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Deriving Halal Transaction Compliance using Weighted Compliance Scorecard (WCS)

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Abstract: This study proposes a Halal transaction compliance process using Weighted Compliance Scorecard (WCS) to derive a Halal Transaction Compliance module. This study also attempts to outline the users, experts and authorities that will be implicated in its implementation. The transaction data was collected from a payment gateway provider after analyzing literature review, expert interview and central data theme to determine the variables involved in the compliance structure. The data is then aggregated and transformed before subjected to the Halal Transaction Compliance module and verified by the same group of experts. Results indicated that the proposed compliance is effective by a total average score of 4.06. However, improvements to central data theme can include investigative modules to make the variable more dynamically adaptable to real world changes. It can also include more in-depth industrial data compliance. Considerations should also be catered for international transactions and SMEs with global chains. For the purpose of this study, the user scope is limited to Malaysia Halal SME owners that use payment gateway embedded into their e-commerce website. Furthermore, the initial transaction data covers 500 of the payment gateway provider's most active users. It is suggested that future studies involve SMEs with good permissible scores to be benchmarked, so that the range of good compliance scores are gauged. They can also study the complexity of these compliance documentation for Halal supply chain transactions. This study's contribution lies in the enhancement of Malaysia's Halal transaction ecosystem, as well the development of a standardized Halal Transaction Compliance Protocol and the complexities involved in its operationalization and regulation.

Keywords: Transaction Management, Balanced Scorecard, Halal, Compliance Structuring

1. INTRODUCTION

Online transactions have become increasingly popular due to the emergence of e-commerce with embedded transactions of payment gateway services, particularly during the pandemic in 2020. According to the Department of Statistics Malaysia, e-commerce recorded a staggering RM254.6 billion in the first quarter of 2021, with establishments operating at 38.1 percent during MCO and 92.4 percent during RMCO [1]. The report also indicated that those establishments recorded a steady and stable income during that period.

The emergence of e-commerce financial technology (fintech) also indicated that there would be future surges in transaction payments. Unfortunately, this surge in transactions also give way to uncertainties from within the transaction itself, making it complex to determine whether one single transaction has achieved permissibility or *Halalan toyyiban*. One paper suggested that the intricate legality of online transactions must be operationalized in order to make a single transaction permissible [2]. However, there are limited researches highlighting its implementation and its implications to businesses and consumers alike, such as Halal SMEs and Halal consumers.

Transaction permissibility or Halal transaction is legal *fiat* (money) exchanges during business dealings between the owner of a Halal SME and another business partner or client, in which the entire process is known as *thoyyib* [2]. According to the hadith Book of Transactions and Muslim scholars, a single transaction must contain contractual parties, subject matter, form, transaction policy requirements, and system requirements to be legally bounded as permissible [3], [4], [5], [6]. Although most contemporary e-commerce systems in Malaysia have met the contractual parties and subject matter criteria, many of those systems exhibited limited fulfilment of their system requirements, transaction policy requirements, and the fundamentals of confirming a *fiat's* purchase source and usage. The increased number of online transactions underlines the need

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to develop an appropriate document compliance scoring to measure the permissibility of a single transaction.

2. LITERATURE REVIEW

A. Malaysia Halal SME Owners and Transaction Compliance

Small and medium-sized businesses, or SMEs, constitute an important segment of Malaysia's economy. It includes industries that provide manufacturing and other services, such as those in agriculture, mining, quarrying, and building. In addition to microbusinesses in all industries, SMEs also encompasses publicly traded firms and their subsidiaries, multinational corporations, corporations with links to the government, state-owned enterprises, and corporations organized under the Ministry of Finance [7].

Malaysia Halal SME owners (MHSO) are owners of Halal SMEs in Malaysia, and they play a significant role in the overall growth of Halal Industry 4.0 [8]. In a study developing an implementation framework for Halal supply chain management systems, it is further observed how MHSOs use e-commerce for customer engagement and transaction, indicating that business platforms are key for Halal SMEs' business longevity within their respective supply chains. The study also highlighted that due to limited capabilities, business platforms were not made mandatory but outlines that there are added global reach for MHSOs that utilizes them. This shows that MHSOs who leverage on business platforms such as fintech can increase their overall transaction performance globally, hence increasing their business growth and Malaysia's overall GDP growth [9].

The scope of transaction compliance has also expanded in Malaysia since 2010, with studies reaching Islamic financial activities for Halal SMEs such as crowdfunding and *sukuk* [10], [11]. However, in the scanty studies related to transaction compliance, all discussions typically relate to each of the instruments' or activities' specific model and not outline a single transaction's standard permissibility structure. For example, the crowdfunding study [11] highlighted specific requirements for regulatory platforms, the model behind it, and electronic requirements such as who are the issuers and the due diligences involved. The *sukuk* study [12] focused on bonds structure and the due diligences involved in that. None of the two studies highlighted how one transaction is standardly characterized as operationally permissible. Instead, both studies focused on how the instruments or activities can be operationalized based on their own scope.

Due to this, the current transaction compliance definitions and scopes are limited to activity based, instead of one standardized flow from the party giving the transaction to the party receiving the transaction. Therefore, the proposed solution is to show that once each party have established these standards, only then can each activity proceed under their own underlying rules. A simple analogy of this is similar to how internet users all adhere to one standard internet protocol called The Hypertext Transfer Protocol (HTTP), before proceeding to use the internet to perform any online activity. Hence, each MHSOs can use business platforms and achieve transaction compliance through the standardization of a single transaction's permissibility structure.

B. Understanding Transaction Compliance Structuring from AML Systems

Since there are limited resources to compare Shariah compliant transaction structuring and operationalizing, this study investigated the Anti-Money Laundering (AML) System as the basis of comparison. AML is a detailed risk-compliant system designed to review financial transactions and flag them when an anomaly is detected in the transaction [12]. The compliance detection follows a simple structure that can be used as the basis of many compliance processes to date. The process structuring steps include identification, assessment, and understanding. Identification in the AML Systems defines sources of risks, whether they are customer-related, issue-related, or activity-related [13], [14]. Following the definition, the next step involves onboarding the participants related to the defined sources.

For Halal transaction compliance, the context of the risk is transaction permissibility. For the purpose of this study, the two parties that are involved includes a buyer and seller within the e-commerce and fintech payment environment. However, the definition of buyer and seller would differ if the transaction occurs across a supply chain [15], [16] or any other financial instrument and activity. For instance, in the context of attaining raw material for a concrete factory, the raw material provider is the seller and the concrete factory is the buyer. This definition can easily be deduced within a fintech-embedded e-commerce site, where the seller and buyer can be easily defined within a single transaction receipt regardless of the commerce activities.

Next, AML systems have assessment that involves the due diligence of either the KYC (Know Your Customer) or KYP (Know Your Partner) [13], [17], [18]. KYC consists of regulations for customers, including customer identity verification, source of money, and nature of business dealing, while KYP consists of regulations for business partners, such as partner identification, business account monitoring, and screening activities. These fundamentals are similar to a fintech-embedded e-commerce definition of B2C (similar to KYC) and B2B (similar to KYP). This similar assessment due diligence can be adapted to outline the basic mechanisms for Halal transaction compliance. For the purpose of this study, the proposed system will be implemented for MHSOs, their business partners, and customers.

The final compliance structuring in AML after assessment is understanding, which includes understanding the business and level of risk through analysis, management, and review. For this proposed Halal transaction compliance, the analysis is performed using a formula, where the compliance is formulated using suitable score schemes to

analyse and verify a single transaction's permissibility. This step is performed using documentation scoring, where these scores are then communicated to users of the system. The users can then manage the transaction manually or through automation before re-evaluation. It is during this review process can the user prompt their customers or business partners to increase their compliance scores by updating their respective documents [14], [18].

C. Compliance Scope: Basic Mechanisms for Halal Transaction Compliance Structuring

This section highlights the basic mechanisms for Halal transaction compliance, which are contractual agreement, transactional flow in and out of the system, *fiat* usages and *fiat* sources.

For contractual agreements, permitted and promoted commerce in Islam are based on Surah al-Baqarah verses 275 and 198 of the Holy Qur'an. According to scholars like Ibn Qudamah and Ibn Kathir, these verses highlighted that the trade on agreed conditions is *Mubah* in its degree of acceptance and that online business or e-commerce is *Mubah* in the same degree as long as it adheres to the permitted business contracts under Islamic law [19]. Moreover, contracts are acceptable in either verbal or written form, according to Fuqaha. However, the contract has to be fair. For this reason, both the buyer and seller must agree on all conditions to share all gains and risks from a commercial transaction. Referring to Surah an-Nisa' of the Holy Qur'an, verse 29, scholars established two conditions in contract negotiations, namely *mustabinah wa marsumah* [19]. Halal transactions in Islam states that contracts must be written on something permanent or *Mustabinah*. Meanwhile, it can also be written in an ordinary human written format or *Marsumah*. Both these criteria in the e-commerce scope are operationally defined by databases and electronic documents.

For transactional flow, a system's database and electronic document attain the status of *mustabinah wa marsumah* when the details are transparent between the buyer and the seller, where disputes can be avoided and ensure rights exclusivity within every transaction [20]. These are typically recorded in transactional flow, where *fiat* flowing in and out of the accounts is transparent. Procurement papers in a supply chain system such as a request for bids, seller proposals, purchase orders, agreements, invoices, and receipts depict a *fiat's* transactional flow. These documents provide a simplified tracking system from the beginning of the business transaction until the acquired item or service is delivered. The system protects the supply chain and procurement quality, besides the safety and rights of both parties through such tracked documents. This transaction information (order documents, delivery notices, and receipts) are usually included within the ordering system of an e-commerce site for fintech like payment gateways. Applications like Shopee and Lazada employ *mustabinah wa marsumah* systems because the system can holistically track and manage a single purchase transaction.

The methods are defined in the contract conditions established by *Bai' as-Salam* once the *fiqh* component of the operational definitions is secured. By understanding the contract's essential provisions, scholars were able to apply a hadith from the Prophet SAW in Sahih Bukhari's "Paid in Advance" volume. The fundamental prerequisites are defined as price offer *(Ijab)*, acceptance *(Qabul)*, *fiat* payment, *ijab qabul* done at the same meeting spot, identifiable products, and a delivery date [6]. The main issue that frequently emerges with contemporary e-commerce transactions is the contract's legitimacy in terms of its meeting location and ambiguity [6]. In e-commerce and internet transactions, meeting sites are virtual. Hence, obtaining timestamp data is insufficient. Therefore, sessions' keys, pre-order consent, digital signature, seller digital declaration post-dealing, and transactional compensation *(khiyar)* policy may all be used to operationally establish the legality of the meeting place in a business transaction [4], [5], [6], [20].

Lastly, the most critical compliance step is declaring the source and usage of *fiat*. According to a prominent hadith from The Book of Transactions, when a source of *fiat* is properly obtained and it meets the criteria of resource preservation, it is acceptable *(Hifz al-Mal)* [3], [20]. Although the uses of *fiat* are quite easy to understand, gaps in operationally defining the source within a system remains. Therefore, these definitions must be defined within a suitable system before the compliance mechanisms are verified by experts. The experts field of expertise are SMEs, Halal or Islamic Business, Islamic Finance, and Statistics along with other technological field, especially within the fintech domain [20], [21], [22]. The main gap in understanding Halal business and Halal transactions in past research has always been the limited Halal transaction definition, which focused on either e-commerce or fintech separately [20]. Therefore, determining the source of *fiat* in a single transaction in such conditions becomes challenging. Fintech can structure the operational definition of *fiat* sources, while e-commerce websites and their related documents can structure the operation definition of *fiat* uses. In short, a combination of these data points could serve well in defining an operational Halal transaction mechanism.

3. METHODOLOGY

A. Research Activity

This study began by interviewing experts to validate the literature review findings, where the central data theme is studied. These themes form the baseline for the Halal transaction variables involved in the study. Next, transaction data of 500 MHSOs were requested from a payment gateway provider. The e-commerce data and the transaction data were then aggregated and transformed before subjected to the compliance process and validated by experts. The full research flow is as shown in Fig. 1.

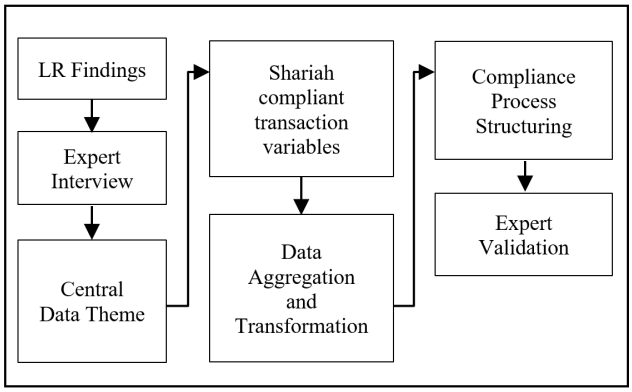

Figure 1. Research flow for the development and validation of deriving Halal transaction compliance

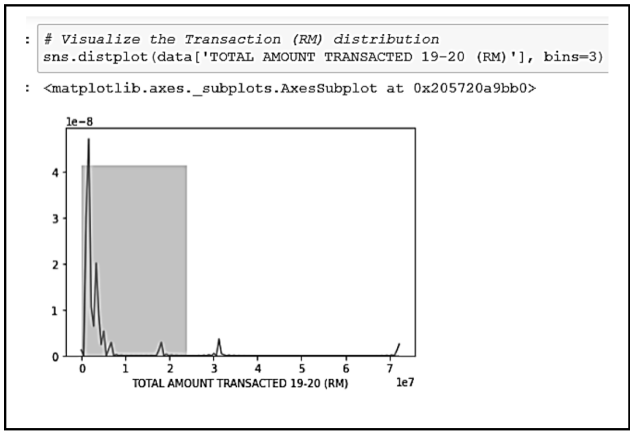

Figure 2. High degree of skewness exhibited due abnormally distributed data and too many outliers within the main transaction dataset

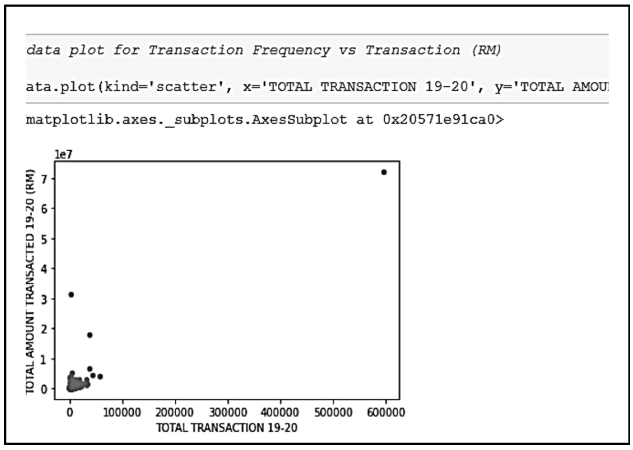

Figure 3. Inconsistency in visualization plotting due to skewness

B. Expert Scope

According to previous studies, field integration research such as this requires experts with experience, education, awareness of the discussed theme, and are well-versed in their own field [23], [24], [25]. All of the experts in this study were mindful Halal consumers. The experts involved in validation of the study were SME Owners (SO), SME Experts (SE), Halal Knowledge Expert (HE), Technologists (TE), Finance Experts (FE), and Islamic Finance Experts (IFE). SOs and SEs verified the Halal transaction compliance's usefulness to an SME's business. HEs, FEs, and IFEs verified the transactional components of the compliance [26], [27], [28], [29]. TEs confirmed the compliance's applicability, while two main experts namely the data science coach (TE) and statistical expert (STAT) validated the Weighted Compliance Scorecard (WCS) method and data structure. Due to the complexity of this study, the experts related were cross-expertise experts with one main expertise yet specialization in another field. The experts are as shown in Table I.

C. Expert Interview and Central Data Theme Analysis

17 experts were individually interviewed to understand the central data theme related to Halal transaction compliance. The interview has three sections, starting with a structured interview to collect the experts' profile. The second section is an unstructured interview, where open-ended questions gauge the experts' knowledge and awareness regarding Halal, Islamic transactions, SMEs, and fintech. The last section then collects their feedback on the type of data suitable for the study. The central data themes along with LR findings were then mapped onto a Shariah compliant variable structure table.

D. Transaction Data and Its Related Variables

Based on the LR findings and central data theme discovered, the Shariah compliant variable structure for the transaction data was established. The transaction data was then collected from a payment gateway provider. The dataset consisted of transactions from 500 of the provider's most active MHSOs from 2019 to 2020. The daily pseudonymised transaction data were then reinforced with its e-commerce details such as product descriptions and transaction coordinates, which were then merged into a monthly and annual dataset. For each daily transaction, the *fiat* uses and source documents were collected.

Because there were no missing values in the dataset, the dataset was cleansed by converting the categorical data to numerical data. Following the cleansing, the skewness of both datasets was checked. The multi-layered verification of the data structure is critical because the skewness of the dependent variable must be bell-shaped and normally distributed to ensure that the dataset plots consistently, has no outliers, and can be properly derived [30], [31]. Results showed that the primary transaction dataset exhibited a significant degree of skewness of 17.21. The skewness was caused mostly by the irregularly distributed data and the presence of too many outliers, as seen in Fig. 2. Skewness also resulted in inconsistencies in data plotting as observed in Fig. 3.

TABLE I. EXPERTS RELATED IN THE STUDY

No	Experts	Description
1.	HE1	A Halal Research and Development director for 4 years, specializing in Halal product development
2.	HE2.SE2.IFE1	A Halal consultant and Halal SME trainer for 4 years, with a 4-year background in Islamic finance, Shariah compliance, and business management
3.	HE3.SE3.IFE2	A Halal consultant and Halal SME trainer for 3 years, with a 6-year background in Islamic finance, Shariah compliance, and *Usl Fiqh*
4.	HE4.SO3.TE6	An MHSO for food and beverage manufacturing for 6 years, with a 25-year Halal and 15-year technologist background mainly in logistics and international business
5.	HE5.TE10	A Halal business expansion consultant for 15 years, with a 14-year background in Halal system and business development
6.	IFE3.TE8	An Islamic finance specialist for 3 years, with an 8-year background as an IT business analyst
7.	IFE4	An SME Islamic finance accountant for 19 years, specializing in Islamic financial marketing
8.	SE1.TE2.FE1	An SME unemployment strategist and financial intelligence strategist for 9 years, who also does 10 years of data science and data analytics development
9.	SO1	An MHSO for food and beverage manufacturing for 10 years, with Halal Research and Development and quality assurance background
10.	SO2.TE3	An MHSO for data science and analytics for 4 years, with a 11-year software development and cyber forensic background
11.	SO4.TE7	An MHSO and payment gateway provider for 20 years, with a background in business management, e-commerce, and technology development
12.	SO5.FE2	An MHSO for 3 years, with a 20-year experience as a Chief Finance Officer (CFO). This expert is also a representative non-Muslim MHSO among all the experts
13.	STAT1	A statistician with data structuring and algorithm development for 10 years, with a background in statistical verification
14.	TE1	A software engineer and process developer for 4 years, with a background in software automation and Research and Development
15.	TE4	A payment gateway provider technologist and customer engagement officer for 2 years, with a background in system compliance
16.	TE5	A payment gateway provider Chief of Operations and technology project manager for 9 years, with a background in e-commerce and business development
17.	TE9	A big data analytics and data science coach for 3 years, with 14 years of experience as data analyst and background in algorithm development

As a treatment solution, the data was log transformed before its data structure was re-cleansed. Fig. 4 depicts the log transformation and its outcomes, still exhibiting a high degree of skewness of 16.57. This resulted in its standard deviation being abnormally close to the mean.

STAT1 proposed partitioning and aggregating the primary dataset to restructure it. The original dataset variables were preserved. However, the primary transaction dataset was separated based on the size of the SMEs. This meant that transaction compliance is successful if its compliance layer is set based on those sizes. The dataset in this study was divided into fifteen (15) medium MHSO, 132 small MHSO, and 353 micro MHSO. The micro dataset was selected due to it being the largest amount out of the three sizes. The aggregated data then went through the same skewness correction procedure. At 10.21, the data was skewed to the right and was processed using log transformation. Results are as shown in Fig. 5, indicating that the dataset now has a statistically correct data structure.

E. Using Weighted Scorecard for Document Compliance Process Calculation

Next, the dataset along with their related documents were then subjected to compliance process calculation. A balanced scorecard is used, which is a technique for selecting decisions based on the weightage of its criteria. It has been fundamentally used in document scoring for short- and long-term objectives, including dataset performance and dataset compliance calculations [32], [33], [34]. It also tracks the performance for better capability monitoring, as it can help give weighted importance to each scorecard metric [34]. This scenario can be found in past Islamic transaction studies. In some of the studies, balanced scorecards are used when a system has complex goals to achieve at its most macro level possible. The example of uses range from national strategic planning, multi-criteria decision making for a large scale project, and multi-business scale machine learning projects [34], [35], [36]. However, the novelty for this study is to focus on the foundations of transaction's permissibility while using the weighted scorecard technique to standardize the documents' compliance process calcula-

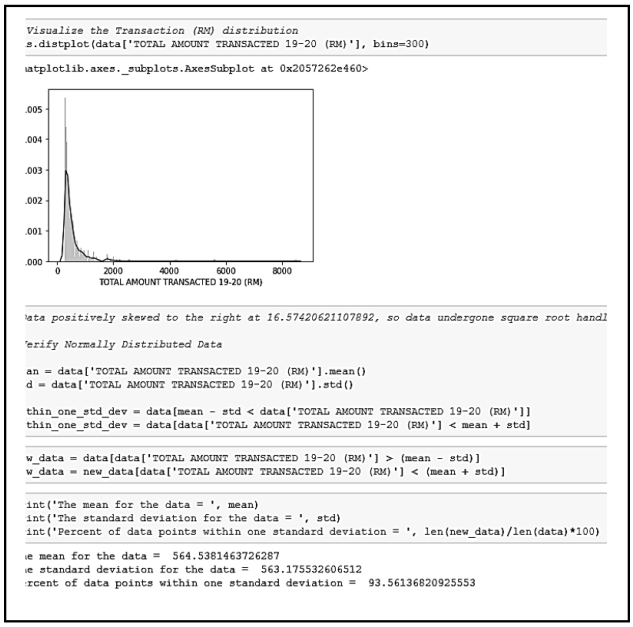

Figure 4. The transaction dataset post log transformation observing abnormally large standard deviation

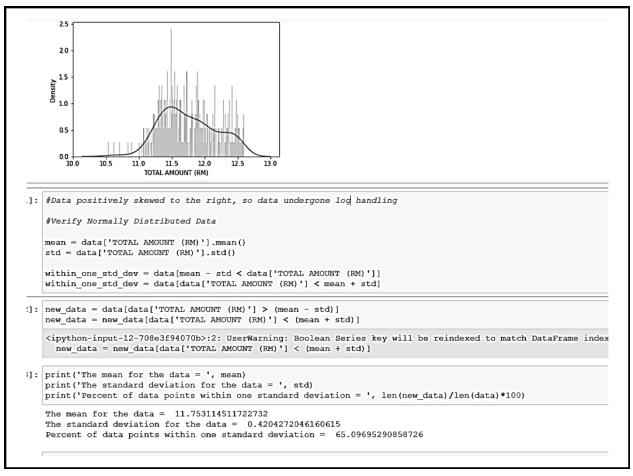

Figure 5. The restructured and aggregated data post transformation log exhibiting a normal distribution with normal standard deviation

tion. It is emphasized that this is to ensure the transaction compliance is one standard protocol to start before any other transaction activity or instrumentation mentioned in previous studies. The final Halal transaction compliance results were then discussed with the 17 experts for validation.

4. RESULTS AND DISCUSSIONS

A. Central Data Theme Analysis and Shariah Compliant Transaction Variables

Based on the expert interview, transaction data, internal data, and external data are the central data theme for Halal transaction compliance. Transactions are the dependent factors since they influence MHSO behaviour choices, whereas internal and external data are the independent variables that are different based on the SMEs' size, industry, and other determinants such as capacity. Table II shows the tabulation of the data themes.

Based on Table II, 76.47 percent of the experts highlighted managerial information as one of the most crucial data in developing Halal transaction compliance. Managerial information such as a MHSOs' profile, their managerial position, and transaction strategy can outline their transactional pattern's typical behaviour. IFE3.TE8 says that we do not want to flag an MHSO's transaction pattern simply because they made an anomalous transaction decision. The behaviour anomaly must be compared to the typical behaviour of other MHSOs of the same managerial position.

For example, an MHSO that is in the Halal research and development field may typically have less frequent transaction but higher transactional amount than an MHSO who is the owner of a food and beverage roadside stall. Some MHSOs may also indicate their transactional strategies within the fintech they use. These may also lead to different documentation uploads within the system. For example, a transaction of an MHSO going to a RM2000 Halal robotics annual seminar may be anomalous in the first year, but may not be anomalous in the next year. The document uploaded of the payment transaction may also have a standard receipt which may change in version over time. Therefore, the system must have a feature for whenever an MHSO makes those types of transactions, the event coordinator or transaction recipient must upload the correct and updated document version into the system.

As for organizational data and financial data, 52.94 percent of experts respectively outlined both data as similarly important. HE4.SO3.TE6 explains that organizational data outlines typical transactional behaviour within organizations of the same size and can also be extended to similar niche. For example, MHSO A is a medical supplier and technological consultant, while MHSO B is a concrete manufacturer and technological consultant, and MHSO C is a software developer that specializes in technological consultation. Although typically MHSO A, B, and C are in three separate sectors, their similar niche as technological consultation can serve as another compliance behaviour layer in Halal transaction compliance. This niche similarity may also be extended to other financial activity as well, where the same standard can be used from transactional flow as well as *zakat*, crowdfunding, investment, or even *sukuk*. This niche to activity link, as agreed by SE1.TE2.FE1 and TE4, is in fact the main bridge between the transaction compliance protocol and other transactional or financial activities.

SO5.FE2 also adds that it is significant to map out similar niches such as situations of MHSO A, B, and C in Halal industry for transaction tracking, especially in detecting non-compliant payments within the proposed system. He states in an example where impermissible transactions have been detected in Halal pharmaceutical and healthcare

TABLE II. CENTRAL DATA THEME FOR HALAL TRANSACTION COMPLIANCE

Expert	Internal Data		External Data	Internal and External Data
	Managerial Data	Organizational Data	Industrial Data	Financial Data
HE1	/	/	/	
HE2.SE2.IFE1	/		/	/
HE3.SE3.IFE2	/	/		/
HE4.SO3.TE6	/	/		
HE5.TE10	/	/		
IFE3.TE8	/			/
IFE4			/	/
SE1.TE2.FE1	/	/		/
SO1	/	/	/	
SO2.TE3	/		/	
SO4.TE7		/		
SO5.FE2	/		/	/
STAT1	/	/		/
TE1			/	
TE4		/	/	
TE5	/			/
TE9	/			/
TOTAL (Percentage)	76.47	52.94	41.18	52.94

sector but only happens to technological consultants such as MHSO A. The system can then trace all other SMEs with similar niche in other sectors and alert MHSO B and C of the possibility that the same impermissible transaction may spread to their respective sector. They can then alert their financial institutions and business partners, further protecting their business and sector from involving in such transactions and its interconnected impact to the overall Halal industry.

Lastly, 41.18 percent of experts primarily believed industrial data as the least crucial data in developing Halal transaction compliance. Experts mainly feel that industrial data such as the complexity of supply chain data as well as other strategic Halal industry data do not affect too much the overall compliance. However, industrial data such as cross-border transactions, documentations, and data policy sharing between different countries need to be taken into consideration. This is because it is difficult to monitor the documentations that are involved in such cross-border transactions. However, SO2.TE3 and HE2.SE2.IFE1 note that if regulators and policy makers are involved during implementation, important requirements similar to the managerial data can be uploaded by overseas companies before receiving payments. This may play a vital role in globally standardizing Halal transaction compliance.

B. Proposed System Requirements

For demonstration purposes of this study, the proposed system is used by micro MHSOs using fintech-embedded e-commerce, preferably embedded payment gateways. This is because payment gateways are more feasible and can be easily installed and used through computers, laptops, and even mobile phones that have access to the internet. This will cover the gaps in SME capacity discussed previously in the literature review section regarding fintech limitations as business platforms. This also ensures that MHSOs can utilize their current payment methods as per usual, as long as they are the clients of the payment gateway provider.

For this proposed system, buyers will browse through the e-commerce websites and view the products or services listed. When a product or service is added to the cart, they are led to an instructions page where it displays mandatory order confirmation and payment receipt documents to be uploaded immediately after payment. These documents initiate the transaction permissibility compliance chain, where documents are uploaded and recorded. The transaction then continues along the chain to upload and record more documents such as delivery confirmation, item received confirmation, and refund confirmation if liable damages occur. The recorded data is then retrieved by a module called Compliance Process. Within this module, the transaction's permissibility is calculated before storing that data which is displayed on a dashboard or to be used for other decision-making analytical purposes. Fig. 6 depicts the processes, where the compliance processing of the documents is automatically performed at the back end.

The Compliance Process has a function named documentScore(), to retrieve the full transaction and document data using a SELECT query. The name of the documents is then automatically tagged to its document feature, such as an item's identification number being tagged as a product description.

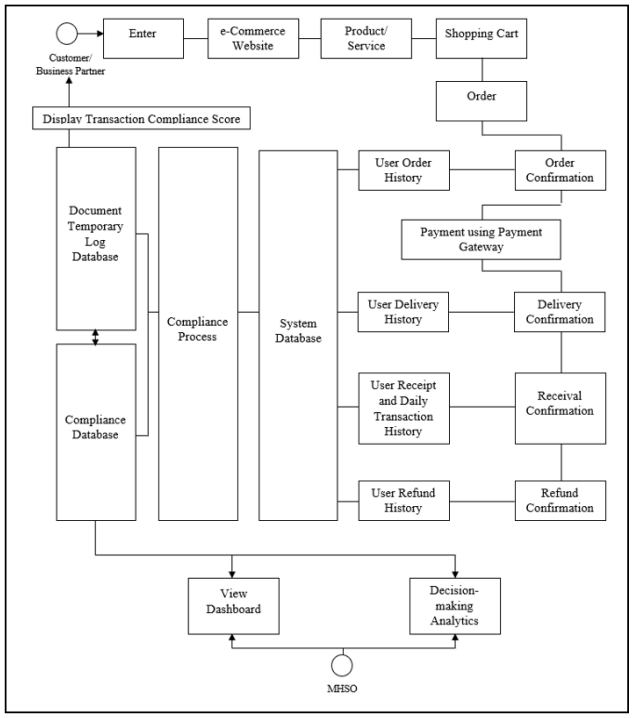

Figure 6. Sample Block Diagram for a Single Transaction's Permissibility Compliance Process

Once the document tagging is completed and its metadata is sorted, the tagged document is now considered a variable and is sorted according to its compliance level, weight factor, and document type. Here the documents are calculated and temporarily stored in a Document Temporary Score Log. This temporary log can be managed and re-evaluated by the customer and business partner. The MHSO can prompt their customers and business partners to upload relevant documents to improve their transaction permissibility score.

C. Document Compliance Process Calculation

Compliance structuring is proposed to focus on determining the permissibility of a single transaction at a time. The formula to calculate the permissibility score is expressed using a weighted balanced scorecard as denoted in (1) and (2) respectively

$$AFS = \frac{Sum(DV * DFS)}{Sum(DFS)} \tag{1}$$

$$AFU = \frac{Sum(DV * DFU)}{Sum(DFU)} \tag{2}$$

where FS is the *Fiat* Source, FU is the *Fiat* Use, AFS is the Average Daily Weighted Score for *Fiat* Source, AFU is the Average Daily Weighted Score for *Fiat* Use, DV is the Document Value, DFS is the *Fiat* Source Weighted Factor, and DFU is the *Fiat* Use Weighted Factor. The final permissibility score is expressed in (3)

$$P = \frac{Sum(AFS + AFU)}{2} \tag{3}$$

where P is the Final Permissibility. The average *fiat* sources and uses are consolidated according to the user's final permissibility report needs, either weekly, monthly, quarterly, annually, or biannually.

The weightage of the four layers of compliance mechanisms was determined based on the number of occurrences in the mechanism's layer [37]. Table III illustrated this method's calibration measurement and documentation of weight determination, as well as summarises the sample weight factor of each document.

For instance, since a session ID is needed in all four layers of the compliance mechanism, the calculation of the weighting factor (DF) is expressed in (4) as:

$$DF = \frac{SumOfOccurrencesInMechanismLayer}{TotalNumberOfMechanismLayers} = \frac{4}{4} = 1.00 \tag{4}$$

Another example is the *khiyar* document, which only appears in *fiat* use, contractual agreements, and transactional flow layer.

The document scores were then calculated by referring to the number of documents uploaded for that day. The calculation is as simulated using the data in Table IV.

In Table IV, a user with ID user1637 from the food and beverage industry has a business partner who made a purchase set to be delivered to 35 of their business locations on October 1st, 2019. As observed in Table IV, not all required documents were uploaded by the user's business partner. Only 32 order confirmation documents and 27 delivery confirmation documents were uploaded. This will make those documents have different document values. The document value is as expressed in (5) as

$$DV = \frac{NumberOfCompletedDocuments}{NumberOfActualDocumentsNeeded} * 100 \tag{5}$$

where DV is the Document Value. Based on these numbers (Table IV), the sample transaction yielded an order confirmation documents DV of 91.43 percent and delivery confirmation documents DV of 77.14 percent. Once every document was scored, the FS and FU were calculated using

TABLE III. WEIGHTED BALANCED SCORECARD FACTOR DETERMINATION

Document	Compliance Layer FU	FS	TF	CA	DF
Transaction Log Data	/	/	/	/	1.00
Key Session ID	/	/	/	/	1.00
Digital Signature	/	/	/	/	1.00
Pre-order Consent	/	/	/	/	1.00
Invoice	/	/	/	/	1.00
Receipt	/	/	/	/	1.00
Khiyar Policy		/	/	/	0.75
Bank Statement	/		/	/	0.75
T-Account Book	/	/	/		0.75
Delivery ID and Date		/	/	/	0.75
Buyer Feedback	/	/		/	0.75
JAKIM Source Process Audit Receipts	/			/	0.50
Traceability Database Document	/	/			0.50
E-Commerce Product Use Description		/		/	0.50
Quotation		/		/	0.50
Purchase Order		/		/	0.50

a. FU = *Fiat* Use, FS = *Fiat* Source, TF = Transaction Flow, CA = Contractual Agreement.

TABLE IV. WEIGHTED BALANCED SCORECARD FACTOR DETERMINATION

Data Name	Values
sessionId	b1932tbcklsh126734
purchaseDate	01/10/2019
actualCompletedSession	35
userId	user1637
bankName	CIMB Bank
industry	Food and Beverage
noItems	35
itemId	42bj423frj0
completedReceipt	35
orderId	fxywvy1234v
completedOrder	32
deliveryId	cbyr68234
completedDelivery	27
receivalId	1763482376fgecw
completedReceival	35
refundId	013444134csdv
completedRefund	0

(1) and (2) as shown in Table V.

Based on Table V, the average daily FS and average daily FU were 95.06 percent and 98.20 percent, respectively. If P was calculated for that one day, then, User1637 would have yielded a permissibility score of 96.63 percent on October 1st, 2019. Hence, User1637 can improve the *fiat* use score by nudging their business partner to immediately update their delivery confirmation documents that can be attained from logistics providers or delivery service providers, such as PosLaju or LalaMove.

D. Expert Validation

The experts were invited to a group validation session, where all of them were presented the main research background as well as the central data theme, variables, proposed system requirements, and the document compliance process calculations. These results were mapped on a Likert scale from 1 to 5 (1 being less effective and 5 being the most effective), where each expert was to rate each results based on the effectiveness of the compliance's accuracy, reliability, and validity. The result of the rating is as shown in Table VI, where CDTV is the Central Data Theme and Variables, PSR is the Proposed System Requirement, and DCPC is the Document Compliance Process Calculation.

TABLE V. USER1637'S AVERAGE WEIGHTED BALANCED SCORECARD FOR ONE DAY

Document	DV	DF	FS	FU
Key Session ID	100	1.00	100	100
Order Confirmation	91.43	1.00	91.43	91.43
Receipt	100	1.00	100	100
Delivery ID and Date	100	0.75	74	75
Delivery Confirmation	77.14	0.50	38.57	-
Item Receival	100	0.50	-	50
E-Commerce Product Use Description	100	0.50	-	50

TABLE VI. THE EFFECTIVENESS OF HALAL TRANSACTION COMPLIANCE'S USABILITY

Experts	CDTV	PSR	DCPC
HE1	4.00	3.00	4.00
HE2.SE2.IFE1	4.00	4.00	4.00
HE3.SE3.IFE2	3.00	4.00	3.00
HE4.SO3.TE6	4.00	4.00	5.00
HE5.TE10	4.00	5.00	5.00
IFE3.TE8	3.00	4.00	3.00
IFE4	4.00	4.00	5.00
SE1.TE2.FE1 3.00	3.00	3.00	
SO1	4.00	4.00	4.00
SO2.TE3	3.00	4.00	4.00
SO4.TE7	4.00	5.00	4.00
SO5.FE2	5.00	5.00	5.00
STAT1	4.00	5.00	4.00
TE1	3.00	4.00	3.00
TE4	3.00	5.00	5.00
TE5	4.00	5.00	5.00
TE9	4.00	5.00	5.00
TOTAL SCORE	3.71	4.29	4.18
AVERAGE TOTAL SCORE		4.06	

Based on Table VI, all experts agreed that the proposed Halal transaction compliance is effective in its usability at an average total score of 4.06. The most effective Halal transaction compliance proposed was the proposed system requirement, followed by the document compliance process calculation and lastly is the central data theme.

According to IFE3.TE8, the central data theme scored lower on average due to the static nature of the suggested variable. He emphasized that while the system supplied scoring and profiles for each client by analyzing specific variables, the system itself should have an investigative module that can update the pattern and behaviour of the transaction using more than just compliance score data. SE1.TE2.FE1 and SO2.TE3 agree with this suggestion, adding that a research or investigative module can be utilized by another user, which is an analytics exploration team. This team can use research data to dynamically update the central data theme as well as data collection point. The same team can even be responsible for enabling REST API consumption and API integration to bridge transaction data already present within an MHSO's internal system. This enables MHSOs to use the payment gateway as an additional module to their current system, instead of using it as a different system and have two databases that are redundant to each other. HE4.SO3.TE6 also concurred, adding that many present MHSOs already have several systems and data points. Regardless of the number of systems in operation, MHSOs must be able to easily examine and download the transaction files when necessary from one easy and ready database.

Besides that, after presentation of the results, experts now can see that industrial data are indeed as important as organizational data and financial data. HE4.SO3.TE6 suggests that international components and variables like cross-border import and export data can be utilized as a future collecting point through the World Halal Summit discussions between Malaysia's Halal leaders with other global Halal participants. Currently, the compliance's variables are more designed to support compliance locally. According to SE1.TE2.FE1, several local MHSOs made a living by importing and exporting goods. This is supported by [38], [39], which shows that adopting e-commerce provides

MHSOs with an effective alternative solution to increase their industry presence and competitiveness by utilizing data from the exporting country such as raw material prices and currency fluctuations. These data are important in determining the degree of presence and competitiveness their business can have in the global Halal ecosystem. As a result, a plan for capturing and monitoring future foreign transactions, as well as mapping out international transactional documentation proofs, is required, especially if the country has distinct documentation proofs such as transaction regulations and separate data sharing acts. SE1.TE2.FE1 concurred, indicating that utilizing correct data tagging enables the compliance system to be used against corruption and monitor *riba*. Data tagging with transaction information may track which Halal supply chains are over-profiteering and the impact this has on the wider Halal ecosystem.

Aside from that, HE5.TE10 mooted that the central data theme needed to consider more in collecting data from globally chained SMEs. To determine this, he said there were previous works that employed causal chain and cross-border gap analysis. However, simply collecting data from Forex exchanges was insufficient. This is due to the fact that transaction compliance necessitates the existence of a *fiat* source, *fiat* use, transactional flow in and out, and a transaction agreement. An example of this discrepancy in documentation is of transaction sources from MHSO A in Malaysia, which exported and imported chickens from MHSO B in Africa. Since the source of *fiat* is characterized as lawfully obtained *fiat* or authorized investigation, then both MHSO A and B must satisfy the source of *fiat*. MHSO B may have differing meanings of a legitimately obtained transaction, necessitating the verification of several documents by authorities such as Africa's Halal committee. Therefore, good coordination of each document's definitions or the identification of an international standard for each document is critical in developing an effective international transaction compliance process. Furthermore, some countries have greater technological capabilities than others, allowing them to deploy fintech in conjunction with the proposed system's analytics dashboard. This difference in capacity for different countries must be taken into consideration for global implementation actions.

E. Operationalization and Regulation Implications of a Halal Transaction Compliance Scoring Implementation

With regards to implementation implications, this study divides it in terms of implications locally and globally. Based on discussions with experts, all experts stated that because there was no formal standardization prior to this, there are only procedures done by financial institutions to verify that each MHSO's payment transactions are Shariah compliant. These verifications are typically activity based, as previously highlighted. This official action does not include Department of Islamic Development Malaysia (JAKIM). Furthermore, all financial regulations in Malaysia fall under the purview of Bank Negara Malaysia (BNM).

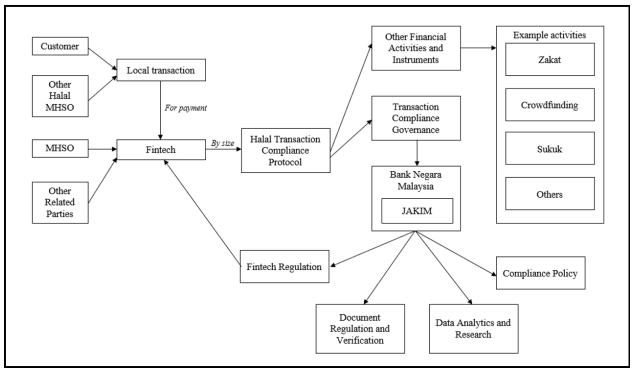

Figure 7. Local Operationalization and Regulation of Halal Transaction Compliance in Malaysia

The major question raised is, "Who will be responsible for compliance and who will be held accountable for taking action?" This study proposes, for regulatory reasons, there will be a sub-department under BNM led by JAKIM. The local operationalization and regulation are as shown in Fig. 7.

All local transactions will be done through fintech and will pass through a standardized Halal Transaction Compliance Protocol. Only then can the transaction pass to any financial activity. For example, if customer A purchases chicken from MHSO B, then the transaction payment will be done through their respective payment gateway and the compliance will be calculated and verified, before passed to MHSO B's e-commerce site and back to the payment gateway. The normal compliance scoring, decision-making, and customer re-evaluation via uploaded documents can be done as per discussed previously.

Next, the digital details from the protocol can then be governed through Transaction Compliance Governance under BNM's sub-department with JAKIM. Under this governance, there must also be departments for fintech regulation, transaction document regulation and verification, data analytics and research, and compliance policy. Fintech regulation is already present in BNM, and this department can manage the fintech related governance of this whole protocol. The document regulation and verification department can keep track of permissible documents uploaded, as well as liaise to keep check of verified document versions and formats with other related parties such as event coordinators or MHSOs. The data analytics and research department will be in charge of updating the protocol's central data theme as well as monitor the digital footprints of each document and database. Lastly, the compliance policy department will underpin the policies related to the protocol.

For local implementation, the operationalization and regulation implicate the whole of Halal industry's ecosystem, especially Halal consumers, MHSOs, other related parties such as local supply chain key players or Halal event

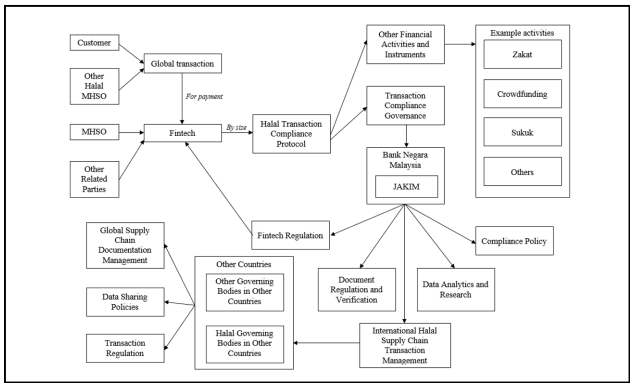

Figure 8. Local Operationalization and Regulation of Halal Transaction Compliance in Malaysia

organizers, BNM, JAKIM, and other financial institutes. For global implementation, the same parties are involved. However, there are other countries that will be implicated, as shown in Fig. 8.

As suggested in Fig. 8, BNM and JAKIM will be the bridge to other countries related with the Halal transaction. There will be an International Halal Supply Chain Transaction Management Department that engages with Halal governing bodies and other authorities from other countries. These governing bodies will provide and align the global supply chain documents, data sharing policies, and transaction regulations involved in the transaction. This international cooperation will then form an International Halal Transaction Alliance, in which both parties will consolidate discussions through the World Halal Summit to update the global compliance protocol and resolve issues flagged regarding documentation, data sharing, and many other issues.

5. Conclusion

The proposed system and compliance scoring method enabled a better understanding of Halal transactions and their compliance management. Effective compliance structuring is key in determining a single transaction's permissibility. However, there are some challenges observed in this study. Although the basic mechanisms and scoring processes led to better transaction permissibility management, the compliance can be enhanced by benchmarking MHSOs best practice in transaction compliance management. The benchmarked SMEs' transaction permissibility score can be collected and averaged to gauge a range of good compliance scores. The best reference to do this is by studying the AML Systems scoring, where the transaction patterns are scored based on their compliance's consistency, profile update, and performance in keeping their account above the compliance threshold [17], [18]. Continuous improvements in these benchmarking can further help MHSOs to understand their customers and business partners better, apart from recognising the multiple Halal document requirements.

On the other hand, future practitioners can study the weighted factor determination of each document within the context of a Halal supply chain, where the factor can differ based on the complexity of the MHSO's supply chain and its position. The MHSOs involved in Halal trading can also experience different document request challenges like import and export documents that may vary in detail, Halal transaction metadata, and document data sharing policy. Hence, more research is required to build a multisource compliance scoring module if multisource documents are to be successfully standardized and scored based on their local or global sources. With this information, local and foreign multisource documents can be compared to further study the different data-sharing regulations of Halal communities in various countries.

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