

## Knowledge Management, Industry 4.0 and Islamic Perspective: a Literature Review

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**Abstract:** This paper discusses the relationship between Industry 4.0 and Islamic Perspectives. The fourth Industrial revolution is substantially the following stage in the digitization of the manufacturing sector. It provides a new approach of doing business and new sources of creating value. Industry 4.0 involves big data analytics. This will expose to information including sensitive or undisclosed information. As a syumul deen, Islam outlines the rules in shariah law and the purpose is described in Maqasid Shariah. The main purpose is to create the goodness and to prevent the harm. It includes five principles which are protecting deen, protecting life, protecting mind, protecting generation and protecting wealth. As an inventor or user of technology, these five aspects should be considered before making any resolution, so that the digital products and data-based services comply with the Islam guidelines.

**Keywords:** Knowledge Management; Industry 4.0; Fourth Industrial Revolution; Islamic Perspective

### I. INTRODUCTION

In this convergence of digitize era, all things seem to be automated and start to move from the traditional method. Manufacturing also started to go through the same situation as to have smart manufacturing, driven by the growth of advanced ICT technology (Saldivar et al., 2016). Historically, industrial revolution had led to paradigm shift through the several eras of reform. Started from the first industrial revolution with the use of steam power and mechanical production, next move to the second industrial revolution with the use of electricity and mass production and the third era is defined by the use of automation in manufacturing processes (Zhou et al., 2015). Now, the fourth industrial revolution embraces the future industry development trend such as the connection between human, systems and objects have become more complex, dynamic and real-time optimized network (Tupa et al., 2017). It is the comparatively new method of managing the production process and in the way to achieve more intelligent manufacturing process.

The growth of technology in the industry sectors is proportional with the growth of unlimited sources of knowledge that people can gain everywhere – people to people, books or references, Internet and World Wide Web. In order to manage or utilize these



abundant of knowledge to make it beneficial, we need some proper guide or tools. This is where knowledge management is being introduced. Knowledge management is important in the process of gaining, storing and disseminating knowledge in the industrial technology. Without strong fundamental of knowledge management, people will left behind or couldn't fully achieve the evolution of technology.

In this digital era, the Muslim also take part in the development and the achievement of the technology revolution. Technology is born from the knowledge. Islam and *al-ilm* (knowledge) are inseparable. In fact, Islam is the only *deen* (religion) that urge its believers to gain knowledge from the moment they entered the world. As commanded by Allah to His Messenger “.....*O my Lord! Increase me in knowledge*” (Quran 20:114, Alharamain Islamic Foundation edition), knowledge is very important to all human being, and the greatest difference between animal and human is knowledge. Allah provides us with the “tools” to acquire knowledge, which are hearing, sight and hearts (to justify the truth and the falsehood) (Quran 16:78, Alharamain Islamic Foundation edition).

## **II. LITERATURE REVIEW**

### **a. What is Knowledge?**

In order to understand what is mean by knowledge, we should be able to differentiate between data and information. In general, knowledge stem from the data, it is made up by the blocks of information, while information is build up from data (Dave et al., 2012). Knowledge is considered to be at higher level than data and information. Oxford's Dictionary defines knowledge as “*Facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject*” while management is defined as “*The process of dealing with or controlling things or people*”.

Knowledge is a most vital thing in each organization in order for ongoing businesses of an organization either in profit or non-profit organization. Dave et al. (2012) said that knowledge is a valuable asset to any each organization because it presents the value of that organization. The plenty of the knowledge that is used to run an organization should be arranged is a systematic ways in order for easy retrieval and maximize the use of that knowledge.

The evolution of the technology significantly impacted our environment today. Mostly every field had influenced by the technology and developed along with it in in order to be competitive in this globalization era.

Nowadays, the organizations had emphasized in knowledge management in order to clout knowledge both within their organization and externally to their customers (Dave et al., 2015). There is some organization that adopted the knowledge management for enhancing their capabilities in knowledge processing (Rowley, 1999). Raising consciousness that knowledge act as a basis for improving efficiency and effectiveness triggered the need for utilizing knowledge gained from previous experiences. In addition to the development of networking and data communications that eases the way to share and transfer the knowledge within or outside the organization. Žemaitis (2014) said that the crucial element to have an effective knowledge transfer within the organization is collaboration between each team inside that organization.

## **b. What is Industry 4.0?**

Industry 4.0 (many consider to be the fourth industrial revolution) is basically the next stage in the digitization of the manufacturing sector. Its provide a new approach of doing business and new sources of creating value. In recent years, the term of “Industry 4.0” is the most popular and widely discussed to describe the next shifts of the industry field especially in the production and manufacturing industry of the developed world (Brettel et al., 2014). It is a complex system with integration of various technologies such as digital manufacturing technology, network communication technology, automation technologies and many others fields.

Hermann et al. (2016) in their paper had highlighted three main components that build the Industry 4.0, they are Cyber-Physical System, Internet of Things and Smart Factory. The concept of Industry 4.0 is mainly dependent on Cyber-Physical System (CPS) in which used of computing, communication and technologies in the process to build a smart factory in order to promote the manufacturing to become more digital (Tupa et al., 2017). CPS also acts to monitor the physical processes of the factory and make decentralized decisions. The physical systems become Internet of Things as the way to communicate and assist human and machines in the performing their task in real time via the wireless web (Hermann et al., 2016).

The Industry 4.0 will effectively change the product and services that will be offered. It also involves the combination of information and communication technologies and industrial technology that had influence the change of traditional method of industrial production and guide future manufacturing (Zhou et al., 2015). In future manufacturing, factories must be able to surpass with the need for speedy product development and flexible production within a more challenges environment.

Moreover, the Industry 4.0 not only affecting the manufacturing area, but the government, business enterprise and education institutions are looking ahead at how best they could respond towards this. In the past three year, this revolution phenomenal had becoming top priority in many research centers, universities and companies (Hermann et al., 2016).

In order to have better transform for implementation of Industry 4.0, the industry should follow its design principle in the way to achieve the goals of this industrial revolution. Hermann et al. (2016) outlined four design principles in order for guiding practitioners and scientists on “how to do” Industry 4.0. They are interconnection, information transparency, decentralized decisions, and technical assistance used to build fundamental for this revolution.

Interconnection is a very important enabler of Industry 4.0 as the many systems work together in an industry. Interconnected systems and human led to the sharing of information and this is the basis of a joint collaboration for achieving common goals (Hermann et al., 2016). A uniform standard needs to be developing in order to connect and integrate the different networking to work together and achieve the interconnection to one each (Zhou et al., 2015).

## **c. When does it start?**

It was firstly mention in 2011 at the Hanover Fair Germany with the concept of integration between internet and manufacturing (Tupa et al., 2017). The previous industrial revolution saw the entrance of digital programming and automation system in

manufacturing. Through globally, German is one of the most competitive in manufacturing industries at global stage. In response to the European debt crisis, Germany's government has presented an approach for Industry 4.0, in the way to further strengthen and promote the influence of German in the global manufacturing industry (Zhou et al., 2015).

The German federal government promotes the idea by announcing that Industry 4.0 will be a fundamental part of its "High-Tech Strategy 2020 for Germany" (Hermann et al., 2016). The industries in Germany had conducted evaluation on their readiness towards implementing Industry 4.0, the result shows that for at least 41% of German firms are aware to the new shift in industry and started to perform (Tupa et al., 2017). The fourth industrial revolution is marked by the intelligent manufacturing. It is also triggered by the internet in which allowed communication between human and machines in Cyber Physical System throughout large network (Brettel et al., 2014).

### **III. RESEARCH METHODOLOGY**

The method used in this article is literature review method which is a literature search both International and National. The researchers trying to find out current article through google scholar and Dar al-Hikmah Library IIUM – Online Database. The Keyword used to search the article namely "Knowledge", "Knowledge Management", "Industry 4.0", " Knowledge in Islam".

### **IV. THE RESULT OF STUDY**

#### **a. Industry 4.0 and Knowledge**

The rapid evolution of the technology especially the internet had changed and affected societies across the globe. People are using it in their daily life to access information for various purposes. Furthermore, the internet has removed barriers of communication access from anywhere in the world. The development of the Internet in the 1970s and followed by the widespread adoption of the World Wide Web since the 1990s have change and increased business data generation and collection speeds significantly (Chen et al., 2012).

In this fourth industrial revolution, there is a fact that data amount and availability in real time had influenced the construction of new infrastructure, management and technologies (Tupa et al., 2017). Consequently, it also has significantly changed the way how the knowledge being shared and delivered.

Now we are towards to accomplish the Industry 4.0, all the elements consist in this phenomenal revolution including the equipment, applications, services and so forth will persist to generate data (Zhou et al., 2015). Consequently, it will result the most notable thing which is known as "Big Data", the collection of the plenty of data with varieties information carries to be mined and analyzed. We are now living in an era of growing mountain of data that nowadays generated by many sources and as a result, the term "Big Data" is appearing in the most every field (Strange and Zucchella, 2017).

The role of big data is important in decision-making and improving many business functions (Chen et al., 2012). Saldivar et al. (2016) address that two main sources of data are available in the Industrial 4.0 context, they are: human-generated data and machine-generated data. The voluminous of data including structured and

unstructured data need to be managing wisely in order to be benefited by the organization. Khan and Vorley (2017) said that big data has a chance to discover hidden knowledge and generate new knowledge in which it can enable and enhance the knowledge management by using big data text analytics. The development of technology in managing data including big data technology is important in the way to obtain valuable information quickly from the various types of data (Zhou et al., 2015).

One of the concepts in Industry 4.0 is to have the machine interconnected through the network or the internet, thus 'Cyber-Physical System' (CPS) is used to interpret this idea. CPS role is to integrate sensor data and enterprise information system (Lee et al., 2015). During this process, large volumes of data will be uploaded into a cloud computing data center to store, analyze and form decisions for human or other machines to make real-time evaluation and guide the manufacturing process. (Zhou et al., 2015).

The system that has been embedded to the machines may collect any raw data related to the operation process of that machine. From those data it can be generated to be the meaningful information for the use of that machines or human (Lee et al., 2015). The data can be saved in the cloud for easy access and retrieval in which can be utilized by the management to make analysis and decision. The process of managing the data, information and knowledge within an organization as well as benefit it to gain a rival influence in an organization has developed into the area of knowledge management.

Nevertheless, in the way of facilitating sharing the information through the web, the security issues have been questioned because the Internet is so easily accessible to anyone and prone to intruders. Consequently, how far the security part has been emphasized in this case?

Sadeghi et al. (2015) said that in this digital era, many of installed devices are used in protection and security critical applications such as new technology vehicles and industrial control systems. Intelligent and smart devices are interconnected to create the real-time communication and sharing data between machines and application system (Tupa et al., 2017). If proper safety precautions are not taken, it will result in the unintended data exposure that could be the threat and risk to an organization.

The term "trust" in the technology industry brings in many aspects including the trust in the capabilities of a machine and also the producer of a product and their ability to keep user data private and secure.

Furthermore, to secure the knowledge within an organization they should include limiting the number of employees who have access to certain information in order to preserve the authentications and integrity of that information. The main protection goals in information technology are secured the integrity and confidentiality of the information (Sadeghi et al., 2015). The employees who want access to the any confidential information especially via web should be secured as the user must have a valid identification and go through sufficient authentication process to avoid ward off any potential of cyber-attack.

Alongside with the development of the technology including in the Industry 4.0 will generate new categories of risk because of the increase in vulnerability and threat that may come either inside or outside the organizations. Bughin et al. (2015) suggest that one of tasks in handling risk is the companies need to embed methods of protecting

critical information into each any related to their businesses such as technology architectures, business-model-innovation processes, and interactions with customers. Consequently, the role of risk management is really needed to be emphasized. Risk management one types of the knowledge and it is probably to be the most challenging and important aspect for the organization (Tupa et al., 2017). It helps one's organization to understand and know the any possible risk they will face and how they can encounter them.

### **b. Importance of Knowledge in Islam**

According to Dr. Sayyid Wahid Akhtar (Akhtar, 1995) knowledge in Islam means an all-embracing term covering theory, action and education. Knowledge in Islam covers all aspects in life, including socio-economic, socio-political and moral aspects. In Islam, knowledge comes before action. Allah says in the Quran, *aayah* (sentence) 36 in Surah Al-Isra' which means "And follow not that of which you have no knowledge; verily, the hearing, and the sight, and the heart of each of those ones will be questioned (by Allah)". It shows the warning from the Almighty that human must have knowledge and understanding in every action they do, because Allah will question all the deed they did in this world.

Islam emphasizes the importance of knowledge through the words of Allah (in the Quran) and the *sunnah*. The word *ilm* or other words conjunction with the *ilm* are mentioned 704 times in the Quran. The first *aayah* delivered to our beloved Prophet Muhammad *pbuh*, *aayah* 1 to 5 in Surah Al-Alaq, shows that reading is the key to knowledge. The meaning of the *aayah*: "Read! In the name of your Lord Who has created (all that exists). He has created man from a clot (a piece of thick coagulated blood). Read! And your Lord is the Most Gracious. Who has taught (the writing) by the pen. He has taught man that which he knew not". By reading, a person can gain knowledge and be a better person. Allah also mentioned the "pen" that related to knowledge acquirement. *The pen is mightier than the sword*. The proverb prove that the pen can accomplish many things and more superior than the sharpness of the sword or the knife, and it is the best tool to gain or use of knowledge.

Knowledge is a symbol of *nuur* (light). The more knowledge we gain, the more higher position we achieve in life. For instance, a person who has a Ph.D. will sit in the highest position in an educational institution or gain highest income compared to people who doesn't has any qualification. Become a tradition or norm to every society, a person is acknowledged because of his or her highest achievement in education. Nowadays, parents are more focusing in giving the best education for their children. They don't mind to spend more money as long as their children be a literate and become intelligent person. The knowledgeable people or the scholars has a special place beside Allah, which is higher than the position of others. As said by Allah in Surah Al-Mujadilah, *aayah* 11: "...Allah will exalt those of you who believe, and those who are given knowledge, in high degrees; and Allah is aware of what you do."

The educated people have responsibility to make a change to the society. They use their knowledge to make the nation better by educating people the perfect lifestyle, the use of technology and guiding people to achieve the life's goals. The civilized society are born with the presence of knowledgeable people. When the nation are well educated and they have the thinking to improve life, they will become more innovative. They will invent or develop lots of applications or tech stuff to ease the life. The impact

of this development is what we have now and it keeps going and growing. From the Industry 1.0 to the Industry 4.0, the world is become more better as human achieve better life.

The Prophet sallahu alayhi wa sallam said: *“When a man dies, all his deeds come to an end except for three – an ongoing charity, beneficial knowledge and a righteous child who will pray for him”* (Muslim). This indicates that a knowledgeable people who spread his or her knowledge for the benefit of society, use the knowledge to do good deed and the knowledge that he or she shares is being practiced by other people, will get rewards from Allah. The rewards will not cease when he or she dies, rather it continues to increase so long as people benefit from his knowledge.

The most ultimate purpose of knowledge is to bring human closer to the Almighty. The more knowledge a person has, the more religious the person is. Allah says in Surah Al- Hajj, aayah 54, *“And that those who have been given the knowledge may know that it is the truth from your Lord, so they may believe in it and their hearts may be lowly before it; and most surely Allah is the Guide of those who believe into a right path.”* Educated people will see the world and the creatures as a sign of the Almighty and they believe with the word from the God. They fear Allah more and try their best to be a good muslim who always do good deed and leave Allah’s prohibition. They stay humble and use the knowledge for the sake of the society. They believe that the useful knowledge they gain is for the good of life in hereafter and help them to enter the *jannah* (paradise). *“SurelyAllah will cause those who believe and do good deeds to enter gardens beneath which rivers flow, surely Allah does what He pleases.”* (Quran 22:14, Alharamain Islamic Foundation edition).

### **c. Knowledge Management, Industry 4.0 and Islam**

Islam encourages its believers to seek knowledge. With knowledge, they become educated. They become creative and innovative. They develop technology. Technology is the part of science (and mathematics), and the aayah related to science were mentioned so many times in the Quran. From astronomy, physics, geography, geology, biology, to medicine – all have been stated in the Quran 1400 years ago. The origin of the universe for example, had been mentioned in the Quran, Surah Al-Anbiya’, aayah 30 which means *“Have not those who disbelieve known that the heaven and the earth were joined together as one united piece, then We parted them? And We have made from water every living thing. Will they not then believe?”*

The science and mathematics knowledge had been discovered by the Islamic scholars like Ibn Sina (medicine), Al-Razi (medicine/physician), Al-Battani (trigonometry), Al-Biruni (astronomy), Al-Haitham (optical), Khawarizmi (algebraic), etc. They were not only expert in the science and mathematics, but mastered in *shariah* (Islamic law) knowledge. In the era of *khulafa’ ar-rashideen*, Muslim scholars also being referred for the Islamic matters. It shows that they lived in a balance life, not like the way Western had educating people; separation of religion with the way of life or called as secularism.

Islam teaches us to balance our life, gain more knowledge and do good deeds. Believe in Allah and try to be the best Muslim who being recognized as a great contributor in the development of the world. Islam doesn’t restrict us to use the technology, in fact Islam encourage us to explore the world through the Quran. Muslim should be the pioneer of technology invention, so that it can be a good approach to

spread Islam implicitly. People will see Islam as the way of life and the concept of *syumul* - which covers all aspect of life – as the best concept to be practiced.

As Islam encourage people to gain knowledge, it doesn't limit the age of learning. As long as we live, we should learn and share our knowledge. In Industry 4.0 where technology is being used widely, whether young or old, people should continue learning, using the knowledge they gain and disseminating the knowledge for the benefit of others or for an organization. This is where knowledge management is important in Industry 4.0. Great leader or senior worker should lead and master in technology usage, and should not let themselves left behind. They should be example for younger worker and indirectly be the best motivator. Digital culture should be nurture for all level in an organization and the knowledge management should be in line with the usage of digital instruments.

Industry 4.0 involves big data analytics. This will expose to many information including sensitive or undisclosed information. As a *syumuldeen*, Islam outlines the rules in shariah law and the purpose is described in *Maqasid Shariah*. The main purpose is to create the goodness and to prevent the harm. It includes five principles which are protecting *deen*, protecting life, protecting mind, protecting generation and protecting wealth. As an inventor or user of technology, these five aspects should be considered before making any resolution, so that the digital products and data-based services comply with the Islam guidelines. This is why we need a knowledgeable Muslim with good understanding in Islam. Allah says in the Quran : “... *and do not throw yourselves into destruction...*” (Quran 2:195, Alharamain Islamic Foundation edition). Harm is a sin in Islam. Allah says in the Quran: “*Leave (O mankind, all kinds of) sin, open and secret. Verily, those who commit sin will get due recompense for that which they used to commit*” (Quran 6:120, Alharamain Islamic Foundation edition). Recorded by Ibn Maajah, the Prophet says: “*There is not to be any causing of harm nor is there to be any reciprocating of harm*”. Clearly, Islam prohibits people from doing any harm or sin and those who has strong faith will balance between technology achievement and moral concern.

Digital technology and the broad use of data and information create a lot of issues in our daily life. The trust in digital ecosystem can be disputed and it is important to protect the sensitive data from the unreliable people. The concept of trust is a vital in Islam. As said by Allah in Surah Al-Anfal, aayah 27 which means “*O you who believe! Be not unfaithful to Allah and the Apostle, nor be unfaithful to your trusts while you know*”.

## **V. CONCLUSION**

Islam is the way of life. Islam urges its believers to seek knowledge, use the knowledge for the benefit of society, develop technology and in the same time promote good behavior towards the growing of digital ecosystem. Islam supports the achievement in Industry 4.0 while providing the guidelines to preserve the ultimate goal – victory in hereafter.



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