

A PRELIMINARY STRATEGY TOWARDS SUPPORTING THE AUTOMATION OF SHARIAH-COMPLIANT REQUIREMENTS

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ABSTRACT

Web-based technology offers a wide range of online services in practically every industry, including the medical field. The ISO MS 1900:2014 certification has been awarded to the Sultan Ahmad Shah Medical Centre (SASMEC)@IIUM (Shariah-based Quality Management System). All hospital reporting processes are currently carried out manually using a variety of physical forms, such as the food premise inspection form, the complaint form, and the programme monitoring form to support the implementation and monitoring of the shariah-compliance-related activities. This strategy necessitates a considerable amount of effort, time, and resources to manage these manual activities. These problems have led to insufficient and inefficient planning for auditing and monitoring purposes. This paper proposes the Shariah-Compliant Hospital Reporting System (SC-HRS) to be implemented in SASMEC. The suggested solution will be able to facilitate the Department of Shariah Compliance with a variety of shariah-compliance-related tasks, such as online reporting and monitoring. The ability of this reporting system to manage all reports pertaining to shariah-compliance in a secured database will be advantageous to the department and SASMEC in general.

Keywords - Automation, ISO Shariah-Compliant Hospital Reporting System, Shariah-Compliant Requirements.

Received for review: 03-03-2025; Accepted: 18-03-2025; Published: 01-04-2025
DOI: 10.24191/mjoc.v10i1.5531

1. Introduction

Sultan Ahmad Shah Medical Centre (SASMEC) @IIUM is a newly established teaching hospital in the nation that plays an important role in providing comprehensive healthcare education and services to the community. SASMEC @IIUM has recently been awarded comprehensive ISO MS 9001:2015 (Quality Management System) and comprehensive ISO MS 1900:2014 (Shariah-based Quality Management System) certification by the International Organization for Standardization (ISO). ISO is a non-governmental international organization,



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which comprises national standards bodies that develop and publish a wide range of proprietary, industrial, and commercial standards (Ali et al., 2016).

As a result, the hospital has earned the title of Shariah Compliant Hospital, and the management is now held accountable for upholding a stringent set of requirements for developing and improving the quality system, considering the needs of clients, creating quality policies and plans, and defining roles, authorities, and communication avenues to support effective quality management. To assist patients and visitors in fulfilling their religious responsibilities while at the hospital, it is also envisaged that medical facilities and services such as halal healthcare goods, amenities, and trained staff shall also be provided.

To ensure that audits performed by SIRIM QAS International's pool of experienced auditors are carried out professionally and the Shariah requirements of MS 1900 are appropriately evaluated, the Shariah Advisory Council (SAC) has been established by the Hospital Management Committee (HMC). The objectives of the formation of SAC are (1) to provide comprehensive guidance to the HMC, management of the SASMEC @IIUM, and the Department of Shariah Compliance in settling its duties in matters relating to Shariah matters and (2) to advise the management concerning any Shariah issues relating to Islamic procedures or policies in SASMEC@IIUM.

The MS 1900:2014 provides a framework as shown in Figure 1, which covers general guidelines for implementing a Shariah-based quality management system (Rosnah et al, 2014). The principles of the Malaysian Quality Management System (QMS) MS1900 from an Islamic perspective address (1) compliance to the principles of Halal (i.e., things that are permissible) and Haram (i.e., things that are not permitted); (2) organizational management and activities are based on values, and (3) decisions and actions taken should be based on Maqasid Shariah (i.e. for human interest and to avoid any harm) (Ali et al., 2016).

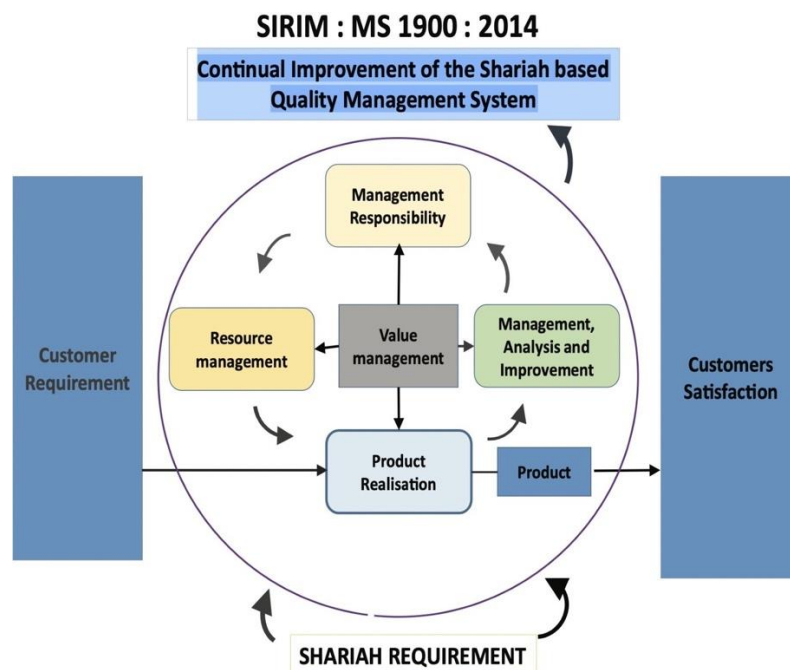


Figure 1. Shariah-based Quality Management System (Rosnah et al, 2014).

An ISO MS 1900:2014 certified organization needs to provide a well-structured hospital information management system (HIMS) and network that delivers the shariah requirements, distributing the news and announcements to all the staff as it is one of the elements that has been emphasized in the ISO 1900:2014 and this will involve a massive data exchange and communication between administration, shariah compliance unit and shariah liaison officers (Shariff et al., 2016).

To achieve digital transformation, the system, which draws inspiration from the Sustainable Development Goals (SDG), seeks to create a digital platform within the hospital environment to enhance the caliber of its process control and monitoring. The current issues with the manual processes are: (1) uses several physical forms; and (2) involves the respective arrangements and reminders for monitoring inspection of hospital units and departments (Al-Rayes et al., 2020).

Given the difficulties the department is now experiencing, closing the gaps, and expediting the work process depend heavily on a well-organized monitoring system. The objectives of the proposed system are: (1) to automate the shariah-compliance hospital reporting processes, (2) to design and develop a centralized digital platform in the hospital framework to manage reporting processes for SASMEC @IIUM, (3) to interconnect SASMEC@IIUM Reporting System with the existing health information management system (HIMS) and i-Pesakit system (SASMEC@IIUM Patient Medical Record System).

This article is divided into six sections, beginning with an introduction, and moving on to related work. The methodology section then goes into greater detail about the procedures followed in this work and includes a dedicated section on prototyping. Finally, the discussion, conclusion, and future work sections will be provided.

2. Related Works

In this section, the related work will be elaborated in two parts i.e. (1) Hospital management system and (2) Shariah-compliant hospital.

2.1 Hospital Management System

A literature review of previous projects and existing literature has been conducted, which covers the hospital reporting system and hospital management system. The Hospital Management System (Al-Rayes et al., 2020) aims to improve the quality of services while identifying cost-reduction areas and evaluating the healthcare services. This system helps users to access reports from anywhere and online. The system can only be accessed through internet browsers, which is a limitation of this project.

The Hospital Management System (Kumar et al., 2013) helps to reduce the amount of cost, tasks, and effort in the administration of patients, the management of doctor's schedules, and the maintenance of patient data that can be accessed throughout the hospital. The system is user-friendly, simple, fast, and more cost-effective than the current manual reporting system. The system is accessible from any internet browser, making it available whenever and anywhere.

The main objective of the Online Hospital Management System is to develop a unique Hospital Management System that will enhance the hospital experience for patients and hospital employees by exploiting the Internet (Devi, 2014). Their main goals are to create a process that will reduce paperwork and save time for everyone. The fact that the management handles every aspect of the user registration process is one of the system's shortcomings. Additionally, users are not able to open more than one account (Purwarini, 2024). A study by Gourisaria et al. (Gourisaria et al., 2022) provide various aspects and factors of AI and IoT-based smart hospital systems and the role of AIoT in the growth of the modern world as a combination of these niche areas is giving outstanding results in the field of healthcare. In addition, Bazel et al. (Bazel et al., 2022) outlined present challenges in hospital information systems while also highlighting the potential for blockchain technology to address these issues in Malaysian healthcare.

Besides Online Hospital Systems and Hospital Management Systems, the public hospital in Malaysia uses the Hospital Information System (HIS). The deployment of the HIS aims to improve healthcare quality, increase productivity, and facilitate the easy acquisition and recording of data. Hospital Information System has the potential to both improve employee

communication and reduce the number of errors that occur as compared to the manual system (Hertin & Al-Sanjary, 2018). HIS in Malaysian government-owned hospitals are separated into three groups, they are Basic Hospital Information System (BHIS), Intermediate Hospital Information System (IHIS) and Total Hospital Information System (THIS).

One of the public hospitals that is categorized as THIS is Selayang Hospital (Hertin & Al-Sanjary, 2018). The hospital is the first medical facility in Malaysia to function in a paperless environment. It is noted for heavily utilizing information technology in its day-to-day operations (Rosnah et al, 2014). Based on Figure 2, the THIS at Selayang Hospital comprises a collection of clinical and administrative applications that are highly integrated, such as digital imaging, critical care, financial, and administrative systems.

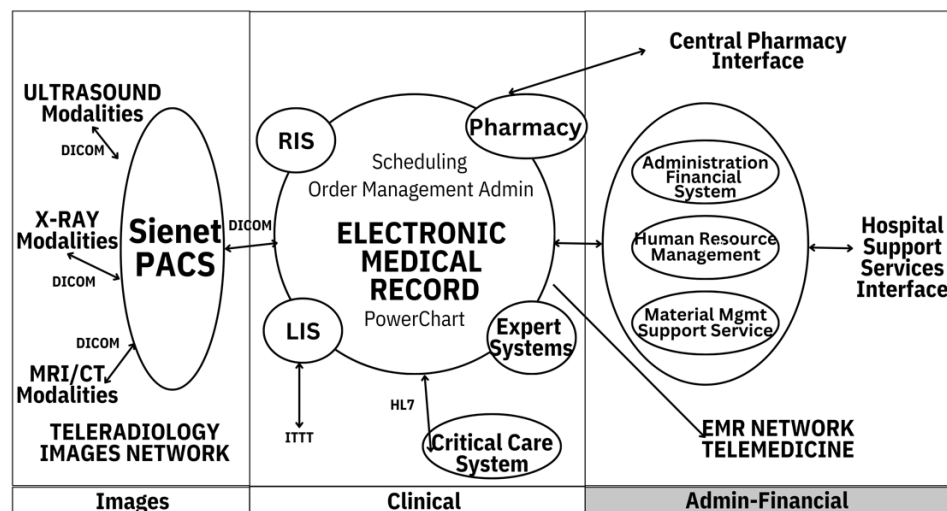


Figure 2. Selayang Hospital THIS Structure (Hertin & Al-Sanjary, 2018).

Most of the hospital management systems under review focus on providing critical information to support the day-to-day hospital operations and services such as Electronic Medical Records (EMR), hospital support services for administration and management, and digital imaging. Although a few of the current hospital management systems already provide reporting for quality assurance objectives, none, according to our analysis, offer a way to support reporting focusing on shariah-compliant operations (Benevento et al., 2023). The unique capabilities of this strategy to provide shariah-compliance monitoring and reporting make it worthwhile to explore it further.

Another work worth mentioning is the implementation of a Shariah-compliant hospital at An-Nur Specialist Hospital (Shariff et al., 2016). In 2015, the An-Nur Hospital became the first private hospital to receive the MS1900:2014 Shariah-Compliant Hospital designation. MS1900:2014 is accreditation for a Shariah-Compliant Hospital standard requirement that is certified by SIRIM as a new guideline for an Islamic Quality Management System.

2.2 Shariah-Compliant Hospital

Shariah-compliant hospital is a system recognized and approved by an independent agency with the power to carry out the certification process to guarantee the hospital is adhering to Shariah requirements (Ismail et al., 2018). In which the shariah compliant hospital should adhere to the components that will truly reflect Islam as the comprehensive way of life consisting of (1) understanding the basic principles of shariah, (2) understanding the principles of halal and haram, (3) understanding the principles of mualamat, (4) implementing the concept of quality in Islam, (5) establishing the Islamic core values within the hospital organization (Ismail et al., 2018).

Hospitals that adhere to Shariah compliance cover two components consist of Fiqh Ibadah and Fiqh Muamalah (Shariff & Rahman, 2016). Shariff and Rahman (2016) describe Fiqh Ibadah as the relationship between the persons with Allah encompasses daily prayers, fasting and cleanliness, whereas Fiqh Muamalat refers to the actions that pertain to society and including things like buying and selling, takaful, food preparation, and other things.

There are a few criteria for Shariah Compliant Hospital according to SIRIM MS1900:2014. According to the guideline, shariah compliant hospital does not engage in the business of selling pork or liquor on its grounds, should not be associated with conventional financials or insurance from the perspective of the hospital's finances. If the hospital has investments, their investments must be in businesses permitted by Shariah or in stock markets that comply with Shariah (Ali et al., 2016). Participation in riba and other forms of risky gambling should be avoided at all costs by employing Takaful and other forms of Islamic finance. While investing in a Shariah-compliant stock market, investors may rest assured that the companies in which they have an interest do not engage in activities that are forbidden by Shariah, such as the consumption of pork, alcohol, riba, gambling, or the production of pornographic material. Regarding the activities that take place in the hospital, they need to consult with the Shariah Advisor or the Shariah Compliant Officer to ensure that their actions are not in conflict with the Quran and Sunnah or that they do not participate in activities that are forbidden by Shariah (Yahaya, 2018).

3. Methodology

IEEE defines prototyping as “A type of development in which emphasis is placed on developing prototypes early in the development process to permit early feedback and analysis in support of the development process” (Suchitra, 2018). For this project, the prototyping model was adopted to guide the overall software development process. Figure 3 depicts the flow of the prototyping process model.

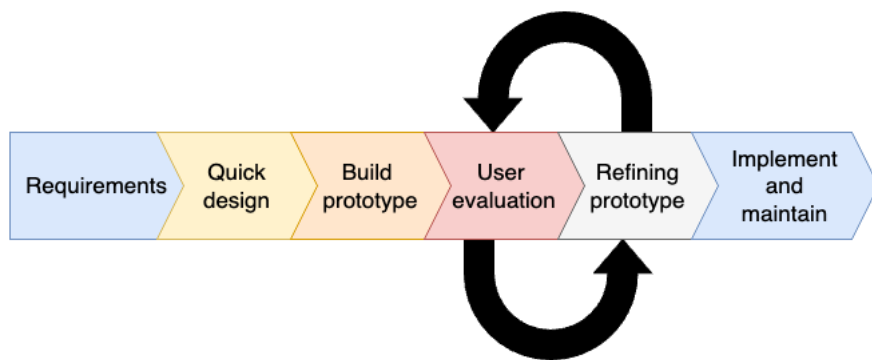


Figure 3. Prototyping Process Model (Suchitra, 2018).

This type of prototype is known as evolutionary prototyping, which uses an accurate and complete description of the system serving as a basis for both evaluation and program generation (Trivedi, 2021) (Kumar et al., 2013). The prototyping model is a method of system development in which a prototype is created, tested, and then reconstructed as necessary until an appropriate result is attained by which to develop the complete system or product (Lee et al., 2016).

In the early phase of the system development, the system requirements were collected, analyzed, and documented in the Software Requirement Specification (SRS) document (AbdulHam & Noor, 2023). Then, the design is created, and the prototype for a particular design is modelled and delivered to the users to get their feedback. In other words, this approach establishes a foundation for producing the ultimate system or software and performs at its best in circumstances where the project's requirements are not fully understood. It is an iterative

process that involves developers and all key stakeholders to produce a working prototype that will satisfy customers and be ready for system development (Jalaludin et al., 2023).

Prototypes are advantageous from an economic standpoint because they are often less expensive to build than completed systems (AbdulHam & Noor, 2023). Therefore, prototypes can be used to assess the proposed solutions when stakeholder approval or development viability is in doubt. Particularly as a solution becomes more sophisticated, prototyping can help to lower the risk of requirements errors and reduce the total implementation costs (Susanto & Meiryani, 2019).

3.1 Requirements Engineering (RE) phase

Based on the prototyping model, during the first stage, requirements were gathered from the requirements sources i.e., existing documentation, relevant stakeholders including SASMEC@IIUM Shariah Compliance Officers (SCO), Shariah Liaison Officers (SLO), management, and existing similar solutions on reporting or auditing systems. All the needs of the stakeholders were identified and analyzed.

During this phase, several requirements elicitation techniques were performed including interviews, observation, brainstorming, and comparing existing similar solutions (Selvarajoo et al., 2023). Based on the requirements elicitation process, 12 modules were identified and each of the modules comprises several requirements as listed in Table 1.

Table 1. Modules and Requirements

Module	No. of Functional Requirements
Authentication Module	3
Process Registration Module	5
Document Review Module	12
Food Premise Inspection Module	14
Referral Module	6
Program Monitoring Module	12
Complaint Module	8
Terms And Conditions Agreement Module	5
SLO Report Module	11
Shariah Clinic Report Module	6
Administration Module	4
Reporting Module	11
Total	97

A total of 97 functional requirements were listed in the requirements specification, and in addition, three quality requirements related to conformance, interoperability, and integrity were included as quality requirements. The details of these requirements were included in the Software Requirement Specification (SRS). This project aims to provide an efficient reporting management system that can be represented in a use case diagram as shown in Figure 4.



Figure 4. Use Case Diagram for SASMEC@IIUM HRS.

This project was designed to cover the 12 modules and to be used by several categories of users based on their respective roles, which are:

- Administrators-who manage the access levels and the overall system operations,
- Shariah-Compliance Unit (SCU) representatives who are responsible to manage the SCU operations based on the modules,
- Shariah Liaison Officer (SLO) representatives who are responsible for handling the unit operations,
- Food premise representatives who provide food inspection details,
- Witness-who has the role of verifying any provided information,
- Program organizers-units that organize any shariah-related activities,
- Patients and their guardians-representing client and their relatives or spouses,
- Complainant-who intends to report an issue, and
- The SASMEC medical staff - including the doctors, ward/department representatives, and clinic staff.
- The administrators shall be able to assign tasks to a specific SCU and/or SLO officer. In order to initiate a process or program or activity, the responsible actors such as the

food premise representatives, program organizers, SASMEC medical staff, the complainant, and SLO are accountable for registering the respective activities. The relevant processes are based on the 12 modules as listed in Table 1.

Figure 5 is an example of a representation of the Document Review workflow. In each document that is to be reviewed, the document owner is required to register the document details and upload the document to the system. The first reviewer provides his feedback and verifies the document if there is no issue. Then, the second reviewer will receive the task to review and finally verify the document.

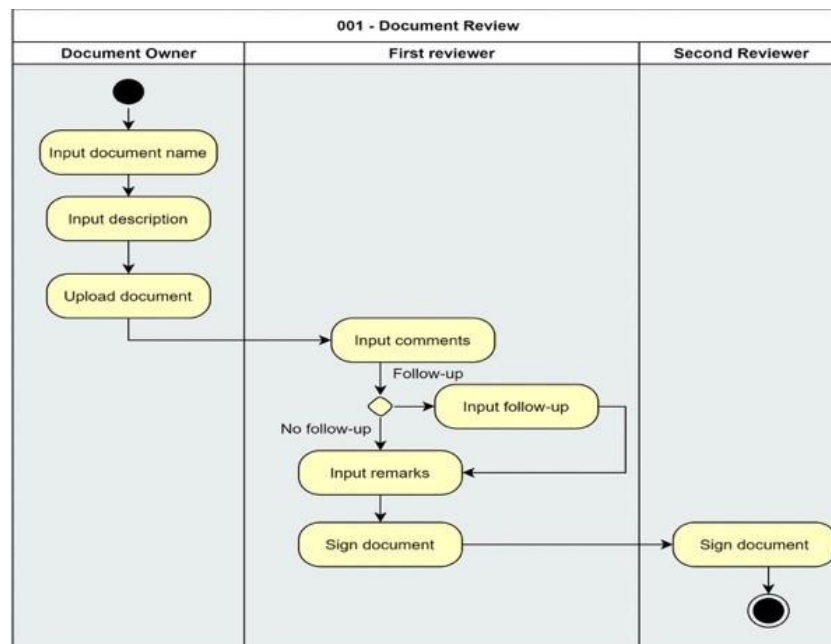


Figure 5. Activity Diagram for Document Review Module.

The specified requirements were then validated by the stakeholders to ensure there were no missing requirements or any requirements issues.

3.2 Design phase

After the requirements had been verified, a quick design of the system was prepared by using a low-fidelity prototype to give a brief idea of the system to the developer and the stakeholders. In addition, the database and architectural designs were also created.

3.3 Prototype phase

A high-fidelity prototype was built according to the verified requirements and information gathered before the user evaluation was initiated. The prototype was iteratively developed toward the end solution. The details of the prototyping activity will be elaborated in Section IV.

3.4 Evaluation phase

From the user feedback, refinements and improvements to the prototype were performed.

3.5 Refine prototype phase

The prototype was referred to throughout the development phase. Once the final system was completed, testing was executed. Testing was also performed to ensure that all the requirements had been satisfied and the purpose of the development had been achieved. All the functional

and non-functional requirements that were included in the SRS were tested in the functional testing and non-functional testing respectively. Unit testing was conducted throughout the development of this project to ensure all functionalities of the system worked smoothly.

3.6 Implementation and maintenance phase

The SASMEC@IIUM reporting system is a web-based development project, which utilizes HTML, CSS, and JavaScript as the implementation solution. Besides the three languages, the website was developed with the support of multiple frameworks and tools, which are Laravel, TailwindCSS, xampp, myphpadmin, and Google Fonts.

Finally, the deployment activity was conducted after all the improvements and updates were done. Routine maintenance was planned to be performed to save downtime and prevent large-scale failures.

4. Prototype

In this section, the low-fidelity prototype that has been presented and verified by the stakeholders before the system development phase is documented. The authentication page is depicted in Figure 6. Here, users can enter their login information to access their accounts. Access levels are determined by these credentials.

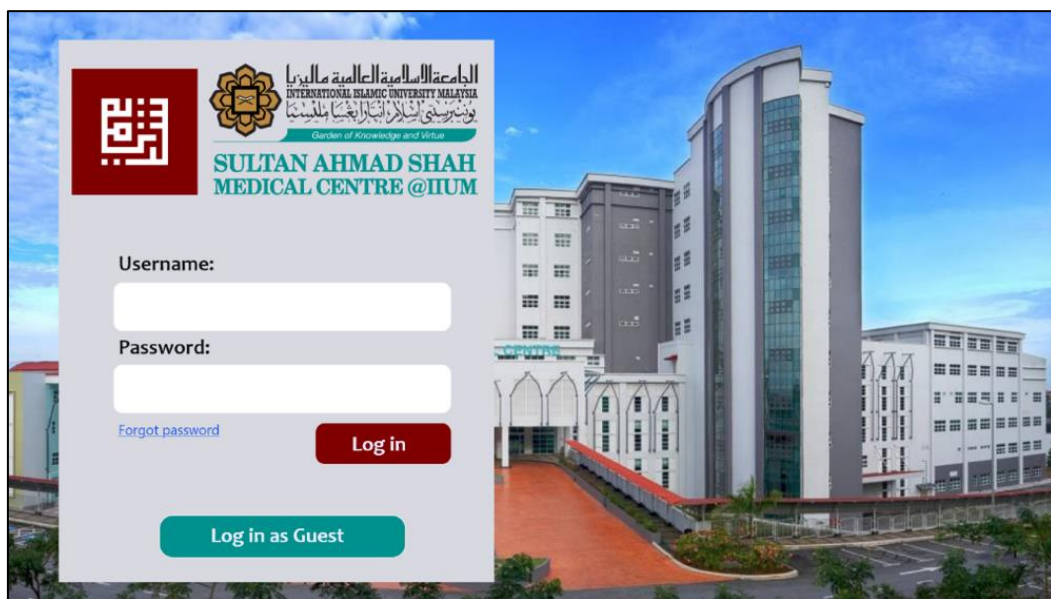


Figure 6. Authentication Page.

Figure 7 depicts the dashboard of all categories of users. This page will list the recent reports with their status and registration modules.

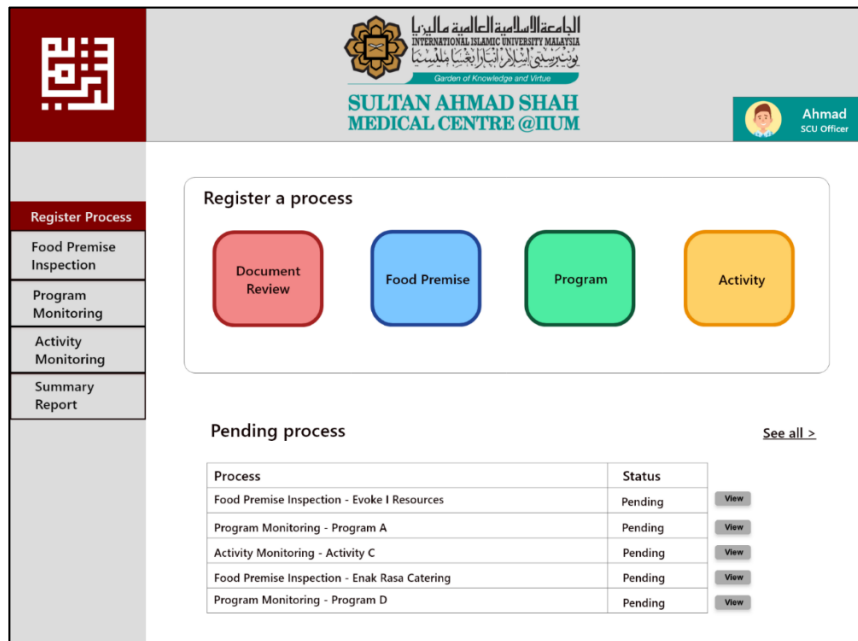


Figure 7. User Dashboard

The document review registration module is depicted in Figure 8. Through this module, the user can submit a document for review by Department of Shariah Compliance (DSC) officers.

Submission of Document for Review

Name:

Brief description:

Please upload your document below:

Drag or click
to choose your file

[Submit](#)

Figure 8. Document Review Module

Figure 9 illustrates the form for the food premise inspection module. The DSC officer may conduct the food premise inspection by providing the required information. This module is divided based on the food categories.



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**SULTAN AHMAD SHAH
MEDICAL CENTRE @IIUM**



Ahmad
SCU Officer



Register Process

Document Review

Food Premise Inspection

Program Monitoring

Activity Monitoring

Food Premise Inspection Evaluation

4. Food Handler
Yes
No

1. All food handler vaccinate with Typhoid injection

Remark:

☒
☐
2. All food handler are Muslim

Remark:

☐
☒
3. Friendly

Remark:

☒
☐
4. Helpful

Remark:

☒
☐
5. Clean Clothes

Remark:

☒
☐
6. Clean Nails

Remark:

☒
☐
7. Not have any open injuries

Remark:

☒
☐
8. Wearing suitable shoes

Remark:

☒
☐
9. Washing their hands before handle the foods

Remark:

☒
☐
10. Washing their hands after go to toilet

Remark:

☒
☐
11. No coughing / sneezing towards food

Remark:

☒
☐
12. Not touch the foods directly with their hands

Remark:

☒
☐
13. Cover their heads

Remark:

☒
☐
14. Others:

Remark:

☒
☐

4/9

Back
Next

Figure 9. Food Premise Inspection Module.

The referral form module is illustrated in Figure 10. Here, a doctor can provide the referral information for a patient's diagnosis and case type using this module.

Figure 10. Referral Module

Figure 11 shows the Shariah compliance activity for monitoring the inspection module. This module allows the DSC officers to evaluate the inspection checklist for the respective activities.

Figure 11. Activity Monitoring Module

The complaint form is presented in Figure 12. In the event that there are any non-compliance Shariah-related issues, anyone may file a complaint by using this complaint module.

Complaint Form

Personal Information

Name:

Contact No:

Clinic/Ward/Department/Unit:

Date:

Types of Complaint

☒ Improper attire / Dress code

☒ Inappropriate Socializing

☒ Improper Attitude

☒ Others:

Details

Save and Next

Figure 12. Complaint Module

The shariah compliance program monitoring module is depicted in Figure 13. The SLO prepares the report of the program monitoring inspection before, during, and after the program using this module.

Shariah Compliance Program Monitoring

Before Program

1. Organizing committee give a briefing about program to Representative from Department of Shariah Compliance?

Yes ☒ No ☐

Date:

Time:

Briefing given by:

2. Organizing Committee ask an advice from Representative from Department of Shariah Compliance regarding to the flow of the program?

Yes ☒ No ☐

Date:

Time:

Details of advice:

Next

Figure 13. Program Monitoring Module

Figure 14 displays a snippet from the module for the Shariah clinic form. The DSC officers shall provide information about Shariah-related matters as part of this module.



The screenshot shows the 'Shariah Clinic Form' interface. At the top, there is a header with the Sultan Ahmad Shah Medical Centre @ HUM logo and a user profile icon labeled 'Asim SCU'. The form itself has a title 'Shariah Clinic Form' and four main sections, each with a text input field: 'Issue' (with a sub-label 'Clinic issue reported'), 'Suggestions/Recommendations/Comments', 'Corrective Actions', and 'Next Follow-up'. A 'Save' button is located at the bottom right of the form area.

Figure 14. Shariah Clinic Report Module

Figure 15 depicts the terms and conditions form. This form will be used and signed by patients and doctors for consent purposes.



The screenshot shows the 'Terms and Conditions' form. The header is identical to Figure 14. The form contains fields for 'Name:', 'NRIC:', and 'Address:'. Below these is a consent statement: 'I hereby give my permission and consent: Dengan ini saya memberi izinkan dan bersetuju'. There are four checkboxes, all of which are checked: 1) 'Only necessary part of my Arah (privacy) is revealed during the treatment process.' (Hanya sebahagian sahaja maklumat peribadi saya akan terdedah semasa proses rawatan.); 2) 'Treatment is given by any health worker who is a different gender to me.' (Rawatan diberikan oleh petugas kesihatan yang berlainan jantina dengan saya.); 3) 'Permitting skin contact between me and doctor or any other health worker of different gender as needed in the diagnosis, care and treatment process.' (Bertujuan membolehkan sentuhan kulit antara saya dengan doktor atau mana-mana petugas kesihatan yang berlainan jantina dengan saya jika ia benar-benar diperlukan dalam proses rawatan.); 4) 'Clinical Training Students will be involved in the treatment process.' (Penglibatan pelajar latihan klinik semasa proses rawatan dijalankan.). At the bottom, there are two lines for 'Patient's signature' and 'Surgeon's signature', and a 'Save' button at the bottom right.

Figure 15. Terms and Conditions Module

5. Results and Discussion

Among the challenges in this project was understanding the domain and the Shariah-compliant part concerning the reporting requirements. This took most of the time during the early phases of the project and due to the COVID-19 issue, all the validations and progress were performed using online platforms. Nonetheless, when the stakeholders had a clearer idea of the solution, more insights and positive feedback were received.

One of the critical success factors in the adoption of any IT solution is the acceptance of the users. For this solution, awareness and training should be provided to all the potential users of the system so that the solution can be widely used, and the relevant information is properly and sufficiently recorded. Such cooperation from all levels of users is critical to exploiting the system's benefits, otherwise, the system's full potential could not be able to be achieved.

From the SASMEC@IIUM management's perspective, given the benefits of utilizing the solution, it is necessary to impose relevant regulations on all potential users. If the shariah-compliance reporting activities are automated, it is projected that a significant amount of work, time, and resources will be reduced.

6. Conclusion and Future Works

In summary, the automation of the manual processes covered in the 12 modules shall be used to facilitate the DSC at SASMEC@IIUM to reduce the relevant costs in implementing and monitoring the shariah-compliance procedures. This solution will serve as a preliminary strategy for the DSC in providing an effective shariah-compliance monitoring system. The SASMEC@IIUM is going through a digital transition in order to better control and monitor reporting processes related to Shariah compliance issues. The change will eventually increase community standards of living at SASMEC@IIUM while also enhancing the sustainability and efficiency of its operational processes. The potential future work of the present study can be summarized as:

6.1 Mobile application platform

The approach might also be used in a mobile application platform for future improvements. This makes the system easier to use and more accessible anytime and anywhere. However, a feasibility study is necessary to determine whether this platform is required and suitable in light of the types of activities (from the 12 modules or any future modules) and the difficulty of the corresponding tasks, as well as any other pertinent criteria. It is expected that not every task will be appropriate for use in a mobile application environment.

6.2 Potential use of design pattern

It is highly recommended that for future enhancements, the design should take into consideration potential future customizations. In the project scope, only 12 modules were covered. Nonetheless, some recurring patterns might be potentially relevant. If this is the case, it is recommended to adopt an existing design pattern for future improvements. This method makes it feasible to automate reporting that is not limited to the modules that are covered. Nonetheless, the developer team must comprehend all the relevant areas in order to analyze and propose a potential solution.

6.3. Comprehensive user evaluation

Following deployment, the evaluation step requires the participation of users from all user categories. The evaluation's suggestions for improvement could be incorporated into the

solution's subsequent iterations. Actions must be taken to address any problems after a thorough analysis of the feedback from all these users.

Acknowledgment

The authors would like to thank the sponsor SASMEC Research Grant SRG21-023-0023 who has provided the funding to financially sponsor and support our research entitled the “Development of Shariah Compliance Monitoring System for Implementation in Shariah Compliant Hospital Framework”.

Funding

As stated above, this research is funded by SASMEC Research Grant SRG21-023-0023.

Author Contribution

Normi Sham prepared the literature review and oversaw the article writing. Azlin, Madihah and Aminudin wrote the research methodology and performed fieldwork. Norzariyah and Mohd Khairul Azmi conducted the system development and validation.

Conflict of Interest

The authors have no conflicts of interest to declare.

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