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Research Article

# Conceptual Model of MIS for Integration of Halal and Green Practices in Clothing SMEs Based on SSM

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**Abstract:** Small and Medium Enterprises (SMEs) in the apparel sector in Indonesia are increasingly pressured to comply with both halal standards and green sustainability practices. However, most SMEs lack a management information system capable of integrating these two aspects in a unified manner. Therefore, a systemic approach is needed to design solutions that align with the complexity of the SME context. This study aims to develop a conceptual model of a management information system that integrates halal and green practices in apparel SMEs using Soft System Methodology (SSM). SSM is used as the primary approach to understand the problem situation, identify stakeholder perspectives, and build a conceptual model. This study produces a conceptual model of an integrated management information system consisting of modules for halal compliance, green performance, production, and managerial reporting. In addition, this study also provides practical implications for policymakers such as the Ministry of Industry and BPJPH who can utilize this model to build an integrated digital-based halal-green certification system; local governments can use it as a guide in SME development and digitalization programs; and educational and research institutions can use this model as a curriculum reference for integrating halal industry topics, sustainability, and digital transformation.

**Keywords:** Management Information System, Halal, Green, Apparel SMEs, Soft System Methodology.

## 1. Introduction

According to the Directorate General of Small, Medium, and Various Industries, in the Performance of Small and Medium Industries Report 2024, Small and Medium Industries (SMEs) are the backbone of the Indonesian economy, with a contribution of more than 60% to the national Gross Domestic Product (GDP) and absorbing around 97% of the workforce. The clothing sector is one of the dominant subsectors that has a strategic role in non-oil and gas exports and job provision at the local level. However, the increasing consumer awareness of products that are ethical, sustainable, and by sharia principles encourages clothing SMEs to adapt to the demands of halal certification and the implementation of green practices in the production process.

Government policy through Law Number 33 of 2014 concerning Halal Product Guarantee (JPH) and Minister of Environment Regulation Number 13 of 2021 concerning Industrial Waste Management emphasize the importance of implementing a management system that guarantees compliance with halal aspects and environmental sustainability. On the other hand, the emergence of green economy and halal value chain trends at the global level makes the integration of these two principles a strategic opportunity to increase the competitiveness of Indonesian SMEs in the international market.

However, most clothing SMEs face great challenges in implementing halal and green systems simultaneously. According to the Ministry of Religion of the Republic of Indonesia, in the Halal Certification Statistics Report of the Small and Medium Industry Sector, only around 18% of SMEs in the clothing sector already have a halal certificate, while the implementation of the ISO 14001 environmental standard is still very limited to the medium to upper scale. Limited capital, lack of

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technical understanding, and low level of digitalization are the main inhibiting factors. The production process, from recording raw materials to halal and environmental audit documentation, is mostly still done manually. As a result, the audit process becomes slow, the potential for non-conformity increases, and the halal-green market opportunities have not been optimally used.

This condition shows that there is an urgent need for a system that can integrate the management, control, and tracking functions of the halal-green process digitally. Management Information System (MIS) has the potential to be a strategic solution in supporting decision-making, operational efficiency, and monitoring sustainability performance at the SME level. However, earlier studies still focus on the development of halal systems or green systems separately. The study of the integration of the two aspects in one contextual managerial platform for clothing SMEs is limited.

In terms of method, many earlier studies use technical approaches such as system development life cycle (SDLC), design thinking, or information system design method (ISDM) to build information systems. This approach tends to focus on technical aspects and does not describe the social, cultural, and regulatory complexities inherent in halal and green practices in the SME environment. In the context of designing a system that involves various stakeholders (business owners, halal auditors, environmental regulators, and consumers), a systemic and participatory approach is needed.

Soft Systems Methodology (SSM) is one of the relevant approaches to understand and model these complex situations. SSM emphasizes the systemic learning process through problem mapping, actor perspective identification, root definition preparation, and conceptual model development that is conceptual but operational. With SSM, information system design not only focuses on technological aspects, but also pays attention to social, regulatory, and underlying values, such as halal and environmental sustainability.

Based on the description above, this research was conducted to answer the main question, namely "how to design an integrated conceptual model of halal and green practices in clothing SMEs using information system management based on soft system methodology?". The purpose of this research is to identify the needs, problems, and actors involved in the halal and green system in clothing SMEs; develop a conceptual model of halal-green integrated Management Information System (MIS) with the SSM approach; and compile system design recommendations that are adaptive to the context and capacity of clothing SMEs.

This research produces two main contributions. First, a theoretical contribution in the form of the development of a conceptual model that expands the implementation of SSM in the context of the integration of halal and green systems in the small manufacturing sector. Second, a practical contribution, which is to provide the basis for the design of an information system that can be implemented to increase compliance, efficiency, and competitiveness of clothing SMEs in the era of sustainable industry.

## 2. Research and Methodology

### 2.1 Library review and state of the art

#### 2.1.1. Management information system (MIS) in the context of SMEs

The fourth industrial revolution (industrial revolution 4.0) brought fundamental changes to many aspects in global life, characterized by the increasing development of creativity and innovation using information technology, disrupting various aspects of global life, including competition in the economic [1]. This rapid change is a challenge for businesses, both in large corporations and SMEs. The transition to Industry 4.0 requires a strategy and organizational model, as it needs significant changes around the entire organization in terms of physical infrastructure, manufacturing processes, and technology, as well as human resources and process management [1]. An information system is a set of

interconnected components that integrate the collection, processing, storage, and distribution of data, information, and digital products to support decision-making, coordination, control, analysis, and visualization in an organization [2]. In the context of Small and Medium Industries (SMEs), MIS plays a key role in increasing efficiency, transparency, and competitiveness through the digitization of business processes.

### 2.1.2. Halal practice in management and production systems

In research done by [3], there are several important aspects that must be considered to ensure the halal status of a products or service. Some of the element involved in the halal supply chain include: halal raw materials; clear assets (halal sources); halal factory, equipment, and production process; halal certification; halal storage and distribution; labeling and information. Currently there are few textile and clothing products that have been certified halal. Whereas textile and clothing products have enormous potential to develop their business in supporting the strengthening of the value chain in the halal industry [4]. Thus, the development of a management information system that accommodates halal data traceability and halal compliance monitoring is an important need for clothing SMEs [5]. Therefore, to bridge the principle of halal and supply chain management, an integrated information system is needed to ensure that the supply chain process is following Islamic sharia. This information system must support halal traceability, especially in the audit and reporting process.

### 2.1.3. Green practice and sustainability on the clothing industry

Textile, apparel, and fashion (TAF) industries contribute significantly to global environmental pollution at every point of the supply chain. Clothing manufacturing and transportation produce a large volume of waste and high greenhouse gas emissions, often taking advantage of cheap labor in developing countries [6]. This is due to the growth of “fast fashion,” which implies that the current textile and apparel industries are not sustainable [7]. The concept of integrating environmental thinking into supply chain management is called green supply chain management (GSCM) [8], [9]. The main targets of clean manufacturing and GSCM practice are to reduce emissions of environmentally deteriorating gases, chemicals, and solid waste throughout the supply chain during raw material collection, product design, manufacturing processes, and delivery of final products to improve environmental performance [7].

In Indonesia, the textile and clothing industry plays a key role in the national economy, but also contributes significantly to water pollution and solid waste. Besides that, based on the study [10] The textile and apparel industry in Indonesia faces challenges in moving up the value-added chain as it strives to fulfill demand from overseas customers and international brands and retailers while providing quality products that are produced in environmentally and socially sustainable ways. At the same time, customers are pushing for lower prices, forcing manufacturers to increase productivity and reduce production costs.

The dominant linear economic model of production, consumption, and disposal has proven to be unsustainable [11]. Therefore, the importance of the role of the local government in providing incentives and supporting regulations so that industrial players are encouraged to transform into a sustainable production system [11]. The concept of green manufacturing and eco-efficiency is the main approach in suppressing the impact through resource optimization, waste reduction, and the implementation of a cleaner production system. In the context of clothing SMEs, an effective MIS not only supports the management of production data, raw material stock, and distribution, but also needs to be able to integrate halal compliance functions and green performance management to be able to answer consumer demands and regulations.

### 2.1.4. Soft systems methodology (SSM) in management system engineering

Soft Systems Methodology (SSM), introduced by Checkland in 1981, is a systemic approach used to understand and fix complex problem situations (ill-structured problems). SSM not only focuses on technical solutions, but also considers the social context, values, and beliefs of the stakeholders involved. SSM is a structured approach to information system development that is used to understand the problem thoroughly, design conceptual models, assess the feasibility and desired changes, and then implement them into reality [12]. The stages of SSM include: (1) identification of problem situations, (2) exploration of real situations, (3) formulation of root definition using CATWOE, (4) construction of conceptual activity models, (5) comparison of models with the real world, (6) identification of desired changes, and (7) improvement actions.

Research by [13] there are several other reasons why the SSM method is used and considered appropriate in building an information system, the following is a reason that is quite reasonable: (1) systemic thinking, supported by the recognition of the characteristics that appear in the system and activities carried out jointly in monitoring and controlling, (2) in the social and organizational aspects of the development of information systems, it is recognized in the form of a cultural flow of analysis, which is constantly examined and updated, (3) the technical process needed to develop the system can be represented by logic streaming analysis, although not by the original process, (4) offering an in-built learning process, (5) it is assumed that there is a participation of all stakeholders.

In the context of this research, SSM was chosen because of its ability to integrate the dimensions of technology (information system), religious values (halal), and environmental values (green) in one participatory and adaptive conceptual framework.

### 2.1.5. State of the art and gap research

The following table presents a concise map of the results of previous research studies that are relevant to the topic of halal, green, and management information system integration in the SMEs sector.

**Table 1.** State of the art and gap research

| No. | Researchers & Years | Research Focus |
|---|---|---|
| 1 | Jefi et al. (2022) | The study was conducted in the fast food industry. The study revealed that 77% of respondents stated the need for a comprehensive halal tracking system capable of providing information about the halal status of a product from start to finish. The findings of this study include 12 functional requirements and 7 non-functional requirements, a use case diagram was developed, and a system user interface was created as a visualization of the customer voice identified from this study. This study only focuses on the halal system and does not cover green practices. |
| 2 | Mishra et al. (2019) | This study examines the impact of adopting green practices in SMEs on their corporate and environmental performance. The findings of this study are that the implementation of green practices impacts SMEs' corporate performance, such as cost savings, increased efficiency, attracting new suppliers and customers, and improving brand reputation. Meanwhile, environmental impacts, such as environmentally friendly product design, imply effective material use and waste reduction. Waste reduction can lower costs for organizations, and better material use can have a positive impact on performance, while environmentally designed products can also improve brand image. This study only focuses on the green practices |

| No. | Researchers & Years | Research Focus |
|---|---|---|
| | | and does not cover halal system. |
| 3 | Jannah, S. and Wijayanti, D. (2025) | This study examines the impact of implementing ten aspects related to the halal supply chain on its effectiveness, particularly in increasing demand across economic, social, and environmental dimensions for MSMEs. The results show that six aspects of halal supply chain management contribute significantly to upholding halal integrity, increasing customer satisfaction and branding, and improving process quality. Furthermore, higher implementation of these aspects is directly related to improved sustainable performance of MSMEs. This study provides insight that MSMEs still need guidance in implementing Halal Supply Chain Management. |
| 4 | Fei – Fei Ye et al. (2023) | This study focused solely on the impact of implementing ten aspects of the halal supply chain, and it was demonstrated that these aspects can drive the implementation of halal supply chain management. However, the study's findings did not address the impact of implementation on environmental sustainability. |
| 5 | Nyapom and Padi (2025) | This study identifies key barriers to digital implementation in SMEs. The findings highlight the need for a holistic approach integrating technical, organizational, and cultural aspects to address these barriers. The study focuses solely on digital transformation in SMEs and does not address integration with halal systems or green practices. |
| 6 | This research | Based on the explanation of previous research above, it can be seen that there is still a lack of research focusing on the integration of halal and green, particularly in clothing SMEs in Indonesia. Currently, more research focuses on one aspect, either the implementation of the halal system alone or the implementation of green practices. Therefore, this study aims to produce a conceptual model of halal and green integration by utilizing a management information system based on the soft system methodology. |

From the study above, integrative research that combines halal and green aspects in one management information system for clothing SMEs has not been done much. In addition, the implementation of SSM in this context is limited to the general conceptual level and has not been developed specifically to support the halal-green management system.

This research is here to fill the gap through the development of a halal-green integrated management information system conceptual model using the soft systems method as a holistic and participatory system design approach.

### 2.2 Methodology – conceptual framework and initial model of halal–green integrated MIS

#### 2.1.1. Basic conceptual system integration

The integration between the halal system and the green system in the context of the Small and Medium Industry (SMEs) clothing is an effort to realize ethical, sustainable, and competitive production practices. This concept combines the principles of sharia compliance (halal assurance) and environmental sustainability (green compliance) into one management information system that supports the strategic decision-making process. MIS integrated halal-green functions as a data and knowledge management platform that supports the main activities of SMEs, including halal-green production planning, choice and supervision of raw materials, process monitoring and production

waste, audit and compliance certification, and reporting and managerial decision making. This integration is in line with the triple bottom line (TBL) approach, which emphasizes the balance between profit, people, and the planet, with an added dimension of faith in a halal context rooted in Islamic ethical values.

### 2.1.2. Halal and green dimension in MIS

To develop an integrative conceptual model, this study defines two main dimensions and one supporting dimension, namely, the halal dimension, the green dimension, and the supporting dimension. Halal dimension consists of traceability of halal materials, which is the system's ability to trace the origin of raw materials, halal status, and storage process. Halal process compliance is used to integrate production processes to follow the Halal Assurance System (HAS 23000). The last one is halal documentation management as digital management of halal certification, audit, and report documents.

Furthermore, the green dimension consists of resource efficiency, which is the efficiency of using energy, water, and chemicals in production. Waste and emission monitoring involves the recording and analysis of solid, liquid, and gas waste. The last one is an environmental performance report, reporting of environmental performance indicators (EPIs) based on real-time data.

The last is a supporting dimension that consists of a decision support system (DSS), which is useful for data-driven analysis to support halal and green decisions. Integration platform as a module that connects halal and green with SMEs' operational systems (production, logistics, finance). The last one is the user interface and access control for ensuring ease of use and data security by different actors.

### 2.1.3. Components and inter-subsystem relationships

The conceptual framework of MIS halal-green is built from the interaction of three interconnected systemic layers, namely, the input layer, the process layer, and the output layer. The input layer includes raw material data, production process, resource usage, and certification data. Process layer consists of the main modules, namely, halal management module, green management module, and information integration module (inter-module hub). Furthermore, the output layer consists of reports, decision recommendations, performance indicators, and compliance dashboards that can be accessed by business owners, halal auditors, and environmental regulators. This MIS functions as an interactive and adaptive system, able to accommodate feedback (feedback loop) from audit and evaluation results, so that process improvements can be carried out continuously.

### 2.1.4. Conceptual relationships between components

Conceptually, this system consists of production operational data, halal module, green module, information integration module, and decision support system (DSS). Production operational data is collected through an input system for raw materials, labor, and production processes. Halal Module to assess the conformity of materials and processes to halal standards (HAS 23000, MUI). Green Module for measuring environmental impact (emissions, waste, energy). Information integration module to process data from both modules to generate integrated reports. Decision support systems (DSS) to provide data-driven analysis and recommendations for strategic decisions (e.g., material substitution, energy optimization, or halal-green certification). The results of DSS become the basis for managerial evaluation and operational policies of SMEs, which are then fed back to the system as part of the continuous improvement cycle.

### 2.1.5. Halal – green MIS conceptual model (visual description)

The conceptual model of the halal-green integrated management information system can be visualized as a three-layer framework, namely:

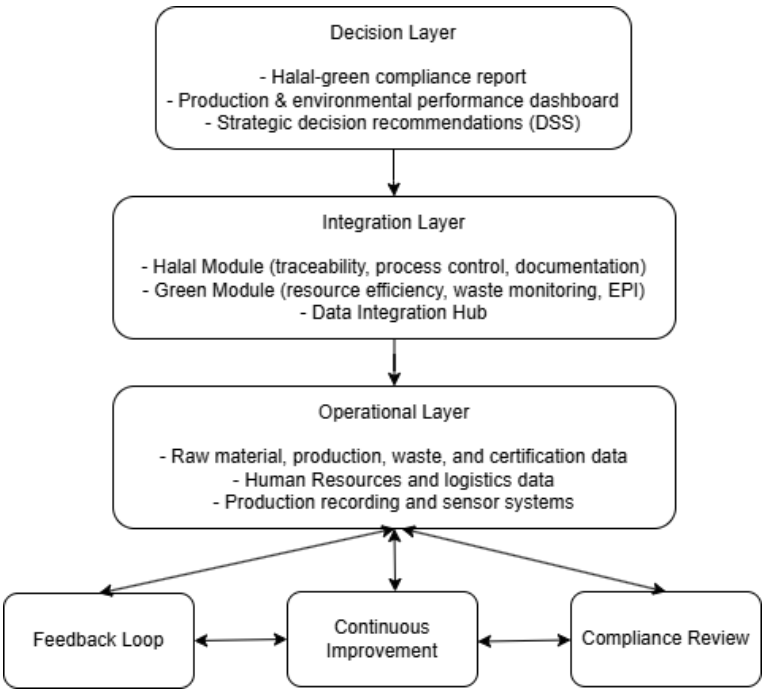


**Figure 1.** Conceptual model of the halal-green integrated management information system

The model describes how data from clothing SMEs operations is processed in two main modules (halal and green), then integrated to produce insights and data-based decisions.

### 2.1.6. System design direction based on the SSM approach

This conceptual framework will be the basis for the next stage using soft systems methodology (SSM), namely identifying the problematic situation of SMEs (real world), analysis of actors and system objectives (CATWOE), preparation of root definition of halal-green system, development of activity-based conceptual models, comparison with real situations to determine the desired change. With this approach, system design not only produces a technical conceptual model but is also adaptive to the social, cultural, and regulatory realities of clothing SMEs in Indonesia.

## 2.3 System design direction based on the SSM approach

Soft Systems Methodology (SSM) is a systemic approach to understand and improve complex situations (ill-structured problems) involving many actors, values, and perspectives. In the context of this research, SSM is used to design a management information system (MIS) that integrates halal and green practices in clothing SMEs in Indonesia. This approach is used because SSM emphasizes the shared learning process between designers, stakeholders, and system users, so that the design results are not only technical but also contextual and adaptive to social and regulatory conditions. The process of developing a conceptual model for halal-green integration based on the SSM stage can be seen in Figure 2 below.

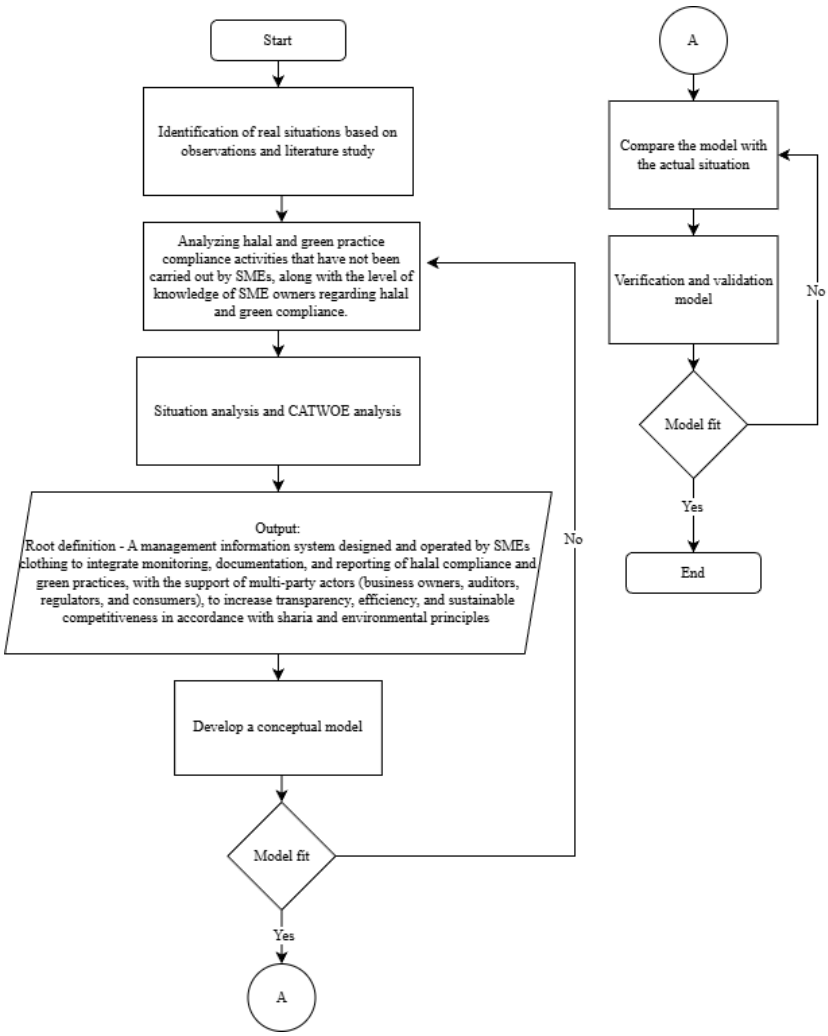


**Figure 2.** Flowchart of conceptual model development based on SSM

### 2.3.1. Stage 1 - problematic situation identification

The initial stage of SSM aims to understand the real context of clothing SMEs that face the complexity in the implementation of halal and green principles. Based on observation and literature study, the problematic situation includes most SMEs do not yet have a digital recording system for raw materials and production processes, halal audit and environmental audit are carried out separately, causing data duplication and high costs, SMEs owners have a high awareness of halal values, but do not understand the aspects of environmental sustainability, there is no integrated information system available to support double compliance (halal–green) reporting, and regulation and certification are top-down, while the capacity of SMEs is limited in terms of technology and human resources. This condition creates a "messy situation" that requires a systemic approach so that all socio-technical aspects can be managed in an integrated manner.

### 2.3.2. Stage 2 - real situation analysis

Situation analysis is carried out through the identification of stakeholders, main activities, and information flow. The parties involved in the context of clothing SMEs can be seen in Table 2 below.

**Table 2.** The parties involved in the context of clothing SMEs

| Actors | Roles in System | Information Needs |
|---|---|---|
| Owner/SMEs management | Key decision makers | Data production, report on halal and green practices |
| Halal auditors (BPJPH/MUI) | Process and raw material verifications | Digital halal audit documentation |
| Environmental regulator (DLH) | Waste and emission monitoring | EPI & waste reporting data |
| Consumer | End users of halal–green products | Label and transparency information |
| Supplier | Material supplier | Halal certificate and material data |
| Production operators | Process implementer | Halal – green procedure guide |

This analysis shows that the system to be designed must allow the exchange of information across actors efficiently, verify, and sustainably.

### 2.3.3. Stage 3 - CATWOE analysis

SSM uses CATWOE analysis to compile the root definition of the system, which is an explicit statement about the purpose of the system from various perspectives.

**Table 3.** CATWOE elements

| CATWOE Elements | Description in Research Context |
|---|---|
| C – Customer (impact recipients) | Clothing SMEs, halal auditor, environmental regulator, and end customer. |
| A – Actors (system performer) | SMEs owner, production staff, and information system developer. |
| T – Transformation process | Transformation from a manual system to a halal–green integrated digital information system. |
| W – Weltanschaung (worldview) | An information system that combines religious values (halal) and environmental sustainability (green) will increase the competitiveness and ethical responsibility of the industry |
| O – Owner (system owner) | SME owners and small industry development institutions (Ministry of Industry). |
| E – Environmental Constraints | Halal and environmental regulations, technological limitations, HR readiness, and implementation costs. |

### 2.3.4. Stage 4 - root definition

Based on CATWOE analysis, the following root definition is obtained "A management information system designed and operated by SMEs clothing to integrate monitoring, documentation, and reporting of halal compliance and green practices, with the support of multi-party actors (business owners, auditors, regulators, and consumers), to increase transparency, efficiency, and sustainable competitiveness in accordance with sharia and environmental principles". This root definition emphasizes that the system is not only a technological device, but also a platform for learning and collaboration between actors.

### 2.3.5. Stage 5 – conceptual activity model

Based on the root definition, the conceptual activity model describes the relationship between the main processes that form the halal-green system. This model consists of six core activities that are interconnected in one systemic cycle, namely the identification of halal-green materials and processes in the form of collecting data on raw materials, suppliers, and production processes. Compliance evaluation and internal audit to evaluate data against halal standards and green indicators. Data integration and system validation for connecting halal and green data in one database. Compliance reporting and performance indicators for presenting reports and dashboards for management and auditors. Feedback and Continuous Improvement to implement audit and analysis results for process improvement. Coordination and involvement of stakeholders to ease interaction and communication through digital systems. A diagram of the relationship between components (in text form) can be seen in Figure 2. This model shows that the system has a feedback loop for continuous learning and improvement.

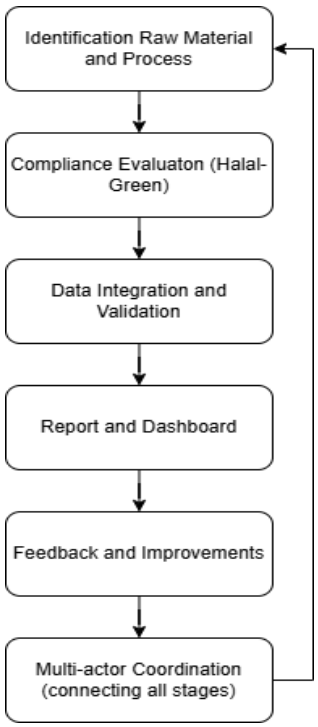


**Figure 2.** Diagram of the relationship between components

### 2.3.6. Stage 6 - comparison of model and real world

The conceptual model was then compared with the real condition of SMEs' clothes. The results of the analysis show that the main difference lies in the availability of a digital system for integrated reporting, the lack of integration between halal auditors and environmental regulators, and the limitations of human resource training in digital system operation. For that, the proposed changes include development of a cloud-based halal-green integrated digital platform; implementation of technical training for SME operators and owners; preparation of joint operational guidelines for halal-green audit; government incentives for SMEs that implement an integrative system.

### 2.3.7. Stage 7 - implementation plan and desired changes

The expected changes from the implementation of this system design are a transformation from manual process to digital information system, constructive interaction between halal institutions, the environment, and industry, improvement of operational efficiency, transparency, and product added

value, and increased SMEs compliance with national and global regulations. The implementation of this system is designed in stages: system design and testing stage (pilot project), limited adoption stage, and the stage of wide dissemination with the support of public policy.

#### 2.3.8. System design results based on SSM

Based on the seven stages of SSM, the resulting halal-green management information system design reflects social and technical integration as seen in Table 4.

**Table 4.** Design characteristic

| Aspect | Design Characteristics |
|---|---|
| Approach | Participatory, systemic, learning-based |
| Focus | Halal and green integration in one platform |
| Main function | Monitoring, reporting, decision making |
| Technology base | Digital, cloud-based, multiuser |
| Expected impact | Increased compliance, efficiency, and competitiveness of SMEs |

## 3. Results and Discussion

### 3.1 Halal – green management information system design results

Based on the seven stages of Soft Systems Methodology (SSM), a management information system (MIS) design was obtained that integrated the aspects of halal assurance and green compliance in one digital framework. This system is designed to ease the collection, processing, and reporting of halal-green data simultaneously and in real-time at the clothing SMEs level. The result of the system design includes three main components, namely the halal management module, the green management module, the integration module, and decision support.

The halal management module functions to ensure the halal of raw materials and production processes. Key features from the halal management module are halal material tracking, supplier verification, digital halal documentation, and audit readiness. The output data in the form of a halal compliance report can be accessed by BPJPH or MUI auditors.

The green management module functions to manage and monitor environmental aspects of the production process. Key features from the green management module are resource efficiency tracking, waste and emission logging, the EPI dashboard, and environmental performance analysis. The output data in the form of an environmental performance report is used by environmental regulators (DLH or Ministry of Industry).

The integration module & decision support functions as a link between halal and green modules. Key features from the integration module & decision support are data integration engine, cross-compliance analytics, and decision support system (DSS). Providing recommendation reports based on halal-green combined indicators to support SMEs' managerial decisions. These three modules are interconnected in one cloud platform-based system architecture, so that they can be accessed by various stakeholders (SMEs, auditors, regulators, consumers).

Based on the explanation above, this soft system methodology-based management information system design can be implemented by SMEs using a cloud system that is inexpensive and offers large data storage capacity. Research by [14] shows that the cloud-based MIS successfully streamlines key management processes such as inventory tracking, financial management, and customer relationship management. Besides that, users reported increased operational efficiency, easier data access, and better decision-making capabilities. The study concludes that cloud computing-based MIS can significantly improve the management processes of SMEs, contributing

to their growth and sustainability. Research analysis by [15] shows that adopting cloud-based MIS resulted in a 40% increase in operational efficiency and a 35% reduction in operational costs, both statistically significant. Integrating cloud-based MIS significantly enhances operational efficiency, reduces cost, and boosts competitive advantage for SMEs. However, addressing data security and integration challenges is essential for maximizing these benefits.

### 3.2 System conceptual architecture

Conceptually, system architecture can be described as shown in Figure 3 below.

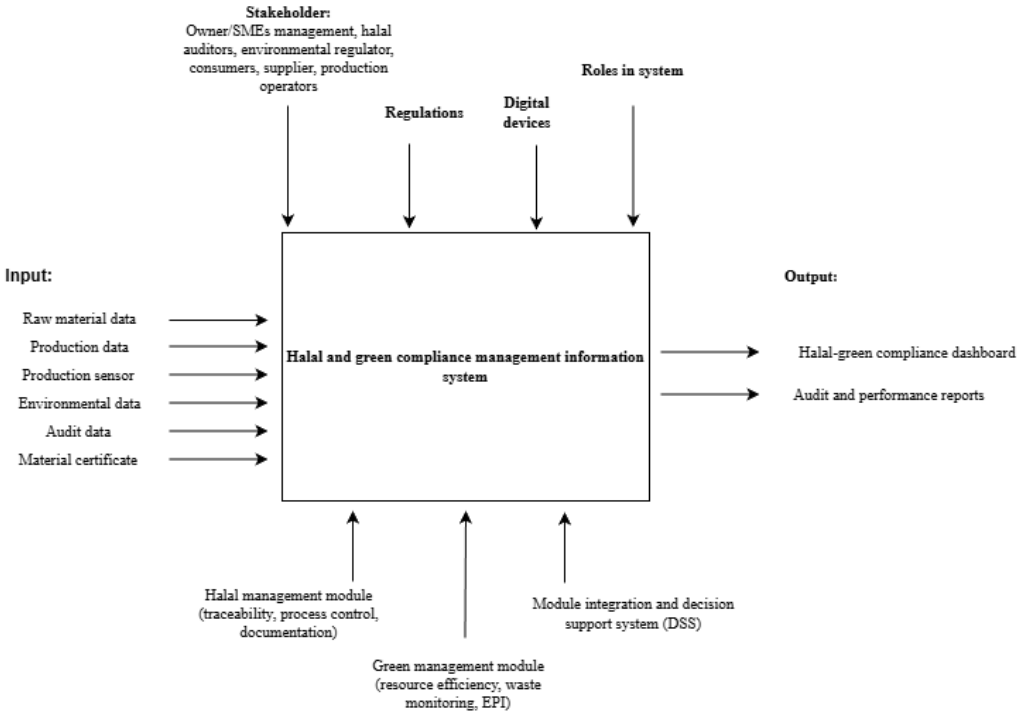


**Figure 3.** Halal-green integrated MIS conceptual architecture model

The information flow moves from the input layer (SMEs operational data) to the process layer that performs halal and green analysis in parallel, then is integrated to produce comprehensive reports and strategic recommendations. This architecture enables data-driven decision-making and strengthens the constructive interaction between religious, economic, and environmental dimensions.

### 3.3 System process and actor interaction

The results of system activity modeling show that there are six main processes that take place cyclically, as shown in Figure 4 below.

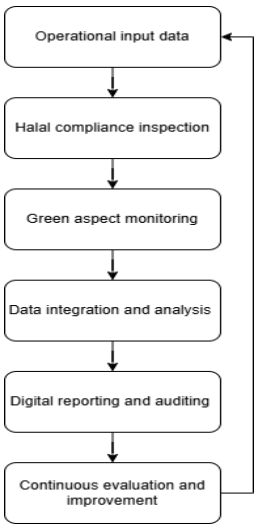


**Figure 4.** The operational process cycle of the halal-green system based on SSM.

Interaction between actors (SMEs owners, halal auditors, environmental regulators, and consumers) occurs at every stage, eased by a multi-user interface-based system. Digital audit results are automatically updated and become the basis for continuous improvement (continuous improvement).

### 3.4 Theoretical discussion analysis

From the theoretical side, this model expands the application of soft systems methodology (SSM) in the context of value-oriented management information systems. Some important findings are SSM as an integrative approach. This method can accommodate technical (data, information system) and social (halal values, environmental awareness) dimensions simultaneously. Constructive interaction between halal and green that integration of the two concepts creates a new management system based on ethical compliance - combining religious principles and sustainability. Contextualization of SMEs is considered in the design of this model, considering the limitations of technological capacity, human resources, and costs of SMEs, so that it is more realistic to implement. Thus, the SSM approach not only produces a conceptual model, but also a systemic thinking framework to understand the relationship between actors and the dynamics of change in the SMEs sector.

Most SMEs face limitations in preparing the infrastructure to implement a management information system, particularly due to the high costs of having an integrated system. However, SMEs can now utilize cloud-based management information systems, which can reduce the cost of information system infrastructure without reducing the usefulness of the information system itself. Furthermore, cloud-based MIS facilitates the integration of advanced technologies such as Artificial Intelligence (AI) and Big Data analytics, empowering SMEs to harness data-driven insights for strategic planning and personalized customer experiences. These capabilities not only improve operational performance but also enhance customer satisfaction and loyalty [15].

### 3.5 Practical discussion analysis

Practically, the implementation of this system has several important implications for SMEs clothing, for regulators (BPJPH and DLH), for consumers and society, and for academics and researchers. Besides that, this system can strengthen product credibility in the local and global markets. For regulators (BPJPH and DLH), this system can provide access to compliance data in real-time and accelerate the integrated certification and monitoring process. For consumers and society, this system can provide a guarantee of halal and product sustainability transparently and

encourage the increase of ethical consumption literacy. For the academics and researchers, this system can provide a new conceptual basis in the integration of information systems with ethical and sustainability values and can be developed into a cloud-based prototype system for field trials.

Based on research [16] In the halal industry sector, real challenges are found in implementing information technology, namely, resistance to the adoption of digital technology and infrastructure limitations. These issues underscore the urgent need for regulatory harmonization by the government, increased investment in infrastructure and digital literacy by industry stakeholders, and enhanced academic engagement in Shariah-compliant digitalization research. Therefore, digital transformation in Indonesia's halal industry must be systematically designed, supported by inclusive policy frameworks, and strengthened through multisectoral collaboration [16].

### 3.6 Initial evaluation and validation

This model has been conceptually validated through evaluation of the suitability of the system structure to the SSM stage; comparison with the best practices of the halal system (HAS 23000) and the environmental system (ISO 14001); test conceptual rationality through consultation with halal and green manufacturing industry experts (literature study and short interviews). The validation results show that the model has met the conceptual feasibility criteria to be implemented in clothing SMEs, with the potential to expand to other sectors such as halal food and cosmetics.

## 4. Conclusion and recommendations

### 4.1 Conclusion

This research produces a conceptual model of the halal-green integrated Management Information System (MIS) for Small and Medium Industries (SMEs) clothing in Indonesia using the Soft Systems Methodology (SSM) approach. This model is designed to address the complexity of socio-technical problems faced by SMEs in fulfilling the demands of halal compliance and environmental sustainability simultaneously. Thus, the SSM-based halal-green management information system can be a systemic solution to increase competitiveness, sustainability, and consumer confidence in Indonesian clothing SMEs' products in the global market.

### 4.2 Advanced research recommendation

Based on the results and limitations of this research, there are several directions of future development namely, system implementation test (prototype testing) as the next stage needs to be done through the development of a web/cloud platform - based prototype system to be tested on several SMEs pilots; integration with national and international standards so the system can be expanded to support direct integration with BPJPH, Ministry of Industry, and ISO 14001 databases to facilitate integrated certification and audit; artificial intelligence based analytical module development as further research can develop a machine learning module for the prediction of halal - green compliance as well as early detection of the risk of violations; a sustainable participatory approach is needed for a sustainable participatory mechanism between SMEs, academics, and regulators to ensure the system remains relevant to industry dynamics and national policies; replication to other sectors that this model can be adapted for other halal - green industries such as food, cosmetics, or pharmaceuticals, to expand the impact of MIS implementation based on ethical values and sustainability.

### 4.3 Policy implications

This research also provides strategic implications for policy makers such as the Ministry of Industry and BPJPH can utilize this model to build a digital-based integrated halal-green certification system; local governments can use it as a guide in the SMEs development and digitization program; educational and research institutions can use this model as a curriculum reference for the integration of halal industry topics, sustainability, and digital transformation.

### 4.4 Research limitations

This research is still conceptual and does not involve full field implementation. Therefore, the results presented focus on system design and conceptual validation. Further testing is needed to measure the effectiveness, efficiency, and user acceptance in the real context of SMEs.

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## 5. References

[1] K. K. Rafiah, S. Widianto, I. Kamal, A. Shofiana, A. M. Fajar, and A. A. Rudini, “Digital readiness of SMEs: An Insight from Indonesia,” AFEBI Management and Business Review, vol. 7, no. 1, p. 12, Jun. 2022, https://doi.org/10.47312/ambr.v7i01.517.

[2] Dr. Mahesh. S. Rasinghani, *Foundations of Information systems*. OpenStax, Rice University, [Kendall Hunt], 2025.

[3] H. Hasanah, D. Hardianti Rukmana, M. Ali Syaifudin Zuhri, U. Cahya Ningrum, and K. Haji Achmad Siddiq, “Halal Supply Chain Integration, Sustainability, Environmental Ethics, and Maqashid Syariah in The Halal Industry,” Journal of Islamic Economic and Business, vol. 7, no. 3, p. 2025, https://doi.org/10.24256/kharaj.v7i3.7758.

[4] G. R. Wardiani, “Design of Halal Traceability System Model for Rectangular Veil Products at PT. X and PT. Y,” *Sainteks: Jurnal Sain dan Teknik*, vol. 6, no. 2, pp. 172–187, Sep. 2024, https://doi.org/10.37577/sainteks.v6i02.826.

[5] I. P. Tama, C. F. M. Tantrika, D. Hardiningtyas, and E. Mohamad, “Review of Industry 4.0 Strategy and Organization Readiness Level of Automotive SMEs in Indonesia,” *Asia Pacific Management and Business Application*, vol. 009, no. 03, pp. 313–324, Apr. 2021, https://doi.10.21776/ub.apmba.2021.009.03.9.

[6] S. Abbate, P. Centobelli, R. Cerchione, S. P. Nadeem, and E. Riccio, “Sustainability trends and gaps in the textile, apparel and fashion industries,” Feb. 01, 2024, Springer Science and Business Media B.V. https://doi.10.1007/s10668-022-02887-2.

[7] S. Akter *et al.*, “Clean Manufacturing and Green Practices in the Apparel Supply Chain,” Open Journal of Business and Management, vol. 08, no. 01, pp. 104–113, 2020, https://doi.org/10.4236/ojbm.2020.81007.

[8] S.-Y. Lee, “The effects of green supply chain management on the supplier’s performance through social capital accumulation,” Supply Chain Management: An International Journal, vol. 20, no. 1, pp. 42–55, Jan. 2015, https://doi.org/10.1108/SCM-01-2014-0009.

[9] M. A. Dzikriansyah, I. Masudin, F. Zulfikarijah, M. Jihadi, and R. D. Jatmiko, “The role of green supply chain management practices on environmental performance: A case of Indonesian small and medium enterprises,” Cleaner Logistics and Supply Chain, vol. 6, Mar. 2023, https://doi.org/10.1016/j.clscn.2023.100100.

[10] E. Weinthal, “Developing Competitive Sustainable Manufacturing in the Indonesian Textile Industry Titi Susanti.”

[11] M. A. Ghiffari, R. Christian Sondakh, and M. Pambudi Nurwantara, “Implementation of Circular Economy Model in Textile Industry in Purwakarta: Innovative Strategy Towards Sustainable Production”, *Jou. of Agri. and Loc. Wisd*, vol. 8, no. 1, pp. 1–7, Jan. 2025, https://doi.org/10.22437/jalow.v8i1.44072.

[12] A. Alfathsyah, N. Nurhasanah, S. W. Zakaria, and W. Tripiawan, “Model Konseptual Perancangan Fasilitas Industri Konveksi Pakaian dengan Soft System Methodology,” Jurnal Al-Azhar Indonesia Seri Sains Dan Teknologi, vol. 9, no. 2, p. 215, May 2024, doi: 10.36722/sst.v9i2.2879. http://dx.doi.org/10.36722/sst.v9i2.2879.

[13] T. D. Septiana dan R. Maulany, “Pengembangan Manajemen Data Dan Informasi Menggunakan Analisis Soft System Methodology Di Universitas Advent Indonesia”, *TeIKa*, vol. 11, no. 1, hlm. 1-13, Apr. 2021, https://doi.org/10.36342/teika.v11i1.2473.

[14] A. Villanueva, C. Fernandez, and Z. Li, “Development of a Cloud Computing Based Management Information System for MSMEs Article Info,” *Journal of Loomingulisus ja Innovatsioon*, vol. 2, no. 2, pp. 90–100, 2025, https://doi.org/10.70177/innovatsioon.vxix.xxx.

[15] Rahman, S., & Hossain, M. Z. “Cloud-Based Management Information Systems Opportunities and Challenges for Small and Medium Enterprises (SMEs)”. Pac J Bus Innov Strateg, 1(1), 28-37, 2024, https://doi.org/10.70818/pjbis.2024.v01i01.014.

[16] A. D. Suganda, Euis Amalia, Muhammad Maksum, and Nur Rohim, “Digital Transformation in Indonesian Halal Industrial Zones,” Journal of Islamic Economics and Finance Studies, vol. 6, no. 1, pp. 187–204, Jun. 2025, https://doi.org/10.47700/jiefes.v6i1.10834.

[17] Jefi, I., Pratami, P., Sukarno, I. “Analysis of the Need for a Halal Tracking System in Indonesia: A Case Study of Fast Food Restaurant”, Proceedings of the International Conference on Sustainable Engineering, Infrastructure and Development, ICO-SEID 2022, 23-24 November 2022, Jakarta, Indonesia. http://dx.doi.org/10.4108/eai.23-11-2022.2341567

[18] Mishra, M. K., Choudhury, D., Rao K. S, "Impact of SMEs Green Supply Chain Practice Adoption on SMEs Firm and Environmental Performance“, Theoretical Economics Letters, vol. 9, no.6, 2019. https://doi.org/10.4236/tel.2019.96121.

[19] Jannah, S. M., & Wijayanti, D. M., “Improving Sustainable Performance for MSMEs Through Halal Supply Chain Management”. Jihbiz: Jurnal Ekonomi, Keuangan dan Perbankan Syariah, *9*(1), 49–71. 2025. https://doi.org/10.33379/jihbiz.v9i1.6287

[20] Ye F-F, Han S-R, Lu H-T, “Carbon Emissions Management Efficiency Evaluation Based on Indicator Information Integration And DEA-Malmquist Index”, Frontiers in Environmental Science, 2023. https://doi.org/10.3389/fenvs.2023.1301091.

[21] Kevin Hella Nyapom, David Padi, "Key Obstacles to Digital Transformation Implementation in SMEs", Volume 14 Issue 4, April 2025, International Journal of Science and Research (IJSR), Pages: 2165-2171, https://dx.doi.org/10.21275/SR25423133635.