ReactJs and Nod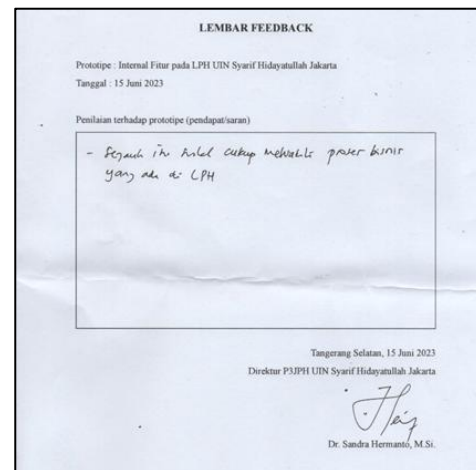eJs can pose challenges for institutions with different technology infrastructures. Limited access to comprehensive data sets may impact the completeness and accuracy of the prototype. Additionally, although efforts have been made to secure systems using JSON Web Tokens, further research is needed to comprehensively address data security and privacy issues. Finally, this study did not extensively evaluate user perceptions and acceptance after long-term use of the system, which could provide insight into long-term effectiveness and usability.

The discussion explains how this study differs in terms of its contribution to existing research. This research succeeded in developing and implementing three prototypes that aimed to answer the challenges faced by LPH UIN Syarif Hidayatullah Jakarta. Prototype 1 focused on developing an informative website profile for LPH, providing clear details about services, processes, scope, and contact information. These improvements are critical to increasing credibility and accessibility. Prototype 2 achieved effective integration between LPH and SiHalal from BPJPH using REST API, significantly improving operational efficiency, ensuring the validity of audit reports, and minimizing data redundancy and inconsistency. This is different in research concept when compared to several previous studies that used the concept of REST API and system integration [18], [19], [20], [21], [22]. Prototype 3 contributes to improving operational management through features such as report management, financial recording, and information updates, simplifying reporting processes, improving service quality, and facilitating compliance with standards. Collectively, these prototypes have had a positive impact on LPH operations, increasing credibility, increasing efficiency, and contributing to the halal certification process in Indonesia.

V. CONCLUSION

This research focuses on creating an information system and website for LPH UIN Syarif Hidayatullah Jakarta to increase credibility, policy compliance, and operational management. First, the development of an informative and fast profile website using the WordPress platform succeeded in providing an accurate picture of LPH's services, flow, scope, and contacts, which is important for expanding the potential customer base in today's digital era. Second, effective integration between LPH and SiHalal from BPJPH through the Prototype 2 System increases the efficiency, validity, and recognition of LPH audit reports while reducing data redundancies and inconsistencies. Third, the Prototype 3 System includes report management, recording income and expenses, and updating information, which helps overcome obstacles in reporting and operational management. All these steps contribute to improving the quality of LPH services.

For future research, it is recommended to address the limitations identified in this study by addressing the need for more advanced LPH, improving data security with comprehensive solutions, and conducting follow-up studies on user experience after long-term use of the system to improve interface design and usability. In particular, future research could focus on expanding the functionality of the developed prototype by integrating advanced features such as data analysis tools, digital signatures, and strong security measures to enhance system capabilities and ensure the protection of sensitive information. Longitudinal studies should be conducted to evaluate user perception and acceptance over time, guiding interface design improvements and system optimization efforts. Additionally, a cross-institutional study involving multiple LPH institutions would be beneficial to assess the generalizability and scalability of the developed solution. Exploring new technologies that are aligned with various institutional infrastructures can further advance halal certification systems and operational management in LPH institutions.

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