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Chapter 1: Understanding the digital transformation of financial systems in the era of intelligent technologies

1.1. Introduction

Deeply rooted in human social behavior, finance and its systems are undergoing deep evolution alongside the transformation of human society since the advent of currency and banking systems. Emerging as part of this evolution, FinTech is viewed as the goal of upgrading the financial industry through new generation Information Communication Technology (ICT) products including Blockchain, big data, cloud computing, and Artificial Intelligence (AI). It has the potential to reshape the traditional financial system that has taken shape over a period of hundreds of years and is experiencing radical warfare. In particular, owing to the impact of the COVID-19 pandemic on the traditional off-line operations of financial institutions, digital finance characterized by online provision of financial services is receiving an unprecedented wave of surge and attention. Like many other industries, it has drawn extensive attention from both academia and industry (Lee & Kim, 2022; Patel & Shah, 2023; Kumar & Gupta, 2024).

Today, finance is not purely an industry which provides a set of services. It is an emerging paradigm that involves more than Java or C++ development. Standing on the shoulders of leading international scholars and implementing the theory-practice coupling approach, a scholarly community focusing on the digital transformation of finance is being built to deeply examine the effects of recent intelligent technologies on finance, understand the unsolved financial questions in the era of intelligent technologies, and contribute to finance through research. Researchers from most disciplines of social sciences, natural sciences, and engineering up to now have conducted research studies on the digital transformation of finance, covering various aspects including but not limited to the understanding of intelligent technologies in finance, system dynamics, market mechanisms, measurement of investments, modeling

of assets, and affective investing and behavior (Soldatos & Kyriazis, 2022; Zhang & Wang, 2023).

Although thorough surveys have been conducted focusing on specific research areas, there lacks a comprehensive overview to systematically cover the research advancements in this budding and interdisciplinary field. To fill this gap, an organizational framework is introduced and in-depth reviews are provided for four basic building blocks of the Framework of the Digital Transformation of Finance, i.e., research on the understanding of the digital transformation of finance, research studies on the effect of digital transformation on the financial system, and regulation of risks brought on by intelligent technologies.

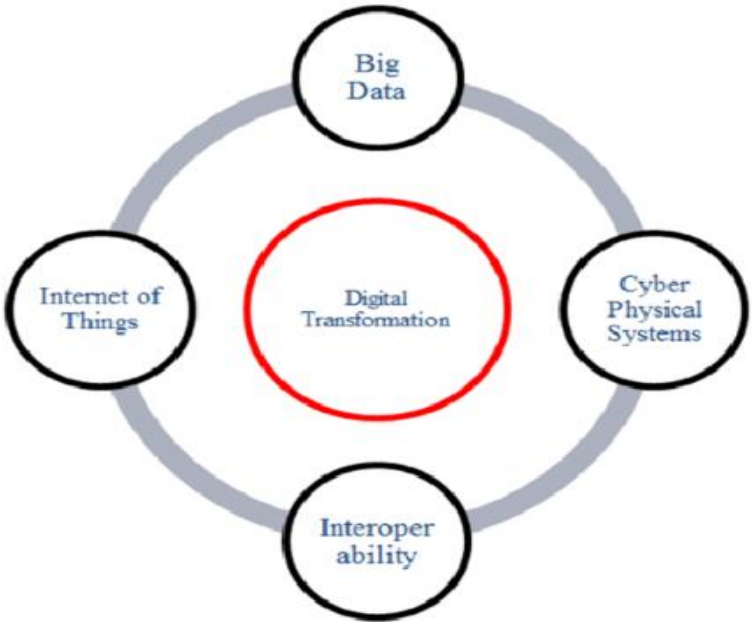

Fig 1.1: Digital transformation

1.1.1. Background and Significance

Humanity is facing profound social and economic transformations prompted by the advent of intelligent technologies that lessen the need for human actors in an increasing array of tasks. Since the 2008 global financial crisis, the financial systems of developed countries have experienced development both as embodiments of advanced historical and cultural trajectories and in relation to the emergence of a global digital economy. As a result, a double transformation is underway: a digital transformation of financial systems that is at once local and global, and an economic transformation brought about

by the rapid deployment of artificial intelligence. The emergence of a few global internet firms is being accompanied by the promise of ubiquitous data and now, more recently, by the "intelligence" that will be deployed through artificial intelligence techniques.

In this context, major shifts towards the widespread adoption of digital technologies in the social and economic realms prompted by COVID-19 have become apparent. Over the last three years, the initial emergency measures have turned into more profound transformations in all domains of society. In relation to financial systems, the current trend is marked by a "digital transformation," a process that includes a manifold set of new digital practices, instruments and services, as well as the attendant emotions and attributions of meaning. The new digital offerings are defined as instruments that leverage digital technology to transform an underlying economic or social activity. This can be increasingly automated (digital services) or not, as in the case of new interaction modalities (digital experiences). Financial systems and the intermediaries that comprise them are gradually embedding digital technology into their operations.

There is a need to rethink the very nature and boundaries of financial systems. Existing studies tend to take for granted the boundary between traditional financial systems and fintech, without adequately incorporating the potential of intelligent technologies [3]. Artificial intelligence tools can modify financial and non-financial behaviors, perceptions and events in a structural way. To understand complex phenomena such as the digital transformation of financial systems in the wake of intelligent technologies, there is a need to adopt wider and more encompassing concepts.

1.2. The Concept of Digital Transformation

The transition to a digital economy has prompted discussions about digital transformation. While studies have been conducted on digital transformation in the context of various industries, scholars and practitioners struggle to understand the true nature of digital transformation. Even relevant terminologies have been studied, their evolution and emergence are poorly understood. Broadly interpreted, digital transformation refers to changes enabled by the use of digital technologies. However, this broad interpretation does not help to understand its essence; previously, the concepts of IT-enabled business transformation, e-business, or online business were equally general.

Digital transformation is conceptualized as a transformation process whereby enterprises leverage emerging digital technologies to redefine their value proposition. Scholars have recently paid more attention to and attempted to explicate the nuances and intricacies of this relatively new concept. Given the expansive scope of digitalization, it is hard to

grasp what digital transformation really encompasses, even with the rising academic and practitioner interest in digital technologies and the digital economy.

Prior research highlights that digital transformation implies radical digital-enabled changes from an organizational perspective. Excessively broadened interpretations like digitalization blur the fundamental distinctions between an organization's digital and non-digital entities. Without distilling the boundaries between objects, it is not clear what digital transformation is in particular. How is digital transformation different from the closely related concept of IT-enabled business transformation? Also, academic and practical interest in the topic will probably be further piqued if the ongoing discussion on digitalization is firmly rooted in solid theoretical grounds and a coherent schema that is careful not to straitjacket researchers' analytical flexibility. By translating organization science and information systems research into an integrated conceptual vocabulary and drawing upon longitudinal case studies on the past digital transformation experiences of a legacy business enterprise in the financial services industry and a new venture in the sharing economy, two fundamental distinctions are distilled to set digital transformation apart from IT-enabled business transformation.

1.2.1. Definition and Scope

In the digital world of financial technology (fintech), cloud computing, big data, artificial intelligence (AI), blockchain, Internet of Things (IoT), and other cutting-edge technologies have reshaped the financial industry and disrupted traditional models for financial institutions. Since emerging in China's Internet environment in the last decade, fintech has drawn special attention from both industry and academia. Academics have made an in-depth analysis of risk management, financial security, online banking, payment & settlement, personal finance, public finance, equity & credit crowdfunding, investment banking, internet insurance, technological innovation, and trading systems, and so on. AI, the core technology of this technological revolution and industrial transformation, has great implications in all aspects of finance. Therefore, research on the digital transformation of financial systems, facilitated by intelligent technologies, makes sense in advancing the theoretical understanding of this overarching topic as AI-powered fintech is rapidly diffusing across geographies and market sectors.

Financial intelligence, as the main application of AI in finance, offers a broad research area on how intelligent technologies transform financial systems. Such financial intelligence demonstrates the capability to handle complex structured, semi-structured, and unstructured data rapidly and precisely, which includes knowledge discovery, predicting future changes, making decisions, improving the intelligence of financial systems, and so on. In the area of financial technology, there is an urgent need to clarify the definition and scope of financial intelligence, which touches on the research

foundation. This research provides an opportunity to construct an organized research framework for guiding future investigations on why and how intelligent technologies transform financial systems.

The construction of this research framework with open issues is expected to guide and motivate financial researchers and practitioners to catch up with the large-scale evolvement of AI-powered fintech, shed light on seemingly subtle transformation of traditional financial processes, and explore possible dark-side that may challenge the well-functioning financial systems. Financial intelligence, as the principal application of AI in finance, is an emergent research area needed by scholars in terms of definition, research topics, theories, methods, and open questions.

1.2.2. Historical Context

The emergence of intelligence-based technologies (IBTs), specifically artificial intelligence technologies, has brought noticeable changes to financial systems, significantly promoting the continuous digital transformation or digitalization of financial systems. Digital finance, a new financial service system emerging from these developments, is shifting the existing financial order and landscape, thus impacting traditional financial service systems in terms of structure, participants, and providers. A profound evolution of financial systems has not been observed since the emergence of electronic finance in the mid-1980s. In fact, the rising waves of digital finance, representing the digital and online components of structural financial changes, are roaring, thinning, and even shaking physical nets of financial systems in many regions. Influenced by the dynamics of digital finance, as well as physical fintech and layer traditional finance, these financial systems are undergoing blockchain-like disintermediation/digitalization virtually overnight. Despite vast financial innovation and changes, the nature of financial systems is barely altered due to a coincidental and fortuitous direction. It is crucial to have an in-depth understanding of these sudden and violent structural changes and transformations of financial systems to well-govern, maintain, and develop them.

This is especially needed in the case of digital finance systems, as national security, social stability, and economic development may be significantly jeopardized by the recent buckling, even stormy falling of trillions of dollars of capitalization of financial platform companies. Historical development outlines the essence of financial systems and their evolution contexts, providing systematic reviews and reflections of financial systems' transformation under intelligence technologies. Examining the intermediating function shifts of financial system layers and the circumstances of unintended disruption, it identifies the relations between and implications of technological evolution, financial system transformation, and the intertwined layer-gap evolution of the financial system.

The scenario and property of a desired nation with high integrity technical layers for the sustainable development of digital finance systems are discussed. Based on the understanding and implications, ongoing studies can be conducted. The recent explosion of development, innovation, and application of IBTs is profound and emergent in many aspects. Several visible consequences can be directly seen from outer manifestations of financial systems. Financial systems framed by financial laws and regulations are composed of several non-trivial layers. Financial service systems generally offer various financial services on the “them” layers, where multiple and diverse commercial participants facilitate the activities.

1.3. Intelligent Technologies in Finance

Intelligent technology is represented by artificial intelligence (AI) and has become the focus of research in recent years. As a technology, AI is the core technology of the technological revolution and industrial transformation, focusing on intelligent systems and products. AI research includes swarm intelligence, robotic intelligence, noise, signal, pattern, knowledge representation, fuzzy mathematics, neural networks, and data

Fig 1.2: Digital Transformation in Financial technology

mining, among others. AI and algorithmic trading have received widespread attention and discussion in the financial circle. At present, the research on AI's ability and performance in finance is still in its infancy, and existing related achievements mainly focus on a narrow scope. Typical tasks and models are proposed to demonstrate AI's performance in the financial field. Traditional time-series forecasting models, such as ARIMA, Garch, and E-Garch, are compared with AI network models (e.g. DNN, CNN, LSTM), but these models must be re-implemented and trained independently because of the lack of unifying coding and data crawling scripts. So far, there is no logical

framework that can encompass more AI techniques and finance-related data. Financial intelligence (FI) is a kind of financial intelligence that analyzes knowledge and achieves autonomous financial analysis. Financial intelligence focuses on intelligent analysis capabilities and represents intelligence technology that simulates the ability of human financial experts to obtain knowledge through experience. Financial intelligence demonstrates the fast and accurate machine learning capability of AI technology to handle big, complex, and heterogeneous data and has gradually acquired the potential to become the financial brain represented by the speech and face recognition system.

In recent years, the term 'FinTech' has become popular and spread quickly, and all financial behavior that involves algorithms is regarded as FinTech. Until now, there is no standard and strict definition of FinTech; however, it is generally accepted that FinTech is the technology to provide financial services. In general, FinTech only contains the technology of finance. Thus, with the rapid development of technology, people's financial behavior is gradually being embedded with many new algorithms, models, or techniques. At present, FinTech covers a wide range of technologies, such as big data, cloud computing, blockchain, biometrics, and AI. AI is one of the most important branches of information technology and the hottest issue in academia, business, and society. AI is a technology that can obtain knowledge, and software systems that can obtain knowledge and achieve intelligent tasks with a high degree of autonomy and become intelligent systems and products through design and development.

1.3.1. Artificial Intelligence

Artificial intelligence (AI) is at the heart of an evolving digital economy that is taking on new shapes and forms. The transition to an 'intelligent world' holds ground-breaking prospects for people and organisations of all kinds. To capitalise on developments in intelligent technologies and seize the resulting opportunities, organisations need to rethink how they operate and compete. An AI-enabled operating environment comprises both AI technologies and human expertise, thus shaping the conditions for intelligence augmentation rather than full autonomy. For capitalism to operate in harmony with an intelligent economy, new models will be necessary.

The sheer scale, pervasiveness and collective impact of emerging AI technologies present an opportunity to re-think the architecture of our societies and economies. COVID-19 accelerated a leap in cross-silo AI to tackle challenges posed by the pandemic. Secure AI conflicts with ownership rights and intellectual property rights. Here, data refer to data that aims to extract knowledge from the data that carries information. On a wider scale, data is directly absorbed from the surrounding environment into a Big Data framework. 4V data frameworks and ETL processes are

employed in Big Data processing. Built-in AI provides data cognition and reasoning engines for enabling privacy-preserving federated learning and federated AI.

Federated Data retrieves data under data protection regulations and for the sake of privacy. Personal information or private knowledge is never transferred centrally or locally. To break the working class exploitation barriers, a market-controlled automatic legacy collaborative system must be adopted to build collaborative blocks or privately shared knowledge graphs. Human-aligned AI specifications should be designed to grasp theoretical knowledge and afford global transparent explainable analyses. Games should be played between players/controllers and general AI mechanisms and AIs to test the hardness of hard problems and verify ownership/knowledge/intentions.

1.3.2. Blockchain Technology

It is suggested that blockchain participants should share the information contained in the blockchain ledger amongst themselves, building reputability, accountability, and controllability. By this, blockchain participants would be enabled to work with a high level of goal congruence and a low level of performance ambiguity. Blockchain technology incorporates cryptographic keys, hashes, digital signatures, and distributed and replicated blockchain nodes. These technical properties are built upon the factors and form a secure non-repudiable digital communication platform. This blockchain-enabled security technology, from a game-theory perspective, both lowers the performance ambiguity and thereby enables incentives to be used, and raises the reputation of the platform and/or third-party providers.

A blockchain is non-credible by itself. Upon credible blockchain adoption, a whole new ecosystem based upon the blockchain would evolve, establishing new businesses, organizations, laws, and regulations. The regulatory landscape, both with regard to blockchain technology and its adoption, would be new, and regulatory aberrations could occur on both the micro and macro levels. A wide range of participants with different business models exists, and new businesses that are potential forked versions of current ones may emerge. There are several well-documented significant startups adopting blockchain, as well as more or less adopted implementations of current technologies focused on financial transactions. To date, there are hardly any financial institutions that have explicitly operationalized the blockchain as a new, independently functioning competition set.

1.4. Impact of Digital Transformation on Financial Systems

To cope with the increasingly competitive situation and survive in the fast-changing environment, digital transformation is considered as a significant measure by financial institutions. New digital technologies have reshaped the financial service delivery process and augmented the capability of financial institutions. Efficient financial access in the digital environment is beneficial to improve transparency and promote mutual trust. However, challenges to the financial access brought by rapid digitalization exist, including digital gaps, regulatory arbitrage, and unnecessary risks. With the rapid spread of intelligent technologies, the existing research on financial digital transformation processes and their impacts is still limited, both theoretically and practically.

An emerging triadic model guiding financial digital transformation is articulated, including banks, third-party platforms, and SMEs. Additionally, applying the Complex Adaptive System (CAS) perspective, the multi-level feedback loops, and interactions between agents are studied, highlighting the adaptation and learning between agents guided by the triadic model [2]. The impacts of the triadic model and agents' behaviors on financial digital transformation are examined, emphasizing the sustainability of the model and the importance of inter-agent learning. The research results aim to assist regulators in achieving regulatory balance at the macro-level, aid third-party platforms and banks in developing effective cooperation at the meso-level, and provide meaningful references for SMEs in selection of suitable partners at the micro-level.

1.4.1. Operational Efficiency

In 2021, the pandemic accelerated digital transformation globally. Institutions that previously hesitated to invest in IT infrastructure pivoted quickly to remote and hybrid work modes. In doing so, it became necessary to bolster embedded risk frameworks for employees, clients, and intermediaries. Cybersecurity threats rose sharply with increases in remote internet connectivity. Financial Institutions (FIs) need to respond urgently for enhanced cyber vigilance. Transformation also accelerated the digitization of the client experience, driven by FinTech innovation in capital markets, payments, and "digital banking as a service" capabilities. Social mandates, imposed by governments on universal banking, to make banking services more widely available also challenged incumbent banks to change product offerings. While key consumer trends remained unchanged, this rapid transformation induced rethink on competency and operating models.

The pandemic triggered this multifaceted change to operational efficiency. Such an evolution of operating model change (OMC), itself a mechanism of digital transformation, from legacy behavior was crucial for banks to cope with the rising

ambition of operating challenges. The accelerating shift in the entrenched banking paradigm created an opportunity for a more holistic architecture of banks to disrupt the traditional holistic architecture of financial institutions. The impact of transformation on efficiency was then applied through the theory of operation efficiency to emerging best practices, with associated changes necessary in IT domain facets and products.

The initial move towards operational efficiency was undertaken on isolated processes or process segments through incremental transformation and embedment of supporting technology, particularly RPA and AI. For example, underlying product structuring processes of capital markets were transformed by introducing R-based pricing/instrument specification engines. The parallel shift on platform confronted legacy paradigm constraints of IT architecture, needed to be de-risked through cradle/early stage incorporation of cloud foundations. This often overlooked factor of unprecedentedly rapid de-risking inspired parallel mainstream mechanistic transfer of the stated pristine OMC immediately to the IT domain, including leapfrogging into advanced architectural paradigms, in bursts of massive investment over two years.

1.4.2. Customer Experience

In addition to structural adjustments, intensifying international competition and innovation have increased customer awareness for banks since the mid-nineties [7]. In this regard, banks operate on electronic markets to enlarge their portfolio structure flexibly. From a customer's perspective, this enables access to more kinds of financial instruments via a broader choice of service providers. Financial transactions can be further accelerated while costs for brokerage and settlement can be minimised decisively. New, automated service channels for informational and transactional processes were created for more customer orientation and better price transparency. But finance, as a slow-moving industry, would have needed more time for implementing these innovations. Similarly the second major push of change in the banking landscape – after the advent of ATMs and automated payment transactions in the eighties – was brought about by e-broking sites and portals being orientated towards the customer's business processes perspective. Nevertheless, tinting through their processes and incorporating them, banks can capture more and more transactions as well as margins still left. In retrospect, traditional banks could have put more emphasis on their strategy in order to retroactively put brakes on the customer-oriented market participants.

Early initiatives for an overview of the most important developments in time have been made under the umbrella of various financial services related conferences. Even on some newly launched stock exchanges this time, both existing and new entities trading at least in some regions the same instruments such as stocks, bonds and indices were brought together. These interlinked electronic platforms with more or less bilateral and even

multilateral trade processes can be classified among electronic markets building new public peer-to-peer processes. On the issuer side, this provided the chance to raise cheaper debt and equity capital once all market makers were alive. Furthermore, transparency compliance barriers and scope of trading were minimised, which led to an intensification of competition and disintermediation for traditional investment banks. On the buy-side with respect to both commercial and retail banks, in particular private customers began to trade but at zero-pricing over the counter by using algorithms.

1.5. Challenges in Digital Transformation

Since the emergence of intelligent technology, technological competition has been the focus of competition among major countries. In recent years, developed countries such as the United States and European Union have been deploying the development of intelligent technology in a series of national strategies, forming the trinity of "computing power, algorithm and software" development systems. China is also paying more and more attention to intelligent technology, putting it in a strategic position. The establishment of the digital economy development and reform leading group is intended

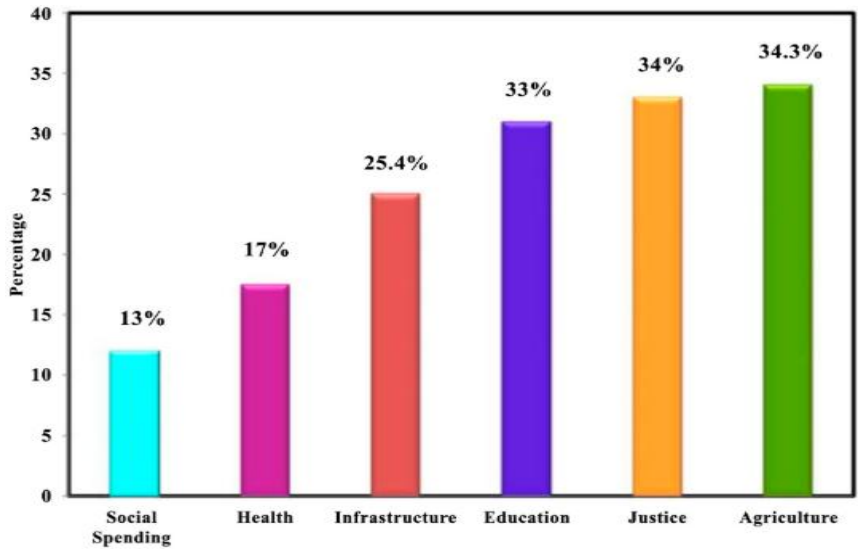

Fig : Impact of Digital Transformation toward Sustainable Development

to coordinate the layout of the digital economy across financial, transportation, energy, commerce and other fields in a nationwide manner, breaking the barrier of vertical management in various industries and forming an overall development plan. China's digital transformation is still in its infancy, and the financial industry is a key focus of promoting the digital economy. However, the biggest problem is that the financial system is highly heterogeneous and independent, and has different processes, algorithms

and scenarios. The centralized deployment and exploration of digital technology can easily lead to the leakage of sensitive financial data. Therefore, a distributed digital transformation framework with privacy guarantees is proposed. The development of intelligent technology requires a distributed digital transformation framework across financial systems.

Digital transformation is necessary for the financial system. Digital transformation has become a hot topic in academia and has been widely discussed in recent years. In particular, the development of intelligent technology and the emergence of the COVID-19 pandemic have accelerated the research on the digital transformation of finance. Financial digital transformation refers to the digital transformation activities of the financial industry in the process of building a digital financial market and a digital financial environment. Digital finance is the conversion of financial information into digital form for storage, processing, transmission and application based on digital technologies. Digital transformation at the financial system level has unique advantages. A financial system with high-level digital transformation can break the barriers of financial space and time and broaden service objects and service models. Digital transformation can proportionally improve the broad interests of diverse clients in financial markets, and enhance capital acquisition channels for the real economy .

1.5.1. Cybersecurity Threats

Cybersecurity threats in FinTech, or financial technologies, remain subject to rapid changes and future predictions remain uncertain. Thus, human-based assessment seems to be insufficient and AI-assisted solutions seem to be necessary. Almost everything connected to the internet might get hacked and infiltrated which results in theft and scandals. Information theft, digital extortion, fraud, denial of service, and many more forms of threats are much likely to occur. It only takes a moment for humankind to be cheated. On the other hand, technology can be a valuable structure for the provision of systems that combat threats and stave off vulnerabilities and raise detection accuracy because technology can enhance the detection of security vulnerabilities. Cybersecurity systems utilize several tools and methods to offer required security, which can be divided into four subsets, Flyaway tools written as capability steps.

The attack detection step offers detection systems of a wide range of detected threat environmental conditions ranging from network hardware-based ones filtering packets from the web to host OS-based ones using executable instrumentation and external traffic analyzers looking at all communications. In this substep, machine learning systems are increasingly used which enhance

classification accuracy by exploiting features of unsolicited contents. As low as possible false positives are desirable in detection models. The incoming threat identification step aims at deciding on the type of the detected incoming threat. For valid detections and higher true positives, it should precisely assess the incoming threat type. Signature-based systems can provide detection but with poor speed or are less robust for a dynamic environment. These systems do not recognize novel attacks or previously unseen variants of current attacks.

Systems in this substep work well and promptly for well-known attacks, but an incoming threat might be new and unseen on the honey pot. Signature extraction, an understanding of how the detection model classifies various incoming threats, and analysis models which reveal backdoors or logic bombs are possible recent directions. In the defensive solution startup step, after identifying the type of the incoming attack, a pool of defensive strategies should be selected that can handle the incoming attack type. Some defenses may start immediately after detection or on-site or at runtime controls.

1.5.2. Legacy Systems

In the late twentieth century, the first generation of Information Systems (IS) emerged, which are still used by many companies today. Information and Control Systems (ICS), as they are called, have passed through the fuzzy logic phenomena, which governs nearly every application with one or another combination of input and output variables, rules, and centers of ongoing fuzzy sets. Once a well-defined system is created, using it is a question only of the entry of input variables and the possibility of monitoring outputs, adjusting constants for obtaining new outputs. Attempts were made to communicate with the machines using the Free Texts method, review the stored knowledge in this way, but rather unsuccessfully, since controlling a smart machine requires very formalized sentences.

ILogfuzy, as the next generation, is working on the grooving algorithm implementable by ICSs. The effort is being spent not so much on the creation of new rules but on the parameterization of the algorithm itself. Though the choice of parameter values is very important, it is very tedious, for there are inherently many rules, which may be lost within the logical hierarchy. Properly tuned, ILogfuzy may govern hundreds of variables and controls in an ICS application. Unfortunately, it cannot remedy the lack of knowledge that will answer the designers' questions. As the last step of IS design, External Knowledge Bases

(EKBs) can be operated, into which the knowledge is coded formally and statable in the Free Texts.

EKBs, as they may be called, administer strict Reasoning procedures. They allow the framing of many other equivalent questions, all having the same answer, which return in the Free Texts. They also permit query asking, proper wording of which is sometimes not an easy task. Unfortunately, not all the questions can be answered by these procedures. Knowledge, which cannot be expressed in this formal language, cannot be addressed either. Is the cumulative product of the past work something envisaged in future perspectives accommodating better needs?

1.6. Case Studies of Digital Transformation in Finance

There is an increasing focus on financial inclusion and digital technology adoption in the banking sector. Hence, further research is warranted on how banks utilize digital strategies to support the provision of services and new products in the financial sector. The shift from traditional banking to e-banking is a serious concern for clients and bank executives. The study uses the thematic analysis approach to assess the opportunities, challenges, and strategies offered by digitalization in banks in Mauritius. The findings of this qualitative study reveal that the most widely adopted digital strategy by financial institutions is to enhance the physical presence in the form of digital branches or kiosks, followed by increased mobile applications. However, the customer-friendliness and ease of access to various technology-based products is a serious concern during the implementation of planned strategies. For a better digital banking experience, the clients' concerns and voices must be addressed. Digitization has enabled faster services, reduced operating costs, and improved customer service. Only those bankers who learn how to turn to financial technology will survive in the industry.

There is an urgent need for further research to better understand the wide range of technological preferences in the financial sector. There is little empirical evidence in terms of both context and literature. Automated Customer Services, like Chatbots, have received very little attention in Mauritius, capturing the attention of international service providers. In-depth qualitative studies concerning major automated customer service providers, evaluating their effectiveness, suitability for emerging markets, and requisite adaptation efforts to suit local contexts, could provide a broad avenue for research related to finance.

1.6.1. Successful Implementations

One area that has been poorly researched is the implementation of financial systems themselves. Specifically, it is important to empirically identify the key issues affecting the successful implementation of financial systems. Furthermore, it must then be established how these critical issues should be dealt with so that financial systems implemented by the finance departments of financial services companies can be more highly regarded by all stakeholders concerned. This paper addresses the aforementioned area by identifying the key issues affecting the implementation of financial systems within financial services companies. A conceptual model for the improvement of financial systems implementations is then proposed that highlights how these key issues can be addressed.

Case study research is utilized to identify the key issues. Additionally, the implementation of SAP was used as a case study for verification of the proposed conceptual model. The financial industry is continuously changing, becoming more global, complex and, most importantly, important to the world. It is this change in gathering complexity that creates an ever-increasing need for systems to assist finance departments in handling their tasks. However, despite having access to such systems, many finance departments within financial services companies continue to need to rely upon mainly manual systems to account with: this is not only costly, but also prone to human error and as such may have adverse consequences. The financial industry has weathered some major upheavals over the past 5 years, and is undergoing massive changes that will transform the industry for good. These changes grant an ever-increasing urgency for the need for a financial system that is able to provide accurate, timely and detailed financial accounting.

Large banks are expensive to run and there is ever increasing pressure from shareholders to reduce costs. There is also pressure from other banks, which by way of merger, share one common system on a global basis. There is therefore a need for large, consistent, high-quality systems. There is an increased focus on the regulatory environment. In particular, this requires systems that are able to support regulatory reporting. This is a challenging couple of areas for systems implementers to face. The world is as unstable as ever; continued events such as sovereign rating downgrades and trading scandals are sure to bring new regulations into force. This will require a system to not only be implemented within a very short timeframe, but also to provide assurance over regulatory reporting far beyond what is currently expected.

1.6.2. Failures and Lessons Learned

Failures and Lessons Learned Digital transformation of financial systems is a growing agenda in the banking industry towards new business innovations and practices. However, most financial service organizations are facing challenges of implementing systems in this context. A better understanding of systemic failures in large implementations is needed in terms of knowledge, experience, techniques, and insights learned from past implementations. Identification, prioritization, and collection of findings in large implementation failures are presented. The results reveal critical reasons for the failures, and valuable lessons learned. A common framework is designed so organizations can understand and benchmark their own projects. Future research direction is further addressed. The financial industry is undergoing digital transformations, being pressured to adopt and implement emerging intelligent technologies that the new technologies bring about new organizational and operational models. It is important to observe past implementation in knowledge, experience, technique, and lessons for the knowledge of digital transition and transformation. A bibliography of more than one hundred references is compiled comprising the most relevant papers in the stream being indexed in WoS and Scopus database. Practitioners are suggested to adopt proper technology project types which appropriately cope with the financial services industry demands. Financial institutions should assess market opportunities based on insight market structures, emerging technologies, and customer preferences. The adoption of information technology (IT) in financial services firms has transformed the operations of the industry. The increasing size, complexity, and rapid change of financial services firms are a great challenge for their managers. Financial institutions, banks, and financial services firms are also technology companies today. They require very agile, time-sensitive, and detailed reporting, accounting, information systems, and all types of technologies, including artificial intelligence, cloud storage, and blockchain-based record-keeping systems. High return systems are needed, which manage to provide the business with a good return to meet its growth, power, and other managerial concerns.

1.7. Conclusion

The digital transformation of financial services is not an end in itself. It is a means for finance to achieve its broader goals better, faster, and cheaper. The transforming financial services industry will be expected to continue addressing customers' evolving needs, provide accurate and timely decision-support insights, facilitate reliable transactions, manage risks, ensure regulatory compliance, and protect from fraud. The race for digitizing and transforming many sectors has energized governments and businesses around the world to accelerate and adapt their operations and offerings.

Financial services will not be an exception. Adhering to the four-stage process of transformation: digitization followed by digitalization, and then two phases of digital transformation involving artificial intelligence (AI) and other intelligent technologies, can provide a comprehensive blueprint that will yield immediate benefits and phase in emerging disruptive technologies and services.

1.7.1.Future Trends

In this new stage of financial systems, now transformed into digital systems based on intelligent technologies, financial disturbances originating in one corner of the globe rapidly propagate across one or multiple dimensions to other geographic or functional financial domains. Cycles amplifying, distorting, and filtering contemporary financial disturbances have largely modified due to the rapidity of transactions and de facto borderless character of electronic money. These effects decrease transparency and accountability.

Artificial Intelligence (AI) can be seen as progression along two dimensions - computing techniques and thinking abilities. Financial systems have moved forward in terms of knowledge gathering, data acquisition, and cleansing along the first dimension. The extent of computing ability and efficiency firmly constraints development along this dimension. Creative context or problem framing and capacity to transfer knowledge from one domain to another were not a concern to financial firms. Talent accumulation on creativity and AI could differ considerably across firms. However, development differences might be alarmingly large. Thoughts can be overlapping and similar expectations, dreams, hopes, beliefs, doubts, etc. can emerge leading to enhanced awareness or expectation formation. A high degree of overlap might cause a collective consciousness and emergence of a dominant standard or idea on how to resolve the current financial disturbances.

Thus, financial systems will be more and more submerged into the collective thoughts of AI, absorbing more “additional” intelligent agents. Individual agents will be disadvantaged in processing through the collective consciousness whereas the prevailing standard might disregard individual opinions and market imperfection leading to episodic bubbles or extreme financial turbulence. New solutions will be sought in collective mediation for enhancement of individual firm performance, prosperity, and happiness through regulatory and monetary action. On the other side, greater dependence and potential malfunction of individual financial systems would accompany the emergence and establishment of online AI-based thoughts.

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