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RESEARCH ARTICLE

Development of the Philosophy of Science and its Impact to Halal Science Industries

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ABSTRACT

The philosophy of science serves as a foundation for understanding scientific methodologies, knowledge development, and the ethical dimensions of research. This essay examines the development of the philosophy of science and its substantial impact on the emerging halal science industries. By tracing the development of key philosophical paradigms positivism, empiricism, and scientism. This study highlights their roles in shaping scientific practices and frameworks that align with Islamic principles. The halal science industry, which includes sectors such as food, pharmaceuticals, and cosmetics, relies heavily on scientific advancements to ensure compliance with Shariah requirements. This study employs a qualitative research design, utilizing literature-based data collection to analyze relevant theories, historical progress, and contemporary applications of the philosophy of science. The interplay between scientific rigor and religious ethics is examined to demonstrate how philosophical principles foster innovation, quality assurance, and trust within halal markets. The findings underscore the importance of a balanced integration between modern scientific methods and traditional Islamic values to support sustainable growth and global acceptance of halal industries. This study further emphasizes the role of philosophy in addressing contemporary challenges such as halal authenticity, standardization, and consumer awareness.

INTRODUCTION

The development of science and technology has a significant impact on human existence, including education, medicine, the economy, and socio-culture. The halal industry is no exception. The halal science industry's capacity, quality, and marketability are expected to increase as science and technology continue to advance. This, in turn, will increase consumer confidence in the ability to obtain these halal products. The term "halal" itself is characterized by rigorous standards. The acquisition of halal standard certification, whether through Sharia or legal means, signifies quality, cleanliness, safety, and a guarantee of security (Sahari, 2018). Consequently, the advancement of the halal science industry is not only closely associated with the demand for halal products for community use, but it also necessitates the promotion of Islamic principles. It is also necessary to conduct a comprehensive and in-depth examination of the halal science industry's development, with a focus on its most fundamental aspect, which is its philosophy (Ramli, Mokhtar, et al, 2016). In

general, the philosophy of halal science is rooted in historical development, as philosophy typically commences with the consideration of paradigms that have been established over an extended period of human civilization (Yatim and Wan Muda (2009) and Weingart (2015).

LITERATURE REVIEW

The philosophers of Islamic science are responsible for the development and significant contributions to the philosophy of Islamic science. Subsequently, researchers concentrate on their thoughts to ensure that their contributions endure and remain pertinent over time (Mohd Salleh, 2012). His research focusses on the typology of the interaction between religion and science, as proposed by scholars in the field of religion and science, including Ian Barbour, Immanuel Kant, John Haught, Ted Peters, and Margaret Osler. This is followed by an analysis and evaluation of these typologies in relation to the methodologies employed by Islamic philosophers. However, the research conducted by Amir, Abd Razzak, et al (2015) is primarily concerned with the ideas of Muḥammad Mutawalli al-Sya'rawiy. The investigation provides a scientific explanation of the Qur'an's interpretation. In contrast to the research conducted by Ibrahim (2015), which examines the ideas of the traditional scholar, the Proof of Islam Imam al-Ghazali, in his effort to reconcile Islam with science.

The study by Abu Hassan and Mohd Khambali@Hambali (2013) analysed and explained different responses and significance of the Islamization of science in Malaysia and worldwide, from the perspectives of notable academics such as Syed Muhammad Naquib al-Attas, Osman Bakar, Shaharir Mohamad Zain, and Wan Mohd Nor Wan Daud. A comparative analysis by Daneshgar (2013) highlighted the scientific perspective in the Qur'an, highlighting two Islamic scholars, Tantawi and Maurice Bucaille. Dogan (2014) further analyses the concepts of Badiuzzaman Said Nursi in his work, Rasail al-Nur. Rasail al-Nur, which impacted the ideology of modern science during that era.

Following that, two studies analyze Ibn Khaldun's philosophy: Mahdi (2014) and Abdalla (2007). Of the two studies, Mahdi's (2014) research is more thorough and elaborate. Mahdi's (2014) study indicates that Ibn Khaldun significantly contributed to social sciences and was also a pioneer in Islamic sciences. Alongside Mahdi (2014), Machouche and Bensai (2015) completed a study on Ibn Khaldun's thought, focusing specifically on his critical thought that influenced the fundamentals of knowledge, including the philosophy of Islamic science.

Afterwards, Widiyanto (2017) and Habsullah, Abdul Murad (2017) completed a study on the modern Islamic philosophy of science scholar Seyyed Hossein Nasr. The study emphasized Nasr's essential perspectives on the development of science by clarifying its ontological, epistemological, and axiological foundations. Simultaneously, Nielsen, K. (2008) examined another modern Islamic scholar, Osman Bakar. Osman Bakar's contribution, conversely, reconstructs the philosophy of Islamic science outside of current scientific influence.

This research emphasizes the significance of studying Islamic philosophical scholars to comprehend and analyses those who contributed to the development of Islamic science philosophy, like Seyyed Hossein Nasr, Osman Bakar, Mutawalli al-Sya'rawiy, al-Ghazali, Ibn Khaldun, among others.

RESEARCH METHOD

The data for this study collected from the document analysis method will be analyzed using content analysis. Content analysis is employed to examine and interpret the documents systematically and objectively. There are three methods of content analysis to ensure the research results are completed effectively: first, it must be objective, indicating that it is structured according to established standards and processes. Secondly, systematic in nature, indicating that the material is structured according to a specified method; and thirdly, general in nature, signifying that the research findings align with established ideas (Long, 2016). Bryman (2012) discusses that content analysis typically entails the methodical evaluation of data. The process generally involves identifying fundamental themes within the analysed material, including references to previous studies. Subsequently, the concepts were delineated with greater specificity.

DISCUSSION AND ANALYSIS

The development of the philosophy of science

The beginning of the term philosophy does not signify a singular definition. Philosophy was once the foundation of all fields of knowledge. As changes arise periodically, all these fields of knowledge evolve and can exist independently of philosophy. Grant (2007) says that philosophy initially constituted a method of comprehending nature. Subsequently, humans persisted in their efforts to engage in studies grounded in logical reasoning for survival. Humans collect diverse knowledge and transmit it throughout generations. Zakaria and Long (2013) assert that philosophy aids individuals in their lives and facilitates the comprehension of meaning and life

Generally, the development of philosophy also begins when science is merely regarded as knowledge and is refined over time. Science may have begun in primitive times, then progressed through the Paleolithic era, and subsequently through the civilized era that began to develop and advance. (Grant, 2007). At that time, society became complex and a system for measuring progress was introduced. Next, society began to think, conduct research, and propose various scientific ideas. At this time, science is also considered important because it has had a significant impact on the philosophy of human thought. Even though there are scientists who separate science and philosophy, in reality, science is a branch of philosophy. The principles found in philosophy also further strengthen the discipline of science as it should be. (Dallal, 2010 & Pigliucci, 2010).

From a historical perspective, science initially emerged in the Middle East rather than in the West. The evidence indicates that Egypt contains the Nile River Valley, while Babylon (Mesopotamia) encompasses the Tigris and Euphrates River Valley. Both rivers are regarded as forerunners of knowledge in ancient civilisations due to their legacy of intellectual achievements and developments in science and technology that were unparalleled elsewhere. (Grant, 2007). Abdullah (2010) asserts that research indicates the prophets and messengers were the original sources of knowledge in Egypt and Babylon. Subsequently, scientific progress persisted in India and China before permeating the West, where it grew swiftly. Initially, the Greek world adopted the advancement of the philosophy of science; however, this progress was swiftly usurped by the Islamic world (Abdullah, 2010)

Nasr (1986) states that although Islam attained the pinnacle of its scientific philosophy, the West experienced the dark ages of its civilisation, influenced by the ecclesiastical authority of the church from 400 to 1100 AD. During this period, the advancement of science in Western Europe hit its lowest. During the 12th century AD, Islamic civilisation prevailed over the civilisations of Africa, Asia, and Andalusia (Spain and Portugal) under the auspices of the Islamic caliphate (Mohamad Zain et al., 1985:10; Zein, 2014)

During the Abbasid Caliphate, there were sovereigns accountable for the advancement of knowledge. The Abbasid Caliphate is historically recognised for establishing a remarkable and affluent Islamic civilisation, particularly during the reign of Caliph Harun al-Rashid and his son al-Ma'mun. Wan Hassan (1990); Ali Kettani (1991); Renima, Tiliouine, et all (2016). During that period, philosophy and science significantly contributed within the comprehensive framework of Islam. All fields of knowledge are interconnected with religion, either directly or indirectly. Due to the tenacity of intellectuals and leaders, Islam has attained its golden age (al-Edrus, 2009; Azhar, 2017). While most of the scientific information embraced by Islam originated from Greek philosophy, its advancement did not transpire directly due to a considerable temporal gap between the Greek and Islamic periods. Greek science initially reached India, subsequently influencing Persia and later Islamic nations (Wan Hassan, 1990)

Nevertheless, post-1750 AD, the development of scientific thought within Islamic civilisation slowed. Numerous causes contribute to the slowing down of scientific efforts, including political instability and insufficient governmental backing for scientific activities, and others. Nonetheless, the progression of science was not impeded by religious endeavours, and Islam itself served as a fuel for scientific improvement. Simultaneously, the advancement of knowledge transpired not alone in Islamic nations but also disseminated to Europe. Evidence indicates that Europe experienced the Renaissance, a period marked by advancements in knowledge, science, and technology (Samian & Mastor, 2003 and Zein, 2014).

Prior to the Renaissance, European and Islamic science were synonymous, both defined as a source of knowledge. This comprehension arises from the fact that the idea of science that permeated Europe originated with Islamic intellectuals (Samian and Mastor, 2001). During that period, the majority of European philosophers were clerics or, at the absolute least, individuals who had undergone religious education in monasteries. They assert that a divine power governs and generates human existence and the environment. (Mohamad Zain, 2000). Following the Renaissance in the 14th century, religion diminished in the scientific endeavours of European civilisation, with Christianity confined mostly to churches. They contest the ecclesiastical institution due to their belief that it is no longer congruent with critical and scientific reasoning. European scholars commenced to pursue political relevance and proclaimed Greek and Roman philosophy as their legacy. (Stroumsa, Guy G, 2010; Yahaya, 1996). The Renaissance era, spanning the 15th to the 17th century, was a period that rejuvenated the spirit of learning, art, and literature through the humanist movement. While Europe was progressing towards an era of enlightenment in contemporary science, this advancement was neither absolute nor original, as it involved a transfer of information from Islamic scholars to European scientists. (Othman, 2009; Mohd Amin et al., 2007).

Additionally, this movement promotes a number of theories, like scientism and empiricism, which hold that human cognitive capacities are at their peak and should be in line with their mental capacities. Hassan, Wan Fuad (1990). Empiricism generally uses material and physical evidence to arrive at knowledge and truth. Only the physical world is observable and data-gatherable, hence thus can be regarded as the scientific domain. Furthermore, this approach rejects subjective evidence as evidence of truth, such as an individual's experience. This knowledge firmly establishes human freedom to contemplate and study everything that physically exists. opposing the reality of God at the same time as rejecting the existence of all non-physical elements, including spirits, angels, jinn, and devils (Shaharir, 2018 and Aziz, 2016)

The philosophy of scientism emerges from an empiricist perspective that regards science as the only arbiter of truth. These scientific concepts constitute the laws of natural sciences, including physics and related disciplines. This notion is further endorsed by Western philosophy, which emphasises factual knowledge as the foundation of authentic understanding. Consistent with the Western scientific emphasis on nature, a primary element of the empirical principle is its reliance on the five senses as a means of acquiring knowledge and truth. Md Nawi and Md Nawi, 2017. One aspect of scientism is the conviction that only objective, inductive, and quantitative scientific procedures are seen as the most valid and worthwhile for academic research. Scientific, empirical, and experimental methods grounded in the law of cause and effect are deemed valid solely upon the execution of a scientific study.

Consequently, this perspective causes a significant reliance on modern technology as an indicator of progress and societal benefit. (Othman, 2017). In addition to the comprehension of empiricism and scientism, there exist numerous other philosophical frameworks that rely exclusively on the potency of human reason, including rationalism, naturalism, secularism, and others. All of them represent strands of thinking in Western philosophy of science that are at odds with Islamic philosophy of science, either in their objectives or in their comprehensive scientific endeavours. (Azhar, 2017; Abdullah, 2010).

The development of the strength of science was a catalyst in European society to foster a spirit of free thinking and a change in attitude. There were three factors that drew attention to science at that time. First, the effectiveness and practicality of science compared to the explanations of Christianity at that time. Secondly, European society prefers embracing truths that can be proven by the senses. Thirdly, scientific methods encourage thinking and research activities among intellectuals compared to religious teachings that are dogmatic in nature. (Hussain, 2002; Samian & Mastor, 2003). The revival and development of scientific disciplines in Islam can be seen in its impact to this day. Although research and study of Islamic knowledge are not like during the golden age of Islam in the Abbasid Empire, they still contribute to the development of Islamic knowledge, whether theoretically or practically. Among the fields of knowledge that have been impacted by the development of science are astronomy, geography, physics, mathematics, cosmology, biology, chemistry, medicine, pharmacy, design, education, zoology, botany, engineering, and others. (Awang, 2003; Mohd Salleh, 2014; Suyurno et al 2006). In general, all these fields contribute to the development of civilization. It also symbolizes the achievements of science and technology that guide humanity towards greatness,

while respecting knowledge. The source of knowledge or epistemology in a philosophy of science according to Islam places revelation as the source whose truth is believed. Epistemology also involves the process of rational debate, classification of knowledge, its specialization, and the scope of the limitations of reason in addressing it. Besides epistemology, there are two other elements to the philosophy of Islamic science, namely ontology and axiology (Abdullah, 2010:89; Awang, 2003; and Zein, 2014).

Axiology refers to the study of values, including their ideas and systems. The progress of science enables people to quantify values objectively and precisely. Values signify an aspect that mirrors human behaviour. In Islam, the significance of knowledge and intellect is the paramount factor influencing human acts and behaviour. In addition to epistemology and axiology, Abdullah (2010) identifies ontology as another essential characteristic of the philosophy of science. Ontology examines the boundaries or constraints within the realm of knowledge. The conventional scope of knowledge is typically confined to empirical experience; nevertheless, Islam posits that it also encompasses metaphysical knowledge or the unseen universe. Consequently, the discourse on Islamic philosophy of science must include its epistemology, axiology, and ontology, either explicitly or indirectly.

The philosophy of science as the framework of halal science

Zakaria and Long (2013) state that there exist four necessitate and interrelations between philosophy and practical life. Philosophy assists individuals in discerning the fundamental causes of issues, categorising them, and subsequently devising remedies. Furthermore, philosophy emphasises critical, logical, systematic, orderly, rational, and objective thinking. Third, philosophy can broaden perspectives, allowing discussions to be more comprehensive and interdisciplinary, while maintaining emphasis on the central problem. Fourth, philosophy also provides a summary at the conclusion of the cognitive process. Nonetheless, philosophical conversations rooted in Islam must revert to the source of revelation. This pertains to the utilisation of many means of referencing the Qur'an, highlighting the concept of 'tadabbur' concerning natural phenomena, the emancipation of the human intellect from taqlid, among other aspect (Hamat, 1998)

Therefore, in the philosophy of Islamic science, it serves not only a philosophical purpose but also addresses practical matters within the domain of halal research. The extensive knowledge ecosystem, encompassing halal science construction, halal science research, technological advancement, societal issues pertaining to halal product consumption, environmental development concerns, and more, necessitates a stringent and cohesive scientific philosophical framework. (Othman, 2017).

Specifically, numerous issues within the field of halal science require attention, particularly concerning the scientific approaches employed, which are notably beneficial in the formulation of legal rulings, especially regarding contemporary matters (Man, 2013; Jamaluddin & Ramli, 2013; Zainal Abidin, 2003). According to Awang (2013), a definitive interest is necessary to prevent harm to the land. There are three significant features of halal science that are essential in tackling contemporary societal concerns.

At first, halal science can satisfy the growing market demand. The worldwide halal market is presently valued at USD 2.3 trillion and is anticipated to sustain its growth. Mohd Shahwahid et al., 2015. The global Muslim population is estimated at 1.8 billion and is projected to reach 27% of the total population by 2030. (MIHAS, t.t.). Consequently, it is unsurprising that the market for halal products and services is attracting global interest, particularly within the food sector. (Mian Riaz, 2007:192; Fischer, J., 2016). Halal items are increasingly appealing not only to Muslim consumers but also to non-Muslim consumers who value quality, cleanliness, and safety in their purchases (Azizol, 2016). The expansion of the global halal market necessitates progress in halal science to manufacture halal products and services more efficiently and economically (Jamaludin & Ramli, 2013) and to promote them to customers globally (Ab Rahman, 2007). Halal science may generate food in substantial quantities over a specified timeframe and can be preserved for extended periods by procedures such as expiration date establishment, flavour enhancement, stabilisation, and emulsification (Yun Hashim, 2015)

Furthermore, the growth of the halal science industry can enhance the sustainability of the quality and safety of halal products. It urges industry participants, particularly, to enhance the quality and diversity of products available in the open market. In Islam, the issues of dietary health and safety have significant importance (Jamaluddin, 2013; Rahman & Che Man, 2011; Ahmad & Mustafa, 2014; Hashim & Abd Rahim, 2014; Malboobi & Ali Malboobi, 2010).

Thirdly, to solve more complex current concerns, the Islamic world necessitates ijtihad from scholars to resolve new matters concerning the wellbeing of Muslims (Man, 2012). Examples of these issues include the risks associated with biotechnology in plants (Amin et al., 2011), machine-assisted halal slaughter, the utilisation of feathers derived from animal or human sources, and the incorporation of pig components and their derivatives in various products (Fadzlillah, Che Man et al., 2012), as well as the presence of alcohol (alchohol and ethanol) in food (Najiha & Nadiah, 2014), among others. The halal science approach is vital in examining societal difficulties and advantages, particularly in the legal decision process (Man, 2013; Jamaluddin and Ramli, 2013; Abidin, 2003). Consequently, these three factors establish a distinct correlation in the discourse surrounding halal science from its philosophical perspective (

The philosophy of halal science and current issues

The philosophical foundations of halal science in food safety encompass not only religious dietary rules but also emphasize a comprehensive approach that aligns with Islamic legal objectives, or *Maqasid Shariah*, prioritizing both physical and spiritual well-being. Central to this foundation are the principles of *halal* and *toyyib*, rooted in the Quran and Sunnah and aimed at safeguarding human welfare (Aksin & Nu'afi Qurrota Aini, 2023; Othman et al., 2018). While *halal* generally involves adherence to prohibitions, such as avoiding pork and alcohol, *toyyib* elevates the standard by emphasizing safety and cleanliness in food production. For underprivileged Muslim consumers, however, the priority may shift towards lawful acquisition of food rather than a stringent focus on purity or specific ingredients (Safitri & Sa'dudin, 2022). This discrepancy highlights potential tensions between economic necessity and the broader spiritual and physical ideals encapsulated within the halal philosophy, suggesting that while the integration of *halal* and *toyyib* aims to promote ethical food safety standards, socioeconomic realities often shape their practical application (Connor, 2008). Thus, while halal food production aspires to meet both permissible and pure criteria, its effectiveness may be contingent upon balancing these ideals with accessible, practical implementations that align with the needs of diverse Muslim populations (Khoiri, Siregar. et.al (2024)

In Islamic thought, food safety is not merely a regulatory matter but is considered fundamental to holistic human health and development, embodying both physical and spiritual dimensions (Aalipour & Mahdavi, 2014). Islamic dietary teachings endorse a balanced diet, adherence to *halal* requirements, and consumption that honors divine intention and upholds the rights of others, including the needy (Marzband et al., 2015). This holistic view underpins specific recommendations regarding the quality of water and food, which, if observed, are believed to mitigate many health risks (Fakhar et al., 2016). Furthermore, the concept of *halalan toyyiban* reinforces the idea that lawful food must also be clean, nutritious, and safe, aligning with broader Shariah goals that aim to protect life and health while encouraging ethical consumption practices (Mohamad et al., 2015). This dynamic understanding extends beyond traditional dietary frameworks, underscoring a need for public awareness and institutional accountability within the halal food industry, which is increasingly seen as a global brand with added value through its commitment to food integrity and ethical standards (Rahman et al., 2014). This shift towards halal certification not only validates the authenticity of products but also serves as a bridge for Muslim consumers worldwide seeking assurance regarding their food sources and manufacturing processes.

The Islamic principle of *Maqasid al-Shariah* further substantiates halal science by emphasizing food safety as an essential aspect of preserving life, one of the core objectives of Shariah. *Maqasid al-Shariah* supports an adaptable approach to law, focusing on the protection and welfare of society rather than rigid textual interpretation (Kamali, 2017). This flexibility is evident in the evolving scope of *Maqasid al-Shariah*, with recent scholarship proposing the inclusion of environmental protection and health preservation as priorities within the halal framework (Deuraseh, 2023). Through the lens of *halalan toyyiban*, the objectives of Shariah underscore not only consumer welfare but also ethical

obligations across the production, distribution, and consumption of food, thus fortifying the values of Islamic consumerism and the greater well-being of the *Ummah* (Othman et al., 2018). These evolving perspectives on *Maqasid al-Shariah* highlight the adaptability of Islamic law in addressing contemporary challenges, situating halal science as a robust, ethical framework for modern food safety (Sahari., Abdul Aziz, et.al, 2024).

Halal science, therefore, extends beyond mere certification to encompass a comprehensive approach to food safety, incorporating frameworks for integrity across the supply chain. For instance, a halal traceability model has been developed to ensure compliance with Shariah from production through distribution, while the integration of Six Sigma principles into halal assurance systems offers a method to minimize defects and enhance food quality (Shafii & Wan Siti Khadijah, 2012; Vanany et al., 2020). Further, the concept of *toyyib* reinforces the demand for not only lawful but also wholesome, uncontaminated, and ethically produced foods (Ur Raheema, 2018). In response to modern food safety challenges, frameworks for halal supply chain integrity have been proposed, addressing factors such as raw materials, production processes, service quality, and information transparency (M. H. Ali et al., 2017). As halal science faces challenges in the modern marketplace, such as supply chain complexities, raw material sourcing, and the verification of authenticity, scientific advancements now enable the detection of haram substances in food, helping address concerns around adulteration and contamination (Ahmad Fadzillah, 2012). With consumers increasingly influenced by halal certification, awareness, and religiosity, the industry must evolve in tandem with technological advances and emerging legal interpretations to meet these rising expectations (Lia Febriati et al., 2024; Usman et al., 2024). The adaptability of halal science thus provides a flexible yet comprehensive approach to food safety that aligns with both religious mandates and the evolving demands of Muslim consumers.

CONCLUSION

Understanding the development of the philosophy of science is crucial for elucidating its impact and relevance on the evolution of the halal sector. Advancements in the halal sector encompass not only scientific and technological progress but also the philosophical principles that underpin and structure the development of the halal science industry, particularly in theoretical dimensions. This also aligns with SDG 9, which is Industry, Innovation, and Infrastructure. The halal science industry can boost innovation in the industry both domestically and internationally, while also being able to invest in sustainable infrastructure to support industry, innovation, and infrastructure development. In addition, Responsible Consumption and Production (12th SDG) refers to, rooted in Islamic principles, emphasizes the responsible use of resources. Halal Science industries comply with ethical norms, promoting responsible practices in the food sector and encouraging a sustainable and ethical halal science industry.

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