


Blockchain-Empowered Halal Fashion Traceability System in Indonesia

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ABSTRACT

Incorporating blockchain into Halal traceability systems is developing in nature; the research aspires to examine the participation intent in blockchain-empowered Halal fashion traceability (BHFT) system via a joint framework that includes diffusion of innovation theory, institutional theory, and Halal-oriented approach. The study uses a simple random sampling method to collect the data from 165 Indonesian Halal fashion manufacturing companies. PLS-SEM is employed to examine the conceptual framework. Findings show that Halal-oriented approach significantly affects institutional pressures, while institutional pressures significantly affect perceived desirability, and perceived desirability significantly affects the participation intent. The companies operating an inclusive Halal-oriented approach will be more aware of the institutional pressures that expect them to partake in a BHFT. The paper enhances the existing literature in Halal supply chains, blockchain, operation management, and information systems via a cohesive framework and empirical insight.

KEYWORDS

Blockchain, Diffusion of Innovation Theory, Halal Fashion, Halal Orientation Strategy, Hijab, Innovation, Institutional Theory, Supply Chain, Traceability System

INTRODUCTION

Halal ethics are set in Muslims' everyday practices and behaviors (Ab Talib et al., 2016). For example, regarding food and drinks, Muslims abide by the Islamic dietary rules (Poniman et al., 2015), which require all Muslims only to consume the permitted (i.e., Halal) food and drinks, not the prohibited ones (van der Spiegel et al., 2012). Similarly, in the context of clothing, Muslims are only permitted to select fashion products that fulfill the Islamic dress code –a Sharia law that regulates all Muslims regarding which types of clothing are permissible (i.e., Halal) or forbidden (i.e., Haram) to wear (Sumarliah, 2021; Sumarliah et al., 2021a, 2021b). “Halal,” an Arabic term signifying “legal” or

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“lawful,” is a sacred duty that must be observed by every Muslim irrespective of their Islamic teachings or groups (Sumarliah et al., 2020).

In 2018, global Muslims’ spending for Halal fashion products (i.e., footwear and apparel) had reached 283 billion USD, and it is estimated to reach 402 billion USD in 2024 (Dinar Standard, 2019). Thus, halal fashion has become a significant international market sector with continuously expanding market volume since twenty-four percent of the global population are Muslims (Sumarliah, 2021). Furthermore, as Muslim customers are obligated to choose only Halal products for daily consumption, non-Muslim customers can decide to buy Halal products because they consider Halal products are more hygienic in preparation and processing (Poniman et al., 2015). Thus, producers of Halal goods (including fashion goods) can enter the untouched Muslim marketplaces as upholding the current non-Muslim marketplaces when they can fulfill Halal ethics in their manufacturing activities. Presently, that Halal fashion goods are not only manufactured by local companies in Muslim-majority nations but also interestingly produced by the well-known global brands as the main actors, e.g., Chanel, Zara, Dolce and Gabbana, Oscar de la Renta, and Tommy Hilfiger, as reported by the 2020 Market Watch (Sumarliah, 2021).

To guarantee Muslim customers that the goods are Halal, Halal-certifying bodies that publish the Halal certificates must assess producers’ activities from the early phase of the supply chain until the end (Sumarliah, 2021). This assessment should be conducted from procuring raw Halal materials/ingredients, manufacturing process, packing, handling, storing, retailing, and shipping until the products reach final customers (Sumarliah et al., 2021a; 2021b). In addition, halal-certifying bodies must confirm that all supply chain activities performed by manufacturers follow Sharia (Islamic) standards. Subsequently, a Halal certificate can be issued; it is generally exhibited on the product label as a logo (van der Spiegel et al., 2012).

Presently, more than 100 Halal-certifying organizations exist globally and obey various Halal criteria (Ab Talib et al., 2016). Consequently, the absence of the internationally agreed Halal criteria has challenged the attempts to confirm Halal product integrity (Tan et al., 2017). Moreover, it causes several immoral forgeries on the Halal logo for attracting Muslim customers to purchase goods with no Halal certification initially (Poniman et al., 2015). Thus, it is essential to develop a united global Halal criterion to stiffen Halal product certification (Abdul-Talib and Abd-Razak, 2013).

Furthermore, Halal ethics strictly oblige a commodity to be manufactured and processed hygienically and cleanly with permitted materials/ingredients, from the source to the consumers’ hands (Sumarliah et al., 2021). This Halal ethics must be applied not only to foods and cosmetics but also to fashion and textile products such as apparel, shoes, bags, and accessories (Sumarliah et al., 2021a, 2021b). In a Muslim-majority country such as Indonesia, the government, via the Halal Product Guarantee Agency (known in Indonesian as BPJPH), requires all products in the country, including fashion and textile, to use the halal logo in the product labels starting 2019 (CNN Indonesia, 2019).

Consequently, maintaining the Halal integrity of fashion goods is vital in all phases of supply chains, from the sourcing point to the consumption point, or in other words: from farm to wardrobe (Sumarliah et al., 2021a, 2021b). Those existing issues faced by the Halal fashion supply chains can be tackled and solved, primarily due to the current development of blockchain technology (Tieman and Darun, 2017). The incorporation of blockchain in traceability systems that enable final customers to trace the raw materials can effortlessly carry out information sharing, traceability, and transparency all over the supply chains to deliver quality guarantees (Sander et al., 2018).

Halal fashion traceability is not a sole company’s duty as Ab Rashid and Bojei (2019) suggest that every supply chain member should take part in it and deliver messages to one another to confirm Halal integrity. Basically, in compliance with the institutional theory, those external actors or organizations possibly will use pressures (i.e., normative, mimetic, and coercive pressures) upon companies and consequently affect their supposed hi-tech features of the BHFT system (Yigitbasioglu, 2015; Hu et al., 2016), in order to drive their intent to partake (Teo et al., 2003). The BHFT hi-tech features (i.e., compatibility, complexity, and relative advantage), originating from the diffusion of innovation

theory, will be critical for effective technology implementation and dissemination (Lai et al., 2016). Via these assumptions, companies' intent to take part in the BHFT system can be clarified. Besides, the Halal-oriented approach that explains the operative approach in applying the Halal principles by the producers must be associated with their concerns for the system's institutional pressures and hi-tech features, assuming that the systems are devoted to Halal goods (Zailani et al., 2015).

Indonesia is one of the leading nations heading in the governing management of Halal fashion manufacture (Dinar Standard, 2019); however, companies in a developing country have a slightly traditional belief that inhibits them from accepting emergent technologies (Kit Yeng et al., 2015). As the blockchain-empowered Halal fashion traceability (BHFT) systems are not a compulsory scheme to use and need extra exposes, Indonesian Halal fashion producers will not find it desirable and positive, consequently desisting them from taking part. Therefore, it is stimulating and appropriate to pay attention to the inquiries of "what does affect the users' perception of BHFT?" and "what does inspire Halal fashion producers to partake in BHFT?".

Generally, examining the intent to partake in BHFT systems via an integrated framework that includes the Halal-oriented approach, diffusion of innovation theory, and institutional theory will enable the research to enhance the existing literature on Halal supply chain blockchain, operation management, and information systems. Essentially, the paper delivers knowledge about more effectively inspiring the Halal fashion producers to partake in a BHFT, which can ultimately help the final customers, mainly Muslim customers, by ensuring the Halal integrity of fashion goods in all supply chain phases.

Based on the arguments above, this study has five primary purposes: (1) to examine the relationship between Halal-oriented approach and perceived desirability of the BHFT, (2) to evaluate the link between Halal-oriented approach and institutional pressures, (3) to check the association between institutional pressures and perceived desirability of the BHFT, (4) to analyze the relationship between institutional pressures and the intent to adopt BHFT, and (5) to investigate the connection between perceived desirability and producers' intent to join BHFT system.

The remainder of this paper is organized as follows. Part 2 explains the concept of BHFT. Part 3 is the literature review, hypotheses, and conceptual framework of this study. Part 4 provides the research design, followed by a discussion of the findings in Part 5. Finally, part 6 deals with the implications for theory and practice, while Part 7 provides the research limitations and suggestions for future studies.

BLOCKCHAIN ADOPTION IN HALAL FASHION TRACEABILITY

Blockchain has been advertised as a tool that can modernize commercial practices soon after it is firstly presented in the company of an automated currency scheme called Bitcoin (Cole et al., 2019). Blockchain signifies a statistics configuration that links information accesses called blocks; the chain is an automatically dispersed ledger, specifically upheld by some indistinguishable hosts across the system (Hughes et al., 2019; Cole et al., 2019). Wang et al. (2019a) explain that every time an operation occurs, it will be logged in a block associated with the one after and before it in an unalterable chain. The blocks cannot be over-recorded when linked because their archives are duplicated and preserved by the system's clouds. Besides, when a novel operation is documented in a block, a miner, whose task is to confirm every process in the system, should resolve the new block (Hughes et al., 2019). Wong et al. (2020) argued that this kind of process guarantees that the operations recorded in the blocks are unchangeable and improve trust. When its arrival, the implementation space of blockchain has been extended from the cryptocurrency such as Bitcoin to various commercial perspectives and fields (Wamba et al., 2018; Weigand et al., 2020). For example, Halal food (Hew et al., 2020; Tan et al., 2020), accounting (Weigand et al., 2020), supply chain and operation management (Wong et al., 2020; Cole et al., 2019), finance (Chen and Bellavitis, 2020), circular economy practices (Khan et al., 2021), and especially, fashion supply chain (Agrawal et al., 2021).

Adopting blockchain in supply chains enables and improves the legitimacy, authenticity, and traceability of a product (Wang et al., 2019a). Via the usage of open and dispersed ledgers to document every supply chain operation, blockchain can fortify trust and reliability into Halal fashion goods by enabling Muslim customers to apply a QR code on the product label to validate the Halal integrity supply chain effortlessly. Furthermore, due to blockchain's unalterable characteristics (Queiroz et al., 2019), its adoption in BHFT systems can record comprehensive supply chains from the starting point to the end customer point.

Furthermore, because every member shares the same data, it inhibits and avoids counterfeit in the Halal supply chains and ensures Muslim customers complete-level Halal integrity (Tieman and Darun, 2017). Presently, numerous emergent service providers offer blockchain-empowered Halal traceability systems, e.g., Malaysia's Halal Digital Chain and UAE's HalalChain. However, Indonesia is still in the early stage of using Blockchain-empowered Halal Traceability; HARA and Sreeya develop the system in 2020 (Hara, 2020). Presently, Indonesia, Turkey, and UAE are the top three nations in the global spending of Halal fashion, but Indonesia is the top leader in Halal fashion manufacture after UAE (Dinar Standard, 2019).

Indonesia is the biggest inhabited Muslim nation globally, with more than 268 million citizens, and 85 percent of Muslims mostly wear Islamic/Halal fashion. As such, Halal fashion is an enormously notable sector for Indonesia's manufacturing industry, with sales worth 12.4 billion USD in the national marketplace (Sumarliah et al., 2021c, 2021d) and contribution to 1.3% of total GDP (Sumarliah et al., 2021d). Also, Halal fashion is the top two significant sectors that subsidized Indonesia's exports (Sumarliah et al., 2021c). Thus, it can be unfortunate to global Muslim customers if deceitful behavior with Halal-certified goods because they are only subject to the policymakers and producers to assure the Halal supply chain integrity (Soon et al., 2017). The BHFT system seems to be a solution for guaranteeing the Halal integrity of fashion goods in all supply chain stages to protect Muslim customers in this matter.

According to Tan et al. (2020), the main objective of employing blockchain is to guarantee data accuracy. Therefore, this study proposes to employ a private permissionless BHFT which is most appropriate for strengthening Halal integrity and increasing Halal transparency of the Halal fashion supply chain (Tan et al., 2020). Private permissionless BHFT is a platform where there exist limitations regarding who can write and read the information on the system, but there is no restriction regarding who can partake in the consent practice (Tan et al., 2020). Recently, nearly all current devices to track the Halal status are untrustworthy, take longer to track or trace, not real-time basis, and not secure. Therefore, Tan et al. (2020) recommend using the Practical Byzantine Fault Tolerance tool in blockchain to alleviate handling costs and time. Based on the model suggested by Tan et al. (2020), this paper uses blockchain with smart contracts for the BHFT system in Indonesia (see Figure 2).

The model in Figure 2 aims to obtain related data alongside the Halal fashion supply chain from the sourcing stage to the retailers using blockchain. Blockchain in this BHFT system will deliver sharing ledgers and smart contract to guarantee data flows' validity and authentication among stakeholders in the BHFT (Tan et al., 2020). In addition, it will allow actual data to be informed when the Halal fashion goods are shifted alongside the supply chains.

MUI and BPJPH as government/public Certifying bodies in Indonesia will profit from criteria authorization and intelligent contract verification because they have complete power to ensure the standards are practiced and followed in the supply chains. It is vital to reduce the reconciliation process, error rates, risks, and administration costs, enabling Muslim consumers to share a joint network. The tasks of blockchain and smart contract guarantee complete transparency and traceability because every QR code is verified by smart contracts in which every activity must fulfill Halal criteria. Halal certifications can be notarized, stored, and hashtag in the blockchain to verify the certificate's authenticity. At this phase, identifying off-chain and on-chain information will be valuable because operational problems can be solved by the current ERP and not essentially be positioned in the blockchain.

LITERATURE REVIEW, HYPOTHESES, AND CONCEPTUAL FRAMEWORK

Traceability in Halal Fashion vs. Conventional Fashion Supply Chains

Recent studies have been focused on green/sustainable supply chains (Khan et al., 2018; 2020; 2021; Khan and Qianli, 2017a; 2017b; Sayed et al., 2017; Yu and Khan, 2021a; 2021b), but few have examined Halal supply chains, especially in the perspective of Halal fashion products (Sumarliah, 2021; Sumarliah et al., 2020; 2021a; 2021b).

Halal fashion supply chain comprises the entire activities involving procurement, provision of halal materials for manufacturing, and delivery of the end fashion products for consumption (Sumarliah et al., 2020; Sumarliah et al., 2021b). The manufacturing activities must ensure the segregation of Halal fabrics/materials from non-Halal ones (Sumarliah, 2021; Sumarliah et al., 2021b). The fabrics of Halal apparel and other fashion goods such as shoes, belts and bags must be verified Halal; the products made of the leather must not comprise any skin, fur, and parts of pigs or animals that were not correctly killed using Islamic law (Sumarliah et al., 2021b). Thus, the Halal fashion supply chain must also ensure the proper split-up of Halal materials/goods from the *haram*/unlawful materials/goods during the production process, storage, distribution, transport, and retailing, until they reach the end-users (Sumarliah et al., 2021b).

The Halal fashion supply chain is different from the conventional fashion supply chain. Sumarliah et al. (2021b) propose six attributes of the Halal vs. conventional fashion supply chain: target, focus, drivers, stakeholders, cross-pollution, and segregation (see Appendix Table 8). The table shows that the conventional fashion supply chain targets minimizing expenditure, maximizing profit, and fulfilling consumers' satisfaction. Meanwhile, the Halal fashion supply chain targets maintaining Halal integrity to eradicate doubts among Muslim customers at the consumption point (Sumarliah et al., 2021b). Thus, traceability is needed to ensure the integrity of Halal fashion products.

Academicians such as Poniman et al. (2015) have associated "traceability" with tracing and tracking. Tracing a product is typically from the final stage towards its source/origin; tracking is from the source and persists until its final stage (Sunny et al., 2020). Some scholars propose traceability in numerous Halal supply chain settings. For instance, Poniman et al. (2015) introduce a new concept for Halal food traceability in Australia. In addition, Sumarliah et al. (2021b) introduce a new Halal fashion supply chain framework that includes traceability (see Appendix Figure 3).

For *conventional* fashion products, there are many possible questions regarding traceability, for example: How can you ensure that every component used in a fashion product is original? How do you know that the fabrics and textiles are manufactured in legal factories? How can you distinguish which item is fake or authentic? How can you trace the whole record of an item? These scenarios depend on how accessible and transparent is the traceability information. To ensure and make the whole process traceable and transparent, it is crucial to possess a technology that validates the traceability data, e.g., ledgers of all life events and transactions for every component in the supply chains. Those electronic system-enabled logs can save the all-inclusive record of the authentic materials, the whole process of the products up to the distribution of the products.

Furthermore, every stakeholder in the supply chain can employ its control system using a separated protected database where the possessor controls the data access delivered to other players. Therefore, every player can develop a record system accessible for other stakeholders in the supply chain. Linking the data of these numerous stakeholders is crucial to develop an all-inclusive traceability system.

Halal fashion supply chain face many more challenges than the *conventional* one. According to Poniman et al. (2015), there are three challenges in the Halal supply chain. First, the lack of internationally approved Halal certification as criteria indicates disparities in product processing regulation in Muslim society. It has made Halal manufacturers select criteria that are tolerable in one marketplace, restraining other prospective marketplaces. Secondly, the absence of the internationally agreed Halal criteria has challenged the attempts to confirm Halal product integrity (Tan et al., 2017). It causes several immoral forgeries on the Halal logo. Due to the numerous Halal certifications in

one nation, there were situations where Halal logos were counterfeited to entice customers, while in reality, these goods were not even licensed by Halal-certifying bodies (Poniman et al., 2015). These situations have reduced customers' trust in Halal labeling and logos (Poniman et al., 2015). Thirdly, product technologies have caused the distorting of borders among non-Halal and Halal materials of products. If the sources or raw materials of products are uncertain, they need Muslim specialists to deliver Islamic verdicts, consuming resources and time (Tieman et al., 2017). Even if the material/ingredient is slight, the incapability to verify its Halalness endangers the status of the final product. The traceability system for Halal goods provides transparency in product handling and processing, allowing customers to increase trust in Halal products (Poniman et al., 2015), especially Halal fashion products. Traceability is thus vital for suppliers, producers, and marketers of Halal fashion products.

Traceability systems in fashion supply chains log and follow the data path of materials and goods obtained from supply partners are handled and eventually allocated as end fashion goods (Agrawal et al., 2021). Traceability enables operative data flows and distribution in various fashion supply chain stakeholders; hence, it assists in generating logistics management, demand forecasting, fashion product information control, and transparency (Agrawal et al., 2021). In the Halal fashion supply chain context, a traceability system records and tracks the Halal status in the entire supply chain. As shown in Appendix Figure 3, the traceability starts from the resourcing stage where the Halal status of raw materials (e.g., fabrics, cotton, leather) is tracked; manufacturing stage where the Halal status of design and producing/sewing machines are tracked (whether the design follows Islamic dress code, and the machines are clean and free from cross-pollution from non-Halal materials); packaging stage, where the Halal status of packaging materials is tracked; handling, storage, and logistics stages, where the cleanliness and dedicated containers for Halal products are tracked; retailing stage, where the cleanliness and non-polluted showroom and display racks are tracked; until the consumption stage where Halal logo is applied in the final product. Besides, a traceability system of the Halal fashion supply chain can track and trace the banking system involved in the fashion business to ensure it follows Halal ethics/Islamic law.

Halal-Oriented Approach

The Halal-oriented approach signifies the operative strategy performed by Halal goods producers in applying and gratifying Halal ethics (Zailani et al., 2019). The Halal-oriented approach's four key components include sourcing (raw materials), manufacturing practice, staffing, and storing and shipping. Of these components, sourcing is the primary component as raw materials must be verified Halal and not having *haram* (a.k.a. non-Halal) resources /substances to ensure the end fashion manufactured goods are Halal (Zailani et al., 2019). Subsequently, throughout the manufacturing activities, the equipment and utensils employed for production and preparation, such as cutting and sewing machines, must be protected from the pollution of haram components (Sumarliah, 2021; Sumarliah et al., 2021d). Besides, employees who work, uphold and control the manufacturing activity should be trained with appropriate information about Halal principles to prevent the pollution of haram components.

Following the manufacturing activity, Halal and haram goods must be separated from one another to prevent cross-pollution throughout the packing, storing, warehousing, transporting, and shipping phases of the supply chain until they attain the final customers (Zailani et al., 2019). Thus, the Halal-oriented approach is demonstrated as a determinatively gauged secondary variable while sourcing, manufacturing, staffing, and storing, and shipping as its primary variables (Zailani et al., 2015).

Halal-Oriented Approach and Perceived Desirability

Implementing the new Halal systems, e.g., Halal logistics, can lead to extra expenses, but the supposed advantages will compensate the budgets, and it ultimately causes the acceptance (Ab Talib et al., 2016). Also, adopting Halal logistics relies on whether the new system is compatible with the current systems (Haleem and Khan, 2017). Therefore, the research proposes that the Halal fashion producers,

which intensely interest Halal ethics and thus apply an inclusive Halal-oriented approach, are more prospective to value the compatibility and benefits provided by the BHFT system than the producers, which are lacking in their Halal-oriented strategies. Besides, the Halal fashion supply chain can be a slightly complex notion to be understood and adopted, particularly amongst non-Muslim Halal-goods producers with little knowledge of Halal ethics (Ngah et al., 2015). Thus, it can be presumed that when the Halal fashion producers adopt the appropriate Halal-oriented approach, they will understand the Halal ethics and consequently consider the BHFT system as easy to adopt and operate. Finally, the Halal fashion producers adopting the appropriate Halal-oriented approach will have a greater level of perceived desirability for the BHFT system. Hence, it can be hypothesized that:

H1: Halal-oriented approach significantly and positively affects perceived desirability.

Halal-Oriented Approach and Institutional Pressures

The Halal-oriented approach can help the Halal producers seek new business routes by functioning as a recommendation in making novel strategies (Zailani et al., 2019). Notably, the Halal fashion producers that adopt a complete Halal-oriented approach are those who attempt to persist in the strongly institutionalized Halal fashion industry via continual adjustments that can promote sustainable competitive benefit (Zailani et al., 2015; Ab Talib et al., 2019). Some published articles indicate that the producers of Halal goods have faced institutional pressures before their adoption of Halal ethics in the production process. First, the demand for Halal-certified goods is great because Halal certification of products is typically perceived as a logo that implies the products are clean and safe to use (Ab Talib et al., 2019; Ab Talib et al., 2016). Specifically, Halal fashion products are made of Halal materials which are: (1) of high-quality, (2) not containing harmful substances that can cause skin irritation and skin cancer, (3) free from impure substances such as urine and feces, (4) more plant-based and less animal-based, and (5) not containing the hairs and skins of animals which eat filth such as pig and animals which are not slaughtered using Halal method based on Islamic law/Sharia (Sumarliah, 2021; Sumarliah et al., 2021a; Sumarliah et al., 2021b). Besides, the modest design of Halal fashion products, which is characterized by comfortable for skin, loose-fitting, breathable, not tight, and not transparent, is not only suitable for Muslim consumers but also preferred by Non-Muslim consumers, e.g., in the case of burkini/Halal swimsuit (Sumarliah, 2021; Sumarliah et al., 2021a).

Second, the coercive pressures from supervisory authorities and main customers have motivated the producers to incorporate Halal ethics in manufacture to meet the customers' demands and fulfill the supervisory obligations (Ab Talib et al., 2019). Besides, producers that obey Halal ethics can depict an affirmative public perception and image (Ab Talib et al., 2019). Therefore, it generates normative pressures that induce the producers to apply Halal ethics in business processes. Third, as the producers of Halal goods can attain higher business success, mimetic pressures are created in support of the non-Halal producers and thus inspire them to imitate (Ab Talib et al., 2019). Thus, it can be presumed that the Halal fashion producers that apply an inclusive Halal-oriented approach will be more aware of the institutional pressures that stimulate them to take part in BHFT systems. Hence:

H2: Halal-oriented approach significantly and positively affects institutional pressures.

INSTITUTIONAL THEORY

The institutional theory consists of two significant variables, i.e., commercial and social (Turkulainen et al., 2017). The former proposes that companies are pushed by commercial profitability (Miner and Johnson, 1997), while the latter suggests that companies are motivated by lawfulness values (DiMaggio and Powell, 1983). This research uses the social variable as many previous studies of operation management focus on social motive (Kauppi, 2013) and technology adoption in the

companies are stimulated mainly by the necessities for lawfulness instead of efficiency (Wang et al., 2019b). Therefore, companies must react appropriately to institutional pressures by harmonizing their operations to maintain their lawfulness (Hu et al., 2016). These institutional pressures supported by social variables consist of three types (Sayed et al., 2017). First, normative pressure comes from the joint rules amongst the stakeholders of a company's social network (Son and Benbasat, 2007), such as industry bodies. Second, mimetic pressure appears when a company tries to copy other winning companies' strategies (typically competitors) to alleviate unpredictability in dynamic environments and safeguard its continuous presence (Kauppi, 2013; Hu et al., 2016). Third, coercive pressure arises as a company gets informal and formal pressures from other companies (i.e., regulators, industry bodies, suppliers, and consumers) that it is reliant on (Yigitbasioglu, 2015). Since these three pressures are equal, the research uses the model proposed by Hew et al. (2020), in which institutional pressures are determinatively gauged secondary variables with the deeply gauged primary variables of normative, mimetic, and coercive pressures.

Institutional Pressures and Perceived Desirability

The circumstantial factors, such as environmental aspects and community characters external to a company's frontier, are vital in accepting new technologies; thus, the innovation diffusion activity will be more successful in a positive societal structure (Li et al., 2017). The institutional atmosphere can create more rapid innovation diffusion by altering the companies' opinions regarding innovations. Scholars support this idea and discover that coercive and mimetic pressures can positively affect the managers' perceptions concerning the adoption of cloud computing (Yigitbasioglu, 2015). Besides, scholars such as Ab Talib et al. (2019) posit that the Halal industry is greatly established, and thus Halal companies are simply influenced by the effects of institutional powers. The research expects similar concepts to hold so that the Halal fashion producers will adapt their perceived desirability, namely type of acceptance, about BHFT systems according to their experiences regarding the institutional pressures. Notably, the Halal fashion producers will have more desire to partake in a BHFT system when facing many institutional pressures. Thus, it can be hypothesized that:

H3: Institutional pressures significantly and positively affects perceived desirability.

Institutional Pressures and Participation Intention

The institutional theory is helpful to investigate technologies that are in the start-up of diffusion or well dispersed; thus, it has been primarily adopted to describe the companies' acceptance and usage of technologies or systems via normative, mimetic, and coercive pressures (Teo et al., 2003; Hu et al., 2016). Besides, it is postulated that institutional pressures are vital drivers for Halal companies (Ab Talib et al., 2019). Thus, the institutional pressures will also affect the intent to partake in a BHFT in the research. Halal fashion manufacturers will mainly try to partake in BHFT systems if they experience pressures from essential players close to them. Hence, it can be assumed that:

H4: Institutional pressures significantly and positively affects participation intention.

DIFFUSION OF INNOVATION THEORY

There are five hi-tech features of effective innovation implementation and best diffusion that are vital according to the innovation theory, i.e., trialability, relative advantage observability, complexity, and compatibility (Lai et al., 2016). However, only three are constantly related to acceptance decisions among these five features, i.e., compatibility, complexity, and relative advantage (Hwan et al., 2016). Thus, the research focuses only on those features from the innovation diffusion theory. Complexity signifies the extent to which an invention is complicated to operate, while compatibility refers to the

extent to which an invention is in line with current industry value system, practices, and processes” (Fosso Wamba et al., 2016). The relative advantage in the research is outlined as the supposed development of innovation compared to the current technologies (Wang et al., 2016). Besides, the research follows Alsaad et al. (2017), who theorizes perceived desirability from the innovation diffusion theory as a secondary determinatively gauged variable consisting of relative advantage, complexity, and compatibility as its primary variables.

Perceived Desirability and Participation Intention

Compatibility, complexity, and relative advantage are primarily accepted as significant and vital hi-tech features that define the assimilation and adoption of technologies and information systems amongst companies (Lai et al., 2016). Moreover, those hi-tech features establish the perceived desirability, which is a vital factor influencing companies’ intent to implement e-commerce (Alsaad et al., 2017). Similarly, the Halal research works propose that the compatibility and relative advantage of information systems can cause the acceptance of Islamic banking services, Halal warehouse, and Halal logistics, correspondingly (Mahdzan et al., 2017; Ab Talib et al., 2016), whereas the complicated feature of services and technologies will inhibit the implementation of Halal warehouse (Ngah et al., 2015). Thus, in the perspective of BHFT, the following hypothesis can be proposed:

H5: Perceived desirability significantly and positively affects participation intention.

Based on the diffusion of innovation theory and the institutional theory, it is suggested that the participation intent in BHFT systems is mainly motivated by perceived desirability and institutional pressures. The Halal-oriented approach is the driver for perceived desirability and institutional pressures due to assuming a direct link between these two forces. Figure 1-A shows this study’s conceptual framework, summarizing the links among those variables (Hew et al., 2020).

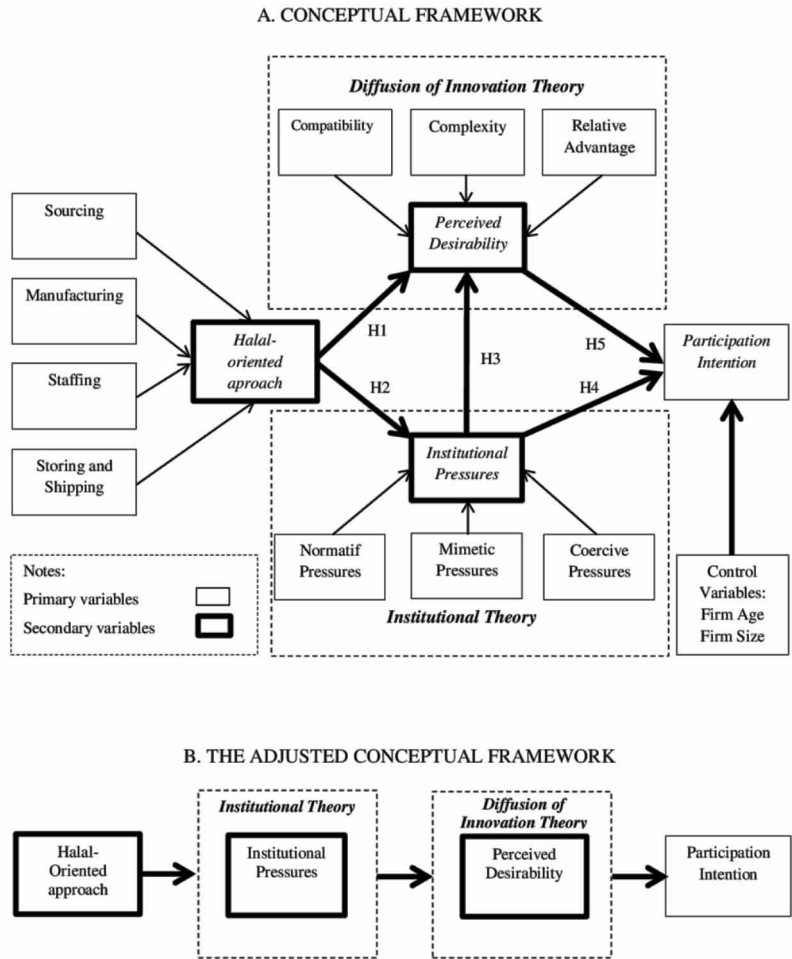
RESEARCH DESIGN

The research identifies the Halal fashion producers from the Ministry of Industry of Republic of Indonesia, Halal Product Assurance Agency or known in Indonesian as Badan Penyelenggara Jaminan Produk Halal (BPJPH), and Majelis Ulama Indonesia (MUI). MUI is a body in issuing the Halal certificates, and similarly, BPJPH is a government organization regulating the Halal Certification in Indonesia. A sum of 500 Halal fashion producers in Java, Indonesia, are discovered via the cross-sectional sampling method to lessen potential bias. The island of Java is chosen as the sampling site because it is the most populous part of Indonesia, with the most significant Halal fashion producers. Information is obtained from the top managers who have knowledge and experience regarding the Halal supply chain. The specialized data collector gathers 165 questionnaire responses via telephone interviews in which only one answer is gathered from every producer/ manufacturing firm. Baumann et al. (2017) propose that specialized data gathering services typically provide the chance to ensure a satisfactory sample size and obtain high-quality information. Table 1 presents the sample characteristics.

It is evident from Table 1 that there are six main products of the Halal fashion industry:

1. **Apparel:** Clothing line for women, men, and children that follow Islamic dress code of modesty and comfort of clothing such as *abaya*, *gamis*, *baju koko*.
2. **Hijab:** Various types of headscarves that Muslim women essentially wear.
3. **Formal wear:** Such as wedding dress, business suit, *batik* (traditional clothing for formal occasions) which follow Islamic dress code in designs and styles.
4. **Footwear:** Shoes, boots, and sandals which are made of Halal leather or clean synthetic materials.

Figure 1. Conceptual framework



5. **Sportswear:** Activewear such as *burkini* (i.e., swimsuits for Muslim women that are usually loose-fitting and containing head-covering).
6. **Accessories:** Handbags, wallets, belts, gloves, socks, jewelry (which are made of Halal leather/fur/fabrics, not containing pig hair and pignskin).

Figure 1 displays two kinds of variables in this study: (1) primary and (2) secondary variables. The explanation is as follows:

1. The secondary variable HOA (Halal-oriented approach) is determined by its primary variables: sourcing, manufacturing, storing and shipping, and staffing.
2. The secondary variable IPR (institutional pressures) is determined by its primary variables: normative pressures, mimetic pressures, and coercive pressures.
3. The secondary variable PDB (perceived desirability) is determined by its primary variables: relative advantage, complexity, and compatibility.

Figure 2. Blockchain in Halal fashion supply chain (with QR code)

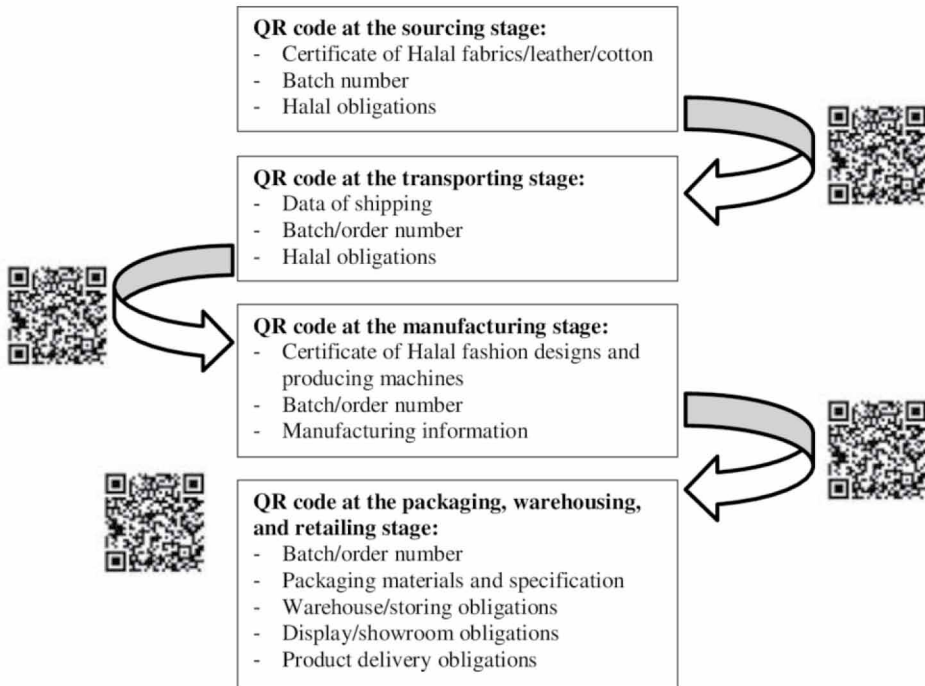


Table 1. Sample profile

Attribute		Frequency	(%)	Attribute		Frequency	(%)
Company's age (years)	<5	27	16.4	Major Halal fashion products	Hijab	67	40.6
	5 to 10	51	30.9		Apparel	41	24.8
	>10	87	52.7		Accessories	17	10.3
Company size (workers)	< 50	75	45.5		Footwear	17	10.3
	50 to 200	66	40.0		Formal wear	16	9.7
	> 200	24	14.5		Sportswear	7	4.2
Company type	Public	1	0.6	Sales income (in million IDR* per year)	< 500	6	3.6
	Private	156	94.5		500 - 1.499	17	10.3
	Sole proprietorship	1	0.6		1.500- 3.000	26	15.8
	Others	7	4.2		> 3.000	45	27.3
Note: * 1 USD = 14,425 IDR						Confidential	71

Figure 1 shows the hypothesized relationships between dependent variables and independent variables. For hypothesis 1 (H1) and hypothesis 2 (H2), the independent variable HOA influences PDB and IPR, respectively. For H3 and H4, the independent variable IPR affects PDB and PAR (participation intention), respectively. Besides, for H5, PDB affects PAR. Moreover, two control variables (i.e., firm's size and firm's age) are hypothesized to affect PAR. As previous publications

related to operation management and information system have examined the underlying roles of a company's size and company's age (Lai et al., 2016), these two variables are then included as control variables in this study framework.

The measurement items for all primary variables are presented in Table 2. Those items are prudently modified from the most pertinent previously published studies. Particularly the measurement items for participation intent from Queiroz and Wamba (2019). All primary variables of the Halal-oriented approach (i.e., sourcing, manufacturing, storing & shipping, and staffing) are adjusted from Hew et al. (2020) and Zailani et al. (2015), whereas the measurement items for primary variables regarding institutional pressures are modified from Yigitbasioglu (2015). Finally, the research adopts the measurement items for the primary variables of perceived desirability from different literature: relative advantage from Fosso Wamba et al. (2016), complexity from Alsaad et al. (2018), and compatibility using Lee et al. (2017). The study employs a 7-point Likert scale to gauge the mentioned measurement items. The scales are varied from 1 (which means "strongly disagree") to 7 (which implies "strongly agree").

DATA ANALYSIS

The study uses the partial least squares structural equation modeling (PLS-SEM) technique to examine the conceptual framework (Sarstedt et al., 2014). This study's sample size of 165 fulfills the smallest sample size of 40 required for the PLS-SEM test (Hair et al., 2017a).

Measurement Model Test

Table 3 shows that all the primary variables achieve convergent validity and internal consistency reliability since the average variance extracted (AVE) and composite reliability (CR) values are below the advised limit of .50 (Henseler et al., 2016). Besides, Tables 4 and 3 propose that the square root of the AVE values of every primary variable is above the inter-variable relations, and each measurement item is immensely loaded on its variable rather than other variables; thus, the discriminant validity is met (Hair et al., 2014). Moreover, the heterotrait-monotrait (HTMT) value is lower than the advised limit of .85 (Hair et al., 2019), excluding the HTMT amongst normative and coercive pressures (i.e., .920). Nonetheless, for theoretically comparable variables, the proposed limit should be .90 (Hair et al., 2017a). As the HTMT among normative pressures and coercive pressures is somewhat higher than the limit of .90, the bootstrap confidence interval (CI) is then calculated, and it is revealed that the CI does not involve a value of 1, supporting Hair et al. (2017b) that normative pressures are different from coercive pressures.

Moreover, as examining the secondary determinatively gauged variables, Hair et al. (2013) recommend that there should not be any collinearity among the primary variables, and the outer weights of all primary variables must be meaningful. Table 5 shows that collinearity among the primary variables is not found because the variance inflation factors are lower than five and all the primary variables have significant outer weights (Hair et al., 2013).

Structural Model Test

Based on Sarstedt et al. (2014), the study engages a bootstrapping process with 5,000 subsamples to check the hypotheses acquired and get the inferential data. Table 6-A reveals the findings by presenting the data attained. Halal-oriented approach does not have significant effect on perceived desirability ($\beta = .1250$, $\rho > .05$), but it positively and significantly affects institutional pressures ($\beta = .4509$, $\rho < .001$). Thus, H1 is unsupported in the research, while H2 is supported. Institutional pressures positively and significantly affects perceived desirability ($\beta = .5357$, $\rho < .001$), rendering H3 supported. Nevertheless, institutional pressures have an insignificant effect on the participation intention ($\beta = -.0260$, $\rho > .05$), thus unsupporting H4. Perceived desirability ($\beta = .8862$, $\rho < .001$) significantly and positively affects the participation intent, hence delivering support to H5. Regarding

Table 2. Measurement items for the primary variables and sources

PV	Measurement Items	Sources
Participation intention	PAR1: Our company intends to take part in a BHFT in the future	Queiroz and Wamba (2019)
	PAR2: I foresee that our company will take part in a BHFT for Halal product supply chain dealings	
	PAR3: I anticipate that our company will take part in a BHFT soon	
Sourcing	SRC1: It is compulsory to procure all raw materials from Halal-certified suppliers	Hew et al. (2020), Zailani et al. (2015)
	SRC2: It is obligatory to ensure the quality of all raw materials based on the Halal principle	
	SRC3: It is essential to ensure the cleanliness of all raw materials based on the Halal principle	
	SRC4: All raw materials used in our company must be Halal	
	SRC5: Ensuring the authentic purity of all raw materials is a must	
Manufacturing	MNF1: Our company guarantees the regular processes in Halal goods manufacture comply with the Halal principle	
	MNF2: Our company concerns about the tools and devices operated to evade the cross-pollution of non-Halal and Halal goods	
	MNF3: This company guarantees that the hygiene of the manufacturing zone is kept in line with the Sharia law accredited by MUI	
	MNF4: Our company assures the handling machinery and equipment are sterile accredited by MUI	
Storing and shipping	STR1: Our company guarantees hygienic and clean transportation that meet Shariah obligations approved by MUI	
	STR2: Our company assures clean and hygienic storage facilities that meet Sharia obligations approved by MUI	
	STR3: Our company assures devoted storage services for products	
	STR4: Our company assures devoted infrastructure for Halal products	
	STR5: Our company assures devoted transportation for Halal products	
Staffing	STF1: Workers in Halal manufacture are capable of doing the tasks	
	STF2: Workers in Halal fashion manufacture are aware of the Sharia requirements in Halal goods	
	STF3: Workers in Halal fashion manufacture know the processes in managing Halal goods	
	STF4: Workers in Halal fashion manufacture are provided sufficient training in managing the Halal goods	
Normative pressures	NRP1: Our key suppliers have joined or would join in a BHFT	Yigitbasioglu (2015)
	NRP2: Our key clients have joined or are expected to join in BHFT	
	NRP3: Our key competitors have joined or would join in a BHFT	
	NRP4: MUI's Halal integrity promotion affects us to join in a BHFT	
Mimetic pressures	MIP1: Our key competitors who have joined or are expected to join in a BHFT will be positively perceived by other companies	
	MIP2: Our key competitors who have joined or are expected to join in a BHFT will be positively perceived by their clients	
	MIP3: Our key competitors who have joined or are expected to join in a BHFT will be positively perceived by their supply partners	
	MIP4: Our key competitors who have joined or are expected to join in a BHFT will significantly profit from it	
Coercive pressures	CRP1: our key clients have required or are expected to require our company to take part in a BHFT	
	CRP2: our crucial supply partners have required or expected to require our company to take part in a BHFT	
	CRP3: The industry organizations have required or are expected to require our company to take part in a BHFT	
	CRP4: MUI has obliged or is expected to oblige this company to take part in a BHFT	

continued on following page

Table 2. Continued

PV	Measurement Items	Sources
Relative advantage	RAD1: We expect BHFT to enhance Halal supply chain transparency	Fosso Wamba et al. (2016)
	RAD2: Our company expects BHFT to guarantee Halal integrity all over the Halal supply chain	
	RAD3: This company anticipates BHFT to improve Halal traceability all over the Halal product supply chain	
Complexity	CPX1: Our company thinks that adopting BHFT is easy*	Alsaad et al. (2018)
	CPX2: BHFT is easy to be integrated into our business practice*	
	CPX3: Our company thinks that adopting BHFT needs little effort*	
Compatibility	CPT1: BHFT is compatible with company strategy and values	Lee et al. (2017)
	CPT2: BHFT is in line with our company's business operations	
	CPT3: BHFT is compatible with our current facilities and equipment	

Note: *Signifies reverse-coded measurement items, PV=Primary Variables, BHFT=Blockchain-empowered Halal Fashion Traceability

Table 3. Reliability and validity estimation of primary variables

PV	CR	AVE	1	2	3	4	5	6	7	8	9	10	11
CRP	.963	.834	.920	.401	.581	.530	.463	.767	.920	.689	.404	.256	.393
CPT	.986	.931	.426	.972	.820	.863	.263	.144	.503	.672	.189	.448	.166
CPX	.963	.872	-.537	-.769	.942	.830	.319	.309	.597	.730	.254	.336	.269
PAR	.982	.921	.496	.822	-.777	.967	.271	.196	.604	.736	.156	.389	.170
MNF	.908	.690	.414	.240	-.282	.243	.837	.421	.313	.445	.637	.643	.822
MIP	.986	.904	.725	.140	-.291	.188	.455	.958	.729	.487	.567	.180	.415
NRP	.973	.864	.860	.478	-.557	.570	.354	.695	.937	.768	.369	.211	.280
RAD	.982	.921	.647	.641	-.683	.699	.413	.466	.725	.967	.405	.298	.220
SRC	.944	.738	.369	.177	-.229	.138	.707	.526	.402	.440	.866	.558	.651
STF	.897	.665	.234	.394	-.304	.347	.548	.153	.192	.275	.485	.822	.646
STR	.938	.716	.356	.149	-.238	.142	.710	.386	.256	.202	.589	.575	.853

Notes: The AVE's square root for every variable is represented in italic and bold along the sloping line, as the HTMT and inter-variables connections are displayed above and below the slope, correspondingly. PV=Primary Variables

control constructs, company's size ($\beta = -.0242$, $\rho > .05$) and company's age ($\beta = -.0820$, $\rho > .05$) are revealed to possess no confounding impacts to the findings.

Hair et al. (2014) suggest that to provide a better assessment of the structural framework, some vital standards that are typically employed in assessing a structural framework, i.e., cross-validated redundancy (Q^2), coefficient of determination (R^2), and effect size (f^2), should be delivered. Table 7 shows that the study framework exhibits an excellent level of extrapolative relevance on participation intent and nearly a significant level of extrapolative accuracy ($Q^2 = .6976$, $R^2 = .7436$), which perceived desirability significantly explains ($f^2 = 1.8311$).

Mediation Assessment

As the unimportant straight effects of institutional pressures and Halal-oriented approach may be fully intermediated by perceived desirability and institutional pressures, this study conducts mediation assessment based on Hair et al. (2017b). Table 6-B shows that perceived desirability fully mediates the direct effect of institutional pressures on the participation intention with an indirect effect of .4673 ($\rho < .001$) and the total effect of .4413 ($\rho < .001$). Similarly, the direct effect of the Halal-oriented

Table 4. Item loadings and cross-loadings

Item/PV	2	1	3	4	5	6	7	8	9	10	11
CRP1	.897	.450	-.494	.491	.344	.657	.774	.634	.379	.201	.262
CRP2	.935	.328	-.505	.416	.473	.654	.772	.527	.297	.228	.403
CRP3	.931	.350	-.496	.437	.365	.622	.745	.551	.332	.189	.371
CRP4	.917	.327	-.451	.454	.320	.691	.825	.629	.329	.229	.258
CPT1	.339	.961	-.741	.755	.205	.070	.374	.562	.109	.362	.079
CPT2	.392	.993	-.733	.785	.214	.129	.477	.613	.164	.393	.134
CPT3	.417	.963	-.734	.819	.269	.201	.517	.663	.233	.376	.212
CPX1	-.484	-.691	.935	-.728	-.270	-.197	-.465	-.604	-.149	-.269	-.248
CPX2	-.462	-.658	.930	-.644	-.275	-.338	-.506	-.605	-.290	-.263	-.247
CPX3	-.542	-.782	.960	-.783	-.241	-.275	-.572	-.686	-.200	-.312	-.172
PAR1	.494	.828	-.766	.978	.228	.191	.540	.680	.198	.350	.153
PAR2	.439	.786	-.751	.973	.177	.162	.536	.676	.142	.305	.088
PAR3	.486	.731	-.701	.952	.294	.184	.555	.639	.049	.337	.168
MNF1	.225	.114	-.174	.111	.718	.141	.027	.073	.231	.390	.618
MNF2	.454	.284	-.304	.276	.904	.432	.383	.500	.644	.449	.562
MNF3	.334	.215	-.212	.247	.826	.384	.289	.390	.535	.450	.535
MNF4	.330	.162	-.228	.155	.888	.388	.280	.341	.622	.510	.641
MIP1	.646	.081	-.259	.158	.359	.948	.606	.378	.491	.170	.372
MIP2	.723	.235	-.353	.233	.427	.967	.718	.483	.474	.181	.372
MIP3	.700	.108	-.238	.143	.431	.960	.661	.454	.513	.087	.372
MIP4	.662	.096	-.243	.172	.368	.958	.630	.437	.507	.141	.342
NRP1	.821	.436	-.501	.493	.345	.597	.927	.656	.335	.228	.338
NRP2	.767	.412	-.507	.528	.260	.646	.955	.642	.331	.189	.211
NRP3	.776	.423	-.485	.510	.324	.636	.956	.654	.335	.174	.282
NRP4	.810	.490	-.559	.572	.226	.682	.909	.722	.359	.118	.116
RAD1	.604	.636	-.684	.661	.376	.427	.684	.962	.351	.302	.155
RAD2	.624	.596	-.646	.668	.413	.459	.678	.977	.413	.262	.208
RAD3	.619	.597	-.619	.666	.390	.445	.710	.964	.395	.218	.214
SRC1	.200	.218	-.130	.073	.519	.328	.181	.231	.786	.493	.473
SRC2	.360	.087	-.151	.048	.577	.543	.349	.321	.950	.342	.525
SRC3	.359	.197	-.214	.161	.625	.495	.340	.414	.951	.425	.539
SRC4	.304	.164	-.255	.149	.556	.397	.333	.374	.860	.472	.498
SRC5	.345	.082	-.226	.162	.414	.473	.370	.385	.764	.333	.473
STF1	.010	.312	-.116	.220	.299	-.033	-.002	.089	.293	.706	.277
STF2	.199	.335	-.232	.299	.439	.053	.134	.269	.407	.921	.449
STF3	.190	.359	-.293	.309	.430	.183	.218	.312	.498	.834	.459
STF4	.300	.277	-.305	.282	.563	.238	.220	.184	.351	.813	.617
STR1	.354	.226	-.306	.260	.534	.309	.282	.226	.398	.422	.830
STR2	.264	.118	-.148	.132	.576	.320	.219	.204	.508	.570	.848
STR3	.260	.039	-.101	.006	.632	.321	.192	.136	.510	.496	.848
STR4	.326	.099	-.223	.080	.679	.379	.226	.173	.607	.501	.879
STR5	.297	.160	-.237	.141	.543	.286	.159	.108	.427	.410	.860

Note: PV=Primary Variables

Table 5. Estimation of secondary variables

Secondary Variables	Factors	VIF*	Outer weights
Halal-oriented approach	Sourcing	1.827	.375**
	Manufacturing	2.393	.281**
	Storing and shipping	2.296	.345**
	Staffing	1.622	.217**
Institutional pressures	Normative pressures	3.783	.415**
	Mimetic pressures	2.349	.311**
	Coercive pressures	4.175	.383**
Perceived desirability	Relative advantage	2.796	.364**
	Complexity	2.886	-.372**
	Compatibility	2.609	.406**

Note: *Variance inflation factors. ** $p < .001$

Table 6. Results of hypotheses testing and mediation

A. Results of Hypotheses Assessment							
Hypotheses	Paths	β	ρ	T	95% CI		Supported?
					Min	Max	
H1	HOA \rightarrow PDB	.1250 ^{NS}	.1525	1.4623	-.0328	.3087	No
H2	HOA \rightarrow IPR	.4509**	.0000	5.6066	.2732	.5940	Yes
H3	IPR \rightarrow PDB	.5357**	.0000	7.0562	.3756	.6765	Yes
H4	IPR \rightarrow PAR	-.0260 ^{NS}	.5914	.5591	-.1191	.0679	No
H5	PDB \rightarrow PAR	.8862**	.0000	2.7749	.7899	.9609	Yes
Control variables	Firm size \rightarrow PAR	-.0242 ^{NS}	.6424	.4862	-.1291	.0709	No
	Firm age \rightarrow PAR	-.0820 ^{NS}	.1308	1.5439	-.1938	.0187	No
B. Results of Mediation Assessment							
Exogenous variables	Mediating variables	Endogenous variables	Indirect effects	Direct effects		Total effects	Results
IPR	PDB	PAR	.4673**	-.0260 ^{NS}		.4413**	Fully mediate
HOA	IPR	PDB	.2377**	.1250 ^{NS}		.3627**	Fully mediate

Notes: ^{NS} $p > .05$; ** $p < .001$; HOA=Halal-oriented approach, IPR=institutional pressure; PDB= perceived desirability; PAR=participation intention; β =path coefficient; CI= confidence intervals

approach on perceived desirability is fully mediated by the institutional pressures, given its impacts through institutional pressures are all significant with an indirect effect of .2377 ($p < .001$) and the total effect of .3627 ($p < .001$).

DISCUSSIONS

The research reveals that the Halal-oriented approach practiced by Halal fashion producers is not significant in assisting them to foster optimistic perceived desirability for a BHFT system. This finding is not consistent with a previous study (Nghah et al., 2015). In this study, the possible reason is that the Halal awareness among fashion producers does not affect their perceptions of the relative advantage,

Table 7. Extrapolative relevance (Q²), Extrapolative accuracy (R²), and effect size (f²)

Endogenous variables	Q ²	R ²	Exogenous variables	f ²
Participation Intention	.6976	.7436	Institutional pressures	.0016
			Perceived desirability	1.8311
Institutional pressures			Halal-oriented approach	.2492
Perceived desirability	.3193	.3563	Halal-oriented approach	.0190
			Institutional pressures	.3494

Notes: Usually, a Q² value of above zero signifies a framework's extrapolative relevance on a specific endogenous variable, while the R² values of .25, .50, and .75 are, correspondingly, explaining weak, moderate, and significant levels of extrapolative accuracy (Hair et al., 2014). Besides, f² is typically applied to calculate the significance of an exogenous construct, and the f² values of .02, .15, and .35 indicate weak, moderate, and vigorous influences, correspondingly (Henseler et al., 2016)

complexity, and compatibility of the blockchain technology for their supply chains. However, HOA is significant in helping them value the institutional pressures that support them in the BHFT. This finding supports a prior study (Ab Talib et al., 2019); that is, fashion producers that obey Halal ethics can depict an affirmative public perception and image and thus inspire them to adopt BHFT.

According to the mediation assessment, the insignificance of the Halal-oriented approach's direct role is due to the mediation effect of institutional pressures. Mainly, the Halal fashion producers who adopt a holistic Halal-oriented approach are more perceptive, and thus they will first respond to institutional pressures that further instruct the producers to foster optimistic perceived desirability regarding the BHFT. A similar interpretation belongs to the insignificance of institutional pressures' effects on the participation intent, which perceived desirability fully mediates. That is why the result is not consistent with Ab Talib et al. (2019).

Based on these findings, the conceptual framework is adjusted and presented in Figure 1-B. It is revealed that before deciding to take part in a BHFT system, the Halal fashion producers will experience a series of the procedure. First, the Halal fashion producers practicing a holistic Halal-oriented approach are more aware of the institutional pressures that require their participation in BHFT systems. Second, Halal fashion producers will assess the high-tech properties of the BHFT systems and further foster perceived desirability according to this rigorous assessment regarding the pressures from various stakeholders. Third, the Halal fashion producers having optimistic perceived desirability should ultimately choose to take part in BHFT. This finding is consistent with a prior study (Hew et al., 2020).

IMPLICATIONS

Theoretical Implications

The research provides some theoretical implications. First, unlike previous literature on the Halal supply chains (Ngah et al., 2015; Ab Talib et al., 2016, 2019), the paper combines diffusion of innovation theory and institutional theory to comprehend the company's participation intent a BHFT system. Besides, the research incorporates and tests the effect of the Halal-oriented approach in an integrated model to justify the potential effects of the Halal-oriented approach implemented by the Halal fashion producers on their perceived desirability and supposed institutional pressures regarding the BHFT system.

Second, the literature related to operational management and information systems has extensively adopted the diffusion of innovation theory and institutional theory in various frameworks (Tsai et al., 2013; Yigitbasioglu, 2015; Teo et al., 2003; Lai et al., 2016; Hu et al., 2016); however, research works focus on how the innovation diffusion theory affects the institutional theory are scarce. As

the innovation diffusion theory is argued not to reckoning environmental and inter-organizational effects, examining such effects is urgently necessary (Tsai et al., 2013). Due to those research gaps, the paper succeeds in addressing the defects in the innovation diffusion theory and reinforces the status quo of literature by examining the extent to which the innovation diffusion theory is directly affected by institutional theory.

Practical Implications

The paper also provides some practical implications. First, to strengthen the involvement of Halal fashion producers in a BHFT system, service providers must inspire the external organizations within the supply chains (e.g., main customers and suppliers) to take part. Besides, service providers may reckon partnership with industry bodies and local government, impacting Halal fashion producers.

Therefore, producers adopting the appropriate Halal-oriented approach need to understand those institutional pressures and foster a positive desire to use the BHFT system, which finally motivates them to partake. Besides, service providers are encouraged to develop the system with relative ease of use and convenience to ensure they are compatible with the existing systems.

Finally, it is deemed that the Halal integrity of fashion goods can be maintained by inspiring the participation intent of all stakeholders in the Halal fashion supply chains, particularly the Halal fashion producers. By doing so, end-users, predominantly Muslim customers, can rest assured of their concerns about the integrity of Halal fashion products from the source to their wardrobes.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

There are some limitations in this study that should be given attention. First, since the BHFT system is a developing resolution for the Halal supply chain and Halal integrity, only Halal fashion producers who have not yet engaged or approved this system are surveyed. As the system becomes more popular in the future, it is advised that the upcoming works can be conducted by employing the Halal fashion producers who have joined the system. The works can use a case study technique and in-depth qualitative interviewing to see if Halal fashion producers' participation intent is affected by Halal-oriented approaches, perceived desirability, and institutional pressures to make a participatory decision. Second, the research adopts a simple random sampling method that ignores chronological extrapolations. As the decision-making process can change over time, upcoming research requires an over-time setting to contrast the results before and after adoption. Third, since this research is located in a country led by the Islamic economic system, attention should be paid when generalizing the findings to other countries where the need for Halal integrity and Halal products are limited. Future research can consider seeking out other countries with these settings to identify possible disparities among different countries.

CONCLUSION

Nowadays, Halal supply chain management is crucial to assure the Halal integrity of fashion goods. However, counterfeit situations were revealed globally even if the Halal fashion goods were licensed as Halal and moving alongside the Halal supply chains. Therefore, final customers, mainly Muslim fashion customers, currently need transparent traceability systems to guarantee Halal integrity. Blockchain technology can solve this problem by ensuring transparency and security. Through the contribution of the entire supply chain players, blockchain-empowered Halal fashion traceability enables final customers to get into comprehensive data from the initial supply chain stage (sourcing) to their wardrobes. Thus, the BHFT is not just publicity but a reality. As the BHFT is still developing, the research tries to elucidate the Halal fashion producers' participation intent; thus, delivering empirical evidence that can help managers make decisions that will affect the Halal fashion producers.

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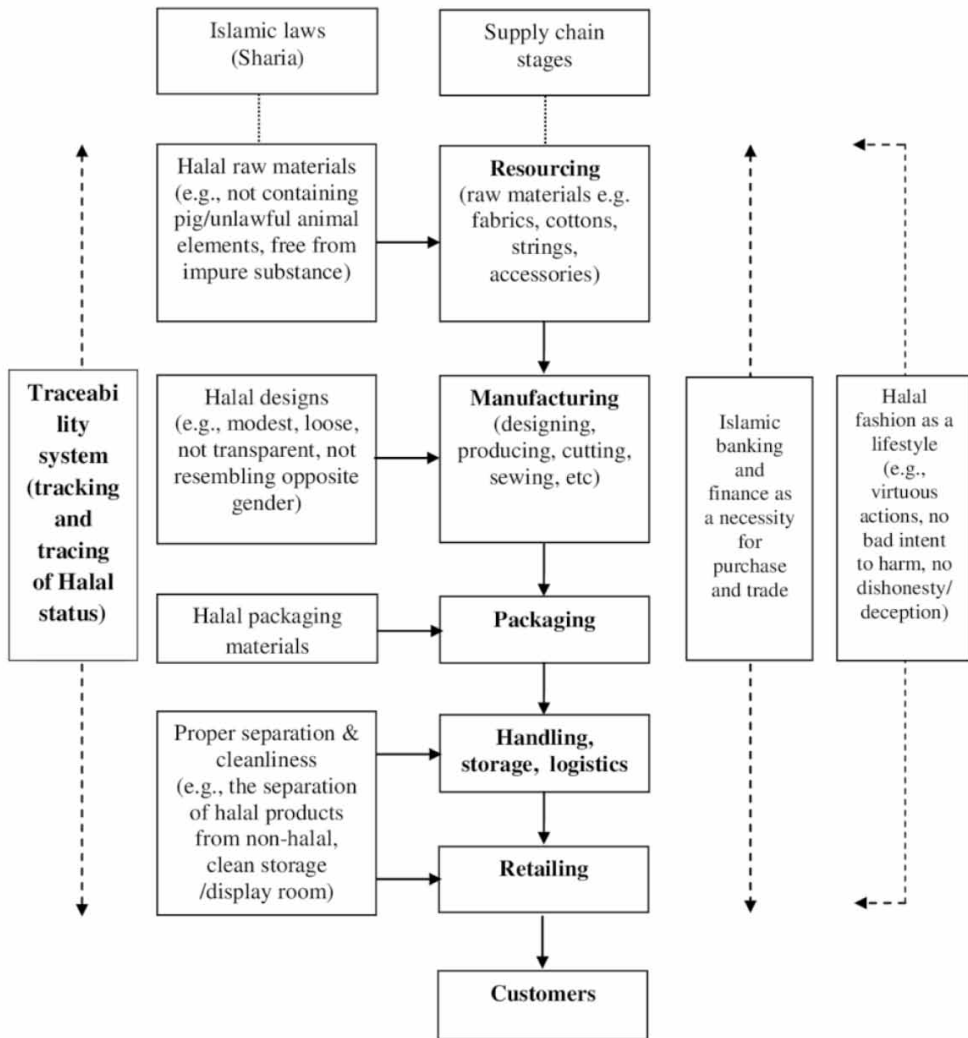
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APPENDIX

Additional Figure and Table

Figure 3. Halal fashion supply chain traceability (Source: Sumarlia et al., 2021b)



← - - - → Covers the whole chain

→ Process flow

Table 8. The Difference Between Halal and Conventional Fashion Supply Chain (Source: Sumarliah et al., 2021b)

Attributes	Halal Fashion Supply Chain	Conventional Fashion Supply Chain
Target	Maintaining Halal integrity of Halal fashion products to confiscate doubts amongst Muslim customers to consume the products.	Sustaining consumers' satisfaction, minimizing costs, maximizing revenues or product values generated.
Focus	Encompassing the all-inclusive processes from planning and procuring of Halal materials, manufacturing, until distributing the end goods to consumers according to Islamic regulations.	Involving the control in manufacturing, storing, warehousing, and delivering fashion products to maximize efficiency and accessibility in the represented marketplace.
Drivers	<p>The fashion business is driven by obeying Islamic regulations in the entire supply chain phases, e.g.:</p> <ul style="list-style-type: none"> • The Halal status of materials/fabrics • Cleanliness of storage and retailing space • The modesty of dressing style • Designs that follow the Islamic dress code • Halal certification/logo 	<p>The fashion business is driven by contingent variables from developed product integrity frameworks, e.g., the drivers for luxury fashion:</p> <ul style="list-style-type: none"> • Exclusivity • Quality • Durability <p>perceived fit, hedonic and symbolic values and consumer involvement</p> <ul style="list-style-type: none"> • Variation capabilities • Market structures
Stakeholders	Ensuring stakeholders, i.e., suppliers, producers, packaging service firms, distributors, and retailers, apply Islamic ethics.	Selecting industrial stakeholders who offer the best quality resources at the lowest costs to maximize the competitiveness of products.
Cross-pollution	Preventing bodily interactions and Handling the risks of cross-pollution among non-Halal and Halal fashion goods/materials.	Cross-contamination among fashion products is possible.
Segregation	Separating the Halal goods/materials from non-Halal ones (employing devoted Halal services).	Mixing the no-Halal and Halal goods in the same boxes, storage, showroom/racks.

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