

## **BIG DATA AND FINTECH IN ISLAMIC FINANCE: PROSPECTS AND CHALLENGES**

Surianom Miskam  
Department of Law  
Faculty of Shariah and Law  
Kolej Universiti Islam Antarabangsa Selangor (KUIS)  
surianom@kuis.edu.my

Siti Hawa Radin Eksan  
Department of Economics and Management  
Faculty of Management and Muamalah  
Kolej Universiti Islam Antarabangsa Selangor (KUIS)  
sitihawa@kuis.edu.my

### **Abstract**

*Financial technology (FinTech) is one of the recent innovations in the financial service industry, including Islamic finance and is evolving at a rapid speed, driven in part by the sharing economy, favourable regulation, and information technology. FinTech has in some ways modified the financial landscape by facilitating the Big Data applications and complex calculations to financial decisions. Big Data applications are becoming more prevalent in Islamic finance as a basis for financial services, including financing, takaful, investment and wealth management by exploiting the value of information. This paper will examine how Big Data is being used in the Islamic financial service sector to improve information sharing, operational efficiency and customer experience. In addition, the prospects and challenges of Big Data and FinTech in Islamic finance will be identified and discussed. This paper is expected to provide an insight into the application of Big Data and its nexus with FinTech in the Islamic financial service.*

**Keywords:** Big Data, FinTech, Islamic finance, financial service

### **1. Introduction**

In recent years, FinTech has become one of the recent innovations in the financial service industry and is evolving at a rapid speed, driven mainly by the sharing economy, favorable regulations and advances in information technology. FinTech began to attract the attention of regulators, industry players and customers since 2014 (Arner, Barberis, & Buckley, 2015).

FinTech is reshaping consumers' expectations of financial services. While Islamic finance has made significant progress domestically and globally, the next growth phase requires the industry to rise the FinTech wave. At present Islamic FinTech is still in its infancy and growing. There is increasing number of FinTech start-ups, innovation labs and incubators that are based on the values and principles of Islamic finance. The case is compelling for Islamic finance to take on a more prominent role in the FinTech ecosystem (BNM, 2017).

From artificial intelligence to cryptocurrency, rapid advances in FinTech are transforming the financial services landscape, creating both opportunities and challenges for consumers, service providers, and regulators alike. Thus, the objective of this paper is to examine how Big Data is being used in the Islamic financial service sector and its nexus with FinTech. This paper is organised as follows: Section 2 reviews relevant literatures on Big

Data and FinTech in Islamic finance. Section 3 analyses the nexus between Big Data and FinTech in Islamic finance. Section 4 discusses the prospects and challenges brought about by Big Data and FinTech in Islamic finance industry. Section 5 concludes the paper.

## **2. Literature Review**

The world of Big Data analytics is a rapidly growing one. Prickett Morgan (2012) highlights that the Big Data market is expected to grow at an annual compound growth rate of 39.4% and reach a value of \$16.9bn by 2015, contrast this to its value of \$3.2bn in 2010. It is clear how quickly this technology is being adopted and the effect it is having on the business environment. Interestingly, the Big Data market is growing at a rate seven times that of the whole of the rest of the information technology (IT) market.

Big Data bring new opportunities to modern society and challenges to data scientist. On the other hand, Big Data hold great promises for discovering subtle population patterns and heterogeneities that are not possible with small-scale data. Big Data promise new levels of scientific discovery and economic value. In the era of Big Data—a term that refers to the explosion of available information, such a Big Data movement is driven by the fact that massive amounts of very high-dimensional or unstructured data are continuously produced and stored with much cheaper cost than they used to be. For instance, in genomics we have seen a dramatic drop in price for whole genome sequencing (Stern, 2010). This is also true in other areas such as social media analysis, biomedical imaging, high-frequency finance, analysis of surveillance videos and retail sales. The existing trend that data can be produced and stored more massively and cheaply is likely to maintain or even accelerate in the future (Donoho, 2000). This trend will have deep impact on science, engineering and business. For instance, scientific advances are becoming more and more data-driven and researchers will more and more think of themselves as consumers of data. The massive amounts of high-dimensional data bring both opportunities and new challenges to data analysis. Valid statistical analysis for Big Data is becoming increasingly important.

In recent years, there has been an increasing amount of literature on Big Data and FinTech from different jurisdictions. Lee and Shin (2018) for instance, introduces a historical view of FinTech and discusses the ecosystem of the FinTech sector. In addition, technical and managerial challenges for both FinTech startups and traditional financial institutions are also examined.

There is a considerable amount of literature has been published on the evolution and development of Big Data and FinTech. Recent evidence suggests that United States has the largest FinTech market, followed by the United Kingdom, Canada, India and Germany at a considerable distance (Haddad & Hornuf, 2016). Evolution of FinTech and outlook for the sector and the regulatory implications of its growth has also been analysed with focus given on focusses on the interlinked evolution of financial services and technology, in particular information technology (Arner et al., 2015) and the effect of 2007/2009 financial crisis that has triggered new regulatory initiatives and has accelerated existing ones (Philippon, 2016).

Many studies have identified the impact of FinTech in the financial services industry worldwide (Guild, 2017; Wonglimpiyarat, 2017). Romanova & Kudinska (2016) for instance focus on the development of the financial innovation and technology market, provide assessment of existing practices applied in the field of FinTech and identify the main risks related to the development of FinTech and financial innovations the banks are exposed to. It is also found that customer trust, data security and the user design interface affect the adoption of FinTech in the industry (Stewart & Jürjens, 2018). This development has the potential to shrink the role and relevance of today's banks, and simultaneously help them

create better, faster, cheaper services that make them an even more essential part of everyday life for institutions and individuals (Skan, Dickerson, & Masood, 2015).

A clear-sighted assessment of regulatory risk is fundamental to FinTech success because regulatory uncertainty makes business planning very difficult, and the financial and compliance cost of regulation has been sufficient to see some new companies exit the market (Allen & Overy, 2017). FinTech is an international issue, thus policymakers need to consider implications for common standards and legal principles, to the extent that they align with national priorities (Dong He et al., 2017).

It is argued that FinTech becomes an alternative transaction for community because it makes easier for people to access financial products, simplify transactions, and increase financial literacy (Wijayanti & Pradipta, 2017) Despite the fact that FinTech has attracted a significant amount of attention, a continuous use of FinTech is still doubtful. Some users are skeptical of continuing to use FinTech because it has considerable risks (Ryu, 2018).

So far however, there has been little discussion about Big Data and FinTech in Islamic finance. Thus, this study attempts to provide an insight into the application of Big Data and FinTech in Islamic finance and the prospects and challenges facing the industry.

### **3. Big Data and FinTech: The Nexus**

#### **3.1 Big Data**

Garner IT Glossary defines Big Data as high volume, high velocity and/high variety information assets that demand cost-effective, innovative forms of informations processing that enable enhanced insight, decision making, and process automation. There are four main V's that have been identified to define the characteristics of Big Data. A brief overview of these V's is presented below (Mayer-Schonberger and Cukier, 2013).

- (1) **Volume:** The volume of Big Data is generally very large and Big Data is characterised mainly by its volume. Chaudhari (2012) has identified that the volume of Big Data is continuously increasing and becoming large in nature because the data has been in storage since years and the use of social media leads to the generation of unstructured data, which contributes to the volume.
- (2) **Velocity:** Another unique characteristic that differentiates between Big Data and regular data is the velocity or speed at which it's generated. Because of the use of Internet, mobile phones and other technologies, Big Data is generated at a very high speed (Snijders et al. 2012).
- (3) **Variety:** Big Data also exists in different varieties, formats and structures. It comes in structured, as well as non-structured manner. The data system can be obtained in different formats, such as text data, data obtained in the form of images or the data feed obtained from Internet (Mayer-Schonberger and Cukier, 2013).
- (4) **Variability:** The inconsistent and variable nature of Big Data is a characteristic that defines the nature of Big Data. The data becomes highly variable in nature because the data obtained from social media and that obtained from mobile phones and Internet can significantly change with time and never remains the same. This not only makes it difficult to predict data load, but the management and analysis also becomes challenging.

The Big Data era makes several other new applications becoming possible which include:

- (1) **Personalised services.**

With more personal data collected, commercial enterprises are able to provide personalized services adapt to individual preferences. For example, Target (a retailing

company in the United States) is able to predict a customer's need by analyzing the collected transaction records.

(2) Internet security.

When a network-based attack takes place, historical data on network traffic may allow us to efficiently identify the source and targets of the attacks.

(3) Personalised medicine.

More and more health-related metrics such as individual's molecular characteristics, human activities, human habits and environmental factors are now available. Using these pieces of information, it is possible to diagnose an individual's disease and select individualised treatments.

(iv) Digital humanities.

Nowadays many archives are being digitized. For example, Google has scanned millions of books and identified about every word in every one of those books. This produces massive amount of data and enables addressing topics in the humanities, such as mapping the transportation system in ancient Roman, visualizing the economic connections of ancient China, studying how natural languages evolve overtime, or analyzing historical events (Jian, 2014).

As far as Malaysia is concerned, Big Data applications are becoming more prevalent in recent years. According to report by IDC, Malaysia has progressed within the ad-hoc stage in the Big Data Analytics MaturityScape from 2014 to 2015. This Big Data and Analytics (BDA) MaturityScape assessment study was commissioned by Malaysian Digital Economic Corporation (MdeC) (Peter Kua, 2016) to understand the current maturity of the BDA adoption in seven selected industries in Malaysia. This study was a continuation of the BDA MaturityScape assessment done in 2014 by International data Corporation (IDC). IDC has provided an analysis of BDA maturity in Malaysia compared to the APeJ (Asia Pacific excluding Japan) in five key dimensions – Intent, People, Process, Technology and Data/Metrics. This study was conducted across various industries including Communications/Media, Financial Services, Manufacturing & Construction & Resources, Public Sector, Services/Utilities, Transportation and Wholesale/Retail. It was found that Malaysian organizations have progressed within the Ad-hoc stage (experimental, silo-ed proofs-of-concept, undefined processes) in IDC's Big Data Analytics MaturityScape (Stage 1 out of 5), but they still lag behind leading countries like Singapore, Australia and Hong Kong in the APeJ region. Diagram 1 shows the relative position of the countries involved in the assessment.

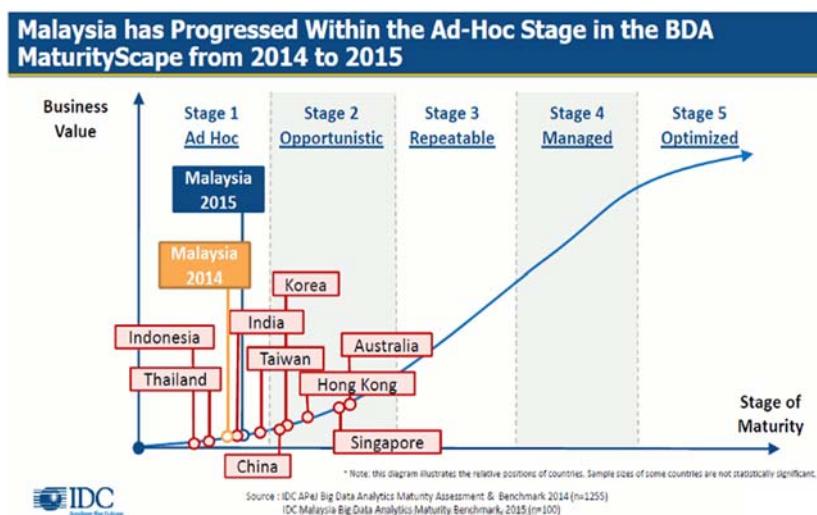


Diagram 1: Big Data and Analytics (BDA) MaturityScape

### 3.2 FinTech

Financial technology or "FinTech" is originated from the 'Financial Services Technology Consortium' a project initiated by Citigroup back in early 1990s to facilitate technological cooperation efforts (Románova & Kudinska, 2016). FinTech refers to a dynamic segment at the intersection of the financial services and technology sectors where technology-focused start-ups and new market entrants innovate the products and services currently provided by the traditional financial services industry (PwC, 2017).

FinTech today consists of five major areas: (1) finance and investment, (2) operations and risk management, (3) payments and infrastructure, (4) data security and monetization, and (5) customer interface (Arner et al., 2015). FinTech has also been characterised as the utilisation of mobile devices and other technology platform to access a bank account, transaction notifications, and debit and credit alerts by means of push notifications vis SMS or other forms of electronic notification (Stewart & Jürjens, 2018).

### 3.3 Big Data and FinTech in Islamic Finance

Generally, Big Data comprises of all data gathered by electronic devices, both structured and unstructured, which can be processed with certain algorithms and analysis methods to organise and extract valuable pieces of information about the user. This data can be used afterwards in various scopes, depending on the parties involved. In the FinTech sector, Big Data can be used to anticipate customer behaviour, but also to create protective strategies and policies for alternative banks and financial institutions from all around the world.

As far as FinTech in Islamic finance is concerned, FinTech solutions should observe Islamic ethics in transactions such as transparency, fairness and justice, avoid cheating, fraud, misrepresentation etc. The regulators should also take into consideration the Shariah compliance of FinTech operations and practice to minimise non-compliance risk and ensure that FinTech will have a proper environment in which to operate (Laldin, 2018). FinTech in Islamic finance shall not vary from the Shariah compliance requirements of any other financial contracts. FinTech based services need their own regulations to oversee its activities and operations to maintain the confidence of Islamic finance stakeholders, fulfils the needs of society and ultimately to achieve *Maqasid Shariah*.

Islamic finance has vast opportunities to leverage on technology as a catalyst to scale up businesses and enhance operational efficiency which includes understanding the potential of block chain technology and its associated risk to enable its effective adoption that is both cost and time saving. FinTech gives the potential to provide value added and customer focus services through the delivery of customised solution using biometric technologies, Big Data and predictive analytics. FinTech also gives the potential to improve market and system efficiency for back-end operations that includes the use of predictive analytics to undertake real time risk simulation and management; and the potential to enhance compliance and regulatory productivity by automating compliance tasks and reduce operational risks associated with meeting compliance and reporting obligations by the regulators (BNM, 2017).

Thus, the global requirement for digital infrastructure investment is an opportunity for Islamic banks, asset managers and investors to harness through Islamic FinTech both in

Islamic and non-Islamic economies. Islamic FinTech offers the opportunity to transform the lives of millions of people globally, and to help transform the Islamic FinTech hubs into 4<sup>th</sup> Industrial Revolution digital leaders (Wintermeyer, 2017).

### **3.4 Use Cases of Big Data in Islamic Financial Service**

Big Data is widely used by Islamic financial institutions to assess credit and market risks. Big Data has the advantage of identifying potential risk in terms of bad investments or bad payers. While Big Data cannot completely prevent such risks, it can identify those at early stages and prevent further development into risky paths. Big Data can help companies in the financial industry tailor programs and strategies that will assess the potential risks and minimise those risks.

Big Data does not only helps IFIs to better understand the spending habits of each customer, but also helps the IFIs to detect fraud and financial crimes involving its system. In this situation, when unusual activity is detected by the system, the holder of the account can be easily contacted or informed about a transaction that seems suspicious, thus early detection of fraud is possible to prevent greater losses to the customers.

Big Data applications can easily analyse spending habits of the customers depending on age, gender, and social class. The most valuable customers, namely those spending the most money, can also be identified. This will generate higher levels of customer satisfaction, as people generally seek highly personalized offers and financial products, thus allowing the IFIs to offer products that will meet the demands of the potential customers.

In relation to compliance, Big Data is enabling banks to conduct stress testing, data analysis and aggregation for regulatory reporting more rapidly. Big Data algorithms can also help deal with compliance, audit and reporting issues in order to streamline the operations and remove the managerial overhead.

Recent developments in the Big Data in Islamic finance have seen introduction of product innovations, to name but a few, for instance Wahed which is based in the USA has launched Islamic Robo-Advisor with access to Shariah compliant Exchange Traded Funds (ETFs), (Wintermeyer, 2017). Robo-advisor is a form of artificial intelligence, but their value proposition lies in their ability to automatically pick out stock investments based on the kind of investment portfolio that an investor prefers according to their risk profile.

Another example is BIMB-Arabesque I Global launched by BIMB Investment Malaysia in November 2017. This multi-currency global Shariah environmental, social and governance equity fund is the first Islamic global equity fund in Malaysia that applies artificial intelligence and Big Data technology in its investment process. The process removes human biases and intuition, to construct the best combination of investment portfolio from a universe of 77,000 global listed companies to form a portfolio of up to 100 stocks daily by applying more than 1600 selection criteria that process more than 100 billion data points (TheSunDaily, 2018).

## **4. Prospects and Challenges**

The Islamic finance market size, now within the range of USD1.66 trillion to USD2.1 trillion, was expected to rise to USD3.4 trillion by end of 2018. Yet, finance technology (FinTech) have yet to commensurate this market boom (Al-Montser, 2017). While Islamic financial institutions have successfully embraced more conventional aspects of FinTech, it will take time for more modern FinTech to be widely accepted. Time will tell, but with technological innovations increasingly transforming the way people carry out financial transactions, and with Islamic finance spreading around the world, Shariah-compliant FinTech is likely to become an increasingly visible part of the global FinTech landscape (Gillet, 2017).

Business has to drive the Big Data solution at firms because they are ones who have the questions that need answering. It is argued that data supply chain can deliver a better architecture in terms of cost Technology is evolving fast and producing even better results for Big Data and Big Data deployment. Big Data architecture is very flexible, especially with new cloud offerings and IFIs are using Big Data in a variety of ways to deliver better business outcomes for the organisations. With the evolution of the Internet of things the future of Big Data is sound and promising.

However, the rapid innovation introduced by Big Data and FinTech entering into financial industry in general and the Islamic finance industry in particular, can lead to disruptive innovation and conflict, if not properly regulated by relevant authorities (Wijayanti & Pradipta, 2017). Among the challenges related to Big Data and FinTech are:

(1) Ethical Issues: One of the biggest problems observed while using Big Data is ethical issues. With the availability of information and data via different mediums, one ethical problem that always arises is that of data privacy. It is ethically wrong to share information related to people with a third person and hence it is important to protect and safeguard the privacy of data collected from people to maintain information ethics.

(2) Trust: Trust is another big issue related to Big Data in organizations. Lynch (2008) highlights the lack of trust that exists in organizations, which prohibits departments from using Big Data collected in other organizations. It has also been observed that often management and people do not trust information gathered with the help of Big Data and hence the credibility issues keep on arising.

(3) Security: Though the development of Internet has connected people all throughout the world, it has also become easier for people to gain access to personal information of people by hacking into their accounts. Hence, keeping Big Data secured to avoid it being misused is one of the biggest challenges associated with Big Data (Rabl et al. 2012).

(4) Audit: Auditing the Big Data obtained from the Internet and other sources is a huge challenge and hence it becomes difficult for companies to make use of the data before ensuring its reliability, validity and originality (Howe et al. 2008).

(5) Governance: Governance problems arise in Big Data when the data is not appropriately managed or used well. The issue usually arises because of the versatile nature of Big Data, which exhibits high velocity and are usually present in huge volumes. The complex nature of data is what makes it difficult to analyse and manage, thus causing governance issues (Rabl et al. 2012).

## **5. Conclusion**

The demand for FinTech solutions is underscored by the rapid adoption of technology; high levels of mobile usage; rising rates of Internet penetration; an increasingly urban, literate and young population; as well as a segment of consumers and SMEs underserved by traditional banking solutions. Despite the fact that FinTech innovations bring many opportunities in Islamic finance industry, FinTech may lead to a number of issues and challenges from legal and regulatory point of view. The rapid innovation entering into financial industry in general can lead to disruptive innovation, if not properly regulated. Thus, regulatory and supervisory authorities should take those issues and challenges into account in order to support the development of a strong and sustainable Islamic financial system.

## **REFERENCES**

Al-Montser, S. (2017). FinTech in Islamic finance. Retrieved from <https://infocus.wief.org/FinTech-in-islamic-finance/>

- Allen, & Overy. (2017). FinTech.
- Arner, D., Barberis, J., & Buckley, R. (2015). The Evolution of FinTech: A New Post-Crisis Paradigm. *UNSW Law Research Series Research Paper No. 2015/047*.
- Chaudhari, S.(2012), What next?: a half-dozen data management research goals for Big Data and the cloud, PODS '12 Proceedings of the 31st symposium on Principles of Database Systems, pp.1-4
- Dong He, Ross Leckow, Vikram Haksar, TOMasso Mancini-Griffoli, Nigel Jenkinson, M. K., Tanai Khiaonarong,, & Celine Rochon, H. T. (2017). FinTech and Financial Services: Initial Considerations. *IMF Staff Discussion Note, SDN/17/05*.
- Donoho, D. High-dimensional data analysis: the curses and blessings of dimensionality. In: The American Mathematical Society Conference, Los Angeles, CA, United States, 7–12 August 2000.
- Gillet, K. (2017). FinTech and Islamic finance: a mutually beneficial match? Retrieved from <https://www.thebanker.com/Markets/Islamic-Finance/FinTech-and-Islamic-finance-a-mutually-beneficial-match?ct=true>
- Guild, J. (2017). FinTech and the Future of Finance. *Asian Journal of Public Affairs*. doi:10.18009/ajpa.201710
- Haddad, C., & Hornuf, L. (2016). The Emergence of the Global FinTech Market: Economic and Technological Determinants. *CESifo Working Paper No. 6131*.
- Howe, Costanzo M, Fey P, Gojobori T, Hannick L, Hide W, Hill DP, Kania R, Schaeffer M, St Pierre S, Twigger S, White O, Rhee SY. (2008)Big Data: The future of biocuration. *Nature*. 2008 Sep 4;455(7209):47-50. doi: 10.1038/455047a.
- Jian qing Fan1,\* ,FangHan2 and HanLiu1, Challenges of Big Data analysis. *National Science Review* 1:293–314,2014
- Laldin, M. A. (2018, 3 October 2018). FinTech and Islamic Finance. *IFN Islamic Finance News*, 15, 67.
- Lynch, C.(2008), Big Data: How do your data grow?, *Nature* [online] available at <http://www.nature.com/nature/journal/v455/n7209/full/455028a.html>, accessed on 08/03/14
- Mayer-Schönberger, V. and Cukier, K. (2013), *Big Data: A Revolution that will Transform how we Live, Work, and Think*, Houghton Mifflin Harcourt, New York, NY.
- Philippon, T. (2016). *The FinTech Opportunity*. Retrieved from Cambridge:
- PwC. (2017). Blurred lines: How FinTech is shaping Financial Services.
- Prickett Morgan, T. (2012) IDC: Big Data biz worth \$16.9 billion by 2015 up from \$3.2 bn in 2010. [Online] Available at: [http://www.theregister.co.uk/2012/03/12/idc\\_cases\\_big\\_data/](http://www.theregister.co.uk/2012/03/12/idc_cases_big_data/) (Accessed on: 12/02/14).
- Romānova, I., & Kudinska, M. (2016). Banking and FinTech: A Challenge or Opportunity? *Contemporary Studies in Economic and Financial Analysis* (pp. 21-35).
- Ryu, H.-S. (2018). What makes users willing or hesitant to use FinTech?: The moderating effect of user type. *Industrial Management & Data Systems*, 00-00. doi:10.1108/imds-07-2017-0325
- Rabl, T., Gomez-Villamor, S., Sadoghi, M. and Jacobsen, H.A.(2012), Solving Big Data challenges for enterprise application performance management, *Proceedings of the VLDB Endowment*, vol.5, no.12, pp.1724-1735
- Skan, J., Dickerson, J., & Masood, S. (2015). The Future of FinTech and Banking.
- Snijders, C., Matzat, U. and Reips, U.D.(2012), "Big Data": Big Gaps of Knowledge in the Field of Internet Science, *International Journal of Internet Science*, Vol. 7 Issue 1, p1-5
- Stewart, H., & Jürjens, J. (2018). Data security and consumer trust in FinTech Innovation in Germany. *Information and Computer Security*, 00-00. doi:10.1108/ics-06-2017-0039
- Stein,L. The case for cloud computing in genome informatics. *Genome Biol* 2010;11:207.
- TheSunDaily. (2018). BIMB Invest declares 8% yield for BIMB-Arabesque i Global Dividend Fund 1. Retrieved from <http://www.thesundaily.my/news/2018/03/28/bimb-invest-declares-8-yield-bimb-arabesque-i-global-dividend-fund-1>



- Wijayanti, D. M., & Pradipta, H. (2017, 6 September 2017). *Sharia FinTech: Positive Innovation in Consumer Perspective*. Paper presented at the International Seminar Academic Network on Competition Policy, Bali.
- Wintermeyer, L. (2017). The Future Of Islamic FinTech Is Bright. Retrieved from <https://www.forbes.com/sites/lawrencewintermeyer/2017/12/08/the-future-of-islamic-FinTech-is-bright/#2bf4e55c65fa>
- Wonglimpiyarat, J. (2017). FinTech banking industry: a systemic approach. *Foresight*, 19(6), 590-603. doi:10.1108/fs-07-2017-0026