FINTECH DISRUPTIONS: THE CHALLENGE TO FINANCIAL REGULATORS

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Introduction

With the proliferation of financial institutions catering to every financial need of customers in the second half of the 20th century, the informal oversight of banks which central banks had started earlier became a formal business of the governments in power in respective countries. This was more prominent in the United States after the establishment of the Federal Reserve System in 1913 and the collapse of the banking system after the Great Depression in 1933 (Armour et al., 2016). Banks were supervised and regulated by national governments as the 'delivery of a public good' in view of the important role they played in an economy. All these banks had been interconnected and interdependent and as a result, the collapse of a single bank which is an important player in the system would lead to a system-wide banking failure. A national government could not afford such a banking disorder without running the risk of the collapse of the entire economic system. Hence, central banks or specially created financial authorities were entrusted with the job of delivering this public good as the agent of the government.

However, in early 1970s, the banking stability which was only a national issue previously became a global concern after the regulatory lapses that were evident following the collapse of Bankhaus Herstatt in West Germany in 1974 (Davies & Green, 2012, P 34-35). In what is now known as 'the Herstatt Crisis'[1] (Mourlon-Druol, 2015), this medium sized German bank was closed down by German banking regulators on 26 June 1974 after they had found that the bank had been bankrupt due to continued wrong speculation against the US dollar. The fiasco started after several banks had delivered Deutsche Marks to Herstatt in Frankfurt pending settlement in US dollars in New York. The Bank was closed at 4.30 pm in German Time and could not honour its obligations to counter parties due to time difference between Germany and New York. This default sent ripples among banking regulators about the safety of commercial banks which had an international presence. The German regulators declined obligation on their part since the default had taken place outside their jurisdiction. Consequently, it led G-10 countries[2] to set up a standing committee on banking supervision under the auspices of the Bank for International Settlements (BIS). This was the birth of the now famous Basel Committee on Banking Supervision

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[1] A detailed evaluation of the Herstatt fiasco could be found in Mourlon-Druol, Emmanuelle, 2015, " 'Trust is Good, control is Better': The 1974 Herstatt Bank Crisis and its Implications for International Regulatory Reform", Business History, 2015, Available at: http://eprints.gla.ac.uk/95628/1/95628.pdf, (Accessed on 12.08.2019).

[2] It was in fact 11 countries consisting of Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the UK and USA; Luxembourg and Spain too participated in the Committee.

that has expanded the supervisory arm beyond the borders of the national governments.

Traditionally, banking regulators had depended on accounting records, good governance codes and market developments to assess and identify problem banks. Thus, the knowledge base that was used by banking regulators to do their job was limited to attaining skills that enabled them to make a priori judgments about emerging banking crises. However, with the advent of advanced information and communication technology, specifically those relating to the Fourth Industrial Revolution, there has been a number of new technologies that have been embraced by the banking industry. With them, the banking industry has been disrupted and that disruption has changed the game-plan being played by the banking regulators as well. It has now been found that the old techniques and the skills base which had helped regulators for decades to do their job are now inadequate to do the same. This article will examine the challenges which regulators are facing now as result of the introduction of such disruptive technology to banking firms.

Part I of the article will present an overview of the emerging disruptive technologies in the financial services industry. Part II will examine the challenges faced by regulators to regulate and supervise financial services firms in the wake of the changing technologies. Part III will be confined to the presentation of a summary and main conclusions derived from the study.

PART I

Disruptive Technologies in the Financial Services Industry

The banking industry emerged as the foremost beneficiary of the advancements in information and communication technology (ICT) in early 1960s. Faced with the twin problems of having a global outreach at relatively low costs and the thinning of the profit margins due to strict market competition, it embraced ICT to cut costs, but still to offer a widespread service to its clientele. The application of ICT in the industry took place at a phase since then and today, the financial services industry has been the leading user of the new technology in the world. It has expanded the horizons of the industry beyond what it could have done through conventional methods. But, it has also disrupted the industry by introducing a host of new technologies completely changing the way the financial services firms make their services available to customers.

In this article, it is proposed to examine how the industry has been disrupted by three of such new technologies. The first disruption occurred due to the application of 'Blockchain Technology' to financial firms. The second took place via the adoption of 'Artificial Intelligence' (AI) and machine learning to provide both routine and specialised services to customers. The third disruption took the form of the entry of non-financial firms to the industry to handle services like payments systems thereby ending the monopoly enjoyed by banks in providing these services.

a) The Blockchain Revolution

The Blockchain Technology was invented by an anonymous ICT developer who went by the name Satoshi Nakamoto when he presented the proposal for a peer-to-peer electronic cash system through a new cryptocurrency called Bitcoin (Nakamoto, 2009). The reason for the quick entry of the Bitcoin to the market was the widespread dissatisfaction which people at large in the globe had about the opacity, cost, and unreliability of the services offered by banks and the wide misuse of the money-printing powers by central banks. In the case of the former, the costs of transactions through banks were so high for small-amount transactors that they were virtually cut off from the existing banking system. In the case of the latter, the central banks, influenced by their political masters, had the habit of overproducing money thereby causing its value to fall over time. In this background, a virtually costless payment mechanism and a new currency that had its own in-built limitations for production were the requirements of the day. Nakamoto promised that his new cryptocurrency – Bitcoin – and its operating system – Blockchain – will satisfy both requirements.

The claim about the Bitcoin has been subject to dispute but the Blockchain technology that was proposed has gained wide acceptance due to its reliability and adaptability to any situation. The Blockchain is simply a distributed ledger in which a large number of people will participate in real time in a chain of transactions that could be viewed by all. As Tapscott and Tapscott (2018, P xxv-xiv) documented, the Blockchain technology has offered 8 big ideas to the globe since it was first introduced in 2009.

1. Blockchain has captured and taken prisoner the Internet and, therefore, the correct description is not 'surfing the Internet' but 'serfing the Internet'. The users can control the data about them that are being stored in the virtual space through Blockchain technology.

2. Blockchain will help the world to create a 'distributed economy' – a kind of an economy in which many can participate at no cost – via seven new domains it would facilitate to build: financial services, architecture of the firm, business model innovation, the Internet of Things, economic inclusion, government and democracy and the proliferation of creative industries.

3. The disintermediation in the financial services industry allowing customers to meet other customers direct at relatively low transaction costs improved the overall efficiency in the system. The easy enforcement of smart contracts eliminating the legal risks between two parties who are to complete a financial transaction which is in fact a distributed application is one such instance of financial disintermediation.

4. It will improve the corporate architecture by reducing the transaction costs involved in search, coordination, contracting and contract enforcement and

trust-building. It would lead the market to a more decentralised system from the present centralised system.

5.   The creation of a distributed economy in which prosperity will be shared by all through redistribution via wider taxpayer outreach, protection of property rights through immutable land titles and helping Diaspora to remit money back to their home countries via reliable, low-cost mobile phone money transfer systems.

6.   The creation of a Ledger of Things to facilitate the oncoming Internet of Things. Smart knowledge could be added to the Ledger of Things by smart things like sensors, cameras, microphones, global positioning chips and gyroscopes. They would be able to reconfigure themselves based on the available bandwidth, storage and capacity preventing interruptions in the working of the Internet of Things.

7.   Citizens can engage in public decision making through blockchain applications thereby improving democracy, governance and public consultation systems. Its best use will be the facility to identify fake news and help citizens to improve their knowledge based on accurate information.

8.   The distributed nature of the blockchain will help society to create a new class of leaders who are amenable to the best principles of governance, ethics and a moral code.

Of these eight big ideas, the one which is pertinent to the subject matter of this paper is the support it would give to the financial services industry via disintermediation, enforcement of contractual obligations and transparency in the transactions.

The global financial transactions completed through financial institutions have recorded a phenomenal growth in terms of number, value and revenue in the past decade. It is also projected to grow at the same high rate in the next five year period too. According to the World Payments Report 2018 compiled by Capgemini and BNP Paribas, the number of non-cash transactions per year has grown from 332 billion in 2012 to 483 billion in 2016. It is projected to rise to 871 billion in 2021[3]. In 2016, the total financial transactions amounted to USD 11,000 trillion, according to BIS data[4]. A study by McKinsey & Company in 2018 put the total revenue out of global transactions at USD 1.7 trillion in 2016 and it is projected to grow to USD 2.9 trillion by 2022[5]. This payment system is subject to disruption due to the growing demand for cost reduction, transparency, trust and inclusiveness.

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[3]World Payments Report, Available at: https://worldpaymentsreport.com/non-cash-payments-volume/,(Accessed on 12.08.2019).

[4]Global Financial Transactions 2006-16 by country, Available at: http://simonthorpesideas.blogspot.com/2017/10/global-financial-transactions-2006-16.html (Accessed on 12.08.2019).

[5]Global Payments 2018: A dynamic Industry Continues to Break New Ground, p. 2, Available at: https://www.mckinsey.com/~/media/McKinsey/Industries/Financial%20Services/Our%20Insights/Global%20payments%20Expansive%20growth%20targeted%20opportunities/Global-payments-map-2018.ashx, (Accessed on 12.08.2019).

According to Tapscott and Tapscott (2018, P 58), the blockchain technology is expected to bring about a revolutionary change to the financial services industry by disrupting its existing payments system. These changes are expected to shatter the payments system monopoly being enjoyed by traditional financial institutions. The blockchain's appeal to transactors and companies in this regard arises from six distinguishing promises which it can deliver to the new industry. First, it will enable two transactors who do not know each other to conduct a transaction by attesting its safe completion. Second, the peer-to-peer transactions underlying the blockchain technology could eliminate the intermediation costs which the transactors have to incur under the present system. Third, transactions can be effected at a speed which is unknown in the present global payments infrastructure thereby facilitating swift fund transfer from one end to the other in the world. Fourth, since transactions take place instantaneously, the counter party risks arising from Herstatt type cross-border transactions can be totally eliminated. Fifth, it has given rise to a number of financial innovations by permitting like-minded inventors to develop new applications based on its algorithm for use in a wide range of activities. Sixth, the blockchain technology has no proprietary rights and therefore could be used by anyone interested in using it. Thus, financial institutions have found that the blockchain technology is a way for them to penetrate new markets, cut-back office costs and boost profits especially in an era of low interest rates (Eha, 2017, P 433).

b)   Adoption of Artificial Intelligence and Machine Learning in Banks

Smart machines have always awed mankind but at the same time caused worries in them. Machines, they have felt, could one day take control of humans and displace them in many fields in which they are leaders today. Futurists like Sir Arthur C Clarke (1968) fictionalised this possibility in science fictions like 2001: A Space Odyssey. Now that fictionalised dream has become a reality and mankind faces not only the threat of their being replicated by smart machines but also by the possibility of those machines doing better than them. In this background, all major industries are competing with each other in developing and employing smart machines to deliver a better service to their customers. Banking industry is one leader in this game.

According to a market survey done by Emerj in 2019, seven leading banks are resorting to AI in a major way today[6]. They include JPMorgan Chase, Wells Fargo, Bank of America, Citibank, US Bank, PNC and Bank of NY Mellon Corp. According to the survey, all these banks have invested heavily in technology that would enable them to convert their banks to firms that are controlled more by robots than by humans in the years to come. The process has been started and would be completed within the next five years.

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[6]AI in Banking – An Analysis of America's 7 Top Banks, Available at: https://emerj.com/ai-sector-overviews/ai-in-banking-analysis/, (Accessed on 12.08.2019).

In another market survey covering the entire globe, Emerj in 2019 has documented the major areas which have been automated by financial industry firms through AI and machine learning[7]. At present, they cover the following areas in financial services.

1. **Trading, Wealth Management and Investment Banking:** A new software called natural language processing or NLP is being used by financial firms in order to gather information on market activities throughout the globe in a real time basis and use such information to make decisions on investment banking activities. If it is done by a human, he has to visit a library or an archive and peruse millions of documents to gather the needed information. But a computer with this advanced software could do it within a few minutes. It has not only helped trading managers to make more informed decisions, but also cut costs and time delays in decision-making. NLP is capable of doing a 'sentiment analysis' allowing traders to decide which stocks they should buy or sell for their clients. Right now, these decisions are made by humans supported by NLP software, but in future, there is the possibility that they could be done by a smart machine. An extension of NLP is the software 'robo-advisor' or RA which will advise customers what stocks they should buy or sell based on their own risk profiles and return objectives communicated to RA.

2. **Digitising Paper Documents:** Since a large volume of historical data relating to a bank is stored in hard copy form, it takes ages and costs fortunes for banks to retrieve and process a given historical record. There is now 'machine vision software' available for bank employees to digitise documents and upload to the digital library for retrieval later. It uses an algorithm to read the document, understand what it says and then, communicate back to the user the result of the search. This also helps banks to cut costs and delays in decision making.

3. **Searching Through large databases of documents:** When more and more data are stored in a data library, searching and processing a given document or a set of related documents becomes a gigantic task. NLP and other related software can now do this job easily for a bank. For instance, JPMorgan Chase is reported to have processed thousands of legal cases relating to mortgages within a short period of time through such software. Humans would have taken years to accomplish this task.

4. **Underwriting:** This is another area where banks are using machine vision software to mine an applicant's public web activity, especially his involvement in social media, to prepare an accurate profile of him before agreeing to underwrite a proposal submitted by him. It enables a bank to make a better choice and decide on the commission to be charged on the risk assessment made in terms of these findings.

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[7]Artificial Intelligence in Finance – a Comprehensive Overview, Available at:https://emerj.com/ai-sector-overviews/artificial-intelligence-in-finance-a-comprehensive-overview/ (Accessed on 12.08.2019).

5. **Credit Scoring:** It is difficult for a bank to assess the trustworthiness of a customer from the information supplied by him since he has all the incentives to present only what is favourable to his application for a facility. But now, new NLP and machine vision software that uses algorithmic techniques can assess the trustworthiness of customers more accurately by mining volumes of information available about him in the cyber space and his own involvements in social media platforms. This is specifically useful when there is no credit history attached to a loan application or if there is one, there is doubt about its veracity.

6. **Managing credit risk across portfolios:** Banks have different credit portfolios and identifying credit risks across them through human eye is a near impossibility. Now there are machine learning software packages that will help banks to identify risks involved in them. Machines can use macroeconomic data and policy changes in the field to assess the risks involved in a given portfolio.

7. **Fraud detection and anti-money laundering moves:** Machine learning and AI can be used to detect frauds in a bank better than the human eye which may not be able to do so swiftly. Machines which can observe unusual patterns in transactions could alert the banks about the possibility of frauds and money laundering. For this purpose, the software industry has developed anomaly detection software that is being used by banks today.

Though AI and machine learning have been disruptive technologies, they also have helped banks to get connected to customers and regulators more effectively. As a result, AI will be the norm in the future banking industry rather than the exception.

c) Invasion of the payments services by non-financial business firms

For decades, banks had enjoyed the monopoly power over payments. Clients demanded safety, swiftness and accuracy in payments and banks were able to deliver them through the adoption of advanced technology. However, the high commissions charged by them when effecting payments caused customers to look for alternative methods of payments that would also meet the high standards which banks have been maintaining. When technology became universal and inclusive, other non-financial sector participants too could deliver payments services, especially the small ones. Today, the financial sector firms are facing a formidable challenge from these new comers to the payments services industry. In addition to specialised payments agencies like PayPal, mobile phone companies and supermarket chains too have entered the payments services industry today. The services provided by these firms became all the more important after e-commerce became a globally accepted cost effective method of buying and selling goods worldwide.

The Committee on Payments and Market Infrastructures at BIS has defined non-banks as those business firms that are "involved in the provision of retail payment services whose main business is not related to taking deposits from the public and using these deposits to make loans"[8]. There are five stages which a payment transaction gets itself involved as follows[9]:

1. Pre-transaction stage in which initial arrangements required for providing payment service is made. It includes client acquisition, infrastructure setup, preparation of enforceable legal agreements, and attending to other service arrangements. While this is not linked to any specific transaction, it is the general setup that is necessary for any agency to effect a payment.
2. Authorisation stage where a payment is created and validated before it is transmitted. An important work involved in this stage is the verification of the availability of funds to make the payment.
3. Clearing stage involving the exchange of relevant information relating to the accounts of the payer and the payee and ascertaining the amounts to be settled.
4. Settlement stage in which the final claims are settled as per instructions.
5. Post-transaction stage where value added services like submission of relevant records, tax deduction certificates etc, to the parties involved.

Non-bank payment service providers are gaining acceptance throughout the globe today due to the low-costs involved and reliable services they provide. Their entry into the market has disrupted the banking industry. With the increase in the popularity of these payment service providers, especially with respect to micro and small payments, banks now have to reorient their businesses to face the new challenge coming from them.

PART II

Regulatory Challenges

The development of financial technology or FinTech in the financial services sector is a process like globalisation that cannot be stopped or reversed by regulators. Hence, the most appropriate approach to the issue by them is to allow it to happen under their supervisory oversight. Recognising this need, the Central Bank of Sri Lanka (CBSL) has initiated a FinTech Sand Box in which banking firms are encouraged to introduce financial technology innovations free from CBSL's stringent supervisory and regulatory measures[10]. This is a proactive measure taken by CBSL to promote financial technology among financial institutions in the country.

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[8] Non-Banks in Retail Payments, BIS, P 4, Available at:https://www.bis.org/cpmi/publ/d118.pdf(Accessed on 12.08.2019).

[9] Ibid. P 5.

[10] Sri Lankan Fintech Regulatory Sandbox, Available at: https://www.cbsl.gov.lk/sites/default/files/cbslweb_documents/press/notices/notice_20180502_sri_lankan_fintech_regulatory_sandbox_e.pdf, (Accessed on 12.08.2019). A detailed analysis of the Sandbox move by CBSL could be found in Wijewardena, W A (2018) "Introduction of fintech regulatory sandbox by Central Bank is a move in correct direction" in Daily FT, Available at: http://www.ft.lk/columns/Introduction-of-fintech-regulatory-sandbox-by-Central-Bank-is-a-move-in-correct-direction/4-654996, (Accessed on 12.08.2019).

In the same way FinTech has disrupted the financial services industry, it has disrupted the banking regulators as well. The challenge faced by regulators in this connection is two-fold. On one side, they need to take measures for consumer protection. On the other, they are required to assure system protection too. Consumer protection arises mainly from the information asymmetry. The system protection arises from both the external shocks and internal failures. External shocks that take place outside the financial institutions are driven by hackers, cyber space criminals and anti-technology groups. Internal failures occur due to frauds by officers, losses that are not accounted for in accounts and disparities between actual assets held by banks and what is listed in accounts.

In a technology-driven world, information asymmetry takes place due to the superior knowledge held by a service provider compared to an uninformed customer. New technology based financial products are complex and difficult to comprehend. Hence, customers are at the mercy of the financial institutions. In this regard, financial institutions are required to keep the customers fully informed of the nature, risks and failures of financial services they provide to customers. This is in line with the new legal principle, Caveat Venditor, which pronounces that the seller should beware of the legal risk he faces if his customer is not properly informed. For many centuries, it was Caveat Emptor or let the buyer beware that ruled the commercial world. But with the introduction of sophisticated market products of which the full implications are not understood by buyers, Caveat Emptor has become irrelevant and meaningless. Getting the financial institutions to fully explain all the implications of a new product in a language which the customers could understand is a formidable challenge which regulators face today. It is therefore suggested that regulators should endeavour to develop 'Financial Citizens' who understand fully the implications of services they are to get from banks (Kingsford-Smith & Dixon, 2015). Financial citizen is a term coined to broad-base what regulators aspire to attain as 'financial inclusiveness' in a society. Thus, according to Kingsford-Smith & Dixon (2015, P 698), a financial citizen should endeavour to get engaged in the financial industry.

However, in the modern high tech banking era, being only a financial citizen is not sufficient. To engage in the banking industry in a meaningful manner, one should be competent in digital skills or be a digital citizen as well. The disruptive technologies employed in banks have automated banking services by using smart machines, replaced bank branches with virtual offices and introduced internet banking to obviate the need for having face to face personal contact banking. All these miracles can be performed by customers as equal partners in progress if and only if they can have the same competence in digital technologies as bankers. However, in Sri Lanka's case, the digital penetration of citizens as revealed in half-yearly surveys on computer and digital literacy has been low at 27.5 percent of the population between 5 and 69 years (Department of Census and Statistics, 2018). This low digital literacy will stand as a serious bottleneck for banks in Sri Lanka to go for high tech banking technologies. Because of this asymmetry in knowledge and skill levels, banking regulators will find it difficult to offer consumer protection to banking customers.

The entry of big tech companies to financial services industry has thrown a serious challenge to bank regulators. As Agustín Carstens, General Manager of the BIS has outlined in 2018, big tech companies that are involved in providing financial services pose two challenges to public policy makers[11].

One challenge relates to the use of what is known as the float of funds for private purposes by a payment service providing big tech company. The float arises due to the time delay between the handing of money by a customer for transferring to a recipient and the time at which such moneys are actually transferred. During that particular period, the money transferring company can use the float for its own purposes. But, if it becomes bankrupt before making the transfer, the country's payments system gets affected. Having taken this issue into account, the People's Bank of China (PBC) has enforced two regulatory requirements on money transferring companies. One is the imposition of a 100 percent reserve requirement on the float of the company as from January 2019. The other one is the requirement from June 2018 that all these companies should make payments through an authorised clearing house. These two requirements not only ensure solvency of the companies concerned but also make payments transparent and monitorable by PBC.

The other challenge arises from the possibility of these companies ending as monopolies in making payments. Monopolies are noted for extracting the welfare of the customers by charging prices which are not competitively determined. Carstens has made the following comment on this aspect of monopoly building.

"It is too early to judge the overall welfare impact of big tech on competition. If the entry of big tech companies is driven primarily by efficiency gains over incumbent banks and insurers, or by access to better information and screening technology, then big tech makes the financial sector more efficient and aids financial inclusion. This may entice incumbent financial institutions to adopt similar technologies, and the financial system could become more diverse and efficient. But if big tech entry is driven primarily by market power, relying on exploiting regulatory loopholes and the bandwagon effects of network externalities, this could encourage banks into new forms of risk-taking. The public policy solution would be to close the regulatory loopholes,.[12]"

The global audit firm KPMG in a report titled '10 Key Regulatory Challenges of 2019' has identified, among others, two other challenges arising from disruptive technologies (KPMG, 2018). One relates to the issue of ensuring data privacy. The other is how to tackle the breaches of cybersecurity.

Banks today consume a large volume of personal data relating to customers. But they also give rise to the need for protecting data privacy. Since there have been instances of the breaches of data privacy, bank customers worldwide are now demanding that a proper control

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[11]Big Tech in Finance and New Challenges for Public Policy, BIS, Available at: https://www.bis.org/speeches/ sp181205.htm, (Accessed on 12.08.2019).
[12]Ibid, p 9.

measure should be introduced to prevent occurrence of such data breaches. In view of the seriousness of the issue involved, KPMG report suggests the following key actions.

1. Inventorise the personal data that are collected, processed, stored and shared; Identify the data that are critical to the organisation;
2. Implement data mapping capabilities that can tie all data processing activities to data records of individual consumers;
3. Perform root-cause analyses of prior known inappropriate data sharing or data breaches;

- Develop, implement and maintain written policies and procedures for data protection and security to include-
  - Identity and access controls;
  - Data lineage governance;
  - Third party data stewardship;
  - Monitoring and testing and escalation and reporting protocols;
  - Communication and notice;
  - Customer protections/rights

- Link data privacy programmes with programmes focused on cybersecurity, information life cycle, legal hold and discovery and incident management;

- Implement culture-change protocols to reinforce employee responsibilities with regard to third party data sharing (KPMG, 2018 P 9).

The main drivers of cybersecurity, according to KPMG report, are the following:

- Evolving and necessarily sophisticated technologies that introduce new threat vectors;
- Regulatory and consumer expectation for data protection, breach notification, and re-mediation;
- Regulatory focus on operational resiliency;
- Interconnected systems with multiple entry points;
- Varying objectives for cyber attacks, including theft, destruction and disruption (KPMG, 2018 P 14).

The following key actions have been proposed to ensure cybersecurity in banks:

1. Conduct cyber threat simulations to test controls and incidence response;
2. Evaluate cyber risk landscape and establish risk appetite alignment to drive effective mitigation prioritisation;

- Develop and implement a forward looking comprehensive cyber security strategy addressing:
  - Identification of the relevant laws, regulations, certifications and standards;
  - Organisation and governance;
  - Policies, procedures and controls;
  - Internal and external risk assessment and management;
  - Integration with existing solutions and processes;
  - Ongoing monitoring and testing, alert thresholds and triggers;

- Design and lay down multiple protective solutions to detect, prevent and deter fraud (KPMG, 2018 P 15).

It is obvious that disruptive technologies in banking and financial sector firms have thrown new challenges to bank regulators. It is necessary that regulators should be equipped with knowledge, power, skills and capacity to handle those challenges.

PART III

Conclusions

Disruptive technologies have disrupted the banking and financial services industry. However, they have disrupted both the customers and regulators as well. These new technologies have taken the form of blockchain technology, artificial intelligence and big tech companies entering the payment services market. The banks have adopted the first two technologies to cut costs, ensure wider global outreach and provide efficient services to customers. The third disruption has been the response of the market to high commission charges imposed by banks on money transfers. This technological transformation has occurred in the financial services industry as a process that cannot be reversed. Hence, what the regulators can do is to adjust the regulatory arm to suit the emerging new technology-driven banking world. In that sense, regulators should tackle the issues involved in payment services provided by non-bank tech firms. Since any failure of these firms will lead to instability in the financial system, the regulators cannot ignore them. As a preventive measure, the Chinese central bank, the People's Bank of China, has introduced 100 percent reserve requirement on the float of funds that accumulate with payment service providing companies. Further, People's Bank of China has required them to channel their payments through authorised clearing houses. In addition to these measures, bank regulators should ensure data privacy and prevent cybersecurity breaches.

References

- Armour, J., Awrey, D., Davies, P. L., Enriques, L., Gordon, J. N., Mayer, C. P., & Payne, J. (2016). Principles of financial regulation: Oxford University Press.
- Bank for International Settlements (2014). Non-Banks in Retail Payments, Committee on Payments and Market Infrastructures, Available at: https://www.bis.org/cpmi/publ/d118.pdf, (Accessed on 12.08.2019).
- Clarke, A. C. (1968). 2001: a space odyssey. Hutchinson, UK
- Davies, H., & Green, D. (2012). Global Financial Regulation: The Essential Guide, Polity Press, UK.
- Department of Census and Statistics. (2018). Computer Literacy Statistics - 2018 (First Six Months), Sri Lanka, Available at: http://www.statistics.gov.lk/education/ComputerLiteracy/ComputerLiteracy-2018Q1-Q2-final.pdf, (Accessed on 12.08.2019).
- Eha, B. P. (2017). How Money Got Free: Bitcoin and the Fight for the Future of Finance. Oneworld, London.
- Kingsford-Smith, D., & Dixon, O. (2017). The Consumer Interest and the Financial Markets. in Moloney, Niamh et al (eds) The Oxford Handbook of Financial Regulation, Oxford University Press, UK. pp 695-735.
- KPMG (2018),Ten Key Regulatory Challenges of 2019, Resiliency amidst Innovation. https://assets.kpmg/content/dam/kpmg/us/pdf/2018/12/ten-key-regulatory-challenges-pov-v5-web.pdf, (Accessed on 12.08.2019).
- Mourlon-Druol, E. (2015). 'Trust is good, control is better': The 1974 Herstatt bank crisis and its implications for international regulatory reform. Business History, 57(2), 311-334.
- Nakamoto, S. (2009). Bitcoin: A peer-to-peer electronic cash system.Available at: https://bitcoin.org/bitcoin.pdf (Accessed on 12.08.2019).
- Tapscott, D., & Tapscott, A. (2018). Blockchain revolution, Penguin.
- Wijewardena, W. A. (2018). Introduction of fintech regulatory sandbox by Central Bank is a move in correct direction, Daily FT,14 May 2018. Available at: http://www.ft.lk/columns/Introduction-of-fintech-regulatory-sandbox-by-Central-Bank-is-a-move-in-correct-direction/4-654996, (Accessed on 12.08.2019).