

## A Plausible Future for High Scientific Literacy in Muslim Societies

Hadi Akbar Dahlan

*Department of Biotechnology, Graduate School of Engineering, Osaka University, 2-1 Yamadaoka, Suita, Osaka, Japan*

*\*Corresponding author: [dablan\\_hadi\\_akbar@bio.eng.osaka-u.ac.jp](mailto:dablan_hadi_akbar@bio.eng.osaka-u.ac.jp)*

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### Abstract

Muslim society had contributed to the development of sciences from the golden age of Islam and throughout the middle ages. However, Muslim society contribution to Scientific knowledge declines after the 16th century. Many scholars had discussed the factors of why Muslim contribution toward science declined, but discussion on how Muslim society could regain the "scientific glory" were very few. This paper intends to describe plausible future of Muslim society returning to high scientific literacy in that context. The plausibility future in this term refers to a possible future if a certain possible "occurable" scenarios are met in present-day Muslim society. The possible "occurable" present-day scenarios are based on historical factors of declining Muslim scientific contribution. Plausible challenges to the plausible future are also discussed in this paper. Plausible challenges in this context are plausible causes that cause the decline of the Muslim scientist in the past but in a future setting. In conclusion, this paper discussed the plausible way for Muslims to become a scientific society as well as becoming an example of how plausibility can be utilized in constructing a future scenario planning.

*Keywords:* Plausibility, Muslim society, plausible challenges, scientific society.

## **1 INTRODUCTION**

Islamic scientists contribute heavily to various field of knowledge throughout history. This includes the development of the medical field (Majeed, 2005), anatomy (Alghamdi, Ziermann, & Diogo, 2017) and mathematics (Abraham, 2017). During this age, the Islamic empire is undergoing an age of "scientific glory". Scholars during that time discussed and developed the various basis of scientific knowledge that cultivates modern science today. However, Muslim contribution to the growing body of knowledge stagnated after the 16th century.

Some would say that Muslim shunned knowledge advancement after the decline due to various Muslim behaviour toward science. However, this is not true since there are records of laws and religious discussion conducted during the time of scientific decline to the present day. Presently, Muslim scientist had already contributed works for the advancement of sciences. However, the work output is a disproportionately small percentage when compared to total world output (Dallal, 2010).

Moreover, the scientific work done by the Muslim scientist today were based on the western view of modern science (Nasr, 1988). It is quite a significant loss since the Muslim scientist during the period of "scientific glory" were able to cultivate scientific inquiry using Islamic philosophy. One can only imagine the future if Islamic civilization were able to retain their scientific inquiry to the present day. However, that is not an excuse for present Islam society to stagnate in scientific contribution since there had been societies that had utilized "Western science" and achieved triumphant scientific discovery without having their own "scientific glory" in the past (Maziak, 2017).

Regardless, the Muslim population is expected to increase and outnumber the Christian population in the near future (Cilluffo & Cohn, 2017). As one of the major global population, it will be a shame if Muslim society still does not produce a sizeable scientific contribution and impact in the future. This is what this paper intends to discuss; the plausible future of Future Muslim society with high scientific literacy and how they could achieve it.

Plausibility future in this context refers to exploring a future scenario where the outcome is plausible with a creative and logical explanation and description (Mahmoud et al., 2009). Although the future scenario might not be within the future scenario trajectory by expert judgments, plausibility future can provide an alternative where the predictive capability is limited due to dynamic and complex variables (Swart, Raskin, & Robinson, 2004).

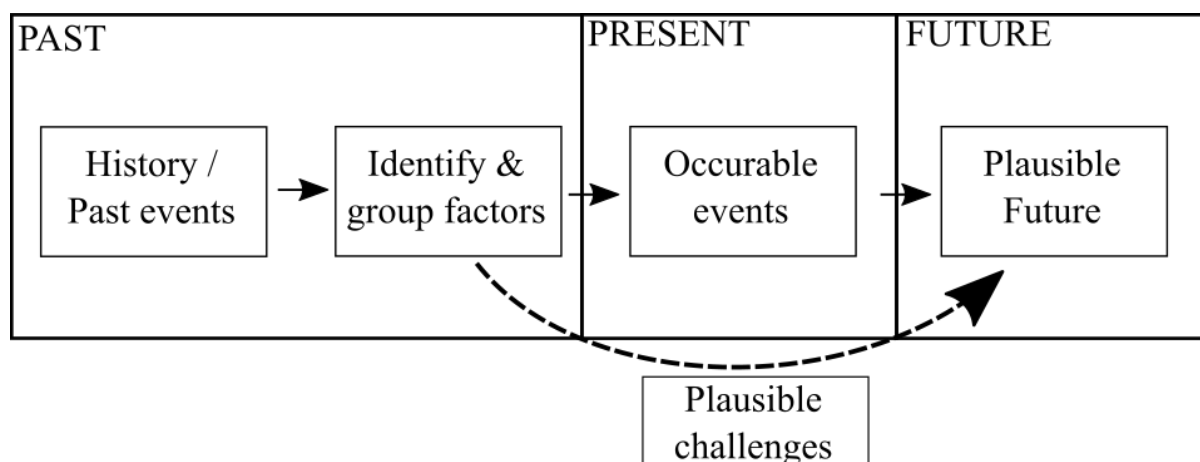
In this paper, a Muslim society can refer to any Muslim society in any country. The plausible future in this context could occur in either a future unified global Muslim community or an independent Muslim society. It is desirable that the global Muslim population be united in the future. However, the path towards it is complex (Aydin, 2017) and is not an objective of this paper.

## **2 METHODOLOGY**

Plausibility scenario planning had been described and discussed (Ramírez & Selin, 2014; Wiek, Withycombe Keeler, Schweizer, & Lang, 2013). In this paper, the plausibility method that I will utilize to construct a plausible future is based on Figure 1. Figure 1 shows 3 compartments: Past, Present, and Future. Based on Wiek et al. (2013), a plausible scenario can be developed by constructing Occurable events that might happen in the present time. Construction of the occurable events must require inputs which can be obtained from various data.

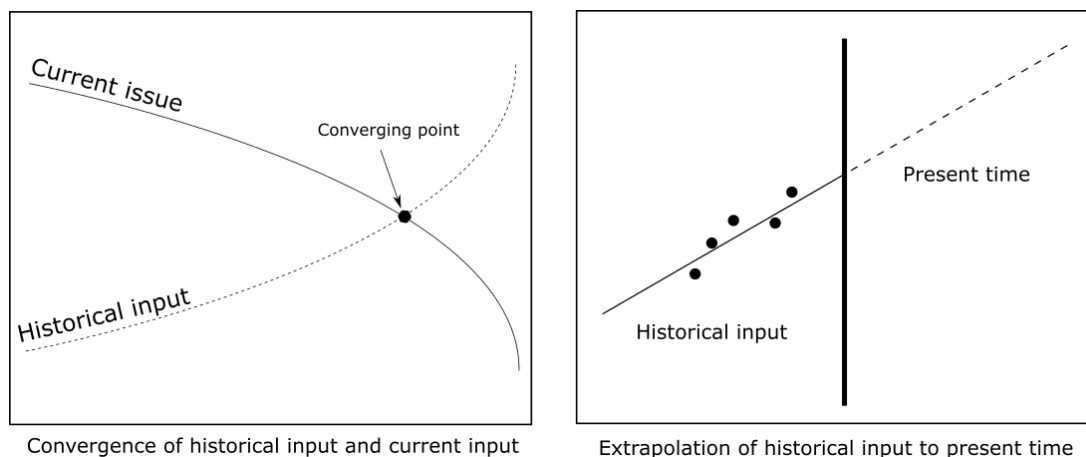
In this context, the input for the occurable event was obtained from scholarly research on the history between science and Muslim society. This will be termed as historical input.

Establishing a plausibility future for society must start by verifying the failure of society in the past. This is necessary because to devise a future without acknowledging the past will only lead to failure once again (Hidekazu, 2018).



**Figure 1.** Plausibility futures method utilized in this paper.

Besides historical inputs, the current state of the subject must also be identified. The current state of the subject includes the current trend and current discussion regarding the subject. This will be termed as current input. When these 2 inputs are obtained (historical input and current input), then occurable events can be constructed. The construction of occurable events can be from a convergence of historical input and current input, and extrapolation of historical input to current times. Figure 2 illustrates the strategy to construct occurable events.



**Figure 2.** Illustration on describing on how to construct occurable events using historical input.

Ramirez and Selin (2014) described that discomfort can be a useful criterion in establishing scenario effectiveness. In this context, I proposed “plausible challenges”; factors that are not included in the list of the occurable events but reframe as plausible factors that may threaten the realization of the plausible future. Constructing plausible challenges is crucial since it will enable the construction of counter-scenario by scholars or policymaker to ensure the realization toward plausible future.

Constructing a plausible challenge requires thinking in a future setting. Figure 3 illustrates the strategy to construct a plausible challenge. The strategy involved reframing a historical input

in a future setting. Another way to construct a plausible challenge is by reframing a plausible event that leads to the historical input in future settings.

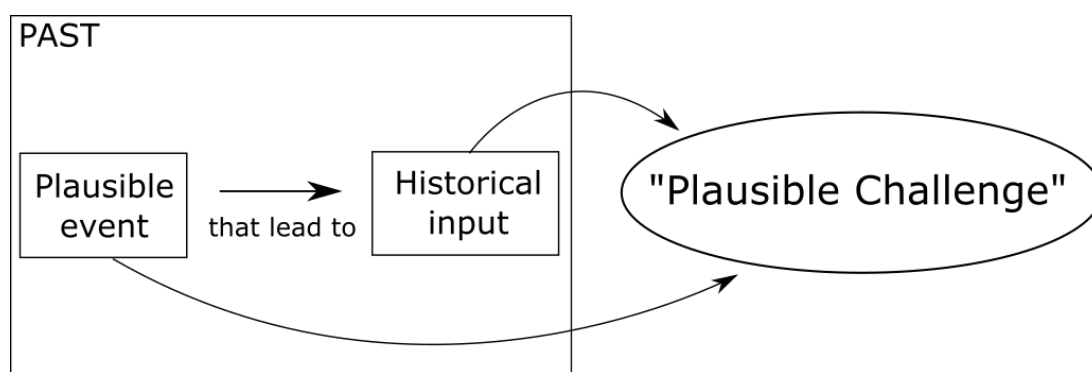


Figure 3. Strategy to construct plausible challenge

### 3 RESULTS AND DISCUSSION

#### 3.1 Factors To Muslim's Decline In Scientific Contribution.

The decline of Muslim's scientific contribution has been heavily discussed and argued by scholars. However, this paper does not intend to argue for each, and every factor proposed by the scholars, instead, this paper intends to take it as a reference for constructing a way forward. Below are the summary of factors and possible interrelation between the factors:

Based on the literature, one of the factors is decreasing support toward scientific scholarship by the Islamic empire. This is due to decreasing numbers of the scientific patron (mostly Muslim rulers such as the caliphate and sultan of a kingdom). The decreasing of the scientific patron is due to either political instability or dwindling economy.

Political instability in the Islamic empire had been discussed by several scholars. In this context, this could be in form of limiting the study of science by the local religious ruler as part of its broader effort to eliminate religious scepticism that threatened their societal influence (Ali, 2007; Chaney, 2016; Makdisi, 1962). Although the political instability by religious leader had been disputed by other scholars (Ahmad Y. al-Hassan & A.B. Zahlan, 2001), it is also possible that effort toward the scientific scholarship at the time dwindled due to loss of institutional and infrastructure to conduct scientific studies.

Scientific studies at the time were based on the patronage of the ruler. This includes research materials and translates scientific works from Greek. At the same time, a religious scholarship was also provided but under a different system (Madrasa education system which was funded by the Waqf system; a charitable endowment from the local populace) (Sabra, 1987). During the peak of Muslim scientific glory, both religion and scientific study were zealously conducted. However, as political instability occurs, scientific scholarship dwindles whereas the religious studies continue due to being an independent system from the government policy (Chaney, 2016; Sabra, 1987).

The loss of scientific endowment is also due to the dwindling economy of the empire. Arabian trading routes were less favoured by traders as newer trade routes emerge. The discovery

of a better trade route around Cape of Good Hope and rising foreign maritime power (The Portuguese) in the Indian Oceans contribute to loss of economic in the Islamic empire (Fischel, 1958). As medieval ages in Europe transition toward the age of enlightenment, the commercial centre of gravity also shifts away from the Muslim world toward Europe (Greif, 2006).

Similarly, another factor of declining Muslim's scientific contribution is due to the foreign invasion. Scholars had discussed that the Mongol invasion had brought significant loss to the Islamic empire. The Mongol invasion leads to the destruction of physical and human capital as well as bringing institutional collapse and cultural changes (Ahmad Y. al-Hassan & A.B. Zahlan, 2001). Interestingly, foreign invasions is still an ongoing factor in destroying Muslim society physical and human capital throughout the world today (Aydin, 2017)

Besides pressure from government policy, another factor for dwindling Muslim's contribution to science is prolonged Intellectual isolation throughout the Islamic empire. During those times, scientific studies were discouraged by aggressive theologians, which lead to a dominant shift of the populace toward the religious study. The difference between intellectual isolation and political instability is that the intellectual isolation was done not due to government policy, but was done due to overzealous pursue salvation to Allah.

Evidence of intellectual isolation can be seen from shifting views from prolific Muslim scholars throughout the Muslim scientific age (Mohammad Abdus Salam, 2013). Earlier in the Islamic empire (around 1100 C.E), Al-Ghazali had already written that scientific knowledge is part of the truth of religion in his great work, Ihya Ulumuddin (Al-Ghazzali, 1993):

*“Some think that science is opposed to religion. This is not at all correct. Such a man sets up one learning of Shariat against another. The reason is his failure to coordinate the two.” (Vol III, page 22)*

Although there are opinions that said Al-Ghazali also opposed scientific studies, this is not true since Al-Ghazali works had been known to be ambiguous and contain the element of logic and reasoning. His works were proof of his proponent for scientific studies (Marmura, 1965). Compared to another prolific Muslim scholar whose work published 2 centuries later, Ibn Khaldun (around 1300 C.E) in his work, Muqaddimah (Ibn Khaldun, 1959) said:

*“(Regarding existential and its extension, science of physics) ...However, we must refrain from studying these things, since such (restraint) falls under (the duty of) the Muslims not to do what does not concern him. The problem of physics are of no importance for us in our religious affairs or our livelihoods. Therefore, we must leave them alone.” (Chapter 6, section 30)*

Although Ibn Khaldun works contribute toward ideas in sociology (Syed Farid Alatas, 2006), his works were apathy toward scientific studies and this could lead to the discouragement of Muslim to pursue scientific scholarship during the later centuries of Islamic empire (Mohammad Abdus Salam, 2013).

### **3.2 Grouping Factors**

Based on the literature, there are 3 groups of factors, namely: (1) Foreign intervention, (2) political instability and (3) Wealth and investment. The first factor is based on the fact that foreign power had directly or indirectly caused an effect on the Islamic empire. The effect could be in form of physical and cultural destruction (Such as the Mongol Invasion) or indirectly cause an economic loss to the empire (such as the maritime capability of the Portuguese force in the Indian Ocean).

The second factor, political instability is due to several factors. The foreign intervention also caused political instability as an after-effect (the Mongol conquest cause a loss on rulership). Beside foreign intervention, political instability can be in form of religion and science divergence. This can be seen from either governmental policy (delimiting of scientific scholarship to reduce religious scepticism) or overzealous religious teacher (discouragement of scientific study and encouragement to pursue religious study).

The third factor, wealth and investment are based on the decreasing of scientific patrons towards the end of the scientific glory period. The patrons, who usually are rulers succumb to the political situation at the time. If political instability occurs, the ruler could be replaced with a successor that does not wish to continue to fund scientific studies. Another reason for this group factor is the dwindling economy. Ruler's wealth is based on economic activities of its empire and if the economic activities of its empire dwindle, so does investment toward the scientific scholarship.

### **3.3 The Current State Of Islam And Science**

Science has been recognized as an effort toward understanding and submission toward Allah. Various discussion regarding the field of modern science had been discussed through an Islamic perspective. This includes robotics (Hadi Akbar Dahlan, 2018), food chemistry (Mohammad Naqib bin Hamdan & Mohd Anuar bin Ramli, 2016), genetically modified organisms (GMO) (Ghareeb, 2011) and many more. Many of these papers discussed the pros and cons as well as permissibility (Halal) and prohibited (Haram) issues of modern science's products to Muslim society. Many of this discussion also seek to converge Islam and science harmonically.

However, there are some Muslims that adopt pseudoscience based on scriptural literalism. These Muslim groups believe blindly that the Quran has the answer to all science and technological questions (Bigliardi, 2017). Ziauddin Sardar (1989) had pointed this view for those who adopt the pseudoscience views: Quran motivates pursuing all the various type of knowledge, but not as an answer to all questions.

There is significant effort to decolonize western worldview in Modern science and replace it with Islamic Worldview for Muslim scientist (Bakar, 2016). This is important so that future scientific development can be adopted by Muslim society seamlessly. However, all these efforts will be for naught if the Muslim society does not adopt a science policy that could bring science toward the development of society.

Sohail Inayatullah (1997) had discussed this premise before; Muslim societies tend to discuss Islamic science policies. However, such a science policy was for "Big science". Ironically, most of the time, the condition of the "Big science" in such a society is at a very early stage. Instead of pursuing the "Big science" aggressively, the Muslim society should develop commercial or local science that could better serve the society itself.

Fortunately, some Muslim societies have moved toward developing commercial or local sciences. This could be in form of research grant specifically for developing a prototype that is beneficial for the local population. However, such a grant must be continuously provided so that Muslim society can continuously produce scientific works. For example, governments can introduce a research grant scheme for developing prototypes based on previous research that has validated proof-of-concept.

### **3.4 Occurable Events**

In this plausible methodology, the occurable events were constructed using inputs from history and the current state of the subjects. The three grouping factors were fundamental in constructing the occurable event in the present time:

#### ***3.4.1 Muslim Society Increased And Continue The Investment Toward Scientific Scholarship.***

This occurable event is constructed by extrapolating the money and wealth factor to the present day. It is plausible for Muslim society to return to high scientific literacy society in the future if the present Muslim society provides more grants or investment toward scientific research and development. This could be in form of a governmental grant for research institutes and universities.

However, investing in a narrow group of research key players could lead to slow growth. Therefore, Muslim society should conduct diversifying approach to stimulate the growth of scientific research. This includes establishing open science initiatives for the public in a Muslim society (Vicente-Saez & Martinez-Fuentes, 2018). In doing so, the public will be more inclined toward the scientific effort and thus more public fund could be accepted for used in scientific research.

Besides, open science initiative and more grants, the education system of the Muslim society should also emphasize science education. Ideally, the Madrasa system which used to be for mainly religious education should be expanded with science education. In this context, Muslim society should support the expansion of Madrasa function by providing more funds to the Madrasa endowment. Fortunately, the idea of integrating science education in Madrasa is becoming more accepted. However, significant numbers of Madrasa still resistant to the integration with modern education (Sikand, 2009). The convergence of Madrasa and Open science initiative can also be an effort toward religious convergence, which continues to the occurable event 3.4.2.

#### ***3.4.2 Religious Convergence***

This occurable event is constructed by converging historical input (divergence between Islam and science due to political instability and intellectual isolation by religious scholars) and current input (Muslims adopting pseudoscience and those who adopt scriptural literalism). In order to reduce political instability for plausible future in this context, it is imperative that effort that harmonizing both Islam and science be more vocal throughout the society.

The current effort of decolonizing science could be laudable, but it might not be enough. The way forward in this context should be adopting a scientific policy that harmonizes both science and religion. This could be in form of developing a science policy that attempts not to follow the global benchmark, such as publishing in top-tier journals of the scientific field. Instead, Muslim society should develop a science policy that requires the participation of both theologian and scientist toward creating/developing a piece of knowledge for the Muslim society themselves.

Another way of harmonizing both science and religion is by encouraging the participation of society in Open science initiatives. Encouraging young member of society in pursuing an education in “Modern” madrasa that incorporates science education can also lead to a newer generation that is trained in both theology and science. Ideally, a Muslim society that is well versed in theological matters as well as trained as a scientist should be a respected society, which is the thesis of the occurable event 3.4.3.

### **3.4.3 Obtaining Rapport And Authority**

This occurable event is constructed based on extrapolating political instability and foreign intervention to present day. Based on my opinion, the Islamic empire in the past enjoys great prosperity and wealth before it crumbled due to political instability or foreign intervention. Therefore, present Muslim society today must build a reputation and maintain a relationship with other neighbouring society.

In terms of returning to high scientific literacy society, Muslim society should aim toward championing a specific field of science. For example, a Muslim society focuses on a specific technique of food processing. The society not just contributing to paper publication form, but developing a new technological prototype of the specific food processing technique as well. In doing so, the Muslim society could be viewed as an authority in a specific field. Any collaboration with other society in that specific field could be viewed as building rapport among global society.

Besides the relationship with other society, the members of Muslim society themselves must also have a good relationship with each other. This because instability among Muslim is also a factor in the decline of scientific literacy in the past. In concordance of the occurable event (1) and (2), members of Muslim society should be pursuing scientific research with earnest and sincere. Although there could be negative issues occurring within the Muslim society toward the plausible future, If the society behaves exemplary and continues to contribute toward a growing body of scientific knowledge, others will come to respect the society (Maziak, 2017).

### **3.5 Plausible Future**

If the occurable events were to occur, then it is plausible that Muslim society can return to high scientific literacy. In a plausible future, Muslim society would be a pious and progressive society. Pious, due to the belief that the pursuit of scientific knowledge is an act of understanding the greatness of Allah. Progressive in terms of technologically (having developed future technology for daily life) and culturally (having maintained a good relationship with other society).

Muslim society in this plausible future would be a respectful society. It will be capable of defending itself (either through deterrence due to an alliance with other society or through defensive technology). However, such a scenario would be unlikely due to Muslim society becoming an authority of a specific field of science that could provide benefits to the global population.

Political instability in the plausible future would be significantly reduced, due to the probable high satisfaction of populace to the government. If the occurable event were realized, it is plausible that government policy in this plausible future will be just and cater to the society needs. Maintaining high scientific literacy at this stage would be a matter of good governance with effective leadership that capable of continuing/devising a strategic policy for the betterment of the society.

### **3.6 Plausible Challenges**

However, there still exist plausible challenges for the plausible future. In this context, plausible challenges were constructed based on group factors but were not dominantly pursue during the construction of the occurable events. Plausible challenges could also be constructed by reframing a plausible event in the past in future setting. One of the plausible challenges constructed using past plausible event is maintaining a stable Halal source of income for the society. During the reign of the Islamic empire, political instability is plausibly due to a debate regarding contentious religious issues. A similar debate will occur in this future. As a future Muslim society, Halal and Haram would be a significant issue. In the plausible future, there should be various trading conducted in online settings and this could blur the boundary between halal and haram. In



this case, Religious society might not want to utilize a source of income that came from Haram sources. Accidental used of Haram source of income would lead to political instability. Therefore, the Halal and Haram issue must be discussed for every business decision made by the ruler of the society.

Besides the halal and haram issue, the issue of obtaining a source of income is also a plausible challenge. As mentioned before, the trading business would be a complex and dynamic system on the internet. Therefore, it is imperative that Muslim society equipped themselves with contemporary business operations. If the Muslim society becomes laggard in understanding and utilizing new business operations, then the society will accumulate wealth at a very slow rate.

It is also possible that foreign intervention in the future would be in form of large-scale disruption of online trading activity (Goodman, 2015). This online threat had appeared in current times. It is quite possible that foreign power in the future would amass an army of hackers that could infiltrate and paralyze government system stealthily and systematically. Therefore, Muslim society must devise a strategy to counter against cyber warfare and cyber threats.

Muslim society should prepare themselves for possible physical threat as well. This is especially for Muslim society that possesses important resources to the world. Currently, important resources are in form of an oil reservoir. Future plausible resources could be in form of robotics technology or even energy-generating technology. Thus, Muslim society should be vigilant for any anticipated threats from other society.

## 4 CONCLUSION

This paper intends to discuss a plausible future where Muslim society can achieve high scientific literacy. Any Muslim society could achieve this if the 3 occurable events were to be realized. The 3 occurable events are (1) increased and continued support toward scientific scholarship, (2) religious convergence with science and (3) Muslim society gain respect and become an authority of a specific science. However, the plausible future is not without challenge. Some factors that cause the decline of the scientific contribution of Muslim in the past can still threaten this plausible future. Foreign intervention in future settings such as cyber warfare and religious-science contention issues are 2 plausible challenges that could threaten the realization of the plausible future. In conclusion, the plausibility methodology in this context is an exercise in producing a discussion about alternate future as well as plausible scenarios to realize the alternate future. This planning exercise hopefully could initiate some discussion on the way forward for Muslim society toward becoming a scientific society.

## List of Reference

- Abraham, R. H. (2017). Mysticism in the history of mathematics. *Progress in Biophysics and Molecular Biology*, 131, 261-272. doi:10.1016/j.pbiomolbio.2017.05.010
- Ahmad Y. al-Hassan, & A.B. Zahlan. (2001). Factors behind the decline of Islamic science after the sixteenth century *Science and Technology in Islam (Part 2)* 4(II), 645-663. Paris: UNESCO Publishing.
- Al-Ghazzali. (1993). *Ihya Ulum-Id-Din* (Fazl-ul-Karim, Trans.). Karachi: Darul Ishaat.
- Alghamdi, M. A., Ziermann, J. M., & Diogo, R. (2017). An untold story: The important contributions of Muslim scholars for the understanding of human anatomy. *Anatomical Record (Hoboken)*, 300(6), 986-1008. doi:10.1002/ar.23523
- Ali, A. (2007). The Closing of the Muslim Mind. *Journal of Muslim Minority Affairs*, 27(3), 443-453. doi:10.1080/13602000701737079

- Aydin, C. (2017). *The idea of the Muslim world: a global intellectual history*: Harvard University Press.
- Bakar, O. (2016). Science and Technology for Mankind's Benefit: Islamic Theories and Practices—Past, Present, and Future. In Mohammad Hashim Kamali, Osman Bakar, Rugayah Hashim, & Daud Abdul-Fattah Batchelor (Eds.), *Islamic Perspectives on Science and Technology* 17-33. Singapore: Springer.
- Bigliardi, S. (2017). The "scientific miracle of the Quran", pseudoscience and conspiracism. *Zygon®*, 52(1), 146-171. doi:doi:10.1111/zygo.12321
- Chaney, E. (2016). Religion and the rise and fall of Islamic science. *Work. Pap., Dep. Econ., Harvard Univ., Cambridge, MA*.
- Cilluffo, A., & Cohn, D. (2017). 10 demographic trends shaping the US and the world in 2017. *Pew Research Center*.
- Dallal, A. (2010). *Islam, science, and the challenge of history*: Yale University Press.
- Fischel, W. J. (1958). The Spice Trade in Mamluk Egypt: A Contribution to the Economic History of Medieval Islam. *Journal of the Economic and Social History of the Orient*, 1(2), 157-174. doi:10.2307/3596013
- Ghareeb, B. A. A. (2011). Human Genetics and Islam: Scientific and Medical Aspects. *The Journal of IMA*, 43(2), 83-90. doi:10.5915/43-2-7014
- Goodman, M. (2015). *Future Crimes: A journey to the dark side of technology—and how to survive it*. New York, United States: Random House.
- Greif, A. (2006). *Institutions and the path to the modern economy: Lessons from medieval trade*. Cambridge University Press.
- Hadi Akbar Dahlan. (2018). Future Interaction between Man and Robots from Islamic Perspective. *International Journal of Islamic Thought*, 13, 44-51. doi:10.24035/ijit.13.2018.005
- Hidekazu, I. (2018). Introduction. In Y. Funabashi (Ed.), *Japan's Population Implosion: The 50 Million Shock* 1-25. Singapore: Springer Singapore.
- Ibn Khaldun. (1959). *The Muqaddimah* (Franz Rosenthal, Trans.). New York: Pantheon Books.
- Inayatullah, S. (1997). The Future of Science in the Muslim World. *American Journal of Islamic Social Sciences*, 14(3), 77-81.
- Mahmoud, M., Liu, Y., Hartmann, H., Stewart, S., Wagener, T., Semmens, D., Winter, L. (2009). A formal framework for scenario development in support of environmental decision-making. *Environmental Modelling & Software*, 24(7), 798-808. doi:10.1016/j.envsoft.2008.11.010
- Majeed, A. (2005). How Islam changed medicine: Arab physicians and scholars laid the basis for medical practice in Europe. *BMJ : British Medical Journal*, 331(7531), 1486-1487.
- Makdisi, G. (1962). Ash'ari and the Ash'arites in Islamic Religious History I. *Studia Islamica*(17), 37-80. doi:10.2307/1595001
- Marmura, M. E. (1965). Ghazali and demonstrative science. *Journal of the History of Philosophy*, 3(2), 183-204.
- Maziak, W. (2017). Science, modernity, and the Muslim world. *To improve scientific research in Muslim countries requires profound social and economic liberalization of their societies*, 18(2), 194-197. doi:10.15252/embr.201643517
- Mohammad Abdus Salam. (2013). From the Archives: Islam and Science – Concordance or Conflict? .Retrieved from <http://www.reviewofreligions.org/9422/from-the-archives-islam-and-science-concordance-or-conflict/> Access date: 2 July 2018
- Mohammad Naqib bin Hamdan, & Mohd Anuar bin Ramli. (2016). Daging Kultur Menurut Perspektif Islam: Analisis terhadap Penggunaan ESCs sebagai Sumber Sel Stem (Cultured Meat in Islamic Perspective: An Analysis to the Use of ESCs as Source of Stem Cell). *Global Journal Al-Thafaqah*, 6(2), 129-141.
- Nasr, S. H. (1988). Islam and the problem of modern science. *MAAS Journal of Islamic Science*, 4(1), 59-74.
- Ramírez, R., & Selin, C. (2014). Plausibility and probability in scenario planning. *Foresight*, 16(1), 54-74. doi:10.1108/fs-08-2012-0061
- Sabra, A. I. (1987). The Appropriation and Subsequent Naturalization of Greek Science in Medieval Islam: A Preliminary Statement. *History of Science*, 25(3), 223-243. doi:10.1177/007327538702500301

- Sardar, Z. (1989). *Explorations in Islamic science*. London: Mansell Publishing Limited.
- Sikand, Y. (2009). Bridging Deen and Duniya: The “Modernisation” of Islamic Education in India. *Journal of Muslim Minority Affairs*, 29(2), 237-247. doi:10.1080/13602000902943690
- Swart, R. J., Raskin, P., & Robinson, J. (2004). The problem of the future: sustainability science and scenario analysis. *Global environmental change*, 14(2), 137-146. doi:10.1016/j.gloenvcha.2003.10.002
- Syed Farid Alatas. (2006). Ibn Khaldūn and contemporary sociology. *International sociology*, 21(6), 782-795.
- Vicente-Saez, R., & Martinez-Fuentes, C. (2018). Open Science now: A systematic literature review for an integrated definition. *Journal of Business Research*, 88, 428-436. doi:10.1016/j.jbusres.2017.12.043
- Wiek, A., Withycombe Keeler, L., Schweizer, V., & Lang, D. J. (2013). Plausibility indications in future scenarios. *International Journal of Foresight and Innovation Policy*, 9(2-3-4), 133-147.