Negotiating Halal Crimes: 
The Use Of Block-Chain Technology

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Abstract
For Muslim societies, the issues of halal and non-halal products are of very sensitive nature. Unfortunately, there has been a worrying increase in halal crimes in recent years and there appears to be no end in sight to this issue. For this reason, the application of block-chain technology may be useful for dealing with this issue in Malaysia. The objective of this research is to examine the practicality of leveraging block-chain technology to prevent halal crimes. A systematic review on relevant research publication on this issue was conducted and results from the review indicate that there is a huge potential in leveraging block-chain technology to benefit the halal industry as well as preventing halal crimes at grass root level.

Keywords: Blockchain; Digital Revolution; Technology; Data Networking; Halal Supply Chain

Introduction
The halal industry is currently gaining attention not just in Malaysia but also around the globe. The increase of demand of halal products are increasing over recent years; from 2010 to 2018, the total export value of halal product in Malaysia increased by 163.0% from 15.2 billion (currency) to 40 billion (currency). By 2024, it is predicted that global halal industry will expand by 6.3% to about 1.97 trillion (currency).

Regrettably, such growth does not escape the attention of those who seek to profit off this industry through unscrupulous means such as production of counterfeit halal products, counterfeit logos, questionable or false halal

Moreover, food crimes have occurred on other consumer products such as baby formula, where melamine was added to increase the protein content of baby formula milk in 2008 in China. Spices are also used as a tool in launching food crimes, where they detect Sudan and Myanmar dye adulteration in chilli powders, turmeric in India and Bangladesh, as well as shrimp paste containing dye agents which are not recognized in Myanmar (Alan Reilly, 2018).

In addition, the discovery of horse meat in processed beef products in 2013 shows that food crime is on the rise. A large-scale detection was conducted to identify the origin of the meat, which resulting in pig DNA was found on halal food products in the United Kingdom (Awal Fuseini et al, 2017). In one study, it was found that 22.5% of imported fish products manufactured by Italy were involved in food crime cases when the labels listed were not in line with the actual information. In another case, a honey producer in Corsica was arrested in 2018 for marketing honey as a PDO (Protected Designation of Origin), however the content was fake by blending imported honey (Kristin Guzder, 2019).

According to Food Crime Intelligence (2019), a total of 364 food crime cases were reported in the first quarter of 2019. In Southeast Asia, the highest rate of mislabeling was found on products imported from three countries, namely China, Vietnam and Thailand (Alan Reilly,
In Malaysia, the food crime issue that has been reported is the manipulation of fresh palm oil. This syndicate has taken advantage, as palm oil is widely used by Malaysians in cooking. As a proof, the annual waste generated from cooking oil alone has reached 50,000 tons. Subsequently irresponsible parties have been manipulating fresh palm oil with used cooking oil since 1980-2010 in order to obtain huge profits (Shih Yeh Lim et al., 2018).

After that, in 2015 cases reported involved food crimes such as misuse of the halal logo, adulteration of halal certificates and labels, and even worse cases, the use of halal logo on products containing prohibited ingredients as well as sales of coffee containing pig DNA (Mustafa ‘Afifi Ab Halim, Mohd Mahyeddin Mohd Salleh, 2018). Next, in 2017 the emergence of artificial honey made from sugar, starch and corn flour, fake zam-zam water and fake stevia was reported (Mohd Salim Bin Dulatti et al., 2019). Other common issues are the exchange and mixing of quality content with poor quality content such as replacing oil with lard because it is readily available and requires low costs (Nurul Atikah Poniran, Anwar Fakhri Omar, 2018).

Such crimes may happen at any stage in the halal supply chain; a most recent example of this is last year’s shocking exposure of a major cartel that deals with the export of non-halal food products in the country.

A number of solutions have been formulated and applied to deal with these halal crimes, including the revamp of halal standards, standardization of halal logos, a stricter scrutiny of import companies and halal products. However, it is also prudent to consider the application of contemporary advancements in current technology or there is a real danger that the enforcement of halal standards may be exposed to manipulation and constrained by outdated technologies.

With the advent of IR 4.0, there is potentially an unlimited number of technologies that may help enhance our lives; to put in other words, these technological advancements may not only be used to enhance our education and healthcare systems but also help to fight all manners of halal crimes.

A potential application of one of these new technologies is by leveraging blockchain technology; this technology may not only be useful in eradicating halal crimes but also diminish a variety of potential threats against the halal industry. A real-world example of the application of this technology is the use of IBM Food Trust platform to put in place a tracking system and to ensure a level of transparency along a food chain supply (IBM Food Trust, 2020). The renowned food company Nestlé has also utilized block-chain technology to track the production and supply of its milk from New Zealand to the Middle East (Nestlé, 2020). In Malaysia, the Malaysian Palm Oil Council (MPOC) has collaborated with BloomBloc to develop a palm oil tracking system alongside its chain supply using the very same technology (MPOC, 2020).

Most importantly, block-chain technology has been used and found to be useful in ensuring the integrity of the production of halal food products as well as increasing consumers’ trust in them (Kay Behnke, Janssen, 2020). This technology may also add value to the traceability system because it covers not only food chain supplies but also other aspects such as logistics, packaging, transportation, manufacturing et cetera (Zekhnini, K., et al., 2020). The application of block-chain technology connects both physical and digital contexts and is capable of sustaining transparency in all angles.

Nevertheless, it is important to note that the application of this technology in the food industry is still in its infancy and there are still aspects that are still left for exploration. It is thus important to examine the practicality of this technology so that its utility can be taken advantage of.

**Literature Review**

Block-chain technology was invented by a Japanese national who is only known as Satoshi Nakomoto (Vikram Dhillon et al, 2017); this invention has been hailed as an indicator of what is possible with the exponential advancement in future technologies. This technology was initially applied in the financial industry or more specifically within bitcoin and cryptocurrency contexts (Melanie Swan, 2015).
Both of these examples have long been conflated with the “block-chain” term to the point that the mere mention of “block-chain” brings to mind the terms “bitcoin” and “cryptocurrency”. In reality, these two examples are only examples of what this technology is capable of, namely, to promote transparency, safety, and integrity. The fact that this technology has proven to be of practical value has catalyzed its application outside of financial industries such as within education and halal sectors (Tiana Laurence, 2019).

The word “block-chain” is an amalgamation of the words “block” and “chain”. According to Tiana Laurence (2019), this technology is exemplified by the concept of decentralized databases where data are stored and distributed to various computer networks before they form a block. Each new block will be related and chained to previous, existing blocks to form a chain of blocks (Tiana Laurence, 2019). For some, block-chain technology is a meaningful and useful way to store data digitally through the networking of distributed data and these data will be related to each other. Both of these definitions are however similar to each other (Eka Purnama Harahap et al., 2020).

To put it simply, block-chain technology is a database storage system and the information contained within are based on the relationships between various chains of data block. This technology was conceived with security in mind to prevent manipulation, hacking, or theft of data. This system is capable of self-sustaining operation, contains information about relationships between both types of users (data owners and recipient), is not centralized nor controlled by any middleman or third parties (Paige Cabianca, 2018). Due to these reasons, any information and data contained within the system will not be stored by any single entity but distributed among many peers. This results in high level of security and makes it hard for anyone to manipulate any of the data contained within. In contrast, most existing data storage systems are centralized and thus may be exposed to high security risks.

Evidently, the application of block-chain technology is for the purpose of data protection and to prevent unauthorized data manipulation. Any data that is contained within the block-chain technology system may not be changed, copied, duplicated, falsified nor deleted at one’s whim (Tiana Laurence, 2019). This is due to the fact that each data stored in the system will be distributed to several networks called nodes before blocks are formed. Any request for data manipulation must thus receive permission from and authentication by all nodes that has a copy of the said data (Rosanna Cole et al., 2019).

Still, any request for data manipulation will not result in deletion of existing blocks. The reason for this is that all existing blocks are available permanently and may only have new data added to them. All existing data may not be changed, deleted, or manipulated in any way. Each block has its own identity and is related to other existing blocks. These concepts make block-chain technology extremely secure and protected against hacking by any party (Dra Manovri Yeni, Devi Kumala, 2020).

As a result, block-chain technology is capable of functioning as an open database system and all information contained within can be shared with everyone. All information contained within are recorded in blocks in a transparent manner and shared among all computer networks via direct nodes. This is an evolution of how data can be stored and is capable of ensuring that any data contained within are accurate and protected against forgery threats. Application of this data can thus add value to contemporary management systems and result in a more efficient and effective management.

**Methodology**

This research will discuss the application of blockchain technology to prevent halal crimes. Data will be analyzed from several angles, namely introduction of block-chain technology, its security aspects, functions, and practicality in the halal industry. Data are to be obtained from reputable sources such as article journals, books, and other similar means. One of the documents that will be used in this research is *Blockchain Enabled Applications* by Vikram Dhillon and other documents related to block-chain technology. Data will be obtained through a systematic literature review. Following that, the data obtained will be analyzed via inductive and deductive means as well as through content analysis. It is important to note that the scope of this research will be limited to suggestions
related to the application of block-chain technology only.

How Does Blockchain Work?

During its infancy, block-chain technology can be characterized as open and available for public access and transaction. Subsequent updates to the system have resulted in two types of control namely permissioned and private controls. Permissioned control is a form of consensus-based process that comes under the control of certain nodes and any permission for access can be made public or available to certain user groups (Paige Cabianca, 2018). Generally, this type of block-chain is a combination of both public and private block-chains. In contrast, private block-chains are transactions that require permissions for access, are under strict control and are made confidential for security purposes (Tiana Laurence, 2019). Only individuals with permissions (in the form of private keys) are able to access these private block-chains.

Despite this, this type of block-chain is still considered to be distributed and its authenticity is still assured (Hasib Anwar, 2020), thus ensuring the general core concepts of block-chain technology are still central. In general, block-chain technology may be further categorized into three main types namely public, permissioned, and private. For some, there are only two types of block-chains – public and private (Leon Perlman, 2017). By and large, any decision for the application of block-chain depends largely on organizational objectives and purposes (Tiana Laurence, 2019).

The function of block-chain is very closely related to data, where all information will be stored digitally. In this manner, the chains of block-chain are formed due to combination of blocks. Each block is made up of three main components, namely data, hashes from the current block, and hashes from previous blocks. This is due to the fact that block-chain itself is a form of distributed databases and are closely related to each other.

In layman’s term, a hash is a form of code that are made of a string of characters and integers. Hashes are unique and have their own values that made them distinct from other blocks. Any changes made to any block will result in changes to the hash values and will result in loss of access to blocks. To put it another way, any changes to any block will cause changes to the entire block (Husni Trunojoyo, 2019).

A block-chain begins to function when there is a request to enter a new data. Using peer-to-peer networks, this technology allows all individual data to be combined in a single block-chain and each individual data will obtain the same, full block-chain data including addition of new blocks. Each node must authenticate new blocks before addition can be made. This kind of networking requires the permission and verification of each combined individual data. After successful authentication, the new block(s) will be added to the block-chain (Tiana Laurence, 2019).

A comparable analogy can be made using Google Documents (Charles Yansens, t.t.) – anyone who is allowed to access a Google Doc document may open it any time and any changes made to the document is/are viewable by others who have access to the same document. Through this method, information can be transmitted and moved more efficiently.

In addition, there are several features built into block-chain technology that makes it inherently safe and secure. These three features are the distributed data concept, verification, and the existence of peer-to-peer networks. Firstly, block-chain system is made up of distributed data (Marco Tieman et al., 2017). Each information contained in the block-chain network are viewable, readable, and accessible to all users of the block-chain. This network can only be joined by those who have corresponding keys and access permission in the form of private or public keys.

Secondly, this process has its own verification process (Rina Candra Noorsanti et al., 2018). Before new blocks are formed and joined with...
other clocks, all data that are to be inserted must be verified by certain quarters to ensure the data are correct and there is no new addition to existing data. This process ensures that everyone has the same data. Finally, the existence of peer-to-peer networks allows each individual to conduct transaction without the need of a middleman (Husni Trunojoyo, 2019). Such transactions may then lead to the confidence that all information contained in the system are secure.

Sharia Issues in the Application of Blockchain Technology

Fundamentally, there is currently no explicit sharia issues with regard to the use of block-chain technology. Within digital financial applications such as crypto money or any form of digital transaction, the use of block-chain is necessary to ensure the transparency of any contract, transaction, or process. Sugiharto and Yusuf Musa (2020) noted that the function of blockchain is to:

a. Optimize logistical processes and product cycle.
b. To provide a temper-proof platform to conduct cross-checks.
c. To integrate elements of authenticity, authority, and trust (Sugiharto, A., Yusuf Musa, M. (2020)

Block-chain may thus be considered a data or digital asset platform. For Abu Bakar, block-chain technology can be considered beneficial in the sharia context as it promotes transparency and truthful dissemination of information. Block-chain also requires trust in any transaction or processes, itself being one of cornerstones of the Islamic faith (Abu-Bakar, M., 2017). Since block-chain technology is capable of preventing any element of fraud and data forgery, it can be said that the principles of block-chain technology is compatible with sharia principles (Rizkyana, M. A., 2020).

For the reasons above, the use of block-chain technology is permissible according to this reasoning: “everything that is beneficial is demanded as long there is no argument against it” (Abu Zahrah, Muhammad, 1978). This is further supported by the maxim “the original rule of something is its permissibility” (Al-Sadlan, Salih Ghanim, 1417). The application of such method (technology) has clearly shown that any process that does not require specific ibadah (worship) is considered a necessity especially for matters that are capable of bringing about benefits (maslahat). Such necessity is to be considered as an absolute as long there is no argument against it.

The Application of Blockchain Technology in The Halal Industry

Currently, the safety and security of the halal industry can be considered to be at a moderate level and is still susceptible to halal crimes. It is possible that block-chain technology can be applied to increase the safety and security of the halal industry to a more acceptable level. This technology is also capable of transforming the halal industry. In the context of halal industry, block-chain technology can be applied towards bettering supply chain management and halal certification processes.

The management of halal supply chain requires integrity assurance to be present throughout the entire process. Several fundamental elements need to be considered, namely the means to track information with regard to the origin of halal products, rules and regulations pertaining to product manufacturing and halal prerequisites, and the integrity of the entire halal supply chain (from manufacturers all the way to the final processes) (Mohamed Syazwan Ab Talib et al., 2015). Since it is evident that integrity and transparency is integral in the halal industry, the application of block-chain technology can be useful in ensuring that these two elements can be guaranteed.

Block-chain technology can be applied for the purpose of tracking and detecting the sources of food, manufacturers, and other vital information (Surjandari, I. et al., 2021). For these reasons, the authenticity of halal products can be assured throughout the entire chain. Any essential information related to halal processes can also be included to provide guidance to all stakeholders. With the application of this new technology, the standards of halal processes can be made more secure, assured, and provide new avenues for expanding halal product markets around the globe.

In addition, the distribution of databases in block ledgers makes it possible for all stakeholders to
track the processes of halal product manufacturing from the origin (raw material) all the way to the end users (Abderahman Rejab et al., 2019). Through this, the tracking and quality assurance of the entire process can be assured as all records need to be maintained, documented, and administered according to the principles of halalan tayyiban.

The application of block-chain technology also allows stakeholders such as suppliers, manufacturers, distributors, retailers, and end users to enter relevant data related to the products that they produce, distribute, sell, and use. Such data can then be authenticated by users in the block-chain networks (Surjandari, I. et al., 2021). Through this method, all the relevant information related to halal products can be gathered and examined by all stakeholders in an effective manner. Stakeholders are also able to receive information on process compliance automatically as defined by the scope of the products’ markets. Users of all levels may also obtain and check information through mobile and web applications (Nuraslina Zainal Abidin, Firdaus Fanny, 2020).

In addition, any information exchange that occurs can be integrated and coordinated between technology and halal supply chain. Such integration occurs throughout halal chain especially during performance checks and tracking. This technology is able to increase trust, transparency, and information exchange between networks for several reasons. Firstly, the data are exchanged via distributed ledgers and thus all transactions that occurred are publicly viewable. Secondly, such openness does not prevent the need to preserve confidentiality. Thus, any transaction that will not result in any change to existing data (Surjandari, I. et al., 2021).

Most importantly, block-chain can be leveraged on to provide a secure means to provide protection and to prevent external threats to sensitive data at the lowest security level (Marco Tieman et al., 2017). Permissioned block-chain can be utilized for managing halal chain networks. This allows users some freedom to access public information products, as well as protecting more sensitive ones.

For these reasons, block-chain can be applied within halal certification processes to build trust and assure the authenticity of halal logos. The application of block-chain in halal certification can be compared to the process of authenticating university graduation scrolls in Malaysia. The integration of block-chain technology with halal certification will not only result in better efficiency, but also increase the validity of halal certificates. The processes of issuing halal certificates, authentication of said certificates or any new changes to the certificates, as well as compliance with existing prerequisites can be done easily and automatically. Indirectly, this technology can assist halal certification authorities in improving new application processes, compliance among businesses, renewals, and adjustments (Marco Tieman, 2019).

To sum up, these are the four core aspects that can be brought about by the application of block-chain technology—trust, integrity of supply chain, transparency, and optimized halal performance (Marco Tieman et al., 2017). Through this technology, Muslim consumers are able to verify the integrity of halal products and feel more confident when purchasing halal products. More importantly, fraud crimes in the halal industry can be prevented. Claims such as the existence of porcine DNA in food products, the halal status of a product, halal certification, haram meat cartels et cetera can be handled more competently.

In addition, the application of block-chain technology makes it easier to audit halal supply chain and to deal with sensitive halal issues in a more effective manner. Such technology will also lead to a more transparent storage of data. The performances of proxies such as suppliers, distributors, and manufacturers can also be measured. This will invariably lead to optimal increase in halal performance. Any data related to the aforementioned four core aspects can then be transmitted securely without any risk. For these reasons, the application of block-chain technology should be recommended as its value lies in its ability in solving a variety of issues in the halal industry including eradicating halal crimes as well as guaranteeing the integrity of halal ecosystem.

**Conclusion**

Application of new technologies can bring about more positive impacts and lead to improvement
in quality of life. These new technologies can also improve the economy, education, industries as well as health care. In Malaysia, the increase in halal crimes should be taken seriously by all stakeholders and the application of technology can prove to be an invaluable tool to deal with these immoral issues. A high level of security in data storage can also add value to the halal industry.

Currently, there are no official guidelines or acts of law to coordinate the application of block-chain technology. In spite of this, it is a highly effective tool that should be leveraged on to assist all efforts in dealing with halal crimes so that the halal industry can expand as well as protecting its integrity.

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