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How Traditional Financial Institutions have adapted to Artificial Intelligence, Machine Learning and FinTech?

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Abstract *This article analyzes the implications of the financial sector's recent adoption of artificial intelligence (AI) and machine learning (ML). It identifies the advantages of these technologies in terms of fraud protection, cost savings, and efficiency, while also highlighting worries about conventional financial institutions', such as banks, insurance and reinsurance institutions, and inability to compete with Fintech firms. The report contributes to the conversation about the influence of modern technology by distilling and classifying the tools deployed in established conventional institutions that resulted in continual development and simplification of internal procedures as well as client service delivery. Given the increased competition in the financial industry, Fintech businesses are critical for conventional financial institutions to stay afloat in today's changing world. The study is directed at researchers who are still in the early phases of investigating the artificial intelligence field in the financial sector. The study reviews prior research that documents the changes occurring inside financial institutions from a global perspective as a result of Fintech and the integration of new technologies. The goals of the paper are fulfilled by (1) furthering theoretical studies on the issue, (2) increasing awareness of the financial industry's developments, and (3) gathering proof of the influence artificial intelligence and machine learning have had so far.*

Keywords: Financial services, Artificial intelligence, Machine Learning, Fintech, Banks, Financial institutions, Insurance

Introduction

This paper examines some critical concepts and themes for traditional financial service organizations interested in using emerging technologies such as Artificial intelligence and Machine Learning, in order to stay relevant in a world where Fintech businesses have established a foothold in the financial industry as we approach the Fourth Industrial Revolution.

The process of narrowing the gap between Fintech companies (or startups as they are an emerging form of business) and the traditional company frameworks is work in progress. Fintech startup firms are engaged in a process of "disintermediation via innovation" through the use of Artificial intelligence, Machine Learning, Big Data, blockchain technology, Robo-advisors, and the Internet of Everything (Nicoletti, 2017). Traditional financial organizations have the upper hand in providing services tailored to the needs of their customers, as a standard approach would not fit the objectives sought by every customer due to the extensive relationship formed over the years. To further explain, (Navaretti, Calzolari, & Pozzolo, 2017) argue that since large institutions collect data from their consumers on a broad scale over time, some connections develop and certain risks are eliminated, allowing financial institutions to remain flexible to their customers' demands, hence creating certain bundles, to further quote (Boot, 2017) "Economies of scope justify the internalization and bundling of all these key services within the boundaries of one institutions. They provide a core rationale for banks' existence." Technology enables organizations to quickly

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and efficiently tailor the services and conditions they supply; moreover, technology lowered the risks incurred by banks and built a stronger foundation between the firm and its clients as a result of those mitigated risks. However, Fintech companies also strongly rely on Robo-advisors, which offer standard options for clients eager to invest small, but are not developed to fit the needs of clients with the objective to invest big (Nicoletti, 2017). Robo-advisors are platforms that use algorithms to design investing portfolios for customers by automating the planning and decision-making process; this may also include portfolio rebalancing and management services (Abraham, Schmukler, & Tessada, 2019).

The purpose of this paper is to fill a gap in the literature by conducting a review of the most current research on traditional financial institutions and their capacity to adapt in an era of technological innovation. The study is aimed at academics who are just beginning their investigations into the topic of artificial intelligence in the financial industry. The study examines earlier research that demonstrates how financial institutions are changing on a worldwide scale as a consequence of Fintech and the incorporation of new technology and gathers evidence to demonstrate the methods in which conventional banks are keeping their heads above the water in a world where "traditional" methods no longer align with business strategies and models driven by innovation.

Artificial intelligence (AI) and machine learning (ML) are two core advanced technologies that are disrupting the financial service industry. It is transforming how individuals and businesses access and utilize financial services. The domains in which AI may be used to help activity recognition range from decision making to fraud detection (Mahalakshmi, et al., 2021). However in light of this new emerging trend, several studies have already been conducted on how the financial sector has been affected by financial technology (FinTech) and Artificial Intelligence (AI) but none particular to the ways top, global traditional institutions are implementing these technologies using specialized tools to assist in successfully conducting imperative activities to the financial industry.

Additionally, this paper discusses how traditional institutions are attempting to keep up with growing technological demands and to remain competitive in an industry with few barriers to entry for companies that invest heavily in innovation, particularly those specialized in technology, such as BigTech. These tactics are shown via data gathered on financial institutions and their most recent AI and ML developments, as well as those that participate in business incubators, partnerships, and innovation laboratories, obtaining access to sophisticated and innovative solutions.

Literature review

Financial service organizations, such as banks, insurance and reinsurance companies, aim to provide services in a prompt manner with the help of technology. Companies engaged in this sector, in particular, deal with savings, lending, investing, financing, financial markets, and different forms of insurance (Nicoletti, 2017). Noticing any changes in the financial services business, as a result of technology, can be done by observing how banking was formerly conducted "offline," when all activities took place in-person before everything moved online. One example would be the means by which businesses used to provide physical handwritten checks but now electronically transfer their personnel' paychecks. According to the Bill and Melinda Gates Foundation, virtual application users will reach 2 billion in the banking industry alone by 2030. According to Klaus Schwab (2016), founder and executive chairman of the World Forum, the Fourth Industrial

Revolution is a developed on top of the third industrial revolution, in which the digital revolution blurs the boundaries between physical, digital, and biological realms of technology.

According to McKinsey Global Institute (MGI) (Asi et al., 2020), the use of digital channels will increase in order to adapt to customer behavior, the estimated value being 80% of transactions would be digitally executed. However for any of this to be possible, artificial intelligence would be used to prioritize protection against cybercrimes and fraud. Unquestionably, the benefits of emerging technologies are extensive for both customers and financial institutions. Banks that want to become completely virtual will be enabled by open banking and driven by data saved and shared on cloud-based platforms powered by Blockchain technology. Blockchain is a financial technology (FinTech) for decentralized applications (Omar et al., 2020), (Bollaert et al., 2021) (Jarvis and Han, 2021).

Fintech firms are Financial Technology firms that use cutting-edge technologies with the goal of increasing work efficiency and quality via the use of information technology applications. Fintech is often used in conjunction with peer-to-peer (P2P) lending, distributed ledger technology (Blockchain), and third-party payment processing (Acara and Çıtakb, 2019). Fintech firms are often connected with innovative business models that use artificial intelligence, blockchain technology, and big data to help meet consumer expectations for dependability, low prices, and convenience. As a result, traditional banks are further compelled to deliver in order to fulfill the accelerated expectations set by Fintech enterprises.

As indicated by many of the researchers later mentioned in the study, integrating a significant degree of artificial intelligence in the future is inevitable. Going back to the 1950s when Alan Turning posed the question of "Thinking Machines", the AI foundation was built from that point. Much of the literature discussions on artificial intelligence within the financial sector puts into question concerns of the degree in which changes will occur. Recent advances in intelligent automation have radically altered the practice of a number of conventional professions, including the treatment of the banking sector (Zhang et al., 2020). A new era of intelligence has occurred, as described by (Naqvi, 2020) an epoch of intelligent, automated labor.

Artificial intelligence is exciting because of its progressiveness, unlike any other notion emphasized in the 21st century owing to its ongoing growth at a rapid and steady rate. In other words, technological advancements are perpetual. With that in mind, the financial service industry is not untouched, therefore has experienced the changes occurring in today's world, as a new generation of consumers develops an increasing reliance on services that keep up with digital advancements. New markets are being created in the financial sector, while existing ones are redefined. Comprehensive studies done on the impact of AI and ML tools have increased the industry's delivery quality through process simplification (Mahalakshmi, et al., 2021),

Circling back, the meaning of artificial intelligence, it is often confused with that of automation, therefore to clarify, Dr. Mark Nasila, Head of Advanced Analytics (Artificial Intelligence vs Automation, 2019), states that Automation reduces time and money spent on repetitive, time-consuming operations and frees up workers to focus on more sophisticated procedures, whereas Artificial intelligence is concerned with technologies, systems, or even processes that can adequately replicate how humans make choices, respond to new information, communicate, listen, and comprehend language.

Machine Learning (ML), on the other hand, represents a subset of Artificial Intelligence (AI) that is concerned with the use of data and algorithms to mimic the way people learn, progressively increasing its accuracy according to IBM Learning Cloud Education. Machine Learning is already used by Banco Santander (Peterson-Johnson, 2018) and JP Morgan Chase (The

Economist, 2017), to name a few institutions in the finance industry for the purpose of mitigating fraud.

The presence of Fintech companies, which tend to be focused on being customer-oriented, pushes traditional financial service companies in the market to alter their business model. Due to the business models of Fintech companies, traditional institutions are driven towards other business innovations to match the competitive advantage (Jarvis & Han, 2021). The rapid movement of information between clients and institutions have increased the need for data to be computed, evaluated and analyzed to form an output that would impact decision-making. Technology is being reformed to meet emotional intelligence within conversation-based communications with clients. AI has provided the benefit of interactions in natural forms through body language, talking and writing. Consequently, opportunities to enhance customer experience are rising to meet fast responses and personalized products leading to increased sales and revenues.

Financial institutions are aggressively making significant investments in emerging technologies such as blockchain for financial transfers, extended loans, and loyalty programs (Deloitte, 2017) , as well as enhancing existing banking systems to mitigate money laundering and combat terrorist financing in response to rising competition from FinTech businesses (Jarvis & Han, 2021). Banks such as those included in Table 2 have invested in AI and ML technologies to streamline their operations and lower transaction costs.

However, staying competitive is not easy for traditional institutions, as AI emerges in small bits. A study conducted by (Luisa et al., 2019) showed that unlike Fintech companies, traditional financial institutions are trapped in a mindset that lacks progressiveness. Moral agitation and financial regulations are considered the root causes for the choice these institutions are forced to make, trapped to a traditional structure. This is due to AI and ML systems having a substantial influence on the integrity and safety of the financial system, which need a strong governmental response. An increasing number of challenges, such as bias incorporated in AI and ML systems, the capacity to explain their reasoning for their judgments, their resilience (such as cyber risks and privacy), and their possible influence on financial stability are being raised. When technology innovations overtake existing rules, regulatory loopholes might have an unfavorable effect on financial stability (Boukherouaa, AlAjmi, Deodoro, Farias, & Ravikumar, 2021). Some providers may slip outside the present regulatory boundaries and drive such advancements (. Regulators in the financial sector should encourage innovation but maintain a strong front to prevent threats to financial stability.

Moreover, Fintech companies face less scrutiny over the methods in which they choose to deliver their services, as payment solutions, for instance, are flexible to the point of allowing the circulation of virtual and crypto currency, which are deemed impossible within traditional banking systems (Voican, 2020).

The level of flexibility Fintech companies offer to clients opens the horizon for untouched markets within the financial sector, such as small to medium businesses which face lending difficulties with traditional banking institutions due to risks associated with SMEs. However, due to the emerging technologies at the center of fintech companies, big data is used to analyze the credit risk of a SME and alternative lending services are offered where the gap remains empty in the market of smaller enterprises (Azman, Zabri, Masron, & Malim, 2020). In addition, Fintech companies often require less costs in order to operate due to the strong reliance on technology to provide customer assistance and digital banking processes which would result in reduced payroll costs, thus it can easily be more affordable than traditional banks (Voican, 2020).

With the exception of a few nations where regulatory reforms have facilitated the establishment of new banks, such as the UK, many, if not all, of the FinTech start-ups that first identified themselves as competitors have shifted to a B2B model or have been acquired by existing banks. One example would be Santander's subsidiary, InnoVentures, which was established in 2014 to invest in Fintech startups with the goal of enhancing customer relationships through automated customer service. Additionally, the artificial intelligence provided by the fintech startups improved fraud mitigation and customer advisory.

Another example is Raiffeisen Bank's organized program for Fintech partnerships named "Elevator Lab" where approximately 287 Fintech Start-ups have applied to collaborate with Raiffeisen Bank on a long term. Elevator Lab is present in Central and Eastern Europe countries. The program started in 2019, and is still ongoing.

With regards to other factors impacting traditional institutions, they are facing further competition by large companies unexpressed within the boundaries of the financial sector, such as Amazon, Facebook, Apple and Google also known as BigTech companies, Microsoft and IBM may be equally considered (Voican, 2020). Fintech is opening the market for bigger players with financial service plans without applying to become conventional banks according to CB Insights (2021).

In addition, the original wave of COVID-19 triggered five years' worth of digital behavioral change in consumers and businesses in only eight weeks according to McKinsey. The digital trend has been accelerated at a level that forced banks to re-adjust their strategies. The implementation and improvement of artificial intelligence for better-performing and human-like automated customer care became imperative to customer satisfaction.

Methodology

The methodologies employed in the following investigation use secondary data sources, such as the World Economic Forum, Deloitte and McKinsey reports as well as past research and theoretical concepts investigated previously on the topic of financial services, fintech and artificial intelligence. To arrive at a meaningful result, the researchers and writers of these sources draw on a variety of perspectives and ideas.

The paper utilizes previous research to decipher the role and influence of artificial intelligence and machine learning in the financial services industry, and it contributes to a collection of related papers on the specialized topic of artificial intelligence in the financial industry for a doctoral study by addressing an information gap identified within the literature review section. The objective is accomplished by the generation of (1) advancing theoretical study on the subject, (2) fostering an awareness of the changes affecting the financial industry, and (3) accumulating evidence of the effect artificial intelligence and machine learning has had so far.

The information was gathered through a background section and two structured tables highlighting the issues addressed by financial institutions using AI and ML and the top ten ranked institutions worldwide, by their specialized business category such as banking, insurance, and reinsurance, that are leveraging AI and ML to improve their service delivery and internal operations. Much of the data reviewed and acquired originated from research established in recent years as AI and ML became a more prominent subject of debate.

Results and discussions

The Financial sector has shown great potential in the implementation of technology, particularly AI and ML, due to the increase in suppliers such as Microsoft LUIS, IBM Watson, and Salesforce

Einstein. The nature of the data handled by financial service companies requires tools that handle big data. The business models of these financial institutions are soon to be completely digitized due to the pressure rising from Fintech companies and customer demands (Luisa, Wunderlich, & Beck, 2019). Unlike traditional financial services, Fintech companies are able to offer the innovation and flexibility strengths to their clients through processes which are efficient and responsive (Inn, 2016).

According to previous research conducted the major uses of AI and ML in the financial service sector include the activities listed in Table 1.

Table 1 Application of AI and ML technologies to the activities within the Financial Sector

No.	Activity name	Application
1.	Fraud prevention	Fraud detection systems assess the client's purchasing patterns (Peterson-Johnson, 2018) and identify any credit card abnormal activities, including online transactions which is a current growing concern (Mahalakshmi, et al., 2021).
2.	Automated Customer service	Artificial intelligence verifies the caller's identity, determines their goal, and automatically responds or sends them to the appropriate agents (Khan & Iqbal, 2020).
3.	Cyber security	AI may boost a system's resilience, or its capacity to sustain attacks through threat and anomaly detection (TAD) (Taddeo, McCutcheon, & Floridi, 2019).
4.	Robo advisors and asset management	Assesses an investor's risk tolerance and investment aim using a questionnaire prior to applying Modern Portfolio Theory (MPT) to construct a balanced portfolio (Shanmuganathan, 2020).
5.	Predictive analytics	Algorithms are used to discover patterns in order to predict data ((Young, 2018).
6.	Credit scoring	ML algorithms are used to process all applications and approvals (Peterson-Johnson, 2018). The capacity to forecast credit risk based on big unstructured data sets, such as a client's digital footprint.
7.	Settling transactions and executing payment confirmations	Transactions are confidential and transparent on Blockchain networks, where participants adhere to the same standards. Zero-knowledge Proofs (ZKPs) is an example of the technology used to verify data without disclosing its contents (Swan, 2018).
8.	Payments, reimbursements, and claims from insurance	Utilizing the automated nature of a smart contract to simplify claim payment and reimbursement (Sean, 2020).
9.	Money laundering	Anti-Money Laundering (AML) systems assist in identifying cash transactions above predefined thresholds, foreign financial transfers, and suspicious transactions. These systems monitor transactions for suspicious activity and provide warnings based on established criteria (Kute, Pradhan, Nagesh, & Abdullah, 2021).

Source: Authors' own research.

The majority of banks worldwide have begun to use AI and ML technologies. Existing, large companies that are known as traditional banks have adapted to the emerging trends in technology by incorporating AI and ML tools (see Table 2). These tools are used to enhance customer-facing front-end interactions, as well as to save costs and expand the capabilities of back office systems (Mohan, 2020). The tools are mostly incorporated into the product delivered to customers with the purpose of reducing costs from a company's standpoint and to increase data for better decision making from a customer's perspective. The financial institutions selected to demonstrate the changing strategy from traditional activities to digitally-incorporated activities are known and ranked in the Top 10 at a global scale. The ranks were selected from various sources

such as The Banker, Forbes, Insurance Business Asia, AM Best, S&P Global and Reinsurance News, for which the reports were made taking into account the 2021 performance and asset value.

Table 2 Financial Service companies implementing AI and ML Tools

No.	Company name	Year of application	Artificial Intelligence and Machine Learning Tool	Purpose
1	Bank of China	2020	DeepFX application	DeepFX, was created by Bank of China's digital asset management division utilizing deep learning technology to forecast short-term price changes on key currency pairings according to The Trade and Refinitiv (2020).
2	J.P. Morgan	2017	Contract Intelligence Program	Prevents Loan-servicing mistakes (Futurism, 2017)
		2017	LOXM Robot	LOXM is a smart trading robot which uses deep learning techniques to assess historical data generated from real and demo trading in order to determine the best execution (Boston Group Consulting, 2020).
3	Bank of America	2022	CashPro Forecasting	CashPro Forecasting automatically adjusts to the seasonal and company-specific operational activities of a firm. It involves training the cash flow ML model at the end of each day to choose the best accurate model for each account (Zimmer, 2022).
		2018	Erica, AI-powered virtual assistant	Erica informs clients if their spending patterns are likely to result in a week of zero balance. It also notifies clients if their credit score changes, remembers regular or late payments, it uses anomaly detection tools to highlight payments that are overpriced and uses smart analytics to advise consumers on how to cut monthly expenditure, among other things (Mixson, 2021).
4	Citibank	2021	IBM Cloud Pak for Data and IBM Open Pages with Watson	This provides auditors with access to technology that evaluates and scores control definitions in accordance with the five "W"s (Who, what, when, how and why) (Von Bulow, 2021). The tool can save expenses by using AI-powered search to extract particular answers and trends from files and webpages.
5	Swiss Re Institute	2020	Cogito	Cogito is an AI algorithm developed to assist customer support representatives speak more effectively, sympathize with unhappy customers, and perform better overall. Cogito analyzes customer service calls for tone, pitch, word frequency, and other parameters (De La Garza, 2019).

Source: Authors' own research.

The companies listed in Table 2 are merely scratching the surface of what AI and ML can provide, however these worldwide-known banks are a great representation of what is happening at a global scale. The world is still experiencing an early stage of artificial intelligence, and traditional financial institutions are trailing right behind Fintech companies.

Increasingly, the interfaces of digital integration are a source of innovation, not only in certain disciplines and industries. A single player's ability and experience in protected markets will no longer be significant, but rather the smart connections between different market players' infrastructures, talents, and capacities (Dapp, 2015). In the end, customers will realize the rewards of the many collaborative efforts. Because of the wide range of strategic relationships, they now have access to a considerably broader range of goods, services, and processes than previously.

Despite the severe compression on certain profitability and the ever-increasing regulatory obligations. Developing a digital, platform-based ecosystem while also being open to possible strategic relationships with external financial service providers throughout their whole value chain are major issues for established financial institutions.

One may argue that current banking practices are unlikely to be used in the future, which is consistent with the operations of various other industries as technology advances. Rather of competing against one other, conventional financial institutions should collaborate with Fintech businesses who lack both the capital and the clientele, in order to benefit from each other's strengths. In the financial industry, new markets are being formed, while old ones are being redefined. Comprehensive investigations on the influence of AI and ML technologies have shown that process simplification has improved the industry's delivery quality.

The research demonstrates that clients use a variety of digital platforms to conduct financial transactions. When it comes to the digitization of personal finances, it seems that customers are looking for basic attributes to access their finances (Valverde & Fernandez, 2020) but recently, many have been interested in being able to track their own personal spending habits and manage their budgets. With that in mind, institutions have developed technology in response to changing customer needs, to name an example, Erica, the AI-powered virtual assistant provided by the Bank of America. Thus, the financial sector's deployment of ML and AI enabled clients to benefit from faster responses, enhanced communication, and simple access to their financial service provider. These technologies are used to improve front-end interactions with customers, as well as to save expenses and increase the capabilities of back office systems. The tools are mostly integrated into the product given to customers with the goal of lowering costs for the business and increasing data processing for more accurate representations of forecasted or real time financial statements enabling clients to make better decisions for themselves and their companies.

Tables 1 and 2 illustrate the concerns and solutions that AI and ML have enabled financial institutions in addressing. Among the many additional operations indicated in Table 1, the activities highlighted were combat areas that needed several hours of data analysis to identify purchase trends and detect anomalies within transactions. Overall AI and ML enable financial institutions to concentrate their resources on employee development, thus it has the potential to reshape the financial sector's landscape. The advantages of this notion are difficult to deny in this market, which is undergoing several beneficial developments.

When conventional institutions perceive a threat from additional market entrants, it is necessary for established institutions to enter markets that have been left untapped, which can only be accomplished by investing in emerging technologies alongside Fintech startups before valuable innovation is lost to competitors (Hornuf, Klus, Lohwasser, & Schwienbacher, 2020), particularly BigTech companies interested in entering the financial sector. Additionally, Fintech companies

face less criticism regarding the means by which they supply their services, since payment solutions, for example, are very flexible to the point of allowing the circulation of virtual and crypto currencies. Combating this problem, among others, is an ongoing fight for financial institutions owing to compliance and risk management requirements, which the evidence suggests act as a barrier to applying AI and ML due to the risks associated with big data and privacy concerns.

Conclusion

The purpose of the paper was to provide, from a practitioner's perspective, a better understanding of the emerging technologies occurring in the financial sector and how financial institutions have prepared and are continuously preparing to meet market demands by staying in line with technological trends, particularly those of financial technology, including AI and ML. . This study is a tool to breach the gap that exists in literature about AI and ML in the financial service sector, therefore the results aim to highlight the scientific and societal inference of this shift in the economy.

The degree of flexibility that Fintech firms provide to their customers opens the door to previously untapped sectors within the financial industry, such as small to medium-sized enterprises. Additionally, Fintech organizations often have lower operating expenses than conventional institutions owing to their heavy dependence on technology for customer service and digital banking procedures, which results in lower costs.

Thus, it can be concluded from the research that adopting innovative technology improves an industry's reliability, speed, and competitiveness. Additionally, the paper discusses the many functions that these technologies play in the financial industry. AI and ML activities are many and have the potential to have a substantial influence on the way clients respond in the comfort of the digital world. We can conclude emerging technologies are essentially simplifying the entire framework.

Additionally, the world's largest financial institutions have not remained at the top without incorporating these emerging technologies, whether developed in-house, in collaboration with small startups, or supplied by big tech corporations. Fintech startup hubs have also aided the expansion of existing conventional banks, since they have chosen which startups to cooperate with based on the market sector they serve.

A limitation of the study is that researchers in the financial sector who are more prone to studying the implications of artificial intelligence and machine learning (Baldwin, Brown, & Trinkle, 2006) or financial technology are not often specialized in technological skills, limiting disciplines on improvement or developing a technical perspective on the topic. Another limitation would be the feasibility of obtaining information on the tools used that incorporate artificial intelligence and machine learning in order to gain a better understanding of the structured systems, however due to competition in the marketplace this information is not freely available.

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