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THE EMERGENCE OF HALAL-RELATED FOOD CRIMES IN THE ERA OF INDUSTRY 4.0

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Abstract

The advent of Industry 4.0 offers cutting-edge technologies contributing to the betterment of human life. Internet, since its introduction has now become revolutionary more than ever with the optimization has reached to the conceptualization of "smart technology". Big Data analytics, Internet of Things (IoT), cloud computing, blockchain, augmented reality, artificial intelligence, is a few examples within smart technology that enables information transfer more precise and problem-solving is being more effective. However, even with the existence of sophisticated technology, the problem of food crime is seemingly not fading off, but worryingly unhindered except has achieved to the next level. Food crime has now affecting the halal ecosystem of food industry especially in Malaysia such as the case of meat cartel in 2020. Therefore, this paper is aiming to analyse halal-related food crimes that emerged in Malaysia. This research utilizes fully library research and the data gathered are analysed by using qualitative approach. To gather the data, researcher used online databases such as Google Scholar, Science Direct, Emerald and Scopus for the keywords of "food crime" as well as "Industry 4.0". Relevant literature is then selected and the data extracted in the scope of food crime related to the emerging technology of Industry 4.0. The study finds that there are emerging threats of food criminality that involves halal food production and industry. Therefore, immediate and comprehensive solution needs to be considered by relevant parties in order to combat food criminality as it can affect the halal food industry.

Keywords: *Contamination, Food, Adulteration, Crime, Halal*.

INTRODUCTION

The recent meat cartel scandal in 2020 has shocked the whole society in Malaysia. It is found that the criminal activities have been around for a long time and involve both local and international networks. Malaysia was chosen as its distribution destination, though Malaysia is internationally renowned for championing the issue of halal certification, but leakages persist (Md Ariffin et al., 2021).

Due to the incident, the good track record of the Malaysia's halal industry has already been damaged. Despite its benefits, advances in technology have also opened up space for criminal activities in a cunning and organized manner (Manning, L., Birchmore, I., & Morris, W. 2020).

While on the other hand, the halal ecosystem in general still operates in traditional paradigm. Profoundly, the advancement of 4.0 technology has opened up a more competitive space for halal industry players. For example, internet technology offers various things such as 'internet of food' which allows users to order food and customize

food to their taste. This is followed by 3D printing technology that produces printed food as a solution to combat food security issues (Yang, et al., 2017).

Big data indicates a large volume, high velocity, high accuracy, and/or a wide range of information assets that may be used to improve decision making (King et al., 2017). Blockchain technology and artificial intelligence also emerged and are being utilized in tracking systems, smart containers and smart farm operations (Garaus et al., 2021).

With the influence of Industry 4.0, the traditional supply chain has great potential to transform into a highly efficient digital supply chain with good connectivity from product development, procurement, manufacturing, logistics, suppliers, customers and services. The entire local halal ecosystem will benefit if 4.0 technology can guarantee a secured digital halal supply chain. Nevertheless, this opportunity has not been fully utilized to empower the local and global halal ecosystem.

LITERATURE REVIEW

Generally, contamination can occur at every stage in the food supply chain starting from the preparation of raw materials to the end of the supply chain or to the point of end consumer (Nurul Asmida & Mohd Anuar, 2019). In the context of the halalan tayyiba food crime, this criminal act includes intentionally contaminating prohibited substances for profit without taking into account aspects of food purity and consumer safety.

In the context of the halalan tayyiba food crime, criminal offenses involving food and drink include intentional contamination with impure substances such as pigs, blood, carcasses, unslaughtered halal animals, prohibited animals such as rats and monkeys, harmful, and intoxicating such as alcohol (alcohol content that exceeds permitted level). In addition, this deliberate act of adulteration also involves the use of hazardous agents i.e. biological agents, chemical agents, physical agents and radiological agents that can affect the health and lives of consumers (Manning, 2019).

The cases of food crime are now very concerning since almost every day, various issues arise related to food crime (Soon et al., 2019). The greed of food industry players in making profits without taking into account on the consumer safety causes society to be vulnerable to products that are produced without complying the standards that have been set. This also however ill-favored benefitting the rapid development of technology in the era of the 4.0 industrial revolution saw a variety of new discoveries and innovations.

This means that, the criminals also play a role in taking advantage of the advancement of food technology which involves the act of mixing prohibited substances, forgery of halal certificates, fraudulent product labels, imitation of original products and alteration of product content. This unethical act is done for the sake of making huge profits and is clearly against Islamic law. Accordingly, this study will discuss about food crime in the era of industrial revolution 4.0. Thus, various parties can no longer be skeptical by underestimating the issue of halal in technology 4.0, nor can they be reductionists who feel inferior to technology or take an attitude of escapism that avoids the reality of technological progress.

Emerging Factors Of Food Crime

Food crime can be considered as an emerging threat in halal ecosystem as well as halal supply chain. Md Ariffin et al. (2021) pointed out that food crime occured due to several factors such; the first one: the nature of underworld business or crime organisation that exploiting food to gain profit (Md Ariffin et al., 2021).

The first factor explained that crime organisation that applying 'fraud business model' by selling forgery products. According to Chris Elliot of Univeristy of Belfast, food fraud becomes food crime when exponential changes of organisational level in which both formal or informal networks of perpetrators are involved having different roles in criminal activity (Evershed & Temple, 2016).

This criminal activity has now seemingly involving halal food supply chain such as the halal meat scandal in the United Kingdom where the trade of fake halal meat is on the

rise (Pointing & Teinaz, 2004). Other causal factors of food crime are economic downturn, integrity issues among authorities and low level of awareness among industrial players (Md Ariffin et al., 2021).

METHODOLOGY

The search involved discussions of Industry 4.0 technology, food crime and halal food. The study also focuses on the rise of food crime incidences in particular, illegal meat cartels in Malaysia, as well as the loopholes in the halal supply chain network. This research applied qualitative research design. Through library research approach, relevant data was extracted from authoritative sources as research base.

To complete the research, reference or secondary material such as articles, journals, books, conference papers, and so on are used as base data. This qualitative study uses a full literature approach by referring to the literature in scientific databases such as Google Scholar, Science Direct, Emerald and Scopus. The data were then analysed from the criminal possibilities perspective on halal supply chain before further discussion on the urgency to develope halal smart system.

From the analysis outcomes, its main contents were analysed according to thematic methods in figuring mutual responsibilities model to be carried out by all halal industry players in fighting the food crime issues especially pertaining to halalan tayyiba aspect in order to guarantee Halal integrity.

RESULTS

The industrial revolution has brought a disruptive change to the world, from an agriculture-based economy to a computer-based industrial economy, then shifting to a digital economy based on cyber-physical systems. With the rapid development in industry 4.0 technology, food crime activities are also becoming increasingly sophisticated (Manning et al., 2016).

Technology 4.0 has offered a variety of innovations that add to the creativity of food criminals. Basically, there are nine technical cores in industry 4.0, namely cloud computing, industrial data, industrial networking, industrial robotics, 3D prototyping such as 3D meat printing, knowledge-based automation, industrial communications security, virtual reality and artificial intelligence (Simon et al., 2018).

Industry 4.0 enables industrial systems to develop a global cyber physical network of machines, equipment, sensors, and facilities for better data exchange and control (Tay et al., 2018). This global cyber physical network is very flexible and smarter in managing smart factories, smart farms and smart food supply chains.

Despite the wide range of benefits offered by 4.0 technology, there are also other concerns particularly involving the food crime chain both globally or locally. Advances in 4.0 technology will be leveraged to increase profits with more illicit and organized criminal acts. Internet networks and super-advanced computing are also used in criminal acts. So, in this case, the food supply chain needs to adopt better technology because food criminals will use criminal approaches that are in line with technological developments as well; since one of their main goal is to get maximum profits.

For the criminal acts itself, criminals will use substances that are so difficult to detect with the naked eye or inhaled through the nose (Beck, 2002; Franko, 2020). These challenges include the ability to detect the malicious microbial elements, chemicals and personal and household hygiene items (Fung et al., 2018). The materials used are concerningly affect consumer safety. Therefore, authentication and tracking techniques need to be improved to ensure the safety of halal food throughout the supply chain.

DISCUSSION

Food crime activities are now shifting to the use of advanced technology. Now, the technology used for food fraud is based on artificial intelligence as well. The same goes with economically motivated counterfeiting, is being introduced (Iymen, 2020). In agri-

food 4.0 (agri 4.0), blockchain technology has been leveraged to ensure transparency of transactions and ensure food security in the food supply chain whether from agricultural or livestock farms. Combined with multi-purpose internet (IoT) technology and big data a tracking system has been created to collect food data along the supply chain and food information is shared effectively to end users (Corallo et al., 2020).

In addition, smart contracts are also used and shared with all stakeholders. Users can track and trace the food to be purchased in terms of place of origin, type of food, and various information related to a food. Similarly, smart container systems based on sensor and barcode technology are also utilized to assist consumers in food selection. Nevertheless, some setbacks still remain a big challenge that there are criminals who attack and hijack the technology to steal data, cheating or scamming which causes huge losses to entrepreneurs (*Blockchain Threat Report*, 2021).

Additionally, in the manufacturing of additives, criminals can leverage 3D printing technology to produce artificial foods and prohibited substances such as drugs and marijuana as well. The printing machine is now capable of personalizing the food needed to suit the motives of the criminals. This situation is become even worse where copyright infringement will be rampant (Abdulhameed et al., 2019).

In addition to that, similar situation is potentially to occur in which food crime is executed by manipulating the Internet of Things (IoT) technology used in the food chain. For example, food chains that use IoT technology can increase the issues of mixing halal and prohibited substances illicitly, especially in the process of food preparation and delivery.

Thus, halal authorities need to act progressively in the face of emerging technologies in the era of Industrial Revolution 4.0 such as leveraging halal smart contracts for halal certification based on blockchain technology (Ali, et al., 2021) and the Internet of Things Halal (IoTH) to protect consumers from the threat of food crime (Mohd Anuar, 2019). Clearly, there is a urgent need to develop a digital halal ecosystem in addition to developing halal standards related to the application of 4.0 technology so that safe and halal food is guaranteed.

CONCLUSION

The world today is witnessing drastic changes in the digital technology era. The Industrial Revolution 4.0 has impacted many aspects of human life. Both conventional food supply chain and halal food supply chain also facing similar either in positive or negative implications. What is clear is that, the food criminal networks are also adapting to technological developments in making a profit with deliberate acts of pollution without thinking about the impact on consumers.

Thus, the matter of safe food is a very valuable commodity because it can ensure the safety and health of consumers. With the Industrial Revolution 4.0, the threat of food crime is increasingly challenging and its capability of threatening human survival as well as the agricultural sector is now concerning than ever. Therefore, various parties need to adopt the latest technology in ensuring the halal and safe food supply chain, whether from the aspect of technology creation to strengthen the halalan tayyiba food supply chain such as blockchain technology that can track and trace (traceability) food products, smart contracts for halal certification, also developed an efficient technology to authenticate the presence of harmful substances in food. As a result, consumers will have safe halal food as well as the halal 4.0 ecosystem can be preserved.

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