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Regulatory Compliance & Supervision in AI Regime: Banks and FinTech

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<p>Post the financial crisis of 2008, European Union has introduced a plethora of laws to reform the financial system and make it further resilient. While the crisis led to financial reforms that have created heavy load of compliance, it also created a field for innovation led financial services called Fintech. In the post-Covid-19 era, the need for financial institutions and supervisors to speedily and efficiently deal with compliance has become more pronounced, as they brace for the impact of pandemic and focus on other critical tasks.</p> <p>The combination of regulatory compliance load on one side and innovation on other side have made the role of AI critical to regulatory compliance and supervision. On this premise, the thesis discusses existing role of AI and the challenges in successful deployment of AI where it can be scaled to exploit all its abilities.</p> <p>The challenges in deployment of AI are two fold – one that relate to its role in compliance with financial governance framework including AML, PSD2, MiFID II and GDPR etc. requirements, and other that deals with the role of AI within compliance procedures such as reporting, following up with regulatory requirements and policies etc. The discussion aims to identify the gaps in technology such as black box problem and inductive bias in AI, as well as regulatory framework that hamper the deployment and exploitation of AI in compliance and supervision of financial institutions. At the same time, innovations such as RegTech and SupTech enable AI to provide fast solutions to banks, Fintech and supervisory authorities. The technological and regulatory challenges of AI are identified by doing empirical research and applying legal dogmatics, as well as considering socio-economic factors affecting the financial industry. The discussion also notes the vision of a Digital Europe and how the recently announced policy discussions such as the AI strategy, Data Strategy, Cloud Initiative, Digital Finance Strategy etc make a profound impact on the gaps identified, but also leave exposure to other possibilities such as lengthy process of adoption, implementation and testing of these policies.</p> <p>The discussion concludes that successful adoption of the proposed laws, provisions for financial industry in the AI strategy and new and innovative methods such as data ethnography can together solve the technological and regulatory challenges identified as hinderance to scaling up AI role in regulatory compliance.</p>			
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Table of Contents

List of Acronyms.....	3
Regulatory Compliance & Supervision in AI Regime: Banks & Fintech.....	6
Chapter 1. Introduction.....	6
A. Topic, research problems, and delimitations.....	6
Research problems.....	8
B. Structure.....	10
a) Methodology.....	11
b) Laws.....	12
C. Empirical Research.....	14
Chapter 2. Recent Advancements in Financial Services and Regulations.....	16
A. Introduction to Fintech.....	16
B. Fintech Regulation.....	18
C. <i>How are Fintech and specifically Banks affected by Technological and Regulatory Advances?</i> 22	
Chapter 3 - AI in Financial Industry, Supervision and Compliance.....	24
A. Introduction to AI in Financial Industry.....	24
B. What are the applications of AI in Financial Industry (more examples) for Regulatory Compliance?.....	25
C. How can Regulatory Compliance and Supervision benefit from AI driven Technology?.....	28
Chapter 4 - The challenges of AI in Financial Industry.....	39
A. Challenges of AI in process of Regulatory Compliance.....	39
B. Can Financial Institutions and Regulators Share Data for Training AI?.....	46
Chapter 5: Regulatory Landscape: Challenges and Solutions for AI Deployment.....	49
A. Regulation of AI.....	49
B. Regulatory Challenges and Solutions.....	51
C. EU Policies to strengthen Digital Finance.....	55
D. Regulatory Solutions.....	59
Chapter 6. Conclusion.....	62
Bibliography.....	65
EU Laws	65
Other EU and Official Sources	65
National Law Sources	67
Act on the Financial Supervisory Authority. No. 878, of The Parliament of Finland, Adopted on 19 December 2018.....	67

Other National Sources	67
FIN-FSA ‘European Single Electronic Format for Listed Companies Starting with Financial Statements For 2020.’ (2020) [online] Available at: < https://www.finanssivalvonta.fi/en/capital-markets/issuers-and-investors/esef-xbrl/ > Accessed on 8 March 2020.	67
Cases	68
Joined Cases C-293/12 and 594/12 Digital Rights Ireland and Seitlinger and Others.	68
<i>Joined Cases C-203/15 and C-698/15 - Tele2 Sverige v Post- och telestyrelsen and Secretary of State for the Home Department v Tom Watson and Others.</i>	68
Books	68
Articles	68
Appendix A: Interview of Hanna Heiskanen.....	74
Appendix B - Interview of Jesper Nordström Data & AI Strategist	75

List of Acronyms¹

“**Anti-money laundering and countering the financing of terrorism (AML/CFT)** measures are defined by the Financial Action Task Force (FATF), the international standard setter in this area.” intergovernmental organization formed by 39 member countries to combat money laundering and terrorism financing “The Basel Committee on Banking Supervision regularly issues guidance to facilitate banks’ compliance with their obligations in this area.”

“**An application programming interface (API)** is a set of rules and specifications followed by software programmes to communicate with each other, and an interface between different software programmes² that facilitates their interaction.”

“**Artificial intelligence (AI)** is defined as IT systems that perform functions requiring human capabilities. AI can ask questions, discover and test hypotheses, and make decisions

¹ All definitions sourced from Financial Stability Board (FSB) <https://www.bis.org/bcbs/publ/d431.pdf>. “The FSB promotes international financial stability; it does so by coordinating national financial authorities and international standard-setting bodies as they work toward developing strong regulatory, supervisory and other financial sector policies. It fosters a level playing field by encouraging coherent implementation of these policies across sectors and jurisdictions.” Basel Committee on Banking Supervision, 2018. Implications Of Fintech Developments For Banks And Bank Supervisors. [online] Bank for International Settlements. Available at: <<https://www.bis.org/bcbs/publ/d431.pdf>> [Accessed 14 March 2020].

² An API would normally be created independent of any hardware, to communicate between two software applications. It may be installed on an IoT as a layer but even in that case it would be two software communicating.

automatically based on advanced analytics operating on extensive data sets. Machine learning (see below) is one subcategory of AI.”

“**Big data** designates the large volume of data that can be generated, analysed and increasingly used by digital tools and information systems. This capability is driven by the increased availability of structured data, the ability to process unstructured data, increased data storage capabilities and advances in computing power.”

Bigtech refers to large, global technology companies with a relative advantage in digital technology. Few examples may include Google, Amazon, Facebook and Apple.”

“**Crowdfunding** is the practice of funding a project or venture by raising monetary contributions from a large number of people. It is often performed today via internet-mediated registries that facilitate money collection for the borrower (lending) or issuer (equity).”

“**Cyber-crime** is when a computer system or component is the object of the crime (hacking, phishing, spamming) or is the facilitator of a crime (such as theft of information or money).”

“**Cyber-risk**, according to the definition given by the CPMI-IOSCO 2016 Guidance, 35 is the combination of the probability of an event occurring within the realm of an organisation’s information assets, computer and communication resources and the consequences of that event for the given organisation.”

“**Fintech** (FSB definition): technologically enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services.”

“**Innovation accelerator** is a partnership arrangement between fintech providers and central banks/supervisory agencies to develop use cases that may involve funding support and/or authorities’ endorsement/approval for future use in central banking operations or in the conduct of supervisory tasks.”

“**Innovation hub** is an innovation facilitator set up by supervisory agencies that provides support, advice or guidance to regulated or unregulated firms in navigating the regulatory framework or identifying supervisory policy or legal issues and concerns.”

“**Machine learning (ML)** is a sub-set of AI, which designs problem-solving rules that improve automatically through experience. Machine-learning algorithms give computers the ability to learn without specifying all the knowledge a computer would need to perform the desired task, as well as study and build algorithms that can learn from and make predictions based on data and experience.”

“**Online lending platforms** intermediate loans online, and may be operated by banks or non-banks. Some online lenders keep all or some of the loans they originate, while others sell or

securitise them. Funding may come from “peer-to-peer” arrangements that directly match lenders with borrowers via online platforms. Together with non-loan forms of finance such as invoice trading, these models make up the “fintech credit” category.”

“**Mobile wallets** replicate a physical wallet in a digital interface on a mobile phone. Customers can add credit and debit cards, as well as prepaid cards, gift cards and rewards cards to be stored and carried. This use case not only replaces physical plastic cards, but also allows those cards to be enhanced by additional services.”

“**Regtech (regulatory technology)** is defined as any range of fintech applications for regulatory reporting and compliance purposes by regulated financial institutions. This can also refer to firms that offer such applications.”

“**A regulatory sandbox** is a controlled testing environment, sometimes featuring regulatory forbearance and alleviation through the use of legally provided discretions by the supervisory agency. The testing environment may involve limits or parameters within which the firms must operate (eg restrictions on the time a firm may operate in the sandbox).”

“**Suptech (supervisory technology)** is the use of technologically enabled innovation by supervisory authorities.”

Regulatory Compliance & Supervision in AI Regime: Banks & Fintech

"It is springtime for AI, and we are anticipating a long summer"³

Chapter 1. Introduction

A. Topic, research problems, and delimitations

The 2008 financial crisis did not just reveal the weak foundations of real estate loans in the USA, but it also exposed the cracks in EU's financial institutions⁴. In the next two years after the crisis, the European Commission provided EUR 4.5 trillion of state aid measures to help financial institutions across EU⁵. The crisis revealed the urgent need for reform of the financial services sector, and the aftermath can be defined as change and continuous regulatory change. To bolster the financial industry, the EU has brought a staggering number of regulatory reforms over the past decade and so. As an idea of scale, as many as 50 regulatory reforms⁶ have been introduced since the financial crisis in 2008, providing a mechanism to ensure increased transparency, compliance and collaboration in the whole cycle of financial products starting from design to sale. These reforms are also due in part to the challenges brought by globalization and information technology enabling businesses,⁷ resulting in a significant rise in the complex and evolving regulatory requirements to which businesses must adapt. In this harsh regulatory environment, financial institutions are finding compliance to demand a big chunk of their budgets, with an estimated \$1 US trillion spent worldwide on regulatory compliance, including operational costs and penalties from breaches.⁸

³ Sam Ransbotham and others, 'Artificial Intelligence In Business Gets Real' (MIT Sloan Management Review, 2018).

⁴ 'Ten Years After The Financial Crisis: Have Regulatory Reforms Made The Financial Sector More Resilient To Crisis? - Federal Ministry Of Finance' (Bundesministerium der Finanzen, 2019).

⁵ Adi Dwi, 'New Crisis Management Measures To Avoid Future Bank Bail-Outs' (European Commission - European Commission, 2020)

⁶ 'Progress Of Financial Reforms' Banking and Finance. (European Commission)
<https://ec.europa.eu/info/business-economy-euro/banking-and-finance/financial-reforms-and-their-progress/progress-financial-reforms_en> accessed 3 February 2020.

⁷ Samson Esayas & Tobias Mahler. Modelling compliance risk: a structured approach. *Artificial Intelligence and Law* 23, 271–300 (2015).

⁸ Nachshon Goltz and Michael Mayo, 'Enhancing Regulatory Compliance By Using Artificial Intelligence Text Mining To Identify Penalty Clauses In Legislation' [2017] MIREL Project EU.
<<https://www.mirelproject.eu/MIRELws@ICAIL/MIRELwsPubs/Goltz-et-al-MIRELwsAtICAIL.pdf>> accessed 12 March 2020.

Within past three months of submitting this thesis, the European Commission ('EC') has published a White Paper on Artificial Intelligence - A European approach to excellence and trust⁹, A European Strategy for Data¹⁰ an action plan for a comprehensive Union policy on preventing money laundering and terrorist financing¹¹ and launched two public consultations, first on new Digital Finance Strategy¹² and second on retail payments strategy for the EU¹³, thus outlining its legislative and policy goals for Financial Industry for 2020-2021. These policies and resultant laws will have significant impact on the way regulatory compliance and supervision is approached and how AI is developed and deployed to make these processes more efficient. This shows the urgency at which the EC is moving ahead with digital reforms despite the pandemic being the priority at policy level.

To add to this regulatory complexity are the new branches of the financial industry such as technology-enabled innovation in the financial industry ('FinTech')¹⁴ which have risen rapidly from start-ups to multi-million businesses, reflecting the need of the market and highlighting the gap in traditional institutions and the customer expectations.

In this thesis, regulatory compliance means the rules and laws that a financial institution is required to follow to keep its activities legal, and legal compliance risk is a risk resulting from a breach of the requirements of the law. Such laws also have provisions to penalize institutions that are non-compliant by providing for huge fines, sometimes as much as a significant percentage of the institution's annual revenue. As an example, the fines for violation of Anti-Money Laundering laws globally crossed \$ 8 billion mark in 2019.¹⁵

As regulatory compliance in rapidly changing financial industry becomes increasingly complex and onerous, attempts to apply IT solutions and especially artificial intelligence ('AI'), are on

⁹ European Commission, 'Artificial Intelligence - A European Approach to Excellence And Trust' (European Commission 2020)

¹⁰ European Commission, 'A European Strategy For Data' (European Commission 2020).

¹¹ European Commission, 'An Action Plan For A Comprehensive Union Policy On Preventing Money Laundering And Terrorist Financing' (European Commission 2020).

¹² European Commission, 'Consultation On A New Digital Finance Strategy For Europe / Fintech Action Plan' (European Commission).

¹³ European Commission, 'Consultation On A Retail Payments Strategy For The EU' (European Commission 2020).

¹⁴ Expert Group on Regulatory Obstacles to Financial Innovation (ROFIEG), '30 RECOMMENDATIONS ON REGULATION, INNOVATION AND FINANCE' (European Commission 2019).

¹⁵ Brian Monroe, 'Fincrime Briefing: AML Fines In 2019 Breach \$8 Billion, Treasury Official Pleads Guilty To Leaking, 2020 Crypto Compliance Outlook, And More - CFCS | Association Of Certified Financial Crime Specialists.

the rise. During the cost of Compliance Survey 2019 by Thomson Reuters, the Head of Compliance, Asia Financial Services Firm, Survey, was asked ¹⁶ “What is the biggest change you predict for compliance in the next ten years? He replied, "Changing skillsets and profile of compliance officers (fintech/Big data, cybersecurity, data protection, and other emerging risks to cope with) while being replaced by robotic-advisory and AI for compliance monitoring." The changes in the regulatory environment are being dealt with by implementing many technological forces, together referred to as DARQ (distributed ledger technology (DLT), artificial intelligence ('AI'), extended reality (XR) and quantum computing.)¹⁷ For the purpose of this thesis, we will only focus on the use of AI in the regulatory compliance and supervision of the financial industry. The thesis will mainly focus on the regulatory environment in the European Union but will also give examples from member states and, specifically from Finland wherever possible.

The thesis design is twofold. In the two chapters after this introductory chapter, the thesis will focus on scope of AI to improve the compliance process under laws such as AML/CFT, PSD2 and GDPR. Examples of its use for faster and more efficient credit scoring and financial activity monitoring to detect AML/CFT violations will be discussed and regulatory fragmentation discussed. The use of AI has already begun in many functions of compliance and non-compliance needs of financial institutions, which will be discussed in the later parts of this thesis. This thesis will also analyse the solutions to challenges faced by the financial industry's incumbent institutions such as banks and fintech, in relation to the regulation and the supervision of their activities.

Research problems: This thesis concentrates on the following research problems:

- a) What is the current role and future scope of AI use in regulatory compliance by and supervision of financial service providers such as Banks and Fintech, especially in relation to compliance with laws such as Anti-Money Laundering, GDPR and PSD2?
- b) What are the challenges faced in the regulatory compliance and supervision of financial industry while using AI as the solution to their problems?

¹⁶ Stacey English and Susannah Hammond, 'Cost Of Compliance 2019: 10 Years Of Regulatory Change' (Thomson Reuters Regulatory Intelligence 2019) <<https://blogs.thomsonreuters.com/answeron/cost-of-compliance-survey-2019/>> accessed 10 March 2020.

¹⁷ Paul Daugherty and Marc Carrel-Billiard, 'The Post-Digital Era Is Upon Us ARE YOU READY FOR WHAT'S NEXT?' (Accenture 2019) <https://www.accenture.com/_acnmedia/pdf-94/accenture-techvision-2019-tech-trends-report.pdf> accessed 3 February 2020.

c) How is the regulatory landscape changing in EU to enable AI deployment and what changes are needed?

The thesis will then try to conclude that with the onset of recent regulatory overhaul in EU in favor digitalization and data availability, regulatory solutions will make a flourishing landscape for seamless possibilities where compliance-by-design can be integrated in operational processes. In this process the thesis will also critique the existing and upcoming frameworks and what changes may be needed to catch-up with other leading players in terms of AI development to leverage its capabilities in Regulatory compliance and Supervision.

Discussing the first question lays the foundation of this thesis. The technological and regulatory advances in financial services in the past decade or so will be discussed in order to map the current status of financial industry along with the scope of AI in future of financial services. The discussion will further try to incorporate the ongoing Pandemic and its effect on the discussion in this thesis. Once the foundation is laid against the backdrop of past developments, it will help establish and highlight the role of technologies such as FinTech and AI in financial industry. From there, the discussion will move to research on three important questions this thesis aims to answer through analysis of existing research and reports. The first being the challenges faced by financial service providers in terms of large number of regulatory compliance and how AI has started to meet those challenges e.g. faster and easier AML/CFT screening, fraud detection, credit scoring etc. It will be important to interpret the intention of the legislature in how it aims to deal with these new scenarios by discussing the recent strategic and policy proposals and public discussion initiated the European Commission ('the Commission').

From this, the discussion will move to the second question, i.e. what challenges and risks are associated with use of AI and how the regulatory environment is trying to adapt to the AI regime in financial regulatory compliance and supervision. From this, the discussion will move to the third question being, what is the suitability of the EU laws and regulatory preparedness to meet and resolve challenges that may slow the scaling-up of technology led compliance. The laws play a huge role in smooth adoption of technologies in the financial industry and maintaining market competitiveness, especially in EU where they can be adapted and interpreted differently in different jurisdictions.

The thesis will conclude that current and future innovations will help bring in the AI era to the entire financial industry and not just early adopters of AI. The use of technology in general and AI is an important and significant topic of current times because it can be used to make regulation and supervision more effective as well as promote market confidence. The complex and onerous framework of regulation and supervision can be made easy by creating and implementing compliance-by-design with the help of AI. The effect of proposed Digital Finance Strategy and AI and Data Strategies will be incorporated to analyse the future possibilities of AI in regulatory compliance and supervision of financial institutions.

The financial regulations will largely be discussed from an overall EU perspective unless to draw out the regulatory fragmentation at state levels. A comparative research of AI in regulatory environments of different jurisdictions is not warranted as the goal of most financial regulations is to promote single EU market and strengthen the entire EU economy. Since the EU is seeking complete harmonization of financial services through different projects and institutions, this thesis will proceed with an EU law perspective.

Delimitations: This thesis was researched and drafted in the pre-Covid-19 Pandemic ('the Pandemic') era. If earlier the need to use AI in regulatory compliance was a future goal, now it has become an urgent necessity. Suitable changes in the ongoing discussion are made to reflect the most recent developments in the financial industry and the impact the world in general and financial services are reeling under. The pandemic has suddenly pushed the non-participant population and services also towards the digitalisation and this fast change can only be met effectively with a fast technology such as AI. However, we need to nevertheless trace the beginning of the regulatory and technological shift in financial industry to better prepare for the future demands.

Considering the dynamic nature of this subject and related policy changes at EU level, the sources used for this thesis are mostly latest and may not be of the highest quality in academic scale.

B. Structure

This introduction chapter aims to introduce the topic and develop a basic understanding of the research questions and approach of this thesis. The last part of this chapter will describe the methodology of this thesis, which is a combination of legal dogmatic, empirical research and comparative law.

The second chapter of the thesis will trace the regulatory and technological developments in financial institutions such as banks and fintech since the 2008 financial crisis in order to analyse the pace and scale of changes and what role AI can play in helping the respective institutions deal with that change. Financial Institutions are only one side of the coin, the circle of regulatory reforms and compliance cannot be complete without discussing the Financial Supervisory Authorities ('FSAs'), and how they deal with the huge amount of data received from financial institutions. This discussion is important stepping-stone to further this thesis and works as a background for the reader and the research to understand why the regulatory environment has become exponentially large in past decade and why a regime of technologies like Fintech and AI is the only way forward.

The third chapter will pose a question as to what challenges financial institutions face while moving towards increased digitalisation and using AI to speed their work. The limitations of AI and regulatory scenario will then be presented as the present limitation to use of AI. The analysis will be done through comparative and qualitative research methods. It is crucial to analyse these challenges in order to get a picture of the future scope of AI in these services.

The fourth chapter will discuss and analyse the challenges and support provided by AI in regulatory compliance and supervision tasks to draw conclusion that eventually human intervention will be necessary to strengthen the inviolability (keep it simple of compliance as we know it or maybe compliance will just disappear and become 'by-design').

The fifth chapter will summarize the findings of the thesis from an analytical view. It will discuss how the changes in the global economy and rise of technologies further accelerated by the COVID-19 Pandemic drove the expansion of regulations and how AI is the only way forward for both reporters and repartees of financial compliance to deal with huge data and innovation. It will consider the challenges of technological as well as regulatory landscapes from the view point of financial industry as well as Financial Supervision Authorities ('FSAs') and conclude the thesis by drawing a picture of the future of regulatory compliance in AI regime and that compliance can be by-design at some point in future not so far from now.

B) Sources of Law

a) Methodology:

Legal research involves many methods that can be adopted to approach a problem. This thesis employs a partial legal-dogmatic approach. The method allows to examine legal norms to provide suggestions to a socio-legal problem. It helps to understand and classify laws for producing useful information and in order to pursue the questions identified in previous section, it is important to adopt a systematic and consistent approach to arrive at answers. It is essential to describe the concept of legal method applied for research and conclusions. The method of research used in this thesis is partly legal dogmatic, which consists of interpretation of existing law and systematization of law.¹⁸ It is ‘partly’, because the area of study of this thesis is not only in the context of law, which is inherent in legal dogmatic but also social, technological and global changes especially now in post Pandemic era. Such approach cannot do complete justice to the topic of this thesis that draws from not only the legal, but also social, technological and global changes in financial industry driven by various factors. As the thesis topic is concerned with emerging technologies such as AI¹⁹ and Fintech²⁰, which have a fragmented legal framework governing them, it becomes even more difficult to constraint the research method to legal dogmatic. To supplement the legal dogmatic and analyse and study this topic from all relevant perspectives, factual social changes are examined and empirical study is applied to evaluate effectiveness of laws concerned and technologies discussed. All through the thesis, the discussion will also be mindful of the global landscape and social needs to not isolate the discussion from the needs of society and circumstances under which such needs are to be met. “If account is not taken of factual social change, the legal remedies that are sought to adjust to these changes easily become counterproductive of their aims.”²¹ As we will see during the discussion that many legal remedies can be hinderance to the speed at which the changes are needed to address the current need of AI application

b) Laws

The EU primacy law provides for EU laws taking precedence over national laws of EU states.²² The sources of EU law are categorised as primary, secondary and supplementary law. Primary

¹⁸ Aarnio Aulis, Luentoja lainopillisen tutkimuksen teoriasta. Helsingin yliopisto (2011).

¹⁹ Ibid 9. On 19 February 2020, the European Commission published a White Paper on AI Strategy in EU, aiming to foster a European ecosystem of excellence and trust in AI and a Report on the safety and liability aspects of AI. The white paper proposes “Policy options for a future EU regulatory framework that would determine the types of legal requirements that would apply to relevant actors, with a particular focus on high-risk applications.”

²⁰ Ibid 14.

²¹ Linda Hellsten, 'Disclosure And Delayed Disclosure Of Inside Information In The Light Of The EU Market Abuse Regulation' (Graduate, University of Helsinki 2015).

²² Catherine Barnard, Janet O'Sullivan and Graham Virgo, The Foundations Of Law (Hart 2007).

law is the highest of all three and thus takes priority over all other laws. It includes the EU treaties, and the principles of laws. Secondary law includes legislations such as regulations, directives and other decisions based on treaties and principles. Secondary sources take primacy over supplementary sources.

The standards framework for banks and financial institutions in the world flows from Basel III, which is the source of all financial regulations in the world. As per the website of Bank of International Settlements, they are “internationally agreed set of measures developed by the Basel Committee on Banking Supervision in response to the financial crisis of 2007-09.”²³ The measures advise on minimum capital requirements, supervisory review process and disclosure of risks to enhance market discipline in financial institutions. In addition, providing global liquidity standards and monitoring.

The Bank of International Settlements was established in 1930 to handle the reparations imposed on Germany. It soon developed into a meeting place for regulators and international banks to develop international standards such as Basel Concord, Basel II and Basel III. Basel as a source is the foundation of all financial laws in EU and world. From the perspective of this thesis being EU centric, various laws that have been legislated by EU for implementing Basel measures are enacted based on measures advised by Basel and form bulk of the regulatory compliance for banks, FinTech and other financial services and will be discussed in this thesis are Capital Requirements Regulation²⁴, Payment Service Directive²⁵, Markets in Financial Instrument Directive II²⁶, Anti Money Laundering Directive²⁷, Capital Requirement Directive²⁸ as well as various guidelines issued by European Banking authority from time to time.²⁹ General Data Protection Regulation³⁰ is another law that brings privacy related obligations on financial entities that deal with personal data. Financial Supervisory Authorities to which financial

²³ 'Basel III: International Regulatory Framework For Banks' (Bis.org, 2020)

<<https://www.bis.org/bcbs/basel3.htm>> accessed 9 February 2020.

²⁴ Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms 2013. Also referred as Capital Requirement Regulation, 2013.

²⁵ Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market. Also referred as Payment Service Directive 2.

²⁶ Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments. Also referred as MiFID II.

²⁷ Directive (EU) 2019/2177 of the European Parliament and of the Council of 18 December 2019. Also referred as AML Directive.

²⁸ Directive (EU) 2019/2034 of the European Parliament and of the Council of 27 November 2019 on the prudential supervision of investment firms. Also referred as Capital Requirement Directive.

²⁹ European Banking Authority, 'EBA Publishes Revised Guidelines On Outsourcing Arrangements' (2019).

³⁰ Regulation (EU) 679/2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data. Also referred to as GDPR or General Data Protection Regulation.

entities such as banks and fintech report, are independent authorities established under the national banks of a state. FIN-FSA in Finland is established under Financial Supervisory Authority Act 2008³¹ supervises “banks, insurance and pension companies as well as other companies operating in the insurance sector, investment firms, fund management companies and the Helsinki Stock Exchange.”³² Together these laws will provide the estimate size of compliance and reporting involved in financial institutions, which will help understand the time and resources required for such compliance. In addition to these, FIN-FSA provides a biannual financial stability report to Financial Stability Board of Europe (FSB). The FSAs are responsible for closing the data gaps identified and for promoting the regular flow of timely and reliable statistics for policy use.

C. Empirical Research

To support the research questions with substantial methods, empirical research is conducted by way of two structured interviews. First interview is done in a written form and follow up questions, with an employee at Finnish Financial Supervisory Authority (FIN-FSA)³³. The results give a concrete picture of scope of use of AI and related challenges faced by a financial supervisory authority. For this interview, the interviewee was given an advance brief about the thesis, in order to help them understand the context of questions. Then a questionnaire was shared in Google form which had both long-answer and objective type questions. After receiving the answers, an analysis was done, and answers compared to own research. A further follow up interview was done in written form to clarify and ask new question.

Similar approach was done while sending a structured written interview form to an employee in Nordea Bank who works in Digitalisation & AI strategy of Nordea, Sweden³⁴. The interview was conducted in written through Google form and a follow up interview was done via telephone. A brief was given about the thesis questions and questionnaire shared. After the answers were received, they were analysed and compared with own research.

³¹ Act on the Financial Supervisory Authority. No. 878, of The Parliament of Finland, Adopted on 19 December 2018. Section 3. https://www.finanssivalvonta.fi/globalassets/en/fin-fsa/fin-fsa_act.pdf.

³² About FIN-FSA. FIN-FSA Website [online] Available at: <<https://www.finanssivalvonta.fi/en/about-the-fin-fsa/>> [Accessed 10 February 2020].

³³ Aparna Calderón, Interview of Hanna Heiskanen, 'Scope of AI In Supervision Of Financial Institutions' (2020). Annexed as Annex A.

³⁴ Aparna Calderón, Interview of Jesper Nordström, 'Scope of AI in Regulatory Compliance in Financial Institutions' (2020). Annexed as Annex B.

The results of both interviews are further compared with each other to see if they paint a coherent picture and reflect each other's views. They are also compared with other research material to conclude and validate each other's findings.

Chapter 2. Recent Advancements in Financial Services and Regulations

This Chapter sets the background for the thesis by discussing the technological developments, regulatory landscape and discussing the regulatory fragmentation that is responsible for the compliance burden so severely felt by the financial institutions including Banks and FinTech. It will also show light on the fact that conversely speaking, supervisory burden is equally or heavier on FSAs than what institutions suffer because where institutions each bear their own compliance load, FSAs have to deal with all the work related to their monitoring of various institutions and thus need urgent relief driven by technological innovation and regulatory reforms.

The catalyst to the technical advancements in banking and financial services was the approaching financial crisis. In September 2008, US banking giant Lehman Brothers collapsed, leading to the largest bankruptcy filing³⁵ in history. Many other large banks faced huge financial losses or bankruptcy. The resultant financial crisis lead to unforeseen levels of regulatory intervention across the globe.³⁶ As a result the standard setting infrastructure for financial services and institutions that has emerged, is globally led by a global Basel Committee on Banking Supervision (BCBS). After 2009, the membership of BCBS expanded to Financial Stability Board (FSB) was established after a G20 summit in 2009 to monitor the global financial system and make recommendations to international standard setting bodies and national financial authorities.³⁷

A. Introduction to Fintech

a) Development

Technological advancements, European regulatory landscape and increasingly conservative attitude of traditional banks after the financial crisis lead to the creation of a new type of financial services operated by financial technology (FinTech). The fear of losing money was especially high in people after the crisis. However, this fear proved to be a boon for Fintech and

³⁵ NICK LIOUDIS, 'The Collapse Of Lehman Brothers: A Case Study' (Investopedia, 2019) <<https://www.investopedia.com/articles/economics/09/lehman-brothers-collapse.asp>> accessed 11 February 2020.

³⁶ Burkhanov, Umar, 'The Big Failure: Lehman Brothers' Effects On Global Markets. European Journal of Business and Economics. (2011)

³⁷ About The Financial Stability Board. [online] Available at: <<https://www.fsb.org/about/>> [Accessed 11 March 2020].

PSD as the hatred³⁸ of people towards banks drove them to alternate services that they relied on.³⁹

Since then, FinTech firms and established technology companies (BigTech, or TechFin due to their capacity to leverage their existing large platforms and data stores.), have significantly transformed the landscape of financial services.⁴⁰ BigTech are big firms with established technology platforms that have started providing financial services e.g. Alibaba, Amazon, Apple, Baidu, eBay, Facebook, Google, Microsoft, Tencent. Their services are narrow in scope compared to traditional banking and Fintech services, e.g. Nordea Bank's tie up first with ApplePay and now with GooglePay for real-time money transfer to other bank accounts from within the bank's app.⁴¹

However, FinTech were conceived on this premise, and peer to peer real-time money system was launched. Some popular examples of this system are Sweden based SWISH, and Denmark based MobilePay, which are used for peer-to-peer real-time payments between individuals. In this system, a person's account number or card are attached to their mobile phone number and payments can be made in real-time. Peer to Peer mobile payments take a big portion of Fintech. Mobile payments are made either through Personal Trusted Devices (PTDs) like smartphones or other devices such as set-top box and game consoles etc.⁴²

Apart from peer-to-peer payments, Fintech services across the globe make use of various other technologies such as Transactional Bots, Chatbots, Artificial Intelligence Decision Algorithm (AIDA), Automated Claims Processes, Optical Character Recognition (OCR), Churn Prediction, Algorithmic Trading, Augmented research tools, Valuation Models, and other AI-based technologies.⁴³

³⁸ 'Here's The Problem... People Really Hate You,' US Bankers Told' (The Independent, 2009) <<https://www.independent.co.uk/news/business/analysis-and-features/heres-the-problem-people-really-hate-you-us-bankers-told-1607262.html>> accessed 13 February 2020.

³⁹ Danielsson, Jon, Hyun Song Shin (2003) "Endogenous Risk" in Modern risk management: A history.

⁴⁰ Financial Stability Board, 'Fintech And Market Structure In Financial Services: Market Developments And Potential Financial Stability Implications' (Financial Stability Board 2020)

⁴¹ Nordea, 'Google Pay Nordean Asiakkaiden Käyttöön' (2018) <<https://www.nordea.com/fi/media/uutiset-jalehdistotiedotteet/press-releases/2018/10-30-06h00-google-pay-nordean-asiakkaiden-kayttoon.html>> accessed 8 March 2020.

⁴² Jean-Michel Sahut, 'Internet Payment And Banks' (2011) 3 International Journal of Business

⁴³ Rachit Chawla, 'Artificial Intelligence In Fintech Market: Growth, Trends, And Forecast – DATAQUEST' (mc.ai, 2020) <<https://mc.ai/artificial-intelligence-in-fintech-market-growth-trends-and-forecast-dataquest/>> accessed 26 March 2020.

<https://mc.ai/artificial-intelligence-in-fintech-market-growth-trends-and-forecast-dataquest/>

b) Effect

According to Jesper Nordström,⁴⁴ an AI & Digitalisation specialist at one of the leading Nordic Banks, advancements in technology leading to development of Fintech have most affected the banks in past 5 years and opened markets for new competition.

The ‘disruptive’ character of Fintech can be gauged when Kari Melander, Director of a leading Finnish third-party payment service brand Paytrail Oy tells that “Paytrail account as a product does not exist any longer. We decided to shut it down a year ago due to other market players like MobilePay, Pivo, and parent company Nets’ own products”⁴⁵ These new payments services are called open banking, where TPP can build their services around a bank’s API. These Fintech services have broken the century old monopoly of banks on accounts and payments and levelled the market for competition in more areas than just one. In Europe, institutions like Danske Bank were trailblazers and had a head-start in Fintech with launch of MobilePay in 2013, while others like Apple are making the best of this new industry by launching their own applications.⁴⁶

B. Fintech Regulation

Innovation is the core of Fintech, and as with any rapidly growing industry, regulation of Fintech is affected by its speed of innovation and adaption to latest market trends and customer expectations.

There are two types of regulatory regimes applicable to Fintech in different regions: fragmented and consolidated.⁴⁷ The fragmented framework covers a variety of laws in all areas of industry where Fintech provides services such as banking laws, insurance laws, investment laws etc. Depending on the service or services provided by the Fintech, it may be subject to all or few of those laws applicable to their business activities. The regulatory framework for Fintech in the European Union (EU) is highly fragmented with many directives and regulations applying to Fintech business models. E-Money Directive, Anti-Money Laundering Directive 5 and the Payment Services Directive 2 together regulate E-money, online payments, and EU-wide single markets.⁴⁸

⁴⁴ Ibid 34.

⁴⁵ Calderón, Aparna, Interview of Kari Melander, Director, Paytrail Oy. on 15.03.2020

⁴⁶ Nordea, 'Apple Pay Comes To Nordea'S First Card Customers' (2018) <<https://www.nordea.com/en/press-and-news/news-and-press-releases/press-releases/2018/06-20-06h20-apple-pay-comes-to-nordeas-first-card-customers.html>> accessed 4 April 2020.

⁴⁷ World Bank Group, 'Disruptive Technologies In The Credit Information Sharing Industry: Developments And Implications' (World Bank Group 2019)

⁴⁸ Ibid.

a) *Payments Regulation*

After the financial crisis, open banking started evolving and Payment Service Directive 1 (PSD1) was already in place to open the market for competition and support innovation to integrate payments in Single Euro Payments Area (SEPA)⁴⁹. PSD1 was adopted with an aim to authorize non-financial institutions to offer IBAN (International Bank Account Number) accounts and cards, within the European Economic Area. PSD2 was introduced with an aim to open the market to innovation through FinTech players by Open Banking rules and better protect consumers through strong-customer-authentication. According to World Economic Forum, 4 key aims of Payment Service Directive 2 (PSD2) are market efficiency, consumer protection, competition and security.⁵⁰ Currently, PSD2, the Payment Services Act and the Payment Institutions Act (297/2010) in Finland^{51, 52} regulate the provision of payment services. The key compliances based on PSD2⁵³ are:

- a. Obligation on banks to grant third party access to customer accounts, once customer has given consent.
- b. The introduction of Third-Party Providers (TPPs), which means that third parties are now able to provide financial services under the supervision of the Financial Supervisory Authority (FSA).
- c. Issuing of card-based payment instruments connected to an account provided by another payment service provider (Card-based Payment Instrument Issuer, CBPII).
- d. Requirements related to strong customer authentication to ensure that the transaction is made by only the authorised person.

The General Data Protection Regulation (GDPR) is applicable to all business and activities that deal with personal data⁵⁴. GDPR came into effect in May 2018 and aims to give individuals control over their personal data. The main purpose of the regulation is that every person's

⁴⁹ Bank of Finland, 'Payments Going Real-Time In Finland – Instant Payments' (Bank of Finland 2019) <https://www.suomenpankki.fi/globalassets/en/money-and-payments/the-bank-of-finland-as-catalyst-payments-council/payments_going_real-time_in_finland_report_en.pdf> accessed 27 March 2020.

⁵⁰ R. Jesse McWaters and Rob Galaski, 'Beyond Fintech: A Pragmatic Assessment Of Disruptive Potential In Financial Services' (World Economic Forum 2017)

⁵¹ Finland Act on Payment Institutions (297/2010).

⁵² FIN-FSA, 'Payments Regulatory Framework in Finland' Available at: <<https://www.finanssivalvonta.fi/en/regulation/regulatory-framework/psd2/>> Accessed 8 March 2020

⁵³ Ibid 25.

⁵⁴ Ibid 30. Personal data is defined within GDPR; Regulation (EU) 679/2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation (GDPR))

personal data can only be processed and stored with their informed consent, and that every person has the “right to be forgotten” i.e. have their data deleted. Ever since its transposition many high value fines have been issued for violation of GDPR and it is essential for institutions to detect data breaches with delay and report them. AI can do this task much faster than humans, moreover AI can help institutions. As will be discussed later, good quality and quantity data availability is central to the development of good and efficient AI. Various provisions under GDPR affect the development and regulation of AI, by restricting the governing the outputs of AI to make it consumer friendly and by governing the data availability crucial to training AI. Discussing these regulations, gives a sense of various governing frameworks that institutions must comply with, and FSAs must monitor in order to meet the regulatory requirements and the EU vision of financial market.

b) What is the effect of Regulatory Fragmentation in Fintech?

It is important to understand the regulatory uncertainty and fragmentation in Fintech, in order to understand the need of technology driven and AI enabled regulatory compliance that will be discussed in coming chapters.

The adoption of PSD2, which is now applicable to and allows payment initiation services and account information services by Fintech, has changed the regulatory framework for Fintech companies which were out of the scope of regulations. A Fintech’s activities can now be a decisive factor in ascertaining its regulatory status or, if expressly covered by activities mentioned in PSD2, might require registration under PSD2. An entity may also be subject to regulation partially only for activities that fall in the purview of the laws concerned.⁵⁵

Crowdfunding is one of the Fintech activities and its regulation is fragmented across EU. In Finland, it is regulated by the Finnish Crowdfunding Act (734/2016). A Fintech that provides crowdfunding platform in Finland must apply for authorisation under the Finnish Crowdfunding Act.⁵⁶ A Regulation has been proposed for Crowdfunding at EU level,⁵⁷ and the

⁵⁵ 'Report On Fintech Regulatory Perimeter, Regulatory Status And Authorisation Approaches In Relation To Fintech Activities' (European Banking Authority 2019)

⁵⁶ FIN-FSA toolkit on Disclosure obligations of crowdfunding recipients and obligations of crowdfunding intermediaries offering crowdfunding by means other than financial instruments under the Finnish Crowdfunding Act (In Finnish). Available at: <https://www.finanssivalvonta.fi/en/capital-markets/crowdfunding-intermediaries/regulation/legislation/>. Last accessed on: 19.03.2020.

⁵⁷ Proposal for the Regulation of the European parliament and of the council on European Crowdfunding Service Providers (ECSP) for Business. (2018)

application of a harmonised EU law for all, crowdfunding service operators will enable a level playing field and at the same time, another law for Multis' to follow⁵⁸

While Insurtech is also growing rapidly, unintended cyber exposure is the biggest challenge of this sector. There are general approaches to deal with this exposure, however an approach specific to Insurtech is missing, leading to lack of awareness and action plan. There is need of scientific research and regulatory actions plans to deal with unintended cyber exposure as many customers as well as providers are not aware of the cyber risks involved.⁵⁹

Further, regarding the regulatory fragmentation for Fintech activities EBA found in its report on Fintech Regulatory perimeter “some innovative activities or business models do not fall within the scope of any authorisation or registration regime under the CAs’ [Competitive Authorities’] remit. For instance, depending on the specific business model at stake, deposit marketplace activities – that is, platforms enabling customers to place deposits with credit institutions at various interest rates across Europe – may also be outside the regulatory perimeter and not subject to any regulatory regime.”⁶⁰ EBA also noted that the marketplace deposit activities are fast rising and expanding to activities like non-performing loans and thus constant monitoring and appropriate regulation is warranted.

PSD2 has established framework authorisations for payment institutions and e-money institutions are covered under E-Money Directive 2, which are further explained in the EBA Guidelines for authorisation and registration under PSD2 (‘EBA Guidelines on authorisation and registration’), which lays down the process to be followed before the National Supervisory Authorities for registration as Payment institution. However, it seems that the FSAs are free to add additional rules and restrictions, leading to further fragmentation at state level. Such Regulatory fragmentation is one challenge for Financial Industry that needs to be dealt with by using AI to make regulatory compliance easier. AI can be used to help institutions and Fintech firms to detect compliance risks in multiple jurisdictions or before entering a new jurisdiction.

⁵⁸ Ibid

⁵⁹ The EU-US Insurance Dialogue Project ‘Cyber Insurance Working Group (WG)’, European Insurance and Occupational Pensions Authority. (2020)

⁶⁰ Ibid 57.

C. How are Fintech and specifically Banks affected by Technological and Regulatory Advances?

A note-worthy statement made by Bill Gates in 1994 can summarise the current uncertainty around future of Banks “Banking is necessary, Banks are not”⁶¹ While technological and Regulatory advancements (or the lack of it in the latter) were mostly a boon for Fintech, it has been mostly challenging and less of blessing for Banks, which previously enjoyed the traditional market leader position and whose only competition was other Banks.

a) Requirements under PSD2 and RTS

In addition to the requirements of PSD2 discussed above, the regulatory technical standards (RTS)⁶² that came into effect in March 2019 was an additional critical compliance for Banks. Under the RTS, all Banks are to provide innovation hubs to FinTechs. “the account servicing payment service provider should offer a facility enabling the payment service providers to test the technical solutions at least 6 months prior to the application date of these regulatory standards”⁶³ The purpose was to provide a space to FinTech developers to test with the Bank’s API (Application Programming Interfaces) in a secure setting, using dummy data. These APIs then had to be ready for customer use in live settings by June 2019 providing access to real customer data.

The RTS also required banks to provide strong customer authentication⁶⁴ to prevent fraud and unauthorised transactions. Although the opportunities provided by Open banking were introduced to provide competitive benefits to consumer, a survey conducted by Accenture in April 2019⁶⁵ of 4000 consumers in Nordic countries shows a lack of awareness and enthusiasm amongst customers about these services.

⁶¹ Original source not found but reproduced in many Articles; Zetzsche, Dirk Andreas and Buckley, Ross P. and Arner, Douglas W. and Barberis, Janos Nathan, From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance (April 28, 2017). New York University Journal of Law and Business,; European Banking Institute Working Paper Series 2017 - No. 6; University of Hong Kong Faculty of Law Research Paper No. 2017/007; University of Luxembourg Law Working Paper No. 2017-001.

⁶² Regulation (EU) 2018/389 of 27 November 2017 supplementing Directive (EU) 2015/2366 of the European Parliament and of the Council with regard to regulatory technical standards for strong customer authentication and common and secure open standards of communication. Also referred to as Regulatory Technical Standards (RTS).

⁶³ Ibid

⁶⁴ Ibid

⁶⁵ Satu Pulkkinen, Jarkko Linnainmaa and Harri Hurmalainen, 'Open Minds To Open Banking | Accenture' (Accenture.com, 2019) <<https://www.accenture.com/fi-en/insights/banking/opening-minds-open-banking-nordic-consumer-study>> accessed 24 February 2020.

b) Regulatory Fragmentation good for Fintech growth?

The fragmented regulatory environment for Fintech, compared to the conservative and historical regulations for Banks, shows that at this point, Fintech are at an advantage in terms of risk taking capacity and faster adaptation and innovation. And yet, it is the BigTech that are a bigger threat to banks, due to their already established infrastructure and capacity to sustain the dynamic regulatory environment.⁶⁶ The difference between the pace of Fintech and BigTech (alternatively Techfin) is defined by a well-known Fintech blogger Chris Skinner as follows: “Techfin firms start with technology and wonder how that can be used for commerce and trade. Alternatively, fintech firms start with existing trade structures and wonder how to make them cheaper and faster with technology. I liken it to fintech firms are making faster horses whereas techfin firms are working with airplanes.”⁶⁷

Although Banks are investing huge amounts of their budgets in technological innovation, there is a unique hinderance to this task, which is their legacy infrastructure and data storage. According to Jesper Nordström⁶⁸, that the Banks have their data in legacy places from where it is difficult to access and restore for technical use today. He says that the challenges are not only in difficulty to access but also to retrieve, as many times the data retrieved is in no form to use for current innovation. Jesper adds that the effort of retrieving data requires trained staff, which is another challenge. Maintaining legacy systems is a huge cost to the Banks, however losing them can be equally costly as well as risky.

Another problem in successful integration of Fintech and Banks is the old IT infrastructure vs new Fintech technology, that raise compatibility issues. Added to this is the is the complex agency structure of Banks, and the legacy of bureaucracy becoming impediment to innovation.⁶⁹ BigTech do not have these challenges and thus can be a threat to Banks. EU has started taking note of this threat as will be discussed later in the European Commission’s latest data strategy discussion as data is crucial to development of AI driven solutions in financial industry.

⁶⁶ Rene M. Stulz, 'Fintech, Bigtech, And The Future Of Banks' [2019] SSRN Electronic Journal.

⁶⁷ Brett King - Founder Moven and author Banking 2.0 and 3.0 and Breaking Banks this <https://www.foresightfordevelopment.org/talk-tive/banking>

⁶⁸ Ibid 33.

⁶⁹ Bank for International Settlements, Papers No 109, ‘The digital economy and financial innovation’ Monetary and Economic Department. (February 2020)

Chapter 3 - AI in Financial Industry, Supervision and Compliance

This chapter will focus on the role AI can play in helping financial institutions stay compliant in more efficient and cost-effective ways by using AI. It will then move to technology driven solutions that can benefit from AI to help in compliance as well as supervision of financial institutions.

A. Introduction to AI in Financial Industry

In recent times, banks and other financial service providers had been looking to technological upscaling including AI with a goal to gain market share and stay competitive in a fast-moving industry, one in which customers are not just looking to banks for all their banking needs. This need has become even more urgent and hard felt in post-Pandemic era where financial institutions are scrambling to meet all the other financial needs and changes in addition to compliance work. This chapter will explore how technology and AI driven services are transforming the landscape of financial services and their regulation.

The growth of technology in financial institutions shows that behind every major technological development, the core needs to innovate were time saving and cost cutting. Artificial Intelligence (AI) is an ideal technology to advance these two goals. It does tasks faster and more efficiently than humans or a team of humans and thereby saves costs and time. Artificial Intelligence connotes the presence of Intelligence. However, intelligence (both in machines and in humans) is a vague concept, despite various researches to define it. AI research applies the idea of rationality, which implies that AI, given the resources and goal, makes the best possible choice. Though, rationality is not the only criteria in the concept of intelligence, but it is essential to it.⁷⁰

AI is changing and will further change how financial risks are dealt with. Everything related to financial services is capable of transformation by adding AI capabilities. On a macro level, AI has four approaches i.e. Knowledge Representation, Natural Language Processing ('NLP'), Machine Learning and Artificial Neural Networks.⁷¹ Introduction of new technologies at a fast rate has become the characteristic of financial services by both Fintech and Banks. Typically, Fintech and BigTtech players are the first to innovate their services, however, Fintech

⁷⁰ The European Commission 'Artificial Intelligence, A definition of AI Main Capabilities and Scientific Discipline', High-Level Expert Group (December 2019)

⁷¹ Ibid 14.

companies have been largely responsible for bringing technological innovation to financial services, and banks have had to follow up.

This thesis focuses on the role of Artificial Intelligence (AI) in Financial Services and therefore it is pertinent to shortly define AI. The Oxford English Dictionary defines AI as “The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making and translation between languages.”⁷²

B. What are the applications of AI in Financial Industry (more examples) for Regulatory Compliance?

Banks have been slow and cautious about adding AI to their stream of expenses compared to Fintech. FinTech have already reduced banks’ revenue streams and at this stage investing in new technology was being debated, whether to ride it out or take a plunge. However, AI support in following services has been able to reduce operating costs for banks while providing shorter turn-around time, real time managerial information, smoother communication within the organization, and better interaction with customers.

AI usage in banks is not at a stage where it can replace humans, but it can augment them to free time and resources for other tasks, thus freeing humans from rote-actions.⁷³

a) *AI In Administrative Services*

Customer Service – Chatbots are being used in banks for assisting customers with simple tasks. This helps shortening the turn-around time. Other bots are being used for investment advisory. The European Supervisory Authorities joint report defines the trend of automation in financial advice as "a procedure in which advice is provided to consumers without, or with very little human intervention and with providers relying on computer-based algorithm and/or decision trees.”

b) *AI In Financial Services*

⁷² Lexico.com Definition of Artificial Intelligence. <https://www.lexico.com/definition/artificial_intelligence> Accessed on 10 April 2020.

⁷³ Daniel W. Latimore, 'Artificial Intelligence In Banking: Where To Start?' (Celent 2017) <<https://www.celent.com/insights/940768915>> accessed 22 April 2020.

a. **Credit Scoring**

Lenders are obliged to lend money to persons who are eligible and likely to return the loan money advanced. The likelihood is assessed based on certain criteria and each such criteria earns the person a point in their favour. The higher the total score, the likelier they are to get the loan. Credit scoring in EU is regulated by the Credit Scoring Directive. Advances in AI and machine learning (ML) are providing credit companies fast, efficient, and cost-effective techniques to mine vast quantities of data and make meaning out of them. Many alternative scoring companies are leveraging non-traditional credit data (alternative data), such as social media footprints, psychometrics, online behaviour data, and telecommunications data, including top-up patterns (for prepaid customers), mobile money use, and even calling patterns and contacts. Others are using advanced analytics and ML to process a range of data pulled out of consumers' phones, including call details, messaging content, browser data, and GPS location data.

Some of the credit lending companies combine traditional and alternative data to determine their scores. The widespread use of alternative scoring, however, is being slowed by privacy concerns, data residency questions, and attempts by local governments to regulate these approaches through supervisory mechanisms.^{74,75} Additionally, post-decision black box approaches have often raised questions about the potential for discrimination.⁷⁶ Notwithstanding, alternative scoring companies can meanwhile play an important role in facilitating the integration of previously marginalized groups by promoting initial access to the credit market.⁷⁷ Most sources of alternative data credit score have traditionally focused on specific subsets of available data: actual loan repayment. A new breed of "Alternative scoring companies employ different methodologies and use a variety of data to assess credit risk." This can include metadata from smartphones and social media. Facebook, for example, blocked third parties from getting access to its data for credit risk assessments.⁷⁸ Alternative Scoring Companies analyse behaviour, which is linked to certain demographic and official data,

⁷⁴ Regulation (EU) No 462/2013 of the European Parliament and of the Council of 21 May 2013. Also referred as: Credit Rating Regulation.

⁷⁵ Directive 2013/14/EU of the European Parliament and of the Council of 21 May 2013. Also referred as: Credit Rating Directive.

⁷⁶ Yavar Bathaee, 'THE ARTIFICIAL INTELLIGENCE BLACK BOX AND THE FAILURE OF INTENT AND CAUSATION' (2018) 31 Harvard Journal of Law & Technology.

⁷⁷ Ibid 49.

⁷⁸ 'How Does Facebook Work With Data Providers? | Facebook Help Centre | Facebook' (Facebook.com) <<https://www.facebook.com/help/494750870625830>> accessed 9 April 2020.

such as address, date of birth, and government identity number. In certain instances, the information expanded to encompass data from other nonconventional credit such as post-paid utilities and court records. The adoption of digital platforms and technologies by individuals and businesses alike has increased the sources of data to include unstructured data.⁷⁹

- b. **Real-time fraud prevention** – AI is being used in banks to refine small credit scorings, understand online behavior and improve customer service to prevent credit card frauds.⁸⁰ “Such AI models use agent based system to monitor and perform real-time alert and notification to accounts that has suspicious entries based on the rules set to monitor what would be considered as suspicious as the transactions happen.”⁸¹ NLP greatly benefits this exercise by making it possible to speedily process and comprehend even complex or simple expressions in documents’ text.
- c. **‘Risk management** – Risk management is a complex area which involves various factors such as risks relating to counterparties, liquidity, volatility, regulatory control, fraud, and operational hurdles that a bank can face due to endogenous or exogenous market factors, each requiring different technique to deal with." Data may also present a practical problem. However, in most cases, the underlying problem of bank risk management can be approximately solved as a sequence of local problems, providing that shared exposures are identified appropriately. This greatly simplifies the technical challenges and makes risk management well suited for AI."⁸²
- d. **Money Laundering** – AI can verify customer identity digitally and perform AML screening and monitoring. It can also verify the authenticity of documents within seconds for KYC purposes thus saving compliance costs. Using AI for such tasks can cut bank compliance costs by up to 30%, according to the International Banker⁸³, saving billions. ⁸⁴ AI can also identify various transactions leading to Ultimate Beneficial

⁷⁹ Ferretti, Federico, ‘The Never-Ending European Credit Data Mess’ The European Consumer Organisation (2017) <https://www.beuc.eu/publications/beuc-x-2017-111_the-never-ending-european-credit-data-mess.pdf> accessed on 9 March 2020.

⁸⁰ Amanze B.C. et al. ‘On the Development of Credit Card Fraud Detection System using Multi-Agents’, International Journal of Computer Science and Engineering, Vol 6, Issue 6, (June 2018.)

⁸¹ Ibid

⁸² Ibid 74.

⁸³ Innovating Bank Compliance: The Real Benefits of Artificial Intelligence (International Banker 2016) Available at:

<https://internationalbanker.com/banking/innovating-bank-compliance-real-benefits-artificial-intelligence/> accessed on 22 March 2020.

⁸⁴ Alan McIntyre, 'Artificial Intelligence-Powered Robots Won't Kill Banks' (Forbes, 2018) <<https://www.forbes.com/sites/alanmcintyre/2018/03/15/artificial-intelligence-powered-robots-wont-kill-banks/#175583ae4c3f>> accessed 14 April 2020.

Owner (UBO). This can be of great assistance to FSAs who try to join the dots to identify individuals involved in AML.

- e. **Analytics** is the most widely used subset of AI, which is used in banking for risk management, biometrics identification, fraud detection and credit underwriting. Analytics analyses large quantities of data to find patterns, groupings, and correlations that allows the industry to move from merely descriptive to predictive, near real-time analysis. A study by Accenture predicted that after PSD2 implementation, banks will be at a greater risk to a wide range of frauds due to open APIs allowing TPPs to innovate their services. It will be a difficult for banks to provide secure platforms. This can be a great setback to banks at a time when they are already losing market share to Fintech and ever persistent cyber-attacks⁸⁵ “Against this background, providing a secure infrastructure to TPPs will be a major challenge for banks. To prevent fraud in real time, most banks use packaged software whose fraud scoring models are trained over a period of 18 to 24 months. After PSD2 introduces new transactions through TPPs, it will take around two years for the banks to generate scores reflecting the transaction risk.”⁸⁶

The fact that AI is already being used in variety of fields, shows its scope and possibility to expand with right research, innovation and governance. Following chapters will discuss why prevailing frameworks and lack of further innovation within AI is currently hampering the possibility of scaling up the deployment of AI.

C. How can Regulatory Compliance and Supervision benefit from AI driven Technology?

This section will focus on technological and regulatory solutions, which combined with Artificial Intelligence (‘AI’)⁸⁷ can help the financial industry meet the demands of the fast-changing regulatory landscape. The financial ecosystem is rapidly changing, and new technologies are moving from innovation to adoption stage in matter of months. New FinTech firms are entering the market directly as well as in partnership with established incumbents. This fast pace industry needs regulatory solutions to match. In addition, the recent dependency

⁸⁵ Accenture, 'PSD2 & Open Banking Security And Fraud Impacts On Banks Are You Ready?' (Accenture 2017) <https://www.accenture.com/t20170106T040658__w_/us-en/_acnmedia/PDF-40/Accenture-PSD2-Open-Banking-Security-Fraud-Impacts.pdf> accessed 11 April 2020.

⁸⁶ Ibid

⁸⁷ Note that the term AI is used broadly in this thesis and includes subfields such as machine learning and natural language processing.

placed on digital finance due to circumstances created by COVID – 19 pandemic⁸⁸ has left the financial industry scrambling to meet the demand. Crowdfunding, Credit applications and defaults, IT challenges to remote working, bankruptcies and other consequences have understandably put immense toll on regulatory compliance leading to intentional or unintentional oversights in compliance to prioritise other critical matters. Never was the need of AI driven compliance and supervision solutions more apparent than now in year 2020.

The number of following laws entering into force between 2018-2020 will give an idea of the regulatory change and burden over financial institutions: MiFID II; Amendments to AML5/CFT, expected AML6 in 2020 and their national transpositions; Insurance Distribution Directive (IDD); Packaged Retail and Insurance-based Investment Products Regulation ('PRIIPs Regulation') to be revised in 2020; Payment Service Directive 2 and RTF, proposed PSD3 proposed Retail Payment Strategy and others not relevant for this discussion. This list is not exhaustive and as apparent, every regulatory change in every state jurisdiction is followed by uncertainty as to the interpretation and implementation of the regulations. In addition to that, as discussed in previous chapter, regulatory fragmentation in FinTech also leads to confusion in the functioning of Single Market.

In such scenario, AI's ability to process large amounts of data with speed and accuracy can dramatically transform regulatory compliance and supervision in financial industry. AI can play important role in regulatory compliance, from simplifying regulations to notifying stakeholders of changes in regulations to monitoring institutions' compliance to regulations.

As concluded from the interviews of Hanna and Jesper, AI is critical to both supervision and compliance in financial industry. Hanna said that automation and AI are used to deal with large amount of data, which is otherwise cannot be handled effectively, AI is further used for more sophisticated analysis of data. Many surveys highlight the perceived importance of AI in the future of Financial Industry.⁸⁹ The Accenture Technology Vision 2019 highlighted that almost half of the financial institutions saved almost 15% in expenses by automating processes, few of them reporting as much as 80% savings. Many said that they saved up to 90% of time that was

⁸⁸ The Coronavirus outbreak in Wuhan China in early January 2020 was declared a pandemic by WHO on 11.03.2020.

⁸⁹ Ernst & Young, 'Artificial Intelligence Will Be An Essential Business Driver For Financial Services Within Two Years, According To Study Co-Sponsored By EY' (2020) <https://www.ey.com/en_gl/news/2020/02/artificial-intelligence-will-be-an-essential-business-driver-for-financial-services-within-two-years-according-to-study-co-sponsored-by-ey> accessed 12 April 2020.

earlier spent on compliance. The survey also found that the regulatory solutions powered by AI improved institutions' ability to track changes in local regulations and improve the data quality by excluding human errors.⁹⁰

Technological innovations are already providing solutions in the form of Regulatory Technology ('RegTech') and Supervisory Technology (SupTech'). The terms RegTech and SupTech refer to the new categories of digital technologies that make regulatory compliance and reporting, on the one hand, and supervisory processes and risk analysis, on the other, more efficient and cost effective.⁹¹ Both these topics are dealt with in the following sections, after which, the technological challenges of these solutions will be analysed and new regulatory proposals will be reviewed to assess their impact on current issues and future readiness. It is certain that what was enough at the beginning of this year, is not enough anymore as the recent events due to the pandemic have shown us the need to be future ready in financial industry at a massive scale. It has pushed even those into modernising their regulatory processes, who were sceptical of its need and costs implications.

a) From Spreadsheets to SupTech

In 2019, the European Central Bank ('ECB') estimated that approx. €576 million will be spent on the supervision of banks in EU.⁹² It is to be noted that the supervision cost is paid in fees by the supervised entities. This expenditure becomes much higher when institutions other than banks are included in the cost. The complex and fast changing regulatory environment developing after the financial crisis has only become more fragmented and volatile with introduction of FinTech. The usual approach to regulation and supervision is no longer enough to deal with the influx of statutory mandates for financial institutions giving rise to the numbers of reporting done, At the same time many new responsibilities are placed on FSAs, making it a double quandary for FSAs. The solution, however, may be found in technology that has also caused this spur of innovation and evolution. Supervisory Technology, also known as the popular acronym 'SupTech' helps supervisory authorities oversee the activities of institutions under its jurisdiction. SupTech utilises the subsets of AI, such as big data analytics and machine learning to sort through the large reporting data. With the help on these innovative technologies,

⁹⁰ Ellinor Johansson And Others, 'Regtech- A Necessary Tool to Keep Up with Compliance And Regulatory Changes?' [2019] ACRN Oxford Journal of Finance and Risk Perspectives.

⁹¹ European Securities and Markets Authority, 'Trends, Risks, Vulnerabilities' (European Securities and Markets Authority 2019)

⁹² 'ECB Sets Supervisory Fees At €576 Million For 2019' (European Central Bank - Banking Supervision, 2019).

financial supervision can be and is being⁹³ revamped and old practices based on legacy data and lengthy onsite auditing are being replaced by modern ways of supervision founded on sophisticated data collection and storage, processing and analysis.

When Nordea Bank moved its headquarter from Sweden to Finland in 2018, FIN-FSA had to increase its staff to deal with expected increase in workload. However, that alone is not enough for FSAs to deal with the mammoth task of dealing with the reporting data it receives from "banks, insurance and pension companies as well as other companies operating in the insurance sector, investment firms, fund management companies and the Helsinki Stock Exchange."⁹⁴ For the FSAs to effectively carry out data sharing coordination against money laundering and handle reporting data, it is pertinent that the data be sifted and shared in an efficient manner for a coordinated approach to take place in supervisory work. Needless to say, that the manual handling of such large data would be not only costly but also less efficient than if such tasks were to be done with help of SupTech and AI. Manual handling also leaves room for errors in calculations.⁹⁵

As told by Hanna⁹⁶ "The amount of reporting data is simply so large that it cannot be effectively handled manually. Therefore, SupTech is crucial in the collection and analysis of various data that is used for supervisory purposes. AI is needed for the more sophisticated analysis of data".

What are the benefits of SupTech and how it works?

Supervision of financial institutions is done to ensure that the institutions are managing risks in expected manner, to ensure financial stability and protect the interests of consumers and investors. For effective supervision the authorities and EU require data access, which is ensure by reporting requirements for financial institutions. Many legislations cover different reporting requirements for different financial activities that the financial institutions are supposed to comply with and provide a variety of data to the respective authorities. The sheer number of legislations and their requirements is evident from the financial sectors supervised and the

⁹³ 'can be and is being' has been often used in this thesis one way or the other. It drives home the fact that this topic is dynamic and fragmented at this stage. However, in most cases, Finland seems to be ahead of the curve in leveraging emerging technologies.

⁹⁴" FIN-FSA 'Organisation and Tasks.' [online] Available at: <https://www.finanssivalvonta.fi/en/about-the-fin-fsa/organisation-and-tasks/>. Accessed on 21 March 2020

⁹⁵ TC Notes, 2017. Fintech, Regtech And Suptech: What They Mean For Financial Supervision. [online] Toronto Centre. Available at: <<https://res.torontocentre.org/guidedocs/FinTech%20RegTech%20and%20SupTech%20-%20What%20They%20Mean%20for%20Financial%20Supervision%20FINAL.pdf>> Accessed on 12 April 2020.

⁹⁶ Ibid 33.

services covered such as banking, insurance, various funds, credits, securities and markets. Together all these requirements are called ‘supervisory reporting’

The financial crisis in 2008 also revealed many gaps in EU’s regulatory framework covering financial services. It revealed significant data gaps and insufficient reporting to the relevant supervisory authorities. The post-crisis overhaul of the regulatory framework, which involved adopting more than 40 pieces of EU financial services legislation, generated a significant number of new, and mostly more granular, supervisory reporting requirements.⁹⁷

After the crisis, the demand of reporting data on individual operations has become more and more detailed and intrusive.⁹⁸ Such reporting can no longer be done in excel templates, and requires technology driven granular approach to increase the amount and frequency of reporting data. Data that is not restricted by reporting formats, also gives freedom to the FSAs to filter the data according to the required indicators and helps in faster and smarter decision making. SupTech will not only save time on processing of large data and manual errors, but it will also save cost of regulation by streamlining and avoiding overlapping activities, thus saving resources for further tasks. Smart regulatory compliance and smart regulatory reporting are enabled by core technologies such as AI, on cloud platforms.⁹⁹ The development of SupTech needs special attention from EU governing bodies to push forward with its implementation amongst all the high priority work that Supervisory Authorities are already dealing with during the pandemic time. As per the report of the World Bank¹⁰⁰, SupTech implementation can be most beneficial if it is integrated in a planned supervisory strategy, just like the Digital Finance Strategy discussed in this chapter, and not occasional use of available digital tools.

There are three systems¹⁰¹ of SupTech: i) ‘Data-pull system’ operates more like an API controlled by FSAs where the FSA directly transfers raw data from the systems of institution, placed by automated processes triggered by FSA, and transfer into SupTech solutions that then

⁹⁷ European Commission, ‘Commission Staff Working Document Fitness Check of EU Supervisory Reporting Requirements’. European Commission (2019) <https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/191107-fitness-check-supervisory-reporting-staff-working-paper_en.pdf> [Accessed 31 March 2020].

⁹⁸ Antonio Perrella and Julia Catz, 'Integrating Microdata For Policy Needs: The ESCB Experience' [2020] European Central Bank <<https://www.ecb.europa.eu/pub/pdf/scpsps/ecb.sps33~2b3d9fd6e3.en.pdf>> accessed 15 March 2020.

⁹⁹ World Bank Group, 'From Spreadsheets To Suptech Technology Solutions For Market Conduct Supervision' (World Bank Group 2018) <<http://documents.worldbank.org/curated/en/612021529953613035/pdf/127577-REVISED-Suptech-Technology-Solutions-for-Market-Conduct-Supervision.pdf>> accessed 31 March 2020.

¹⁰⁰ Ibid.

¹⁰¹ Mirosław Ciesielski, 'The Benefits Of New Technologies For The World Of Finance | Obserwator Finansowy: Ekonomia, Debata, Polska, Świat' (Obserwator Finansowy: ekonomia, debata, Polska, świat, 2020) <<https://www.obserwatorfinansowy.pl/in-english/the-benefits-of-new-technologies-for-the-world-of-finance/>> accessed 25 April 2020.

standardise that data; iii) ‘Real-time system’ where the supervisor is able to see and pull real-time data from the institutions for say monitoring real-time activities or even predict activities. SupTech can also create ‘reporting utilities’¹⁰² that can act as centralised platform that can enable data-sharing as well as store FSA’s actions and decisions over the data for future trail and references. Such utilities can be fed standardised reporting data by financial institutions, that can be accessed by all concerned FSAs. This can level the field vis-à-vis current scenario where every FSA designs its own reporting environment based on its interpretations of the laws, costing additional compliance fee in multiple jurisdictions.¹⁰³ These systems of reporting can be accelerated by employing machine readable laws i.e. laws in forms of programming codes, benefitting both FSAs and institutions. The UK, Austria and Rwanda FSAs are three examples where they have used one or the other of the foregoing options.¹⁰⁴ The Dutch Central Bank and Dutch Authority for Financial Markets have already laid down principles for use of AI in financial sector.¹⁰⁵ In addition, with help of AI, SupTech can be used to assess unstructured data to identify customer sentiment through social media and feedback forum, leading to policy making and detecting illegal activities. A Commission report says that “SupTech may someday be able to proactively monitor a financial institution’s transactions or client’s data to prevent non-compliance or at the very least respond to a compliance violation in far less time than it takes today.”¹⁰⁷

SupTech and RegTech are inter-dependent for leveraging their full potential. SupTech enables RegTech and vice versa. An example can be the recent adoption of ‘European Single Electronic Format’ (‘ESEF’) by FIN-FSA of for financial reporting by Companies. ESEF will make it easier to use reporting data for comparison as well as employ such data for assisting technology development such as developing AI. The more developed and trained AI will be, the more sophisticated results it will provide. Especially considering the high quality of data due to ESEF where nothing will be lost in transit or human error.¹⁰⁸

¹⁰² Ibid 98.

¹⁰³ ‘Regulatory Reporting Of The Future’ (KPMG, 2019) <<https://home.kpmg/uk/en/home/insights/2020/03/regulatory-reporting-of-the-future.html>> accessed 23 April 2020

¹⁰⁴ Ibid 104.

¹⁰⁵ Joost van der Burgt, ‘General Principles For The Use Of Artificial Intelligence In The Financial Sector’ (De Nederlandsche Bank 2019).

¹⁰⁶ Ibid 33.

¹⁰⁷ Ibid 100

¹⁰⁸ FIN-FSA ‘European Single Electronic Format for Listed Companies Starting With Financial Statements For 2020.’ (2020) [online] Available at: <<https://www.finanssivalvonta.fi/en/capital-markets/issuers-and-investors/esef-xbrl/>> Accessed on 8 March 2020.

The most important task that SupTech can help is supervisory reporting. As confirmed by Hanna, reporting volumes are extremely high and will be further rising with changing regulations in various fields. AI is already being used in this area to speed and further enable sophisticated analysis of reporting data.

b) RegTech 3.0

RegTech maybe a new acronym but RegTech is not new to the regulatory landscape. RegTech is categorized in three phases: RegTech 1.0, RegTech 2.0 and RegTech 3.0.¹⁰⁹ RegTech 1.0 started around 1960s and continued till 2008, during this time financial institutions ran their own risk management and governance. The second stage is the ongoing RegTech 2.0 today that started after the financial crisis and the resultant regulatory expansion in quantity and complexity. The newer version is developed through technological advances and market participation of financial institutions as well as regulators to make compliance smart and efficient. Enabled by increased amount of data and legislative landscape, operations being digitized, there has never been a better time for regulatory innovation. The phase RegTech 3.0, is going to apply technology to redesign regulatory landscape. This phase will enable regulators, technology and institutions together to create platforms for innovation in regulation, supervision and reporting real time working together and addressing regulation, monitoring and reporting in real time using the same technology and data. In this phase, Know Your Customer (KYC) will transform into Know Your Data.¹¹⁰

RegTech 3.0 or simply RegTech has quickly become an important tool in financial services. The term RegTech was first coined by the UK's Financial Conduct Authority (FCA) in 2015 who called it “a subset of FinTech that focuses on technologies that may facilitate the delivery of regulatory requirements more efficiently and effectively than existing capabilities.¹¹¹ RegTech may further be defined as technology that enables institutions stay compliant with regulations by providing cloud computing technology through software-as-a-service (SaaS). According to Deloitte there are 326 RegTech companies providing services ranging from

¹⁰⁹ Dirk A. Zetsche and others, 'From Fintech To Techfin: The Regulatory Challenges Of Data-Driven Finance' [2017] SSRN Electronic Journal.

¹¹⁰ Douglas W. Arner, János Barberis and Ross P. Buckley, 'Fintech, Regtech, And The Reconceptualization Of Financial Regulation' (2017) 37 Northwestern Journal of International Law & Business; Dirk A. Zetsche and others, 'From Fintech To Techfin: The Regulatory Challenges Of Data-Driven Finance' [2017]

¹¹¹ UK Government Chief Scientific Adviser, 'Fintech Futures The UK As A World Leader In Financial Technologies' (Government Office for Science 2015)

<https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/413095/gs-15-3-fintech-futures.pdf> accessed 25 April 2020.

regulatory reporting, which includes real time reporting and cloud; risk management where AI is used to detect and assess regulatory risks and future risks; Identity management and control that enables counterparty due diligence and Know Your Customer (KYC) procedures. AML and anti-fraud screening and detection; compliance and transaction monitoring provide real time monitoring and tracking of current state of compliance and upcoming regulations.¹¹² Investment in RegTech start-ups reaches new height every year, with an estimated \$ 5 Billion invested in RegTech between year 2013 to 2019. These investments are expected to increase with the role of AI.¹¹³ Between 2008-2016, there was a 500 percent increase in regulatory changes in developed markets, highlighting the need for scalable, reliable and efficient RegTech solutions.¹¹⁴

a. *Shortcomings of Existing Regulatory Framework*

The existing framework is necessary but inefficient. Some reasons can be that regulations:

- i. are entered manually into the systems which can be both error-prone and the interpretations of the regulations and policies can be subjective as well as time consuming;
- ii. due to large amount of data and constant revisions and updates, there can be repetitive or duplicate data in the system requiring institutions to report in different contexts (and potentially using different templates and time series) the same data to different supervisors (including beyond the financial sector);
- iii. The above can also lead to transfer of erroneous data to the FSAs resulting in further delay in data processing and analysis may result in the transmission to supervisors of data that is erroneously or inconsistently reported (as a result of the above), causing delays to data processing and analysis and prompting extensive manual data cleaning or re-submission.

b. *What Can AI & RegTech Offer?*

Technology-enabled innovation can help overcome these challenges by enhancing efficiencies in reporting and compliance through:

- i. Financial institutions and Fintech firms can benefit from machine readable and machine executable laws and policies that enables software of any institution to

¹¹² 'Regtech Universe' (Deloitte Luxembourg, 2020) <<https://www2.deloitte.com/lu/en/pages/technology/articles/regtech-companies-compliance.html>> accessed 14 April 2020.

¹¹³ 'Econmatters: Regtech Grows In Fintech As Financial Organizations Seek To Avoid Fines' (EconMatters, 2020) <<https://www.econmatters.com/2020/01/regtech-grows-in-fintech-as-financial.html>> accessed 1 April 2020.

¹¹⁴ Ibid 14.

retrieve information directly¹¹⁵ This task is achieved by applying a subset of AI called ‘Natural Language Processing’ (NLP) with help of Deep Learning to understand variation in language input and connecting it with formal language of documents.¹¹⁶ It can immensely improve decrease the likelihood of access to outdated laws and policies and misinterpretation of laws and policies due to access to secondary sources only.¹¹⁷¹¹⁸

- ii. AI can speed up the data input into systems and its analysis. It can also process the communications received from regulatory authorities
- iii. platforms which link regulation, compliance processes and reporting (regulatory clearing house, see below).
- iv. Behaviour monitoring and analysis to detect suspicious activities and transactions in an account can help take real-time action against money laundering and terrorist financing activities.

The benefits of such solutions include greater accuracy and efficiency in reporting and data analysis and, in turn, more timely risk analysis and mitigation. aster and lower-cost regulatory reporting (for firms, potentially also lowering barriers to entry and potentially enhancing competition) and data processing will lead to more effective regulation and supervision in AML and CFT, etc.

AI in regulatory compliance can provide many benefits, the first being the recognition of risk pattern so they can be rectified. This can be crucial in approaching the issues of Money laundering under AML, financial crimes under MiFID etc.

While the benefits of RegTech are need of the hour and increasingly so as 2020 brings more regulations for banking as well as AI, RegTech itself is not free from its limitations. When compliance is tasked to AI and RegTech, the actors involved are likely to become less alert about lapses. Therefore, it is of utmost importance to ensure that all actors understand the responsibility when dealing with AI and RegTech. The ECs recommendations and white paper

¹¹⁵ 'GR3C | Governance Risk & Compliance' (GR3C | Governance Risk & Compliance) <<https://www.gr3c.com>> accessed 14 March 2020.

For instance, in 2018 the UK the FCA issued a call for inputs to assess the current compliance burden for regulatory reporting with the aim of reshaping it in a more efficient manner. Financial Conduct Authority and others, RegTech Sprint Technology Roundtable: Model Driven Machine Readable and Executable Regulatory Reporting (2018) <https://www.gr3c.com/wp-content/uploads/2018/04/RegTech-Sprint-Technology-Roundtable-Dublin-April5th-Proceedings.pdf>

¹¹⁶ Financial Conduct Authority, Digital regulatory reporting (2017) Available at: <<https://www.fca.org.uk/digital-regulatory-reporting>>. Last accessed on 20.04.2020.

¹¹⁷ Ibid 8.

in this regard come at an opportune time, and institutions involved will have to train its staff in these regards, as Jesper also confirmed that many are already establishing Centres of AI excellence where everyone dealing with AI will be trained about their responsibility. This will also avoid fragmentation in understanding of different actors involved. The use of semantics and as NLP can risk wrong and singular interpretation of the laws, since laws are made for human and society, their binary interpretation can be far from legislature's intent. Another limitation of AI is that it cannot detect its own fault and may train on a faulty data in loops until someone notices the mistake and removes it. Such mistakes when caused in the area of regulatory compliance, can be very expensive.¹¹⁹ The Scope of using Natural Language Processing is currently limited in RegTech in areas where English is not the native language. As Jesper also said that since languages for small countries need lot of effort, these need to be trained on language, which is easier in English. Lot of Swedish industry and academia try to gather data towards stronger NLPs.” The resolution of European Commission towards creating machine readable regulations and policies is a positive step in furthering the scope and reach of RegTech and SupTech.

Currently, there is no direct regulatory framework for RegTech and SupTech,¹²⁰ and the methods adopted by financial institutions and supervisors to pilot and adopt RegTech and SupTech frameworks is largely need based and fragmented. These fragmentations become a challenge in realisation of full efficiency gains of RegTech and SupTech solutions. For example, a financial institution with operations in multiple jurisdiction is not going to be able to adopt the same reporting technology for all jurisdictions, due to varied expectations and technological capacities of the FSAs involved.

Expert Group on Regulatory Obstacles to Financial Innovation (ROFIEG) in its report dated 13 December 2019 to the European Commission analyses the above factors and recommended that the EU develops and implements a comprehensive and ambitious agenda for the establishment of advanced RegTech and SupTech capabilities, in coordination with relevant authorities in and beyond the EU and international standard setters.¹²¹ It further recommended that the Commission should standardise legal terminology and adopt a strategy on how reporting and compliance processes may become both machine- and human-readable, to the extent possible.

¹¹⁹ Ibid 93

¹²⁰ Mourmouras, John, 'Fin-RegTech: Regulatory challenges with emphasis on Europe' Keynote Speech, Cornell University (Bank of International Settlement 2019)

¹²¹ Ibid 14.

The growth of RegTech is to some extent dependent on regulators, and in this case also on the European Commission, European Banking Association and FSAs for joint effort to continued innovation. RegTech solutions greatly increase the agility, security and adherence to compliance by the companies, thus making it efficient as well as cost-effective.

Chapter 4 - The challenges of AI in Financial Industry

AI can increase risks, and unlike before, where we only saw cyber/network security as a major concern and threat to online banking, the risks with Artificial Intelligence can be of new types and larger scale. Before we discuss the role of AI in financial services, we need to understand its nature and limitations. AI's abilities in relation to financial industry can be weighed from the concept provided through Danielsson and Shin's¹²² classification of risk along a spectrum from exogenous to endogenous. "Exogenous risk is measurable and quantifiable and results in statistical distributions that we can use to exercise control. Endogenous risk is usually neither measurable nor quantifiable and does not lend itself to straightforward statistical representations, being consequently much more challenging to address with formal analytical tools. AI is ideally suited for dealing with exogenous risk. It finds endogenous risk much harder because it cannot train against unknown data."¹²³ One such example of endogenous risk is the infamous failure of AI at Facebook to detect the massacre in live streaming video of Christchurch shootings in New Zealand.¹²⁴

A. Challenges of AI in process of Regulatory Compliance

a) *Black Box Decision Making and Bias*

As discussed before, GDPR requires automatic decision to be explainable. AI has the so called "black box" problem, which means that the decision made by AI are hard to explain in terms of process, steps and methodology followed to arrive at the decision. This is extremely challenging in credit scoring applications, where a decision to reject a credit application cannot be explained and no answer can be provided or explained. This is due to the nature of AI algorithms which make it hard to figure out which concept or idea made it side one way or the other. It would not be such an issue in industry that is not as highly regulated as the financial industry. GDPR provides¹²⁵ the most cumbersome regulation vis-à-vis AI, as it requires an

¹²² Ibid 39.

¹²³ Danielsson, Jon, Robert Macrae, and Andreas Uthemann. 'Artificial intelligence, financial risk management and systemic risk.' Technical report. London School of Economics, SRC Special Paper No 13. p 4 (2017)

¹²⁴ Guy Rosen, 'A Further Update On New Zealand Terrorist Attack - About Facebook' (About Facebook, 2019) <<https://about.fb.com/news/2019/03/technical-update-on-new-zealand/>> accessed 7 March 2020.

¹²⁵ Articles 13-15 and 21-22 of GDPR provide regulations for automated data processing and decision making. Automated data processing and decision making use machine learning, a subset of AI. The intent behind "right to explanation" clauses in GDPR in relation to AI algorithms and models are often debated among AI experts. While some scholars believe that "the GDPR is likely to only grant individuals information about the existence

automated decision to be explainable and interpretable and thus provides the biggest challenge in AI led decision making and credit scoring activities.

One of the most widely criticized and risky effect of Black Box operation of AI is the biases it allows into the algorithms without anyone being able to notice it. concern about AI is its dependence on machine learning from data that it has been trained on. If such data is biased¹²⁶ then even though AI “can operate continuously and automatically, updating their operation via feedback loops that enable the algorithms to improve their own performance”¹²⁷ it would still be as good as the data it is being fed like the “garbage in, garbage out” syndrome.¹²⁸ Data bias can lead to huge financial losses, and as we will see in following examples, undue assumptions that lead to bias. The European Commission ‘EC’ and University of Barcelona studied the role of AI, when exploited to predict criminal recidivism and found that the AI algorithms showed bias where women were predicted to be less likely to repeat an offence and foreigners were more likely to be labeled recidivist. Another example is the now infamous cases of bias in criminal justice system in US wherein computer program called Compass gave scoring to criminals for recidivism and showed clear bias against people of African origin leading to higher conviction rate in African people.¹²⁹ Amazon also dealt with AI bias after one of its AI algorithm built for recruitment showed bias against women as it was based on past 40 years of recruitment data.¹³⁰

These examples show that bias in AI can be inductive i.e. when it is introduced by the data that trains AI.¹³¹ It comes from the human action involved in the data such as decision making and assumptions. When same data is used to train AI algorithms, bias creeps in. Amazon had more

of automated decision-making and about "system functionality," but no explanation about the rationale of a decision." ¹²⁵

¹²⁶ Kate Crawford, 'The Hidden Biases In Big Data' (Harvard Business Review, 2013)

¹²⁷ Yeung, Karen, 'Five Fears About Mass Predictive Personalisation in an Age of Surveillance Capitalism, (International Data Privacy Law. 2013)

¹²⁸ “Unfair discrimination in a machine learning environment may result from deficiencies in the quality and quantity of the data available to train and test the algorithm, as well as problems with sources, labelling, and direct or indirect bias in such data. Algorithms working on incomplete or unrepresentative data may generate spurious correlations that result in unjustifiable decisions.” Kamarinou & Millard & Singh, “Machine Learning with Personal Data” Queen Mary School of Law Legal Studies Research Paper No.247/2016

¹²⁹ Julia Angwin and others, 'What Algorithmic Injustice Looks Like In Real Life' (ProPublica, 2016)

<<https://www.propublica.org/article/what-algorithmic-injustice-looks-like-in-real-life>> accessed 22 April 2020.

¹³⁰ Kodiyan, Akhil, 'An overview of ethical issues in using AI systems in hiring with a case study of Amazon's AI based hiring tool. (2019).

¹³¹ Analytics India Magazine, 2019. Curious Case Of The Missing Gorilla At Cypher 2019. [video] Available at: <<https://www.youtube.com/watch?v=q6f5DRbvgp0>> [Accessed 14 April 2020].

males than females in their technical roles and that is why the data used to train AI had bias. Non-representative sample is another factor that creates bias against people or situation that were not factored-in in the data that trained AI.

Data Ethnography

An article¹³² published in MIT Sloan Review suggests few best practices to avoid bias in machine learning at the time of AI development in banks. Bias should be weeded out by paying attention to it right at the outset of machine learning. One way to do it is by using large datasets that come from variety of sources. The new Data strategy¹³³ of the Commission has made suggestions to make this possible by identifying data availability as a challenge to many innovations including AI development. *Root out bias* –An internal assessment within the financial institution can reveal existing biases that can be removed from the data, once identified. In a talk delivered during Cypher 2019 conference¹³⁴ in India, Sridhar Rao introduced which might be a unique approach to deal with biases. While making his point, Mr. Rao referred to Mr. Rao concluded that learning bias is based on the data sets entered into machine learning and Data Ethnography (study of the origin of data) integrated with Data Science can help in eliminating inductive biases (bias creeping in from previous data) in algorithms.¹³⁵ Such biases can expose financial institutions to more risks than they sign up for when they start using AI as solution to their problems.

Mr. Rao suggests Data Ethnography as the new way of approaching data. He says that after identifying the business problem and the solution that needs to be build, a deep dive in data needs to be made to know from where and how this data was collected and analyze whether it solves the problem at hand.¹³⁶ Tricia Wang used Data Ethnography when she suggested to Nokia that the study of Nokia's data scientists based on past 10 years of data is not

¹³² DeBrusk, C., 2018. The Risk of Machine-Learning Bias (and How to Prevent It). MIT Sloan Management Review, [online] Available at: <<https://sloanreview.mit.edu/article/the-risk-of-machine-learning-bias-and-how-to-prevent-it/>> [Accessed 27 April 2020].

DeBrusk, Chris, The Risk of Machine Learning (And how to Prevent It) MIT Sloan Management Review <https://sloanreview.mit.edu/article/the-risk-of-machine-learning-bias-and-how-to-prevent-it/> (Last accessed on 23.03.2020)

¹³³ European Commission, 'A European Strategy For Data' (European Commission 2020).

¹³⁴ Analytics India Magazine, 2019. Curious Case Of The Missing Gorilla At Cypher 2019. [video] Available at: <<https://www.youtube.com/watch?v=q6f5DRbvgp0>> [Accessed 14 April 2020].

<https://www.youtube.com/watch?v=q6f5DRbvgp0>

¹³⁵ Ibid.

¹³⁶ Ibid

representative of the grassroots data that she calls thick data that she collected in Asia before coming to the conclusion that Nokia should launch a smartphone.¹³⁷

Considering the high stakes in financial industry, adding additional checkpoints in data sensitization is reasonable and even necessary. When having more and more data is not the only solution to the problems AI needs to solve, data scientists need to turn to how the quality of that data can be improved. AI makes the hard work easy if first hard work is done to train the algorithms.

b) Lack of trained AI Scientists

During the interview with Jesper, who is a Data and Machine Learning strategist, he replied when asked about the biggest challenges of using AI that lack of trained data scientists is the biggest challenge. He further explained that dealing and retrieving legacy data in banks for training AI is a cumbersome and highly technical task, for which trained data scientists are required. This view is also reflected in the EU Whitepaper on AI “The European approach to AI will need to be underpinned by a strong focus on skills to fill competence shortages.”¹³⁸

According to the AI whitepaper, the EU Commission has following plans to build skills in AI:

- a. Digital Education Action plan will introduce education methods that involve data and AI powered technologies. It will also be used to increase awareness of AI to prepare EU population for making informed choices in growing AI environment.
- b. Developing skills for working with AI to create a skilled workforce that can lead the AI led transformation will be the priority of revised Coordinated Plan on AI which will be developed in cooperation with Member States. The skills training could include an entire curriculum, which would include ethical guidelines for developers of AI. The plan includes efforts to hire more women in AI.
- c. A centre of research and innovation for AI in Europe to train talent from across the globe. It is to transform EU into global hub of AI excellence

¹³⁷TED, 2016. The Human Insights Missing From Big Data. [video] Available at: <https://www.ted.com/talks/tricia_wang_the_human_insights_missing_from_big_data> [Accessed 25 April 2020].

https://www.ted.com/talks/tricia_wang_the_human_insights_missing_from_big_data

¹³⁸ Ibid 9. Whitepaper on AI in EU, https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf

rooted in EU. World reference centres for AI will be made across EU under the Digital Europe Programme.

It is interesting that, when interviewed, Jesper also talked about establishing centre of AI excellence and best practices in Banks, where everyone who deals with AI within the bank can be sensitized on AI use. The fact that according to Fin-FSA the responsibility of AI decision ultimately rests with the board of the institution implementing the decision goes to show the importance of these local centres of excellence in AI.

c) Cyber Security

The operations of financial industry today largely depend on information & communication technology. This dependence will further increase after the impact of COVID-19 pandemic is fully realised and with the growing use of emerging technologies, as seen in financial services benefitting from the use of AI. At the same time, an increased use of AI in financial services may require upscaling the security measures and increasing supervision. All financial services, be it banking, payments or insurances have come to depend on digitisation and data, which exposes it to associated risks. This coupled with the fact that financial industry is the most valuable industry and is at the highest risk of cyber-attacks amongst all other industries¹³⁹ makes this matter of its security of utmost importance.

Can financial institutions risk cyber-attacks?

When human tasks are assigned to AI, more areas than ever become open to cyber-attacks, meaning higher risks. The need for further cybersecurity has been driving innovation in all areas of finance. New security features such as EVM chip, facial recognition, strong customer authentication and mobile payments to replace online payments have brought the industry closer to that perfect cyber security that is desirable in matters of finance, but is it ever going to be beyond the reach of attackers? The question of cybersecurity in finance highlights the necessity of further regulatory development. In particular, the digital transformation of finance (the FinTech process) has made the industry far more vulnerable to attack. The question of cybersecurity in finance highlights the necessity of further regulatory development.¹⁴⁰ Fintech

¹³⁹ Cora Van Nieuwenhuizen, 'Fintech: The Influence Of Technology On The Future Of The Financial Sector (2016/2243(INI))' (European Parliament 2017) <https://www.europarl.europa.eu/doceo/document/A-8-2017-0176_EN.pdf> accessed 1 May 2020.

¹⁴⁰ Ibid.

has made the industry far more vulnerable to attacks as the areas which were not digitalized earlier are now digital and vulnerable to attacks.

A huge dark market known as Genesis was uncovered in 2019 that at that time sold over 60,000 digital fingerprints, user logins and passwords, cookies, credit card information of online banking users from around the globe.¹⁴¹ providing further evidence of the potential risks even with sophisticated security solutions. Likewise, Osuuspankki was targeted in 2017 with distributed denial-of-service.¹⁴² The cost of such attacks can be measured in monetary terms, but it also affects business and personal plans.

In a recent Accenture survey, 71 percent of IT and business executives felt that cyberattacks were a “black box” and did not know how they would affect the organization. 10 If leaders cannot assess the impact of an attack on their own organization, how will they understand the risk posed to their ecosystem partners—or the risks they are accepting through those partnerships?¹⁴³ Mastercard, WorldPay, Fidelity and 14 other global payment companies recently participated in the first joint cybersecurity exercise meant to test operational preparedness during simultaneous attacks on payment systems. the process involved exercises to learn better coordination and ability to respond to cyber-attacks by mapping steps such as ways to respond, involving law enforcements and defining breach.¹⁴⁴

Such joint efforts may be the only effective way going forward to counter the continuous onslaught of cyber-attacks that are increasingly sophisticated and coordinated.

d) Scale of loss from AI Failure

In addition to cyber-attacks, the cases of AI failure in various spectrums where it is being used are not unknown. The latest being the failure of Facebook AI to detect the mass murder that was live streamed on Facebook from Christchurch, New Zealand. The role of AI, was to

¹⁴¹ Jamie Condliffe, 'A History Of Yahoo Hacks' (MIT Technology Review, 2016)

¹⁴² 'Finnish Bank OP Under Persistent Ddos Attack - Slashdot' (It.slashdot.org, 2020) <<https://it.slashdot.org/story/15/01/04/2252230/finnish-bank-op-under-persistent-ddos-attack>> accessed 2 May 2020.

¹⁴³ Paul Daugherty, Marc Carrel-Billiard and Michael Biltz, 'Understanding The DNA Of DARQ' (Accenture 2019) <<https://www.accenture.com/us-en/insights/technology/new-emerging-technologies-darq>> accessed 21 April 2020.

¹⁴⁴ Accenture, 'The Dawn Of Banking In The Post- Digital Era' (Accenture 2020) <https://www.accenture.com/_acnmedia/pdf-99/accenture-banking-technology-vision-2019.pdf> accessed 3 May 2020.

prioritize harmful content for human reviewers but according to Facebook, the AI failed to do so because it did not have any such training data to train on.¹⁴⁵ An obvious question then is that can AI be relied on when there is always a chance that someone or something will blindside it due to lack of training data or other such technological limitations. Could it then be possible to train AI in such sensitive areas as a financial system in all permutations and combinations that human mind can conceive and execute? Just as in case of Facebook, an AI failure in financial systems, although monetary, can be disastrous.

The stability of financial systems is crucial to state economies and human welfare.

When financial systems fail¹⁴⁶, they can start a wave of failures that resonates for years to come. Financial crisis have been few and far stretched, but systemic failures are even fewer. In the new-age AI led systems, the failures will be new and unknown from one crisis to the next “so that each event will in many ways be unique. In AI models vulnerabilities spread and amplify through opaque channels, often in areas in which confidence is supported by ill-thought-through assumptions rather than in places known to create risk. This global problem is hard because the financial system is for all practical purposes infinitely complex and any entity, human or AI, can only hope to capture a small part of that complexity. The combination of sparse data, complex structure, uncertain and changing rules with high degrees of endogeneity make systemic risk an exceptionally difficult and quite possibly intractable challenge for AI.”¹⁴⁷

AI failures are still key to discover the vulnerabilities of the model and although this means accepting huge risks with a pinch of salt, it is necessary to scan the system for vulnerabilities. Even if we understand this, the exponential growth in technology and regulation means that anomalies found today and the algorithms that they are based on would not remain the same tomorrow when the landscape of innovation and regulation would have changed. “It is almost definitional that each crisis triggers a sudden unpainful-evaluation of previously comfortable assumptions. Here, the systemic danger emanating from an AI engine working for the financial authorities is that it will focus on the least important types of risk, those that are readily measured while missing out on the more dangerous endogenous risk. In effect, it will automate and reinforce the adoption of mistaken assumptions that are already a central part of current crises. In doing so, it will make the resulting complacency even more likely to build up over

¹⁴⁵ Ibid 126

¹⁴⁶ Sēmitēs, Kōstas, et. al. 'The European Debt Crisis' (Manchester University Press 2014)

¹⁴⁷ Ibid_126

time. While human risk managers and supervisors can also miss endogenous risk, they are less likely to do so as they have historical, contextual and institutional knowledge, reason well with theoretical concepts and consequently have some tools to handle it in a way that AI may not.”¹⁴⁸

B. Can Financial Institutions and Regulators Share Data for Training AI?

The complete potential of AI can only be unlocked when the data used to train it is of good quantity and quality. Such requirements can only be fulfilled when the source of data is reliable and least steps removed from its purpose, for example, data from social media and spending behaviour is two steps removed from the purpose of analysing money laundering behaviour. However, real-time data of bank account transaction is direct source to analyse potential illegal transactions. Big data, as already defined, is data that institutions generate on day to day basis and which can be analysed with help of advanced analytics for deeper insights into customer behaviour and patterns. Such data is also highly relevant for development of AI in Financial Industry and specifically in compliance because AI trained on low quality data can lead to further difficulties such as bias.

In the European regulatory landscape, besides being important, data sharing is fundamental to removing entry level barriers in member states and countering money laundering and frauds. A permanent working group of FSAs from all Nordic and Baltic countries has agreed since May 2019 to share experiences and information for a co-ordinated effort against money laundering. The method of such sharing is said to be “maintain regular contact”¹⁴⁹. Whether such contact is in person meetings or digital exchanges of information is not reported. Either of the methods cannot be efficient enough to share even a part of the amount of information FSAs receive and sort on routine basis. Another data coordination is being enabled at local level by FIN-FSA and the Financial Intelligence Unit (FIU) as both signed a memorandum of understanding on

¹⁴⁸Supra note 23

¹⁴⁹ Financial Supervisory Authority, 'Nordic And Baltic Financial Supervisors Enhance Cooperation To Fight Money Laundering' (2019) <<https://www.finanssivalvonta.fi/en/publications-and-press-releases/Press-release/2019/nordic-and-baltic-financial-supervisors-enhance-cooperation-to-fight-money-laundering/>> accessed 30 April 2020.

26 February 2020 to “enhance exchange of information on anti-money laundering”.¹⁵⁰ proposed European strategy for data¹⁵¹ to create EU single market for data.

Differential Privacy

The idea of Differential Privacy was first introduced in 2006 by terming it “calibrating noise to sensitivity in private data analysis”.¹⁵² This will help protect privacy and at the same time use data for training AI and scaling the RegTech and SupTech capabilities. Differential Privacy is not same as other notions of anonymization.¹⁵³ As also explained “differential privacy is not a tool or technique for privacy protection, but a definition or standard for qualifying and managing privacy risks.”¹⁵⁴ Differential privacy can control the privacy exposure, in contrast to anonymity concepts which cannot. “In settings in which one seeks to analyze data that are distributed among several agencies but cannot be shared among themselves or with a data curator, differential privacy may be implemented with cryptographic techniques, such as secure multiparty computation, for computing over the distributed data. In some cases, integrating differential privacy with cryptographic techniques can yield greater accuracy at the same level of privacy.”¹⁵⁵

In simple words¹⁵⁶ Jesper explained that Differential Privacy introduces noise into data to prevent leaks. This technique though debatable few months ago, is now being used at an unprecedented level to fight the COVID-19 pandemic as mentioned in EU’s COVID-19 toolbox published in April 2020 giving several examples of anonymized data use for contact tracing and .¹⁵⁷ There is a fear that once governments get a feel of this powerful technology to keep a track on movements of its citizen, they will continue to use it and at this stage there is not enough research as to whether or not this can lead to violation of personal data. Successful use of Differential Privacy can boost the use of quality data for training AI.

¹⁵⁰ Financial Supervisory Authority, 'Financial Supervisory Authority And Financial Intelligence Unit Sign Memorandum Of Understanding' (2020) <<https://www.finanssivalvonta.fi/en/publications-and-press-releases/news-releases/2020/financial-supervisory-authority-and-financial-intelligence-unit-sign-memorandum-of-understanding/>> accessed 4 May 2020.

¹⁵¹ European Commission, 'A European Strategy For Data' (European Commission 2020).

¹⁵² Dwork, Cynthia 'Calibrating Noise to Sensitivity in Private Data Analysis' Lecture Notes in Computer Science, Vol. 3876, P. 265-284. (2006)

¹⁵³ Nissim, Kobbi and Wood, Alexandra, Is Privacy Privacy? (September 21, 2018). 376 Phil. Trans. R. Soc. A 20170358 (2018); Berkman Klein Center Research Publication No. 2018-5. Available at SSRN.

¹⁵⁴ Ibid

¹⁵⁵ Supra note 70

¹⁵⁶ Google, 2020. Helping Developers And Organizations Use Differential Privacy. [video] Available at: <<https://www.youtube.com/watch?v=FfAdemDkLsc&feature=youtu.be&hl=en>> [Accessed 7 May 2020].

¹⁵⁷ eHealth Network, EU ‘ Mobile applications to support contact tracing in the EU’s fight against COVID-19 Common EU Toolbox for Member States’ (2020) Available at <https://ec.europa.eu/health/sites/health/files/ehealth/docs/covid-19_apps_en.pdf> accessed on 01.05.2020

However, Differential Privacy is not one-size-fits-all product. It needs to carefully tune noise in data output to prevent data leakage.¹⁵⁸ A successful use case of differential privacy is shown all the way from USA where the Census bureau adopted differential privacy to solve some identified issues and was able to resolve those issues for 2020 census.¹⁵⁹

In its recent EU Data Strategy¹⁶⁰, the commission admits that data availability from both public and private sectors is one of the issues that need attention and fresh approach. Changes have already been made in Open Data Directive to enable use of public data for public good. The Strategy will be discussed further in next chapter and helps address some of the issues that were unanswered at the start of this thesis.

¹⁵⁸ Giovanni Buttarelli, 'Inviting New Perspectives In Data Protection' European Data Protection Supervisor (2019). <https://edps.europa.eu/press-publications/press-news/blog/inviting-new-perspectives-data-protection_en> accessed 29 April 2020.

¹⁵⁹ Abowed, John M. 'Staring Down the Database Reconstruction Theorem' U.S. Census Bureau (2019) <<https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/4/7616/files/2019/04/2019-02-16-Abowd-AAAS-Slides-Saturday-330-500-session-FINAL-as-delivered-1iqsdg2.pdf>> accessed on 02.05.2020.

¹⁶⁰ Ibid 10.

Chapter 5: Regulatory Landscape: Challenges and Solutions for AI Deployment

A. Regulation of AI

This chapter will focus on the challenges that threaten to diminish the ability of AI due to their critical role in AI's efficient and continued use.

While the topic of this thesis studies the use of technology and specifically AI in regulatory compliance and supervision, it is indispensable to study the regulation of AI and the elements that affect its effective growth and development so that it can carry out its tasks with required efficiency.

EU has high potential to benefit from AI, not only as user but also as creator of the technology. Finland alone has excellent standing in AI literacy and innovation. However, given the drawbacks identified at current life cycle of AI, it is important that its usage is regulated, and its responsibility assigned. AI is not at a stage where it can perform beyond human capacity¹⁶¹ neither it is at a stage where it can perform independent of human intervention or beyond the data provided to train it. At the least, it will need humans to feed it data and to review its output. Jesper¹⁶² gave the example of false negative in a credit application and asserted the need of provision to raise a red flag.

Jesper¹⁶³ added that AI users “need risk-based approach for everything in AI.” According to a White Paper by European Commission on AI, “AI is one of the most important applications of the data economy”. The report also says that to be able to use AI to its full potential and create level playing field in the single market, a unified regulative framework is essential. It opines that legal fragmentation or provisions at national level will reduce the trust in AI and become an impediment to growth of “dynamic European Industry.”

AI Strategy for EU

The EU Commission published a communication¹⁶⁴ asserting key requirements for an EU AI strategy:

- a) Human agency and oversight: AI enabled services should provide stakeholders ability to make better, more informed choices in their tasks. Such AI systems should

¹⁶¹ Guest speaker in AI and Law class at University of Helsinki, 22.02.2019

¹⁶² Ibid 36.

¹⁶³ Ibid

¹⁶⁴ European Commission, COM(2019) 168, ‘Building Trust In Human-Centric Artificial Intelligence.’ (2019)

contribute to a flourishing and equitable society by strengthening human capabilities and fundamental rights, and not affect human capacity negatively. The general wellbeing of the user should be central to the system's functionality.

b) Technical robustness and safety: AI should be reliable enough to address all faults and errors that creep in during the deployment and be able to self-resolve such issues. AI algorithms need to be built with a margin for error.

c) Privacy and data governance: Privacy and data protection should be built in in AI. Alternative data sources such as meta data can be exploited to infer a lot of sensitive information about individuals, such as, sexual orientation, religious or political views. Data used for AI algorithms should not be capable of exploiting such information and it seems that at this point differential privacy can be used to anonymize the data and still be able to infer useful non-personal information of a large set of people to draw conclusions.

d) Transparency: the strategy expounds on how the black box problem of AI must be dealt with and it should be possible to trace the process of decision making by AI by tracing the process of data gathering and labelling, and explanation the algorithm applied while producing the result. The strategy also suggests that the decisions should be explainable, and stakeholders should know about them being automatic, just as required under GDPR Article 22.

e) Diversity, non-discrimination and fairness: This part of the strategy addresses the problem of bias in AI that we discussed earlier. The strategy suggests that data teams should try to curb bias in AI algorithms by creative separate design teams and ensuring participation of various stakeholders and citizens to address bias.

f) Accountability: this part is already adopted in some jurisdictions to create accountability within the organizations and teams while building AI. As Jesper said¹⁶⁵ Processes such as centres of excellence within different institutions can help ensure that all who deal with AI are well trained and sensitized on these guidelines. The strategy paper also mandates that the AI process should be auditable, and accountability should extend to before and after AI deployment. Impact assessments must be done to minimise inadvertent negative impacts of AI.

¹⁶⁵ Jesper, Ibid 10.

B. Regulatory Challenges and Solutions

Various attempts have been made over short and long term to enable the existing financial infrastructure to meet the increasing regulatory demands through innovation as well as regulation.

a) Regulations for Big Data & Advanced Analytics

Banks use their own core banking data to train their systems, instead of the usual social media and networks big data. This, because banks are concerned about the accuracy of such data in terms of financial behavior. Banking data cannot be effectively utilized unless measures are taken to ensure the protection of personal data. For AI to train on banking data, it is important that the data is anonymized. The European Bank Authority (EBA) published a report on Big Data & Advance Analysis ('BD&AA') in the banking sector in January 2020.¹⁶⁶ The report identifies key pillars or compliance for institutions before use of BD&AA, such as data management for the control and security of data, technological Infrastructure, appropriate organization and governance structures and analytics methodology for adoption of advanced analytics solution.

Trust is the biggest concern while using big data for advance analysis through AI and its use at institutional level increases the exposure of breach of trust of sources of data To establish trust, institutions should make responsible use of Big Data by adhering to principles of ethics, fairness, traceability, data protection and quality, security and consumer protection. We saw in the last chapter that the foregoing approach is affirmed in the ECs White Paper on AI.¹⁶⁷ However, while the White Paper provides framework for regulating AI, there is still scope to focus on data management for AI training and development.

Data is indispensable for a functional AI model for both RegTech and SupTech. The better the data, the better the result. For banks, Fintech and supervisory authorities, data processing is indispensable to identify fraud and money laundering patterns and personalize customer experience. Considering the restrictions under GDPR on use of personal data, it is not possible to train AI on data that has been obtained by consent, especially for smaller organizations which are not Facebook or Google. The solution then is to use anonymized data to train AI and then draw conclusions from a large set of data.

¹⁶⁶ European Banking Authority, 'BIG DATA AND ADVANCED ANALYTICS' (European Banking Authority 2020) <https://eba.europa.eu/file/609786/download?token=Mwkt_BzI> accessed 5 May 2020.

¹⁶⁷ European Commission, 'Artificial Intelligence - A European Approach to Excellence And Trust' (European Commission 2020)

b) Regulatory Sandbox

In addition to the earlier discussed Innovation Hubs¹⁶⁸ established by FSAs to guide Fintech firms in terms of regulations, ‘Regulatory Sandboxes’ are another initiative taken by Supervisory authorities to create additional measures to overcome regulatory barriers. This method of “regulatory ‘sandboxes’ has already been adopted in has been adopted in Australia, Hong Kong, Malaysia, Singapore, the United Arab Emirates, and the United Kingdom.¹⁶⁹ provide financial institutions and non-financial firms with a controlled space in which they can test innovative FinTech solutions with the support of an authority for a limited period of time, allowing them to validate and test their business model in a safe environment.”¹⁷⁰ It is created as a regulatory barrier is the ‘regulatory sandbox’ approach, which has been adopted in Australia, Hong Kong, Malaysia, Singapore, the United Arab Emirates, and the United Kingdom. In 2018 the Commission released a plan for strengthening FinTech in EU by directing each state to find a unified way to regulate and supervise FinTech and guide them¹⁷¹. This requirement has not been well received by the FSAs or responsible authorities who believe that it is out of the scope of their mandate.

One answer in response to the previously discussed issue of increasing amount of regulatory burden has been to build black box risk models in institutional silos. It involves financial institutions conducting risk exposure analysis in hypothetical settings to validate results. However, regulations require transparency and explainability and the silo approach cannot fulfil that criteria. In January 2019, the European Supervisory Authorities (ESAs) published a joint report of innovation facilitators. It gives a comparative report of innovation facilitators established in EU. Giving out best practices for design and operation of innovation facilitators it advised to maintain unified approach in EU during the designing and innovation of , to also provide transparency in regulatory and supervisory policies for the benefit of innovators and help them approach various national authorities such as Consumer Protection Authorities from

¹⁶⁸ See EBA/DP/2017/02 ‘Discussion Paper on the EBA's approach to financial technology (FinTech)’ European Banking Authority (2017) — ‘Innovation hub’ means an institutional arrangement where regulated or unregulated entities (i.e. unauthorised firms) engage with the competent authority to discuss FinTech-related issues (share information and views, etc.) and seek clarification on the conformity of business models with the regulatory framework or on regulatory/licensing requirements (i.e. individual guidance to a firm on the interpretation of applicable rules).

¹⁶⁹ Ingle, Laurence, Why Build a Sandbox on a Beach? An Analysis of Fintech Regulation in New Zealand Victoria University of Wellington Legal Research Paper, Student/Alumni Paper No. 27/2018. (April 4, 2018).

¹⁷⁰ Ibid 171

¹⁷¹ European Commission, n.d. Fintech Action Plan: For A More Competitive and Innovative European Financial Sector. (2018)

same platform..¹⁷² Expert Group on Regulatory Obstacles to Financial Innovation (ROFIEG) in its report dated 13 December 2019 to the European Commission recommended that to maintain a level playing field EU-level facilitation, including ‘the sandbox’ The Commission and the ESAs should further assess the need to establish an EU-level ‘regulatory sandbox’, or similar scheme, taking account of the experience acquired in the context of European Forum for Innovation Facilitators.

c) *Proposed European strategy for data¹⁷³ to create EU single market for data.*

Before we analyse the European Strategy for Data released in February 2020, we must note the challenges posed by current Data Regulation (GDPR) in the ways of innovation. Article 5 of GDPR restricts the collection and use of collected data for declared purpose only, in turn limiting the institutions ability to innovate with the data, thus becoming a major hurdle in development of AI driven solutions. AI benefits and improves only when it is trained on large sets of data, since not all the data is useful for training AI. Restrictions on such data availability affect the pace of innovation.

The data strategy document admits in stated ‘problems’ that EU is held back due to several issues one of which being the availability of data. The document acknowledges the importance of availability and sharing of good quality data within EU. It identifies BigTech firms as creating imbalance in data market by holding large amount of data, amongst few players. It also mentions that lack of EU based cloud operators as one of the issues that does not let EU achieve its potential. As stated by Jesper¹⁷⁴, one of the biggest problems faced by Banks is legacy data that oftentimes cannot be used due to lack of interoperability and bad quality. This drawback is also confirmed in the Data Strategy. After acknowledging these problems and discussing them at length, the Data Strategy document proceeds to lay-out the future and strategy to further its goal of overcoming these obstacles and “acquiring a leading role in the data economy.” The Commission further intends to bring later this year a “Digital Services Act to improve the functioning of the Single Market”¹⁷⁵ that intends to regulate online platforms and lists following protections in AI use:

¹⁷² European Banking Authority, ‘Esas Publish Joint Report on Regulatory Sandboxes And Innovation Hubs. (2019)

¹⁷³ EU Data Strategy Ibid 10

¹⁷⁴ Jesper, Ibid 34

¹⁷⁵ Alex Agius Saliba, 'Digital Services Act: Improving The Functioning Of The Single Market' (European Parliament 2020) <https://www.europarl.europa.eu/doceo/document/IMCO-PR-648474_EN.pdf> accessed 2 May 2020.

“Artificial Intelligence and machine learning - The revised provisions should: “establish comprehensive rules on non-discrimination, transparency, oversight and risk assessment of algorithms for AI-driven services in order to ensure a higher level of consumer protection; establish clear accountability, liability and redress mechanisms to deal with potential harms resulting from the use of AI applications and machine learning tools; establish the principle of safety and security by default.”

In Q4 2020, the Commission commits to propose a governance framework for access and sharing of data. Like the AI strategy, there will be special categories that will invite more focus, such as finance, health and production. It will also make framework for cross-border data transfer and standardisations to facilitate interoperability. A Data Act in this regard may then be brought in 2021 to facilitate B2B and Business to government data sharing. Whether or not these new policies will achieve the policy aim of acquiring a leading role for EU is hard to say, one is hard pressed to believe that EU can challenge the already strong position of BigTech firms. It might appear that by making access to data compulsory in specific fields, the EU is trying to do through Data Strategy, what it could not do under Competition laws.¹⁷⁶ It will become clear once further developments in governance is made in coming months. As also discussed in one Competition commission policy for digital era published in 2019 “The significance of data and data access for competition will thus always depend on an analysis of the specificities of a given market, the type of data, and data usage in a given case” and “More demanding regimes of data access, including data interoperability, can be imposed (i) by way of sector-specific regulation”¹⁷⁷

The Digital Rights Ireland¹⁷⁸ and Tele2 Sverige¹⁷⁹ cases come to mind where the European Court of Justice time and again decided against data retention and access to data beyond its purpose. The full circle now to future Data policies also indicates the overarching activism of ECJ in overruling the political will of the legislator regarding Data retention and access. As in

¹⁷⁶ Kimberley Botwright and Aditi Sara Verghese, 'How The New EU Data Strategy Could Affect Trade And Competition' (*World Economic Forum*, 2020) <<https://www.weforum.org/agenda/2020/02/eu-data-strategy-global-trade-competition/>> accessed 29 April 2020.

¹⁷⁷ Jacques Crémer, Yves-Alexandre De Montjoye and Heike Schweitzer, 'Competition Policy For The Digital Era' (European Commission 2019) <<https://ec.europa.eu/competition/publications/reports/kd0419345enn.pdf>> accessed 28 April 2020. <https://ec.europa.eu/competition/publications/reports/kd0419345enn.pdf>

¹⁷⁸ Joined Cases C-293/12 and 594/12 Digital Rights Ireland and Seitlinger and Others

¹⁷⁹ Joined Cases C-203/15 and C-698/15 - Tele2 Sverige v Post- och telestyrelsen

GDPR, cross-border transfer of data will also have to be smooth under the Data Strategy once the rules are followed. Nevertheless, all these steps are essential for unencumbered development of AI in EU through readily available data that complies with privacy laws. As the Covid-19 pandemic has shown, the future lies with digitalisation and digitalisation is propelled by good and efficient AI.

C. EU Policies to strengthen Digital Finance

The role of AI is interconnected to the removal of regulatory barriers in innovation of financial services and expansion. EU has made progress in policymaking even in recent times despite the Covid-19 pandemic assaulting its major economies. The FinTech and Digitization strategies are being discussed along with pandemic related priorities.

FinTech Action plan was first introduced in March 2018. In December 2019 European expert group (ROFIEG) consisting of industry experts, published a report providing 30 recommendations to the European Commission on how to build a favourable environment for technology-enabled financial services in the EU. Following the report, the Commission published an ambitious communication shaping digital future in February 2020 which lists many 5 year plans, most starting in 2020, few in 2021.¹⁸⁰ The Communication lists 29 key actions under the communication and the most relevant for this thesis are a white paper on AI, Data strategy, building joint digital capacities in DARQ, establishing a joint Cybersecurity Unit, digital education and skills development and Digital Finance Strategy. The initiative towards a vision of Digital Finance in EU is the plan for which a consultation paper was launched in April 2020, and which follows the goals set-out in the FinTech Action Plan. The FinTech action plan set the groundwork by stating that “The European Commission will set up an expert group to assess, whether there are unjustified regulatory obstacles to financial innovation in the financial services regulatory framework”.¹⁸¹ Before we discuss further, it is important to note that these are strategies and consultations, which may turn into laws and policies in coming months.

Digital Finance Strategy Consultation Paper ('DFS Paper') by the Commission in 2020¹⁸² invites stakeholders ‘views to form Digital Finance Strategy/FinTech Action Plan to be adopted in Q3 2020. The plan will influence public policy in digital finance for next five years.

¹⁸⁰ European Commission, Communication on ‘Shaping Europe’s Digital Future’. (2020)

¹⁸¹ Ibid. 174

¹⁸² https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/2020-digital-finance-strategy-consultation-document_en.pdf

According to the document, Digitalisation of finance sector can be expected to accelerate because of the COVID-19 pandemic due to increased reliance on remote services. As part of its focus on digitalisation in Financial industry, the document acknowledges the role of AI in its introduction.

The DFS paper is divided in three sections and the first section invites suggestions on ways to ensure that the regulatory framework in financial services is technology neutral and innovation friendly. This is a welcome step from the commission and the need of the hour as well. Change in policy is the only way to improve EUs chances of competing with other global leaders in FinTech and BigTech, the second part of the document invites suggestions on ways to remove regulatory fragmentation across European Single Market (ESMA). This has been discussed in previous chapters and is one of the reasons why AI is important in Regulatory compliance to keep track of different requirements in different jurisdictions. The third and final section of the document is most relevant to this thesis as it invites suggestions on how to best promote a well-regulated data-driven financial industry. In this section the paper admits that financial institutions can benefit from AI's ability to make better predictions and save costs by avoiding risks. It is also to be noted that when financial services are enabled by AI, its use by consumers can help train the AI to improve further and such improved AI can be used to predict risks and apply solutions.¹⁸³

In its third section the document refers to the advantages of computer storage making data storage in large amounts possible, which leads to sophisticated AI applications trained on this data. The section then poses a question about what can be done in addition to the proposals already made in Digital Strategy and within the document. As data is critical to development of AI, this thesis advances a suggestion in response to that question, that EU needs to develop its own Cloud for large and secure data storage. All except one of the top 10 cloud service providers are from the USA e.g. Amazon, Microsoft, Google etc.¹⁸⁴ Though EU has decided to enter the race in the last leg, it can still use this opportunity to become self-sufficient for its data infrastructure and secure its values and concerns within GDPR. EU aims to become a leader in AI as is stated in its AI strategy, then EU must promote its own cloud service so that it can be

¹⁸³ European Commission, 'Consultation on A New Digital Finance Strategy For Europe / Fintech Action Plan' (European Commission).

¹⁸⁴ Larry Dignan, 'Top Cloud Providers In 2020: AWS, Microsoft Azure, And Google Cloud, Hybrid, Saas Players | Zdnet' (*ZDNet*, 2020) <<https://www.zdnet.com/article/the-top-cloud-providers-of-2020-aws-microsoft-azure-google-cloud-hybrid-saas/>> accessed 13 May 2020.

self-sufficient in terms of data, in absence of that, all EU data is being secured with US companies. The European Cloud Initiative¹⁸⁵ released in December 2019 by the Commission is a right step in this direction and its adoption and implementation needs to accelerate along with all the new strategies on digitalisation and technological innovations.

In addition, the document addresses the need to provide access to publicly available data in finance by involving it in the discussion. As discussed in foregoing chapters, finance data is crucial to training AI and making more sophisticated predictions of financial behaviour of customers as well as regulators. The document contains a total of 6 AI related questions. Question 37 enquires about the regulatory issues faced while adopting AI, 38 invites suggestions of promising areas of AI use and benefits in financial industry, 39 lists lack of legal clarity in horizontal (GDPR) and sectoral (PSD2) EU rules, lack of skills, lack of supervisory understanding as main challenges to AI adoption by financial institutions. It also lists lack of expertise, lack of explainability, lack of coordinated approach at EU level and bias in decision making as challenges of AI adoption by supervisory authorities. As suggestion to these challenges, the document gives options of new EU wide AI horizontal and sectoral rules, guidance, certification and auditing of AI systems, and access to AI systems for FSAs.

The document moves on to inform about existing measures being taken by the Commission to develop a supervisory reporting fit for the future. The commission is mapping the gaps between supervisory policies, definitions and reporting liabilities in financial services across all states and identifying areas for further standardisation. This approach will help the natural language processing and machine learning to develop AI further and streamline the processes to remove fragmentation. In its questions to stakeholders, the document asks if amongst other challenges, lack of real time data is a challenge too. It is crucial to make provision of real-time data for both RegTech and SupTech is pivotal in setting the post AI regulatory regime apart from its predecessor.

The new policies may mean that the existing local and global AI players in AI will have to revisit their processes to ensure compliance with EU policies and retrain AI. It remains to be seen whether this will affect the market size and drive-off companies to more relaxed governance markets.

¹⁸⁵ European Commission. The European Cloud Initiative - Shaping Europe'S Digital Future - European Commission. (2019)

Delayed spur in policy reform fill the innovation deficit in EU? While these strategies and policies for digital finance in EU aim to facilitate the unencumbered growth of financial services driven by new technologies including AI, there is no denying that they have a challenging task at hand in catching up their regulations with fast changing technology, filling regulatory gaps and levelling a largely fragmented market. The fact that FinTech scene in EU has been growing ever since the financial crisis of 2008 and the first FinTech plan came only in 2018 shows the speed of regulatory agility in EU. Klarna, N26, TransferWise, Revolut, and Monzo are one of the few FinTech from EU that are doing well globally. Suffice it to say that the regulatory environment did not create a fertile landscape for FinTech to flourish when it was flourishing in Asia and USA.

In addition to regulation, cooperation at leadership level is another key factor to allow AI to take its course in changing the digital landscape in finance. The single most important element for the development of AI is data. Data that respects European values of data protection and consent. For effective regulation of FinTech and development of AI, it is crucial that data is shared without any undue internal barriers to data sharing and data transfer. The barriers in this area have caused stagnation in innovation in EU in financial services. Therefore, a resolve at EU and state leadership level to scaleup and propel the innovation in financial services with help of AI is what should be the top strategy priority during 2020 for the EU. This becomes even more relevant in view of the rising global competition in financial services and BigTech from abroad becoming key players, as any barriers to innovation can tip the markets in their favour before long.

The DFS is conspicuously silent on BigTech and other global players in FinTech and how their participation in EU market will be regulated. One can only assume that by focusing all the recent policies on making EU a digital power to reckon with, the Commission is trying to sideline the global players or at least their regulation is not a priority. Seeing how EU laws can have impact on global players who wish to provide services in EU, this strategy remodelling may have a negative impact on outside players wanting to expand and this can again create barriers in excess to good data for developing AI. Nevertheless, the strategies that the Commission will eventually adopt for Finance, AI, Payments and Data. will have far reaching extra-territorial implications on key players in FinTech, BigTech as well as incumbents such as Banks, for e.g. The AI strategy's scope is expanded to "all relevant economic operators"

The pace of policy making, implementation, rectifications needed based on feedback and then further provisions need a long time to actualise the Digital Finance vision e.g. API developers and ‘Strong Customer Authentication’ under PSD2 needed Regulatory Technical Specification (RTS) to specify the technicalities. RTS was to be implemented in September 2019 but has been postponed due to missing market readiness, this leaves a gap of over 2 years so far when all PSD2 directives could be implemented. Considering the larger scale of reforms planned under Data and Digital Finance Strategy, it is likely that from planning to adoption to execution it will still take a long time to show results, and meanwhile technological innovations in Asia and America will be further ahead.

D. Regulatory Solutions

While AI can do human work many times faster and more efficiently, it’s not free from its own challenges.

Strong Customer Authentication: The EUs Whitepaper requires Adequate safeguards for use of AI in Biometric Identification. Banks have had to analyse options to replace password protection with an option that would be more secure and convenient. The PSD2 mandates financial institutions to adopt “strong customer authentication”, which is ‘something you have’, ‘something you know’ and ‘something you are’, which could be translated as the customer’s device, the PIN number and their biometric identity. In September 2019 the timeline to implement “strong customer authentication” expired without the financial industry being able to implement it. The deadline has now been extended to the end of 2020.¹⁸⁶ While the industry prepares to implement biometric identification in financial transactions, there is a growing dark web trade in personal data, which is already threatening the move from knowledge based authentication to more modern controls such as face or iris recognition.¹⁸⁷ Deepfakes utilise this illegal data to breach biometric security.

When it comes to AI, where there is some or full automation of process from data gathering to decision making, the need for human oversight will become even more pressing. The case of Knight Capital from back in 2012 serves to illustrate this risk, with their stock trading automation through algorithms resulting in a loss of \$440 million in the space of just 45

¹⁸⁶ 'EBA Publishes Opinion On The Deadline And Process For Completing The Migration To Strong Customer Authentication (SCA) For E-Commerce Card-Based Payment Transactions - European Banking Authority' (*European Banking Authority*, 2019)

¹⁸⁷ Chris Burt, 'Digital Identity: Biometrics, Deepfakes, Cybersecurity And Decentralized ID - Fintech News' (*Fintech News*, 2020) <<https://www.fintechnews.org/digital-identity-biometrics-deepfakes-cybersecurity-and-decentralized-id/>> accessed 10 May 2020.

minutes⁵.¹⁸⁸ The more sophisticated AI becomes, the less likely it is to repeat the traditional risks associated to it, especially with the amount of auditing and safeguards provided for under the new AI strategy. However, we have to remember that we know little about black box related issues in AI as well as cyber risks. As AI starts to automate lending and credit risk decisions it will be imperative to ensure that such risks can be controlled before handing over control. Another challenge with AI driven biometric authentication is its limitations in identifying different demographic groups. A study report from December 2019 found that with some variations, most face recognition algorithms' ability to match two images of the same person varies from one demographic group to another. According to this study women and people of African and Asian origin are more likely to be misidentified by the face¹⁸⁹

Technology developers have to be extra careful when developing technology for biometric identification that it is secure against misuse. Microsoft can be a leading example of developing ethical and secure AI.¹⁹⁰ One significant example can be Microsoft backed US state legislation for proper use of facial recognition technology that will come into effect in 2021.¹⁹¹ While the EU was until January 2020 planning to ban the technology, it has been silent about it in its AI strategy published in March 2020.

Ecosystem of Excellence

We discussed earlier how Black box decision making, bias in decision making and lack of trained scientists are the biggest challenges with using AI. The chapter also discussed how these challenges are addressed by the First pillar of European Commission's White paper on AI. The "ecosystem of excellence" focuses on centres of AI excellence for R&D and trainings to resolve these issues. The second pillar of the EC's strategy for future of AI is an "ecosystem of trust" and focuses on regulatory framework for AI to make AI fairer and more reliable. The requirements under the proposed regulatory framework¹⁹² provide the following steps:

¹⁸⁸ Henrico Dolfing, 'Case Study 4: The \$440 Million Software Error At Knight Capital' <<https://www.henricodolfing.com/2019/06/project-failure-case-study-knight-capital.html>> accessed 2 May 2020.

<https://www.henricodolfing.com/2019/06/project-failure-case-study-knight-capital.html>

¹⁸⁹ 'NIST Study Evaluates Effects Of Race, Age, Sex On Face Recognition Software' (NIST, 2019) <<https://www.nist.gov/news-events/news/2019/12/nist-study-evaluates-effects-race-age-sex-face-recognition-software>> accessed 4 May 2020.

¹⁹⁰ Microsoft, 'Responsible AI Principles From Microsoft.' [online] Available at: <<https://www.microsoft.com/en-us/ai/responsible-ai?activetab=pivot1:primaryr6>> [Accessed 9 May 2020].

¹⁹¹ Ryan Tracy, 'Washington State Oks Facial Recognition Law Seen As National Model' (WSJ, 2020) <<https://www.wsj.com/articles/washington-state-oks-facial-recognition-law-seen-as-national-model-11585686897>> accessed 4 May 2020.

¹⁹² Bruni, Federico, 'The Future of AI in Europe' [online] <<https://mc.ai/the-future-of-ai-regulation-in-europe/>> accessed 4 May 2020.

- a) Since bias in AI decisions is caused by data, the data that is used to train AI should follow the EU laws and principles. It should be broad enough to avoid any risks of leakage of personal or sensitive information.
- b) Auditing of high-risk AI systems on the same footing as for example the competition regulators.¹⁹³
- c) Awareness of affected parties wherever AI is involved; and
- d) The requirement to make AI framework ‘robust and accurate’ is again a high and long-term expectation. Much more detailed roadmap will need to be in place to arrive at this destination starting with what is expected from ‘robust and accurate’.
- e) Human oversight is one issue of AI decision making that is widely debated but recently a consensus seems to have emerged when members of European Parliament passed a resolution to that effect¹⁹⁴. Human oversight is critical either before or after the AI process. Jesper¹⁹⁵ also agreed with this requirement when he said that “everyone working with AI needs to be trained in AI”. This approach of training will not only ensure oversight but also ensure that education in AI is started right from deployment.

The Commission has taken some much needed steps in this direction in its recent consultation on Digital Finance Consultation Strategy published in April 2020¹⁹⁶, with a view to take the previous Fintech Action Plan further and take into consideration all the recent market and technological developments that are making an impact on the financial industry. The Commission has asked stakeholders to respond to its survey by answering if the use of AI for financial services is limited due to obstacles stemming from the EU financial services regulatory framework or other EU level regulatory requirements that also apply to financial services providers?¹⁹⁷

¹⁹³ Ibid.

¹⁹⁴ European Parliament ‘ Draft motion for a Resolution on Automated decision making processes: Ensuring Consumer Protection, and free movement of good and services’. (January 2020)

¹⁹⁵ Jesper, Ibid 34.

¹⁹⁶ European Commission, 'Consultation On A New Digital Finance Strategy For Europe / Fintech Action Plan' (European Commission).

¹⁹⁷ Ibid

Chapter 6. Conclusion

In post-Covid19 pandemic era, all technologies and their use are scaling up. Artificial Intelligence is poised to continue to expand its reach further and deeper in financial industry this year, however with the onslaught of consequences of the pandemic, now more than ever financial institutions and financial supervisory authorities need the abilities of AI to make the tasks related to regulatory compliances fast, systematic, reliable and economical. The regulatory reform that started in EU with the financial crisis in 2008 is further deepened with the innovation in financial services and technology use globally. If financial institutions want to avoid the regulatory fines, they must be ready to scale up in regulatory compliance frameworks to harness the potential of AI. We have seen through the foregoing discussion that an Avant Garde EU is all set to provide required regulatory and infrastructural support to accelerate the pace of innovation in AI and other technological innovations to support supervisory authorities and financial institutions in their efforts to stay compliant. Although it has entered a little late in the game of technological innovations and AI deployment, making changes at policy level and accelerating the speed of adoption and innovation are few steps in the right direction. The upcoming EU policies, strategies and discussions

As the first problem was about the current role and future scope of AI, the second chapter discussed how regulatory compliances and fragmentation in governance of Fintech within EU have become a catalyst to AI deployment in day-to-day tasks of financial institutions. The chapter identifies many challenges, first, with the expansion of technology driven services and enrolment of more and more people and globalisation of businesses causes more and more data to be generated, which is quite impossible to process and leverage for future predictions and improvement by manual resources. Further adding to this, are the current regulatory complexities and cumbersome compliances under various governance frameworks for financial institutions discussed under the second chapter. Regulatory fragmentation creates a divide between the compliances for banks and for various services covered under Fintech, which leads to banks being overburdened and not being as agile as Fintech in their activities. This fragmentation can be resolved with activism of legislators and AI so that Fintech are playing on same fields as banks and no activity is left unregulated.

The second problem examined the challenges faced in the regulatory compliance and supervision of financial industry while using AI as the solution to their problems. To identify the challenges, the third chapter first identified that existing compliances such as AML, Credit

Scoring, Payment Services and Data Protection are already benefitting from AI in the form of credit scoring algorithms, fraud detection and analytics to examine behaviour and AML activities etc. While on one hand, AI helps make compliance smart by deploying algorithms and ML, on the other hand, AI is also used to ease the administrative side of handling compliances within financial institutions as well as supervisory authorities (FSAs). As discovered during the interview with Hanna and Jesper¹⁹⁸ institutions and FSAs are already using AI to process their compliance related tasks such as reporting and processing large amount of data. This use of technology to perform compliance tasks in financial institutions and Fintech is popularly known as RegTech and for supervision by FSAs, its called SupTech. Both these technologies employ AI and are critical in today's time when pandemic has taken the priorities of financial institutions away from compliances to more critical survival tasks of loan defaults etc.

While the foregoing benefits paint a rosy picture of AI led revolution in regulatory compliance, the challenges within AI and the limitations of regulatory frameworks concerning AI can slow the scaling up of AI deployment in financial institutions. Which brings us to the second problem of this thesis to discuss the challenges in AI deployment. Chapter 4 discusses the technical challenges that threaten successful scaling up of AI such as black box decision making and resultant bias that cannot be identified during the process of decision making due to the black box. Many solutions are discussed to deal with this problem such as weeding out bias and using large sets of data etc. One solution that stands out is data ethnography, which means knowing the origin of data and the way it was collected. Representative data sets ensure that no group of sources is left out to ensure even sampling. Further, problems identified by both Hanna and Jesper are lack of trained resources. Cyber security has followed the scale of innovation and the cyber risks keep increasing with innovation.

It is found during recent research that EU is taking steps through its ambitious policy announcements towards its Digital Europe Programme which includes policies covering AI, Data, Cloud, Finance, Payments to mention few. The AI strategy proposes expansive plans to train resources in AI and establish center of excellence across EU. It confirms that automation of compliance process would not mean complete removal of human role. Humans will need to perform 3 important tasks¹⁹⁹ i.e. training the AI, explaining the outcome and sustaining the AI

¹⁹⁸ See Annexes A & B.

¹⁹⁹ H. James Wilson and Paul R. Daugherty, 'How Humans and AI Are Working Together In 1,500 Companies' (*Harvard Business Review*, 2018)

for its day to day functioning. Humans will also be responsible for the decisions, which can conversely have negative effect on its deployment if executives shied away from liability. The third and final question of the thesis deals with the changing regulatory landscape in EU vis-à-vis AI and its suitability for AI deployment in future. The foregoing discussion on these recent changes show that the regulatory landscape has a long road ahead full of yet larger reforms. Had EU done the slow pace progress done in the technological innovation across geographies like Asia and America, it wouldn't have to usher in such large number of reforms that will further create onerous compliance and perpetuate regulatory uncertainty. There are of course positive impacts expected but the road to it is going to be one rough ride.

The thesis gives an overall picture of links that connect the many elements involved in regulatory compliance and supervision landscape. These links can be leveraged to create a web of integrated compliance by design in various products of financial institutions. NLP is a great tool that can enable documents read and interpret digital laws and policies so that there is no gap in information and reporting. Seamless infrastructure through technological innovations can ensure that compliance by design fulfils all requirements and stays upto date with them, and why not predict them as well. Electronic Reporting Forms and NLP are a good example combination that can further reduce human role in compliance and supervision. The steps to deploy compliance-by-design are a topic for another discussion, however before it can be tested, the proposed regulatory frameworks need to be adopted and tested to create a ready field for AI to innovate further and deeper into compliance.

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Appendix A: Interview of Hanna Heiskanen, Senior Digitalisation Specialist, Finnish Financial Supervisory Authority' on 10.03.2020 and 11.03.2020

Name1 response

Hanna Heiskanen

Role and Office1 response

FIN-FSA

Is there need of employing AI (not only automation) by supervisory authorities (SAs)(SupTech) in financial industry (Banks, Fintech etc.)? if yes, why? eg.1 response

- Yes

- The amount of reporting data is simply so large that it cannot be effectively handled manually. Therefore, SupTech is crucial in the collection and analysis of various data that is used for supervisory purposes. AI is needed for the more sophisticated analysis of data

Which technological advancements have most affected the compliance and supervision work in the decade after financial crisis? (e.g. Fintech)1 response

- Increased capabilities to analyse data, i.e. computing power in general

- Advanced analytics and machine learning

How open are SAs in Finland and EU to using AI for supervisory work? On what timeline do you see it actualizing? 5 years or less...? Please refer to any information that might be available online.1 response

- FIN-FSA is already using AI in supervisory work, for example in data sorting. The use is still in early phase, but the aim is to increase the use of robotics and AI in the future

- The SAs in EU are in very different stages in using AI for supervisory work

Can you list any latest examples of use of AI in regulatory compliance and supervision? 1 response

- FIN-FSA is using robotics e.g. in handling notifications that are sent by other SAs. AI is used in sorting data

The use of RegTech by financial industry can be amplified if SAs use SupTech.1 response

Disagree 0

Neutral 1

Agree 0

What can be the biggest challenges of SupTech?1 response

Value

Count

Lack of data to train AI?

0

Value	Count
Reluctance of SAs in EU to share data?	0
Mindsets or slow pace of work	0
Cyber security	0
IT resources an IT budget	1

Successful implementation of RegTech and SupTech can bring about "compliance by design". 1 response

Agree 0

Disagree 0

Hard to say 1

The scope of using automation and artificial intelligence for compliance and supervision related tasks is: 1 response

Equal 0

more for automation and less for AI 1

less for automation and more for AI 0

Hard to say 0

Any other inputs, please mention below. 0 responses

No responses yet for this question.

Follow up queries:

Do I have your consent to quote your answers in my thesis with your name, job and office?

Yes.

Do Supervisory authorities in Nordics share data to train AI?

this is a question that I cannot comment much. We and the Bank of Finland are sharing some open data, which anyone can use. But on the other hand, supervisory data is confidential. So, the answer is yes and no at the same time.

Appendix B - Interview of Jesper Nordström Data & AI Strategist
Master's Thesis Questionnaire

Topic: “Regulatory Compliance in AI Regime: Banks, Fintech and other Financial Services”
by Aparna Calderón, master’s in international business law, University of Helsinki.

Please answer as many questions as you can. There is also space for 'other...' input after every objective type question and in the end of questionnaire, where you can freely provide any information that maybe relevant in your opinion for this thesis topic. Thank you!

* Required

Name *

Jesper

Briefly describe your role in Organization *

Data & AI Strategist

In your knowledge, which laws and technical advancements have most affected banks in past five years and how? (e.g. Fintech and PSD2 impact)

MIFID2, GDPR, PSD2,

Follow up call: Fintech and PSD2 opened up for new competition. We have a lot of activity in data to make sure that we are GDPR compliant and bring all data in one place. All data is not completely synchronized and exists in many places. It might also have different information. GDPR talks interpretability and explain ability for AI. Still working on AI based credit scoring.

In which areas most banks are already using AI and in which areas automation?

Process automation, credit scoring, financial crime, churn prediction, chatbots

Follow up call: These are all examples of AI use, not automation.

What are the current and future projects in banks that aim to utilize AI further and in which areas?

Same as above

Finland's Financial Supervisory Authority says that the organization's board is responsible for decisions made through AI (). What is your opinion on this matter and any challenges? Do you know if other supervisory authorities in EU share this view?

Everyone working with AI needs to be trained in AI risks and responsible AI.

Follow up call: We are working on creating AI for risk catalogue and establishing AI centre of excellence, best practices and framework on how to work with AI. All banks work with risk management, also needs to start incorporating AI best practices in previous risk management rather than incorporating new frameworks.

Big data sharing between banks for training AI - what is the situation in Nordics and EU? Please refer to the "Financial Data Exchange" formed by the likes of JP Morgan, Wells Fargo and American Bank. Could that be replicated in Nordics or EU?

I believe there is cooperation around creating NLP Nordic language models

Follow up call: we were trying to initiate a common language model. Because there is this new thing called BERT neural language architecture, which has proved to be lot better, but since language for small countries need lot of effort, these need to be trained on language, easy in English. Lot of Swedish industry and academia try to gather data.

In your opinion, how can such big data be regulated for AI use?

Not sure.

Follow up call: Differential privacy means creating noise in data to avoid leakage. As of now there is no open source library for doing that.

What role is AI playing and can play in future in regulatory compliance by banks? please differentiate between AI and automation while replying.

AI can e.g. help prevent crime and identify money laundering

In your opinion, would human intervention be always important or necessary in tasks performed by AI? Please add what type of human intervention (supervision, escalation, oversight etc.) and your reasoning.

Depends on use case (e.g. credit vs recommendation engine).

Follow up call: Netflix shows you recommendations based on recommendation engine. Example of human intervention for low risk application. if credit rejection is based on false negative. option to raise red flag in rejection. Need risk based approach for everything in AI.

Would it be correct to say that if Regtech and Suptech are thoroughly implemented by financial institutions and supervisory authorities, compliance could be adopted by-design in future?

Yes

No

Maybe

I don't know

Accenture's Banking Technology Trend Survey 2019 reported that bank executives interviewed believed that amongst all technologies, AI will have highest impact (47%) on their organizations in the next 3 years. Do you agree?

Strongly disagree

Disagree

Neutral

Agree

Strongly agree

Other:

What are some of the biggest challenges of implementing AI in the areas of bank that could benefit from it? Eg. budget, data, slow pace, technology development, regulations, resources, fragmentation of regulations at EU level etc.

Data and technology infrastructure.

Follow up call: Our biggest challenge is has been to setup to necessary infrastructuere. Need tech to train and deploy the deploy. Data is about lot of data in many different places, legacy data. Difficult to extract and hidden in different systems and connect to that data and put it data leak and then data pipeline – source the data from original source to machine learning. Often data maybe low quality. Data access and data quality. hiring data scientist and machine learning. The European approach to AI will need to be underpinned by a strong focus on skills to fill competence shortages. 20

Do you give your consent to quote your answers in my thesis? Can I use your name and title and the name of your organization as source?

Yes

No

Other:

Follow up communication: **Thanks. Last question, is it ok if I quote your responses as "Anonymous, AI expert at a prominent Nordic bank, personal interview, 19.03.2013"? Of course I also have to check with my supervisor how to correctly cite anonymous interviews..**

- Jesper Nordström sent the following message at 11:24 PM
 - My pleasure I think it would be fine to use my name :-)