

## Review Article on Potentials of Big Data in the Halal Industry

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### ABSTRACT

The growth of “big data” can be observed in healthcare, financial, education, social network, food and other sectors. Unfortunately, big data has received little attention in the halal industry. This article describes the potentials and benefits of big data in the halal industry. It starts with a description of the concept and application of big data analytics (BDA) in various industries. The background of halal industries are also discussed. The SWOT/TOWS analyses show the strengths, weaknesses, opportunities and threat from big data analytics in the halal industry. The article concludes BDA has huge potential impact on the halal industry such as food and beverages, pharmaceuticals, education and logistics among others.

*Keywords:* Analytics, big data, halal, SWOT/TOWS

### INTRODUCTION

Big data, a new “buzz-word” in the field of science, technology, and industry, refers to massive amounts of data and their different structures. They are too complex to manage, store, and analyse using traditional database management tools. Nowadays, data do not originate only from human beings, but are also created by devices or machines. These data are generated from online transactions, emails, videos, audios, images, click stream, logs, posts, search queries, health records, social networking interactions, science, sensors and mobile phones, and their

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applications (Eaton, Deroos, Deutsch, Lapis, & Zikopoulos, 2012; Schneider, 2012). The characteristics of big data analytics (BDA) are classified into '5 Vs' which represent Volume, Velocity, Variety, Value, and Veracity. Moreover, the growth of Big Data can be seen from the way healthcare, the financial sector, education, food, and other industries apply BDA to help them make better decisions within their organisations. The usage of BDA offers many advantages to the public sector, companies, and customers respectively.

The successful implementation of BDA in various other industries has opened the eyes of companies and organisations involved in the halal industry. The halal industry is among the fastest growing markets in the world, which is estimated at USD2.3 trillion annually (Rahman, Saleh, Rahman, & Hashim, 2012; Shafii & Khadijah, 2012). The demand for halal products and services is growing significantly due to the increasing number of the Muslims worldwide. Approximately 1.8 billion, thereby increasing their purchasing power (Kamaruddin, Ibrahım, & Shabudin, 2012). At the same time the acceptance of halal products and services by non-Muslims also demonstrates positive feedback. The concept of halal not only focuses on food and beverages (F&B), but also applies to the non-F&B products and services, such as pharmaceuticals, cosmetics, and logistics. According to Tan and Ibrahim (2014), there are five sub-sectors in the halal industry landscape that can adopt the concept of BDA.

Section 1 of this article outlines the objective of this paper. It presents SWOT analysis to identify strengths, weaknesses, opportunities, and threats from BDA in the halal industry. The next section defines and describes the characteristics of BDA, methods used in this study, current implementation in various industries as well as issues and problems faced by the halal industry. Section 3 discusses the result of SWOT/TOWS analysis and the potential for implementation of BDA in the halal industry. Section 4 summarises and concludes the paper.

### **Concept of Big Data/5Vs of Big Data**

According to Services (2015), the characteristics of Big Data can be classified into '3 Vs' - volume, velocity, and variety. Recently, the definition of Big Data was stretched from '3 Vs' to '5 Vs' by adding value and veracity (Demchenko, Grosso, Laat, & Membrey, 2013; Katal, Wazid, & Goudar, 2013). Figure 1 shows the '5 Vs' of Big Data.

**Volume.** This refers to the amount or size of data. The amount of data will gradually increase until it becomes difficult to handle them using the existing traditional systems.

**Velocity.** This refers to the speed of data originating from various sources. This characteristic is not limited merely to the speed of incoming data but also the speed at which the data flows.

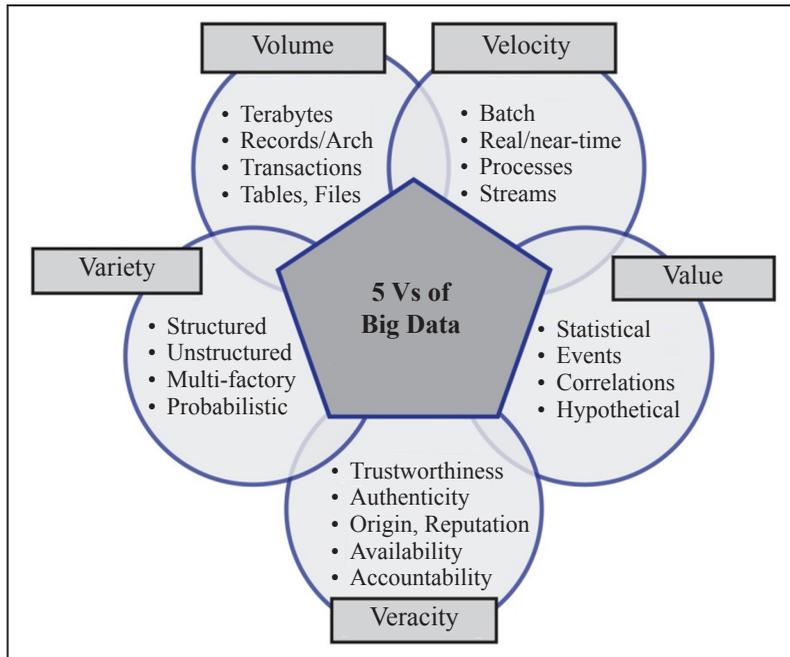


Figure 1. The '5 Vs' of Big Data (Demchenko et al., 2013)

**Variety.** This refers to the inconsistencies of types of data. They may be categorised as structured, unstructured, or semi-structured.

**Value.** Value is an important feature of data which is defined by its added-value contribution to predictive analysis.

**Veracity.** This ensures data is from trusted sources, authentic, and protected from unauthorised access and modification. It must be secured during the its lifecycle commencing from collection from trusted sources to processing on trusted computing facilities and storage in protected and trusted facilities.

To date, there are several types of platforms in BDA including Hortonworks, Cloudera, and MapR. All these various

platforms are also known as Hadoop distributions - an open source data processing platform comprising several types of tools, namely HDFS, MapReduce, Hive, Zookeeper, Cassandra, Spark and Mahout. Every tool has a different task in the Hadoop distributions. The usage of BDA brings a huge advantage to the public sector, companies, and also customers. According to Russom (2011), the advantages of using BDA in an organisation are: improved marketing; better business insights; client-based segmentation; and recognition of sales and market opportunities. Nevertheless, BDA also reveals the existence of potential threats and disadvantages in the use of big data, such as their processes are extremely complex, the programming is intensive, and costly, staff lack expertise, difficulties in designing analytic systems, lack of database

software in analytics, and the need for application of a variety of skills.

**Current Implementation of Big Data Analytics**

Big data is a new technology in the market which can provide considerable benefits to business organisations. Evidence from other industries such as healthcare, government, the finance, and tourism support the successful implementation of big data. Table 1 shows the implementation of big data in various industries.

**Halal Industry**

The halal industry has received special attention not just in Malaysia but all over the world as a potential big business. The demand for halal products and services is on the rise due to demand from Muslims for Shariah-compliant products, also known as halal products (Yunus, Rashid, Ariffin, & Rashid, 2013). The rapid growth of the halal market is not just within limited to food products but also services. According to Che Man and Abdul Latif (2003), the demand for halal products is expanding rapidly and this can be attributed to the increasing number

Table 1  
*Big Data implementation in various industries*

<b>Industries</b>	<b>Big Data Analytics Application (BDA)</b>
Healthcare	It can help physicians and patients identify diseases at earlier stages by providing clinical data, analytics from a physician’s report, and also machine-generated data (Raghupathi & Raghupathi, 2014). Furthermore, BDA assists in managing specific health issues among individuals and the general population as well as the ability to detect healthcare fraud more quickly and efficiently.
Government	It can be used to maintain domestic tranquillity, achieve sustainable development, secure citizens’ basic rights, and promote general welfare and economic growth. Traditional methods usually delay decision making in government (Kim, Trimi, & Chung, 2014). The BDA can also reduce risks and increase efficiency and effectiveness of government decision making (Stone, 2002).
Finance	It can help design marketing activities, execute campaigns, and capture sales leads across all channels, product lines, and customer segments (Turner, Schroeck, & Shockley, 2013). It also enables provision of improved services to customers by having better understanding of their needs and anticipates future behaviours. The BDA can assist financial industries to generate better sales leads, enhance products, and generally improves customer satisfaction.
Tourism	In the tourism industry, data is generated by customers from a variety of sources, namely airlines, hotels, rental cars, trains. Thus, BDA can help the tourism industry to understand customer requirements to better organise their vacation. In essence, BDA provides improved support for decisions, enhanced customer relationships, as well as cheaper, and faster data processing (Davenport, 2013).

of Muslims worldwide and their awareness of halal products.

However, there are a few issues concerning the halal industry in Malaysia that need to be considered to ensure effectiveness and efficiency of its certification process. Noordin, Noor, Hashim and Samicho (2009) highlighted four problems: data being lost or misplaced; an unreliable and outdated e-halal database; lack of integrated halal information; and an unsystematic filing system. Their finding was supported by Ibrahim (2013). He had interviewed industry players who shared the same concerns. They agreed that there is a lack of synchronisation of information in the halal database between halal authorities. Moreover, the biggest concern in the halal industry is the lack of database for halal, haram, and syubhah products, ingredients, and additives (Ismail & Ihsan, 2013). All of these issues ultimately affect the business process. This is especially so for companies producing several products, as they need to obtain certification for each product. These issues can affect the operations of the halal industry in several sub-sectors, such as manufacturing, medical and health, and education. All of these issues are related to the areas where data is constantly being generated, not only by halal authorities, but also by companies, manufacturing plants, suppliers, and laboratories.

## METHOD

In this study, the SWOT/TOWS analysis identified strengths, weaknesses,

opportunities, and potential threats arising from the use of BDA in halal industry. The SWOT/TOWS analysis is an examination of the strengths and weaknesses of an organisation, coupled with both opportunities and threats that it faces externally (Lynch, 2012). The use of SWOT/TOWS analysis provides a platform by which to recognize the preferred future position, and identify issues. This was agreed by many researchers (David, 2009; Porter, 2007). The SWOT/TOWS analysis is defined based on the following criteria:

- *Strengths* are internal attributes of an organisation that are helpful to the achievement of its objective.
- *Weaknesses* are internal attributes of an organisation that are harmful to the achievement of its objective.
- *Opportunities* are external conditions that are helpful to the achievement of these objectives.
- *Threats* are external conditions that are harmful to the achievement of these objectives.

This analysis will allow the organisation to have an in-depth understanding of the potentials and benefits of the implementing BDA in the halal industry. The analysis underlines strengths, weaknesses, opportunities, and threats (SWOT) with respect to the halal industry, as well as the way in which BDA could be used to increase the growth of halal industry. The next section will discuss in detail the SWOT analysis for this study.

**RESULTS AND DISCUSSION**

From the foregoing, it is clear the implementation of BDA can solve issues and problems in the halal industry as it can extract embedded knowledge from large amounts of data and react according to it in real time. Table 2 shows the results of SWOT/TOWS analysis.

In addition to the SWOT/TOWS analysis, this study also discusses each sub-sector in the context of a halal industry

landscape. There are five important sub-sectors according to Tan and Ibrahim (2014). All of these sub-sectors in the halal industry landscape have the potential to implement BDA in their organisations. Table 3 contains the following: five sub-sectors of the halal industry; the usage of BDA in every sub-sector; advantages; disadvantages; as well as the possibility of the BDA application being used in every sub-sector of the halal industry.

Table 2  
The SWOT/TOWS analysis for the halal industry (BDA)

SWOT / TOWS Matrix		Internal Factors	
		Strengths	Weaknesses
		<i>S1</i> 5Vs of Big Data <i>S2</i> Open Source Software <i>S3</i> Decision-Making <i>S4</i> Marketing Strategies	<i>W1</i> Lack of skilled workers <i>W2</i> BDA facilities and equipment items <i>W3</i> Data accuracy
		Opportunities	W – O Strategies
External Factors		<i>O1</i> Improve the quality of products and services <i>O2</i> Efficiency of the halal certification process <i>O3</i> Increase economics of the halal market <i>O4</i> Expand the area of halal industry <i>O5</i> Increase Human Capital Development in the halal industry	<i>S2O2</i> Use BDA open source software to handle the halal certification process in Malaysia <i>S3O1</i> Make a better decision based on the real-time data to improve the quality of halal products and services <i>S4O3O4</i> Increase marketing strategies of the halal industry in Malaysia by updating the trends of halal products and services
			<i>W1O5</i> Expand the skills of human capital in the halal industry regarding BDA <i>W2O3</i> Allocate a portion of the company’s budget to meet the cost of BDA implementation
		Threats	W – T Strategies
		<i>T1</i> Security of data <i>T2</i> Inappropriate data <i>T3</i> Data Extraction process	<i>W1T1T2</i> Provide training to workers on BDA to ensure they can apply it in the halal industry <i>W2W3T3</i> Hire a consultant to identify equipment, facilities, the measures to conduct BDA in the halal industry
		S – T Strategies	
		<i>S1T1T2</i> Apply the 5Vs of BDA (Volume, Variety, Velocity, Value, and Veracity) to capture the issues regarding data <i>S2T3</i> Use BDA open source software such as Hadoop to easily extract data in real-time and process an enormous dataset	

Table 3  
BDA application in the halal industry

Sub-Sectors	Description	Big Data Analytics	Advantages	Disadvantages	Possibility of Application
Manufacturing	Halal products are those that do not involve haram ingredients, are not harmful to be used, and the materials that make up these products must be traceable from the original source (Hanzae & Ramezami, 2011). The manufacturing process covers raw materials, packaging, suppliers, and ingredients for every product.	Examples of BDA are raw materials, supplier ingredients, supplier packaging, utensils used in the manufacturing, standards related to the manufacturing sector, and employee information. By using BDA, all of these data will become valuable information that can help the manufacturing sector to make a better decision and improve their products by ensuring that the products completely comply with the halal concept.	By using BDA, it is envisaged that all of these data will become valuable information that can help the manufacturing sector to ensure halal integrity from the source to the final products. Updated information from the suppliers can assist the manufacturing sector to obtain a halal certificate in a shorter time period.	It is difficult to obtain data from suppliers. This is due to the low level of understanding of BDA concept and the importance of historical data. For most of the suppliers, their information is private and confidential.	It is possible for the manufacturing sector to implement BDA. This is because the sector mostly comprises large business with many employees and a stable budget. The manufacturing sector only needs to convince suppliers to permit access to their information.
Logistics	The process of managing the procurement, movement, storage and handling of material parts, livestock, semi-finished or finished inventory of both food and non-food items, and related information and documentation flows through the organisation and the supply chain in compliance with the general principles of Shariah law (Tieman, 2013).	Examples of data include: a list of transportation used to convey the halal products; a list of the products contained in each transportation delivery; scheduling for delivery; route taken to deliver the halal products; and the standard related to the logistics sector. By using BDA, organisations can detect potential contamination of halal products during the delivery service. Therefore, they can prevent this matter from occurring.	Each of the transportation deliveries used in the logistics sector has a different route or destination and different types of halal products to deliver. Therefore, the usage of BDA can help the logistic companies to keep track of their daily activities such as their destination, the route taken, and products in and around each of the transportation deliveries automatically in a shorter time period. This makes it easier for employees to detect any potential contamination during the delivery process.	It is difficult to scan each of the products being transferred from one place to another. In addition, it takes time for product determination whether it is halal or haram in every pit stop. Moreover, the installation of this scanning tool is expensive.	This process is possible if the logistic companies have enough employees to handle the scan verification for each of the products and monitoring of data.

Table 3 (continue)

Sub-Sectors	Description	Big Data Analytics	Advantages	Disadvantages	Possibility of Application
Standard and Certification	<p>A document issued by the Halal authority (JAKIM) certifies that the products or services listed meet the requirements of Shariah law. It starts from the source of the raw material and extends until the product is ready to be consumed by the consumer. This is known as “farm to fork” (Ibrahim, 2013).</p>	<p>By using BDA, the companies that applied for the halal certification are classified into three categories, namely, pass, fail, and in progress. A lot of data need to be analysed, such as a list of products and ingredients; tools used to produce the Halal product; as well as the Halal standard in each of the halal schemes. These data must be real-time data order to enable the halal authorities to detect any misuse of halal certification or Halal logo, and to grant halal certification for the companies.</p>	<p>The use of BDA makes it more convenient for the halal authorities to grant halal certification. The process of granting a halal certificate will also be faster because there is a platform that can act as a reference that includes the product information (halal or haram) and halal standards. Moreover, halal authorities and companies can automatically update the halal standard when changes occur.</p>	<p>It takes time to extract data, especially for product information. The product information can only be extracted from the companies and suppliers of the product. This information needs to be verified to ensure that there is no error in the data, especially for the halal status segment.</p>	<p>The implementation of the BDA is possible in this sector as there is a need to extract a considerable amount of data from different sources. Any changes in the halal standards also need to be updated by the halal certified companies.</p>
Medical and Health	<p>Products must consist of ingredients that are permitted under Shariah law and safe for consumption. It must not contain human parts and derivatives and must be stored separately from products that are non-halal. Halal pharmaceuticals are a harmonisation of Shariah law, Good Manufacturing Practice (GMP) standards and the approved halal supplier and material list (Ikram, Ghani, &amp; Basari, 2013).</p>	<p>It takes a longer period of time to obtain halal certification for drugs in the market due to the complexity of ingredients used to make them. The ingredients used for this sector are hardly detectable as being halal, haram, or syubhah. The implementation of BDA in this sector will gather all the data from the companies that produce the drugs in real-time. Data is analysed and categorised as halal (Green), haram (Red), and syubhah (Grey). This database will help the halal authorities to expedite the granting of halal certification.</p>	<p>The use of BDA, can help the medical and health sector to identify the halal status of each of the ingredients used to produce drugs. Therefore, the time taken to obtain a halal certificate will be shortened as halal authorities and companies can refer to this platform to identify the product status quickly and easily.</p>	<p>Identification of the ingredients in the drug is extremely complicated because they are too small and cannot be seen through our eyes. Therefore, the recorded data might not be fully complete. The process enables identification of inaccurate results.</p>	<p>The BDA concept has been used in the area of normal medicine by identifying diseases at earlier stages. Therefore, the BDA concept can also be used in this development of drugs that follow the requirements of Shariah law. The BDA can be implemented as long as this sector has a suitable halal database.</p>

Table 3 (continue)

Sub-Sectors	Description	Big Data Analytics	Advantages	Disadvantages	Possibility of Application
Education	It is vitally important to have comprehensive knowledge of the religious and scientific aspects of what constitutes halal or haram. It is also crucial to be able to identify the steps taken to avoid a product becoming Haram and doubtful products especially during this current era. (Al-Mazeedi, 2012).	There is currently a lot of training to being offered so participants can understand the halal concept. The training is important to cater for human capital in the Halal industry. However, some workers lack understanding of halal requirements. All of these issues can be solved by using BDA which means providers and workers can identify the appropriate halal training for Halal certified companies.	The implementation of BDA in the education sector can help the Halal industry to reduce the gap between halal training and human capital in the halal industry. This is after making a prediction on the appropriate training needed for a certain job position in the halal industry.	Unfortunately, the lists of halal training are displayed in various sources or platforms such as websites, social media, and email. It is difficult to extract data pertaining to Halal training. Accordingly, employees need to manually extract the data from various platforms.	It is possible to implement the BDA concept in the education sector. It can lead to greater availability of expertise required for the halal industry and helps job seekers to identify the appropriate Halal trainings needed to fulfil the companies' demands.

## CONCLUSION

This article has described the enormous opportunities for the halal industry by implementing BDA due to enhanced computing capabilities combined with the increasing amount of data that industry generates every second, in various different formats and a variety of sources. The findings indicate BDA will become the logical approach for the halal industry to store, manage, and analyse data. By using a BDA approach, the halal industry players can make better decisions in the most efficient way.

However, the implementation of BDA can also create issues and challenges for the halal industry that still need to be dealt with. The halal industry still faces problems, such as lack of skilled manpower; lack of the BDA tools; lack of accurate data; as well as lack of understanding of BDA in each of the five sub-sectors in the halal industry. The strengths, weaknesses, opportunities, and threats as identified in the SWOT/TOWS analysis for the implementation of the BDA in the halal industry were also discussed in addition to implementation of BDA in the five important sub-sectors in terms of their advantages, disadvantages, and possibility of application.

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