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DIGITAL TRANSFORMATION AND ORGANIZATIONS' PERFORMANCE

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CONTENT

Preface

The quick evolution of technology has catalyzed profound changes in how organizations work, compete, and thrive in today's interconnected world. "Digital Transformation and Organizations Performance" delves into one of the most compelling shifts in modern business: the integration of digital technologies into every aspect of organizational structures, processes, and strategies. This transformation is not merely about adopting new tools but rethinking business models and fostering a culture of agility, innovation, and resilience.

This book explores the multifaceted relationship between digital transformation and organizational performance, drawing insights from a range of disciplines, including management, economics, finance and technology. The chapters highlight how digitalization has reshaped traditional metrics of success, enabled data-driven decision-making, and unlocked new avenues for value creation.

Readers will find a blend of theoretical frameworks, empirical studies, and real-world case analyses that illuminate the challenges and opportunities of this digital era. From the disruptive potential of artificial intelligence to the operational efficiencies enabled by cloud computing, the chapters collectively underscore the strategic importance of aligning technological advancements with organizational goals.

This book is designed for scholars, practitioners, and policymakers seeking a deeper understanding of how digital transformation can be leveraged to enhance organizational performance. It invites readers to reflect on the dynamic interplay between technology and human ingenuity, a relationship that will continue to redefine the future of work, innovation, and competitive advantage.

As we navigate this era of digital acceleration, may this work serve as both a guide and a source of inspiration for those committed to driving meaningful change within their organizations.

NAVIGATING RISKS AND INNOVATIONS: A COMPARATIVE ANALYSIS OF FINTECH AND TRADITIONAL FINANCIAL MARKETS

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Abstract

This article explores the dynamic landscape of the fintech market, emphasizing its intersection with traditional financial markets and the associated risks. It highlights the unique features of fintech asset management, which mirrors the functions of investment banks, facilitating transactions that alter investment portfolios. The fintech market's rapid growth, driven by technological innovations such as artificial intelligence, blockchain, and machine learning, introduces both opportunities and significant risks.

The study underscores the importance of robust risk management systems for fintech participants, addressing challenges related to risks, legal compliance, and client service. It contrasts the regulatory environments of traditional and digital financial markets, discussing how different countries (Estonia case study) have adapted their regulatory frameworks to accommodate Fintech's unique characteristics.

Methodologically, the research employs a combination of scientific, logical analysis, situational management approaches, and advanced technological solutions to predict and mitigate risks in the fintech sector. The development of FinTech in Estonia exemplifies innovative regulatory approaches that balance the need for technological advancement with systemic risk management.

The article provides a comprehensive comparative analysis, offering insights into the evolving risk management strategies in traditional and Fintech markets. It also highlights the critical role of international cooperation and regulatory modernization in ensuring the stability and growth of the financial ecosystem.

Keywords: Fintech Market, Technological Innovations, Regulatory Frameworks in Estonia

1. Introduction

The financial market serves as one of the most crucial economic institutions. Technological innovations in the financial market are not a new phenomenon, but in recent years, investments in cutting-edge financial technologies have significantly increased, with the growth rate of innovative solutions being exponential. Venture capital investments in companies in Estonia developing innovative technologies for the financial market globally increased from USD 1.89 billion in 2010 to USD 53.3 billion in 2021 (Ashta et al., H. 2021). Currently, customer interaction with banks is facilitated via mobile applications, enabling payments, money transfers, and investments. Artificial intelligence, social networks, machine learning, mobile applications, distributed ledger technology (blockchain), cloud computing, and extensive data analysis have transformed traditional services and business models of financial institutions and led to the emergence of new market participants—FinTech companies.

Digital technological solutions integrated into the financial market play a vital role in the economies of developed and developing countries. For instance, mobile payments account for 16% of China's GDP, according to the World Bank, but less than 1% in the United States, India, and Brazil. Especially in developing countries, mobile banking is seen as promising due to the high proportion of consumers with mobile phones and relatively few with bank accounts or credit cards. According to a World Bank study, in many African countries, as well as in Chile, Bangladesh, and Iran, more than 20% of the population have a mobile money account. Meanwhile, peer-to-peer lending and other credit platforms are now economically significant in some segments. For example, FinTech lenders accounted for 8% of the U.S. mortgage lending market in 2020 and 38% of unsecured personal loans in 2022. These platforms are essential for financing small and medium enterprises in China, the U.S., and other countries. In the U.S. and the U.K., such platforms have provided small and medium enterprises with 15.1% and 6.3% of bank lending, respectively. (World Bank, 2020).

The information asymmetry paradigm is a cornerstone in the economic principles of participants' decision-making processes in the Fintech market and risk management. It allows the formation of categories based on the specifics of decision-making and a non-coincidence attitude for events in a market risk model. The economic feasibility of participants' decision-making in the Fintech

market is proved within the framework of the market risk model of the classic utility maximization model, partially taking into account the risks and the principle of non-coincidence of used market risks. Other market risk models are standardized, considering the specifics of a Fintech market and expanding categories for defining extra-business risks. It contributes to the benefits of a soft product. It enhances the forms and method of participation therein, improves the efficiency of mortgage lending with home repurchase, and reduces the mortgage risks of the most effective Fintech market innovation of informational maturity. Technological digital solutions drive new economic sectors and significantly contribute to solving socio-economic problems caused by population aging, social stratification, environmental issues, and climate change. Under the influence of digitalization, the labor market, healthcare, and education are undergoing radical changes. All of the above leads to companies needing to adapt their business processes, as traditional models cannot adjust to the digital environment.

Significant problems faced by participants in the digital financial market include growing uncertainty and risks regarding rules and regulatory norms (compliance risks). On the one hand, this restrains investments, and on the other hand, it causes distrust among clients. Such risks lead to increased compliance costs. There is an obvious need to develop new methods and tools for regulation, on the one hand, to facilitate and support the development of the digital financial market and increase the availability of financial services, and on the other hand, to minimize the risks of participants, violations of consumers' rights, and financial fraud.

Companies of various forms actively seek contacts with another network to enable intensive governance. Perceiving the business from the perspective of signaling reasons, searching for a range of organizations ready to give their positive signals is necessary. New fintech companies can only sometimes offer traditional bank guarantees, limiting their development as potential signalers.

2.Literature Review

The key drivers of any economy are the market and market relationships, including financial and credit relationships. Thus, digitalizing financial relationships and forming a digital financial market is essential in the context of the digital economy. The structure of the fintech market is a network of enterprises and organizations. Enterprises and organizations act as nodes in the network, holding

specific roles. Some enterprises act as 'bridges' between commercial banks, and others provide guidelines for micro-enterprises on the basics of their activities. The authors assume that Fintech and traditional banking organizations develop collaborative partnerships with other network members, addressing the barriers to the fintech market. The paper shows that collaborative partnerships are between commercial banks and fintech platforms. The interests of micro-enterprises are more than those of bank administrators. They have many contacts with diverse organizations. They are interested in collaborative partnerships with various fintech platforms. The main feature of the model of asset management fintech is the performance of the functions of an investment bank. All transactions of the company's clients aimed at changing the structure of a client's investment portfolio have one thing in common, i.e., a change like a financial asset investment tool. As a participant in the stock market, the client invests by selling one financial asset for cash and buying another for cash. The customer enters into an agreement with Fintech on the purchase/sale of innovative products. The trading terminal is licensed to execute orders in the secondary innovative market. Fintech has developed an infrastructure that includes such potential clients for innovative products and experience in effective selling for amounts exceeding the issued ones. It is about legal entities and wealthy individuals, including representatives of funds investing in groups of financial portfolios. (Ashta & Herrmann, 2021)

The fintech asset management model is based on the principles of the investment bank. The company has developed and implemented a licensed trading terminal with the unique functionality necessary to effectively and securely invest in innovative products. The fintech market is at the intersection of finance and digital technologies. This is the most promising segment in terms of future profitability. (Feyen et al., 2023)

Mishra (Mishra et al., 2022) have recommended that the business requirements for finance personnel point to the need for professionals to improve financial education, and the consolidated resources of business and education are necessary for the future effectiveness of finance and economic development.

2.1 Significance of Risk Management

The financial technology market is entering a phase of active growth in activity, accompanied by a significant transformation and an increase in the risks of its participants. The consequences of the development of this sphere force us to develop and form new approaches to managing these risks. Problems and possible scenarios for resolving conflicts in the development process become key. Adopting the most rational provisions and implementing preventive strategies that can reduce the negative impact of these factors are of growing importance in the activities of agencies, firms, and enterprises that participate in this segment of the financial market. With the development of the functioning and expansion of the Fintech Market, states are forced to address the study of this scarce issue and form a regulatory policy that is as optimal as possible in state regulation of the Fintech Market and improve the effectiveness of their functioning. A coherent, well-established, and harmoniously operating financial technology market guarantees competitiveness in digital transformation and effectively allows the management of virtual economic agents' economic and social growth. (Barroso & Laborda, 2022) According to Murinde (Murinde et al., 2022), in assessing risks in the fintech market, international experience is exciting because it is the most competitive internationally. In addition, the fintech market is inherently international. The experience of several countries that have implemented public policy measures aimed at stimulating and developing this market has been studied. The experience of European Union countries Estonia, Lithuania, and Singapore has been studied in the field of incentives for developing fintech services. The conceptual approaches applied by supervisory authorities in developed countries, including the United Kingdom, France, and Italy, are also of interest. The Estonian experience in fintech development is worth exploring. In recent years, Estonia has emerged as a powerful natural force in the European fintech landscape, capturing attention and acclaim for its innovation, digital prowess, and forward-thinking approach to financial technology. Hundreds of fintech startups following the success of three unicorns in the sector, Estonia continues to unfold a series of surprises within the realm of financial technology. (Rupeika-Apoga & Thalassinos, 2020)

2.2 Technology Solutions

The accelerated development of the financial services market using innovative technologies is called financial technologies (Fintech). The expansion of the range of financial technologies and the constant entry of new players from the real and virtual business also create risks, not only for

financial services consumers, who are the main focus of regulatory impact studies, but also for a different group of economic entities that form the fintech market. Innovation in the financial sector is characterized by increased variation and volatility of the structure and content of market risks generated by the participants in the fintech market. Regulatory policy in the field of finance, including financial technology policy, focuses on the activities and products of only those participants in the market who are licensed (authorized) to work, ignoring other participants but who, in one way or another, form new markets and form market risks for themselves and other market participants. (Chaudhry et al.2022)

Digital technological solutions integrated into the financial market play an increasingly crucial and transformative role in the economies of both developed and developing countries. The impact of these solutions can be seen in various aspects of the financial landscape, with mobile payments being a notable example. In Estonia, for instance, mobile payments already account for a significant 11% of the country's GDP, as reported by the World Bank. In contrast, countries like the United States, India, and Brazil have yet to fully harness the potential of mobile payments, with their respective percentages lingering below the 6% mark.

As stated by Aslam (Aslam et al., 2023), the modern fintech market has dynamic characteristics, as it operates based on new ideas and technologies not previously used to provide financial services to users. The rapid development of the fintech market leads to both the growth of existing and new risks. Identifying and assessing these risks are particularly relevant, as new segments may have underdeveloped risk management systems. However, in connection with the dynamic development of the fintech segment of the financial market and the novelty of the research objects in this sector, the issue of assessing the participants' risk profile still needs to be sufficiently studied. Therefore, it is necessary to study the theory and methodology of forming and assessing the risk profile of participants in the fintech market to implement predictive participant risk management strategies. The peculiarities of credit risk management problems in a fintech company, where there is no necessary amount of historical data, are considered using a small dataset associated with newly launched products. It is recommended that methods based on feature selection, outlier detection, and a boosting algorithm be used to predict consumer credit defaults. An approach to mitigating the risks of regulating and monitoring the activities of fintech companies is proposed. Information

technology experts' expertise contributes to mitigating the risks of regulating the activities of the fintech market. This factor should be incorporated into a list of risks that require consideration when assessing the reliability of fintech companies for users and the authorities responsible for regulating the fintech market, i.e., in developing internal systems for risk control management in the functioning of fintech companies. (Hjelkrem et al.2022)

With 193 fintech companies, including notable players like Wise and Guardtime, Estonia has become a global hub of excellence for Fintech. Glia, headquartered in New York City but with Estonian roots, is also revolutionizing customer services in finance, spreading Estonia's digital-first mindset worldwide. "Estonia's success comes in two parts. Estonia was the first post-commie country to adopt a flat rate income tax in 1994, adopted later by several countries as well," says President of Estonia (2006-2016) Toomas Hendrik Ilves.

"A simplified tax system led to a major boost in compliance even with a paper-based system. The second step was to offer digital filing of income tax, which turned to file into a three to five-minute operation since all taxable income and deductions were pre-filled," Ilves also notes. (Ilves, 2024)

According to the Ministry of Economic Development and Communications in Estonia, Estonia's innovation journey has led its companies to develop solutions prioritizing innovation, user-friendliness, and safety in the fintech industry. The country's widespread adoption of Electronic ID and Blockchain technology has further strengthened its position in this field (23).

The Bank of Estonia recognizes digital financial technologies as an integral part of all types of financial services (lending, payments and transfers, savings, investments, and insurance), transforming traditional business models of the financial market and enhancing their customer orientation. Such a technological–digital – transformation requires changes in the regulator's approach. Therefore, at the initiative of the Bank of Estonia and critical players in the financial market, the "FinTech Association" was created in 2016 to form an expert assessment of innovative technologies taking into account international experience, as well as to develop new conceptual solutions in the field of financial technologies and approaches to their safe and effective implementation. (Akimenko, V. V., Belomyttseva, 2014).

According to Kitsios and the baseline scenario and favorable macroeconomic conditions, digital transformation can significantly increase overall productivity in the banking sector. In addition, the average additional contribution to the growth of the financial and banking economic sectors due to digital transformation is expected to be about 24% during 2022-2030. (Kitsios et al.2021). The relevance of the research topic is that the pace of growth of innovative digital products and services in the financial market is rapidly increasing in former soviet country Estonia. For instance, as of 2022, venture capital investments in Estonian technology companies developing financial products amounted to USD 216 million, placing the Estonian digital financial technology market fifth among Eastern European countries.

Much success in various areas of human activity is accredited to artificial intelligence. The combination of the technical capabilities of artificial intelligence allows the creation of digital financial solutions that can analyze large amounts of data in a matter of seconds, study patterns in consumer data, and, principle, perform tasks that previously required human labor in the areas of risk management, decision-making in lending, insurance, asset management, or trading in financial markets. Information asymmetry in the financial market can be eliminated for various reasons. The methods used by new fintech companies are machine learning algorithms, which are used for error control and strengthening probabilistic matrix factorization, as well as deep convolutional networks that analyze images of documents and standard neural networks with many hidden layers that use data sets.

3. Methodology and Research Design

The topic of the research becomes especially relevant given that in a highly competitive financial market, the use of digital technologies becomes a necessity, contributing not only to the efficiency of participants' activities due to the rapid reduction of market, credit, operational, and compliance risks and associated costs, but also to the availability, quality, and range of financial services for end consumers. For an effective transition to a new market model – digital – it is necessary to understand its subject-object structure and identify key features and distinctive features compared to the traditional one.

The work methods include the selection, classification, and systematization of primary and inter-industry bibliographical data related to the market of financial technologies; the development of an explication of the advantages underlying the use of discretionary fintech platforms and individual technologies with the identification of the main channels of occurrence distributed by intermediary groups; the development of models of the main components of risk in the context of market transactions; factorization of the main parameters that determine the amount of operational risk during activities in the financial technologies market; the development of a priority risk group classifier taking into account the specifics of the technology, accompanying financial risks of transaction participants, as well as the developed theoretical and methodological basis for the formation of tools to manage the loss of portal participants.

The relevance of the research topic is that the pace of growth of innovative digital products and services in the financial market is rapidly increasing in former soviet country Estonia. For instance, as of 2022, venture capital investments in Estonian technology companies developing financial products amounted to USD 216 million, placing the Estonian digital financial technology market fifth among Eastern European countries.

Based on the classification compiled and the defined methodological tools, a methodology was formed that includes three blocks. The first aims to identify the peculiarities of the financial technologies market by modeling the advantages of trading and the main components of risks for portal participants by formalizing the main factors of risk amounting as applied to market transactions for fintech platforms. The second block aims to identify priority risk groups according to the classifier developed in the context of economic and financial sciences. The third aims to determine the essence and methodological basis for developing tools to manage the participants in the fintech transaction market using the theory of decision-making and game theory.

The choice of the features of the fintech market analysis in Estonia as objects of financial risk and its participants is justified. This includes many participants with low power relations, information asymmetry in most of the data exchanged, the disadvantage of technology formation, demand, and the offering of financial services. These often involve incomplete knowledge, the prioritization of private interests over the general welfare function, and the digital nature of the market.

The research uses a situational approach to management to the system management of complex structures, the provisions of the theory of rational behavior of participants in the financial market, and the provisions of the general theory of risks, strategic risk management, and risk management in the field of financial market securities to form a risk management model of the leading market participant.

The study uses a step-by-step approach. In the first stage, a comparison and synthesis method are employed. In the second stage, the functional method and the method of classification are utilized.

With its strategic investments in digital infrastructure, progressive regulatory environment, and a culture that embraces technology, Estonia has carved out a prominent place as the fintech hub of Europe. This New Nordic nation has created a fertile ground for fintech startups developing advancements reshaping the financial industry.

It is essential to research the impact of changes in the FinTech environment on the traditional model to find new risks (or accentuate old ones. With this in mind, the objectives of this research are as follows: i) to overview the classical approach to digital markets and FinTech in the economy; ii) to research the impact of digitalization on market relations; iii) to analyze the development that actors face in the FinTech market in Estonia.

4. Comparative Analysis of Technological Solutions development: Traditional versus Fintech (a case study of Fintech in Estonia).

4.1 Infrastructure of the Digital Financial Market in Estonia

In FinTech, there are both traditional forms of risk, which are present, for example, in the operation of banks, and new or significantly changed risks. Among the traditional bankruptcy and market risk, the technological and reputational risks occupy the most significant place. Nevertheless, the legal (regulatory) risk plays a unique role, as the legislative field must continually adapt to innovative transactions and services. Operations between a client and a service provider will be arranged in the shadow of regulations, and the main guarantor of fulfilling the obligations is the platform owner, or the client, bank, insurance company, or payment system becomes a counterparty. In the digital economy, many are losing the old familiar principles and the security

of the classical system. Many participants in the digital environment enter into billions of transactions, primarily unknown to national regulators, bringing unpredictability and discharging the reliability of the market's whole infrastructure into risk. At the same time, we could find here an opportunity to create new products from financial engineering instruments. According to Fintech Time, "Estonia is a cashless society, with over 99 percent of financial transactions occurring digitally. Since 2000, individuals have been electronically declaring their income, and online declarations have accounted for over 99 percent of all submissions. Estonian efforts here have not gone unnoticed. With no corporate income tax on reinvested profits, capital tax, or property transfer taxes, Estonia's transparent and straightforward tax system continues attracting investments and boosting the economy, including the fintech sector.' (27)

Summarizing the above – under the influence of the digital economy's development and the financial market's transformation, a digital financial market emerges, significantly enhancing the efficiency of traditional tools for creating, storing, implementing, and delivering financial goods and services in Estonia. As with the digital economy, the essential means of implementing the functions of the digital financial market is data in digital form. The infrastructure of the fintech market in Estonia includes several vital components that fundamentally differentiate it from the traditional financial market. This includes extensive information and communication technologies and risk management, encompassing hardware and software solutions designed to facilitate electronic transactions and data storage.

According to the Estonian Ministry of Economic Development, with its strategic investments in digital infrastructure, progressive regulatory environment, and a culture that embraces technology, Estonia has carved out a prominent place as the fintech hub of Europe. 'This New Nordic nation has created fertile ground for fintech startups developing advancements reshaping the financial industry. The role of the corporate strategies of fintech companies as a hypothesis that determines their development exceeding the average values and potential for the development of new and existing markets has not been studied enough. Estonia's innovation journey has led its companies to develop solutions prioritizing innovation, user-friendliness, and safety in the fintech industry. The country's widespread adoption of Electronic ID and Blockchain technology has further strengthened its position in this field. At the same time, all participants have an equal share of

responsibility (integral risk) for the security of the financial system. The economic nature of the activities and development strategy of the participants in the fintech market is the choice of an acceptable quality of security, expressed not only in the cost-profit category but in the cost-risk-profit category. Each choice generates not only market values of costs and profits but also integral risk values, which characterize, among other fields, the degree of possibility of an unacceptable situation for the market as an integral indicator of the banking system's stability" (26).

One significant element is the deployment of secure, scalable, and highly available cloud services that provide the backbone for financial operations and data analytics. Moreover, the digital financial market employs advanced cybersecurity measures to protect against fraud and cyber-attacks, ensuring the safety of transactions and the privacy of users.

Digital identity verification systems are another critical infrastructure component. These systems use biometric data and advanced encryption methods to ensure that all transactions are conducted by verified users, thereby reducing the risk of fraud and enhancing trust in digital financial services. The technological solutions mentioned can bring substantial benefits to consumers by increasing the accessibility of financial services and to companies by offering a broader range of innovative solutions, enhancing their operational efficiency. Innovations also stimulate competition in financial market segments, such as online banking or the mechanism for remote banking services via the Internet, Peer-to-peer lending, and Robo-advisory services.

Beyond mobile banking, the rise of peer-to-peer lending and other credit platforms has ushered in a new era of economic significance, particularly within specific sectors. A prime example of this is observed in Estonia, where FinTech lenders commanded a remarkable 8% share of the mortgage lending market in 2022. Moreover, in 2022, these lenders accounted for 38% of unsecured personal loans, showcasing the increasing reliance on these platforms within the consumer lending space. However, it is worth emphasizing that the impact of these digital platforms extends far beyond consumer lending alone.

The World Bank provides substantial insights into the development of FinTech in Estonia, highlighting how the country's strategic initiatives and regulatory frameworks have facilitated growth in this sector. The World Bank report on "Fintech and the Future of Finance" underscores

that Estonia's proactive regulatory environment, including regulatory sandboxes, has fostered innovation while managing associated risks. These sandboxes allow FinTech firms to test new products and services in a controlled environment, thus encouraging innovation and ensuring consumer protection and financial stability (World Bank, 2022).

Estonia has established itself as a leader in FinTech innovation. The country has fostered a highly conducive environment for FinTech growth, characterized by a robust regulatory framework, advanced digital infrastructure, and a supportive government stance towards innovation. According to the World Bank, Estonia's regulatory sandboxes have allowed FinTech firms to test new products and services, accelerating innovation and ensuring consumer protection and financial stability. This proactive approach has enabled Estonia to maintain a competitive edge in the global FinTech landscape.

Digital transformation represents transforming a financial product or service into a digital format – the digitalization of products and services. There is a global digitalization of business processes within the financial market and in most sectors of the Estonian economy. Digital transformation has replaced computerization and informatization – only a narrow range of tasks can be solved using specifically configured computing technology and computer programs.

Estonia is also a pioneer in mobile banking and digital payment solutions. Companies like Modularbank and EveryPay are at the forefront of this innovation. Modularbank provides a flexible, API-first core banking platform that allows banks and FinTechs to deploy new financial services quickly, while EveryPay offers comprehensive digital payment solutions that support various payment methods, including ApplePay, GooglePay, and PayPal. These platforms have enhanced the efficiency of financial services and expanded access to financial products across different demographics, furthering financial inclusion.

Robo-advisory services and the integration of A.I. in financial services are other areas where Estonia is making significant strides. AI-driven platforms are transforming investment management and personal finance by providing automated, data-driven financial advice. These advancements are supported by a robust digital infrastructure and a regulatory environment that encourages innovation while managing cybersecurity and data protection risks. The World Bank

highlights the importance of adapting regulatory frameworks to address these new challenges, ensuring that technological advancements contribute to a stable and inclusive financial system.

Estonia has also leveraged digital technologies to enhance financial inclusion and efficiency. The World Bank notes that digital financial services have significantly improved during the COVID-19 pandemic, enabling rapid and secure delivery of financial services to the populace. Estonia's commitment to digital transformation has facilitated government-to-person payments and cross-border remittances, reducing transaction costs and improving access to financial services for underserved communities.

These innovative solutions have become essential for financing small and medium enterprises (SMEs) in Estonia, Lithonia, China, the United States, and many others. These platforms have empowered countless SMEs to thrive and grow in an ever-competitive business landscape by providing alternative avenues for capital infusion. This underscores the significance of digital platforms in stimulating economic growth and fostering a climate of opportunity for businesses of all sizes. (Zhou2022), (Kumar et al., 2021)

4.2 Comparative analysis of traditional versus fintech markets.

The widespread adoption of the Internet, information technology, mobile communication, and information-computer technologies in Estonia is evident as the foundation of digitalization. These technologies transform processes and decisions, creating a special digital economic environment.

In the generally accepted sense, the traditional financial market involves transactions of buying and selling, through which the movement of cash flows in the economic system is carried out under the influence of changing demand and supply relationships. On the other hand, the financial market is a mechanism that provides for the mobilization of unrestricted cash and distributes it across sectors of the economy.

The digital financial market is the result of the digital transformation of the traditional one, where computer and information technologies are used instead of established approaches. Thus, the critical functions of digital and traditional financial markets are identical, but the interaction methods between participants change. In addition, in the digital financial market, the traditional

functions of the financial regulator are supplemented by the role of the organizer-provider of FinTech infrastructure.

The functioning mechanism of the financial market as a set of forms of interaction of subjects, methods, means, and instruments is aimed at ensuring its equilibrium, which is achieved through the interaction of individual internal elements. To a greater extent, the equilibrium state (balance) within the framework of market economic relationships is achieved through the internal self-regulation inherent in the financial market and, to some extent, through direct or indirect government intervention - regulation.

Digital transformation of the financial market through digital, information and computer technologies simplifies the interaction of its structural elements, providing an expanded range of technological solutions.

If in the traditional market, the primary means of implementing its functions were human capital, systems of linear data storage, and standard office programs, digitalization provides a range of automation tools, from robots-operators of support services and determining the credit rating of an applicant-borrower (scoring), to automatic verification of transactions and detection of prerequisites for financial fraud and terrorism, as well as multilevel identification of the owner of a financial product, including scanning the iris and retina of the eye and fingerprint, oval and other characteristics of the face, voice analysis.

The main differences between traditional and digital financial markets were identified. The results are presented in Table 1.

Table 1: Comparison of Traditional and Fintech Markets

Feature	Traditional	Digital
Resource Allocation Conditions	Ability to pay and urgency (returnability in case of credit relationships)	Use of digital technologies for distribution and storage of monetary resources. Minimization of human factors in operations. Cashless payments, electronic money, digital currency. Automation of most routine and intellectual (qualified) processes, particularly investment decision-making. Automated scoring models for creditworthiness analysis and automation of financial reporting preparation. Electronic document management, digital signatures, cloud data storage.
Specificity of Mechanism	Traditional methods of distributing and redistributing money between creditors and borrowers using intermediaries. Predominantly cash payments and card transactions. A small proportion of automated processes. Creditworthiness analysis by specialists according to approved criteria. Financial reporting preparation by accountants. Paper documents. Data storage in archives needs to be better developed, and database storage needs to be improved. Identification "by passport ."Client service in offices, the most straightforward toolkit of mobile applications (money transfers, payment of receipts, shopping).	Multilevel identification. "Mobile office" – everything is available remotely, so there is no need to visit an office.

Feature	Traditional	Digital
Distribution of Resources	Physical presence and use of cash or card-based systems predominantly involve intermediaries for transactions and crediting.	Digital platforms facilitate direct transactions without intermediaries, using digital currencies and electronic money—the predominant use of automated systems for risk assessment and transaction processing.
Specific Mechanism Characteristics	Operations are largely manual and conducted through human intermediaries, and decisions are often subject to manual review.	Extensive use of automated decision-making systems, A.I. for risk assessment, blockchain for transaction security, and comprehensive digital interfaces for user interactions.

4.3 Current Risk Management Practices in Fintech (Estonian case study)

The main systemic risk of Fintech is the cyber-risk of the "bank as a service" business model of any fintech organizer platform. Unlike the cyber-risk of traditional banks, the "Bank as a Service" model platform organizer faces a specific BPM cyber-risk (bank as a platform model cyber-risk), which is manifested by the risk of the cyber-integrity of the shared economy link, the cyber-gap between the BPM participants and state regulators, and the supplier of the shared economy link. As a complex compound banking organization in the "bank as a service" business model, the bank is a key financial institution of the sharing economy and a key fintech operator. The financial risk management strategies of the bank need help to develop the cloud challenges of the bank as a single-point operation.

The chapter aims to illustrate risk management strategies for participants of the fintech market that have been used in Estonia to minimize the likelihood of systemic risks and individual risks for platform organizers, including the platforms with the business model "bank as a service" and the sharing economy. The methodological framework of the chapter uses the approach of regulators, based on micro and macro-level solutions to the problem of the impact of Fintech on the banking system and individuals, companies in general, as well as financial risk management models and the organizational aspects of the bank as a compound organization in the "bank as a service" model.

The results of the research and the conclusions described in this chapter contribute to the growing body of literature on the opportunities and threats of Fintech, extracting the micro and macro-financial risk management strategies and structural and organizational advantages of the bank as an organization.

The formation of a financial market, the functioning of its constituent elements, and the organization and development of interaction between their participants under the influence of the rapidly developing zone of the digital economy force everyone to change habits and approaches in their activities, to think ahead, to simulate the development of this zone to save time and resources, and direct energy only at the most promising lines. Problems in informatization, information transfer, and protection in the financial sphere, among others, increase risks and can lead to negative consequences.

This difficulty in applying the concept of risk and its control in the Fintech market contrasts with the elaboration and consolidation of very relevant concepts, which follow classical models and are associated with financial institutions. Failure to follow these practices is one of the reasons that many Fintech entities operate in the regular flip market. High competition may include underwriting practices that seek growth above the speed of mature problem solutions. In this sense, identifying the most essential components for planning and long-term activities makes it possible to help companies determine the optimal regulation of this market, which is especially relevant in terms of risk management. Recognizing the importance of this issue and the need for convergent regulations, it will be emphasized throughout this presentation in all models that are now implemented in the Estonian fintech market.

One of the step-by-step points of the action plan on Fintech is the importance of organizing actions to assess the benefits and risks associated with Fintech services, especially those related to comparable services. An imbalance associated with such services can put collectively acceptable financial stability standards at risk. However, considering this sector's diversity and dynamism, defining a unique risk management solution appears difficult. Government or regulatory authorities also need help applying acceptable good practice standards for all existing products. Alternatively, entities that launch unproven products also need help verifying if the solution complies with the

requested rules, often only learning lessons through practical experience; that is when the product already operates in the market.

With the growing fintech sector in Estonia, Participants related to FinTech bring new opportunities and significant challenges. On the one hand, FinTech systems could diversify funding sources, accelerate innovative projects and new startups, create financial products and services, and, in the aggregate, increase the functional connection between investors and businesses.

4.4 Designing the Technological Procedure for Company Participation in the DFS.

This section of the paper establishes that the DFS is a critical tool for advancing financial technology in a safe, controlled, and beneficial manner to all stakeholders involved. By providing a structured environment for testing and refinement, the DFS not only helps mitigate potential risks but also fosters innovation within the financial sector. Estonia's financial services market, valued at approximately USD 22.219 trillion in 2021, has witnessed a remarkable surge in cashless payments. This market is experiencing rapid expansion thanks to the active penetration of the Internet and mobile communications in emerging markets. Moreover, the economy's growth and the increasing acceptance of mobile payments in mature markets are further propelling this trend. Additionally, the global movement towards immediate payment schemes that provide instant real-time payments is fueling the surge in cashless transactions. This transformative shift reshapes the financial landscape and revolutionizes how individuals and businesses conduct transactions. As technology advances and innovation thrives, the potential for further growth in the cashless payments sector is boundless. Cashless payments' convenience, security, and speed make them appealing to consumers and businesses. With this momentum, the financial ecosystem in Estonia is set to flourish, facilitating seamless and efficient transactions for all parties involved. In the digital financial market, financial technologies have significantly accelerated transactions, made the payment process intuitive, and, at the same time, maximally secure, providing substantial economic benefits for customers. The growth driver has been the rapid rise of e-commerce and mobile technologies. Payment instruments have transformed from banknotes to digital currency, loyalty points, and other digital money equivalents. Known as the digital infrastructure of the financial market, this encompasses a combination of organizations serving transactions with traditional and digital assets, conducting control and calculations for transactions, accounting, and transfer of

rights to assets, using digital platforms for collecting, storing, and processing information, and technological solutions to speed up, simplify, and enhance the security of transactions.

The development of a Digital Financial Environment (DFS) represents a significant innovation in the field of financial technology. It offers a controlled environment in which new financial products, services, and technologies can be tested and evaluated. This concept builds upon the idea of regulatory sandboxes, enhancing it with more robust features that allow more accurate simulation of real-market conditions. Digital Financial Solutions (DFS) in Estonia refer to the comprehensive set of digital services and innovations that have transformed the financial sector in the country. Key components of DFS in Estonia include:

- *E-Residency - government-issued digital identity that allows non-Estonians to start and manage a business online, providing access to Estonia's digital infrastructure and services.*
- *Digital Banking -Advanced online banking platforms that offer a wide range of financial services, including account management, payments, and loans, all accessible via the internet or mobile devices.*
- *Blockchain*
- *Mobile Payments.*
- *Automated Tax Filing*
- *Peer-to-Peer (P2P) Lending- platforms that connect borrowers directly with lenders, bypassing traditional financial institutions and offering more flexible loan terms and interest rates.*
- *Crowdfunding -digital platforms that enable startups and small businesses to raise capital from a large number of investors, democratizing the investment process.*

In this section, we provide the framework for a DFS in Estonia, designed to facilitate the collaboration between fintech companies, traditional financial institutions, regulators, and consumers. The DFS provides a platform where participants can experiment with new technologies without the risk of broader financial system disruption. This environment helps identify potential regulatory adjustments and market reactions before full-scale public implementation.

The DFS aims to address specific goals:

- Enhancing the safety and reliability of new financial technologies through rigorous testing.

- Allowing regulators to observe the operational implications of new technologies in a controlled setting.

- Providing fintech developers feedback on their products' functionality and market viability.

- Promoting consumer protection by ensuring that new technologies are comprehensible and beneficial for end-users.

Participation in the DFS is structured to ensure that all parties benefit from the experiment while adhering to a stringent set of guidelines that safeguard the financial system's integrity. This section outlines the process for companies wishing to participate in the DES, which includes rigorous vetting of the technological and business models proposed by the participants.

The procedure involves several steps:

1. Initial proposal submission, where companies outline their technology, intended benefits, and potential risks.

2. Review by a panel of experts, including regulators and industry specialists, who assess the proposal's feasibility and alignment with broader financial and technological standards.

3. The implementation phase is where the technology is deployed within the DES under close monitoring.

The final part of the assessment focuses on developing methodologies to assess the risks associated with the DFS, particularly insolvency. This involves creating economic models that predict how different scenarios might impact the financial viability of the DFS and the technologies being tested.

Evolution of Regulatory Technologies in Estonia:

- Reg Tech 1.0 - from the late 1990s to the mid-2000s, when financial institutions began to develop and implement new technologies for monitoring and analyzing compliance risks. These technologies eventually evolved into some of the quantitative risk management methods used today.

- Reg Tech 2.0 - from early 2008 to 2019, focused primarily on implementing 'Know Your Customer' (KYC) technologies, enhancing consumer protection.

- Fin Tech - a shift from 'Know Your Customer' to 'Know Your Data' (KYD), where financial institutions view risk and regulation as data processing and predictive tasks that technology can address (DFS system)

Table 2. Comparison of Market Functions of Traditional and Digital Markets in Estonia

Function	Traditional	Digital
Distributive	The financial market connects economic agents with a positive balance and those with a deficit budget to implement mutual exchange (buying and selling) of financial instruments.	We are utilizing automated systems to manage transactions, eliminate human error, maintain the required level of risk, and use artificial intelligence to predict price levels.
Pricing	Market prices for instruments (services) and their movement are directly influenced by supply and demand through the financial market.	Market prices for instruments (services) and their movement are directly influenced by supply and demand through the financial market.
Informational	Ensures equal and full access to information for all participants in the financial market.	Decentralized information storage, high protection and reliability, increased speed of information transfer due to cloud technologies, and cryptography as a data protection method.

New entities within the digital financial market infrastructure include companies (I.T. companies) supplying digital financial products, simplifying the interaction of elements within the infrastructure.

4.5 Modernization of Regulator Activities in the Context of Digitalization

To assess the regulatory compliance of a fintech company, an analysis is carried out to determine the presence and compliance of this fintech company with sectoral licenses, the digital issuing of which has not yet been implemented but which is of paramount importance in the legal regulation of almost all financial services at the present stage. Based on the study's results, it has been established that non-credit credit agencies are the most popular segments of the fintech market - 25% of legal entities engaged in fintech activities are engaged in it.

To assess the regulatory compliance of a fintech company, an analysis is carried out to determine the presence and compliance of this fintech company with sectoral licenses, the digital issuing of which has not yet been implemented but which is of paramount importance in the legal regulation of almost all financial services at the present stage. Based on the study's results, it has been established that non-credit credit agencies are the most popular segments of the fintech market - 25% of legal entities engaged in fintech activities are engaged in it. The insurance sector was represented by 6.7% of all organizations implementing such activity. Similar shares are companies accredited as payment system operators who carry out activities to transfer or receive electronic money. (Wang et al., 2023)

At the same time, we must admit that in the fintech environment, institutions include a large share of capital and best management practices. In particular, this applies to financial intermediaries developing in the microlending segment - they account for 65% of the sector's total own capital. The owner's capital, concerning financial intermediaries implementing financial services under the PPP regime, also accounts for a fair share of the sector's total capital.

The modernization of regulator activities is crucial as financial markets embrace digital technologies. This section examines how regulators globally are adapting their tools and methods to keep pace with the speed and complexity of digital financial services. Examples from the European Union, the United States, and Asia show that regulators increasingly rely on technological solutions such as big data analytics and artificial intelligence to enhance their monitoring and enforcement capabilities. These tools allow regulators to detect anomalies and

potential fraud more quickly and accurately, ensuring that markets operate smoothly and transparently.

The digital financial market is characterized by a complex subject-object structure. The subjects include not only traditional financial institutions like banks and insurance companies but also new players such as FinTech and RegTech Estonian companies. These new entrants are typically more agile and technology-driven, focusing on providing innovative financial services such as mobile banking, peer-to-peer lending, and automated investment advice.

Digital financial assets, such as cryptocurrencies, tokens, and smart contracts, are objects in the digital financial market. These digital assets represent a new form of value and ownership and can be traded on digital platforms without traditional intermediaries.

The interactions between these subjects and objects in the digital financial market are mediated through digital platforms that connect various stakeholders and facilitate the seamless exchange of financial services and assets. This interconnected environment supports traditional financial activities and enables entirely new business models and revenue streams, such as decentralized finance (DeFi) applications.

The digital financial market's infrastructure and subject-object structure reflect a significant shift from traditional financial systems, emphasizing the importance of technology and digital processes in shaping the future of finance.

The modernization of regulator activities is crucial as financial markets embrace digital technologies. This section examines how regulators globally are adapting their tools and methods to keep pace with the speed and complexity of digital financial services. Examples from Estonia show that regulators increasingly rely on technological solutions such as big data analytics and artificial intelligence to enhance their monitoring and enforcement capabilities. These tools allow regulators to detect anomalies and potential fraud more quickly and accurately, ensuring that markets operate smoothly and transparently.

5. Summary and Recommendations

This part of the paper focuses on the specific adaptations regulators make to address the risks inherent in digital financial markets. With the rise of technologies like blockchain and the proliferation of digital assets, traditional risk management frameworks have had to evolve. Regulators are now developing new guidelines that address the unique characteristics of digital assets, such as their liquidity, volatility, and the cybersecurity risks they entail. Additionally, this section discusses the need for regulatory sandboxes, which allow innovators to test new financial products and services in a controlled environment under regulatory supervision. This approach helps ensure that new technologies can be tested for safety and efficacy without posing undue risk to the broader financial system.

Digital currencies and ICOs have introduced new complexities for financial regulation. This section delves into how different countries have responded to the challenges posed by these innovations. It covers a range of regulatory approaches, from strict prohibitions to welcoming frameworks that aim to capture the benefits of digital currencies while mitigating their risks. The section also discusses the importance of consumer protection in the context of ICOs, where there is significant potential for fraud due to the lack of understanding and the speculative nature of many such investments.

The final part of this study highlights the importance of international cooperation in managing risks associated with digital financial markets. It points to examples where global regulatory bodies, such as the Financial Stability Board (FSB) and the International Organization of Securities Commissions (IOSCO), have played pivotal roles in fostering dialogue and coordination among national regulators. These international bodies help develop guidelines and standards that ensure a consistent and comprehensive approach to digital finance, helping to prevent regulatory arbitrage and ensuring a stable global financial system.

On closer examination of various "electronic financial products" (and services), the problems of traditional business segments are noticeable. It is logical to consider current business problems in the context of banking operations, other financial intermediaries, banking risks, and financial market risks. In the context of risk management at fintech companies, one way to classify all risks - inherent and channeled through transacting - is to apply the Basel II approach. The business difficulties of fintech companies (and the business problems of their products and services), as well

as their inherent and transacted risks, are visible across the fintech market. They will be attributed to a market risk.

The paper concludes by underscoring that while the digital transformation of financial markets presents significant opportunities for innovation and growth, regulators must be proactive, adaptable, and cooperative at international levels. This adaptability is not only crucial in managing the risks presented by new technologies but also essential for harnessing their potential to improve the efficiency and inclusiveness of financial markets globally.

Investment in financial technology startups is challenging investors, as it is often unclear how much of the promised market is occupied, how much revenue comes from customers, how much investment is required, and what level of risk investors are drawn into. At the same time, investment in fintech platforms and crypto exchanges has become widespread, but many investors may need to be more familiar with these structures. Therefore, any financial technology platform and crypto exchange should consider its risks and develop a plan to prevent or counteract them. Such an establishment can receive support from a sound business model that satisfies each operation's business goals and objectives. Risks for participants in the fintech market, like in the traditional financial system, can be managed through adequate risk management measures to create a profitable business.

Regulatory sandboxes represent a thoughtful approach to integrating innovation within the financial sector. They provide a structured yet flexible environment for fintechs to develop and refine their technologies under regulatory guidance. However, the success of sandboxes requires a balance between innovation facilitation and the stringent enforcement of rules to safeguard the financial system and protect consumer interests. As such, ongoing evaluation and adaptation of regulatory sandbox frameworks are crucial as financial technologies and markets evolve.

The development potential of the fintech business can be harnessed to benefit the proper coverage of risk factors, including those specific to using innovative technologies in the intermediation process. The practice of numerous fintech companies that are both innovatively inherent or associated with other related areas suggests that applying risk management principles enhances organizations' sustainability and resilience and serves as a promising basis for their development.

When assessing the degree of relevance and readiness to spread the relevant risk management tools in the fintech sector, a unique set of properties takes place - flexibility, entrepreneurial character, creative and technical orientation, natural development in conditions of uncertainty, lack of category bias about the probability of risks, dynamics, forms of manifestation - and the entrepreneurial culture of organizations, which in many respects determine the nature and direction of their activity. With the transition period from model proposals to the practical use of these tools, all this may lead to inconsistencies, including the manifestation of risks and threats, reducing the benefits of innovations.

A fundamentally important element of the stability and sustainability of practical operations in innovation intermediary activities is the successful implementation of risk management. To a certain extent, the methodology and tools for risk management that originated in classical financial institutions are forced to be adjusted, transformed, and integrated with objective and transparent assessment and forecasting mechanisms, as well as the mechanisms for an individual and a group's behavior. The transition of fintech companies to advanced methods for providing access to financial services - powered by technologies - is fast and, in some cases, more rapid than their skills in managing their risks and the potential spillages due to increased access and interconnectedness.

From the perspective of regulatory authorities, fintech services expose financial institutions and their clients to numerous operational and credit risks. First, the current model of financial services provision reduces the "barriers to entry" into the financial market, which is overcrowded with new players. They are technologically determined and are expressed, first of all, in a steady improvement in all kinds of new automated technologies, which allows new players to engage in the financial business with lower costs, reaching an unimaginably large number of clients. Meanwhile, mergers and affiliations prevailing in the global banking and insurance market continue to strengthen financially strong participants in business segments of the traditional financial industry.

Recommendations for future research in the area of extending the capabilities of the definitions of forms and methods of participation of participants in the Fintech market, expanding the number of non-coincidence attitudes for event categories, calculation of premium to mortgage and other risks within the model of economic efficiency of decision-making of participants in the Fintech market.

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REIMAGINING GOVERNANCE AND DIGITAL TRANSFORMATION IN THE 21ST CENTURY: NAVIGATING THE DIGITAL ERA, GLOBALIZATION, AND TRANSFORMATIVE FORCES

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Abstract

Digitalization, globalization, and other advancements are transforming 21st-century governance and beyond, involving creativity and theory changes. To understand and contribute, complex systems are studied and scrutinized. The framework applies major governance theories to present realities, and technology-influenced governance is discussed. More still, technology impacts transparency, community engagement, and efficiency. Globalization impacts governance, economy, and society. Flexible responses to transformational forces and governance paradigm adaptation to changing socio-political conditions are stressed in the study. Several case studies demonstrate good and bad governance. After reviewing these available data, policymakers receive explicit recommendations and research goals. Critical chapter lessons and insights and the need for a new governance framework to develop strong and responsive governance institutions for 21st-century politics in the digital era, globalization, and disruptive forces complete this comprehensive analysis.

Keywords: Artificial intelligence, Transformative forces, Governance, Globalization, Digital Era, Political Theories.

INTRODUCTION

The current state of governance is characterized by a significant increase in digital citizenship initiatives, which signifies a fundamental change in the way people participate in civic activities. These projects utilize digital platforms to foster a more inclusive and participatory democracy (Ivan & Ivan, 2024). Online forums, interactive platforms, and mobile applications act as channels, enabling direct interaction between citizens and governance structures. These projects enable individuals to overcome geographical limitations and actively participate in policy input, community conversations, and decision-making processes (Nicolás-Agustín et al., 2024). Digital citizenship programs utilize technology's wide range and easy access to enable a wider segment of society to participate in government. They facilitate and promote collective action, cultivating a sense of ownership and responsibility among citizens towards societal challenges, thus reshaping the dynamics of citizen-state interactions in the digital age commonly referred to as the information age[1] (Rana et al., 2024; Shafik, 2024a).

The rise of transnational governance networks represents a fundamental change in how global concerns are being tackled. These networks go beyond traditional geopolitical boundaries, promoting interactions among various stakeholders across continents. Projects in this domain encompass a wide range of multinational endeavors focused on environmental protection and global health (Ba et al., 2024). These projects bring together individuals and organizations with common goals. These initiatives demonstrate the potential for global collective action by going beyond national boundaries. Transnational governance networks function as forums for the exchange of information, sharing of resources, and making decisions collectively, highlighting the significance of collaboration in tackling interrelated difficulties (Abdul et al., 2024). As globalization strengthens interdependencies, these networks emerge as crucial means for fostering collaboration and solidarity beyond conventional borders, giving a paradigm for effective global governance frameworks (Aldoseri et al., 2024).

The incorporation of blockchain technology[2] into governance signifies a significant turning point

[1] https://www.techtarget.com/searchcio/definition/Information-Age

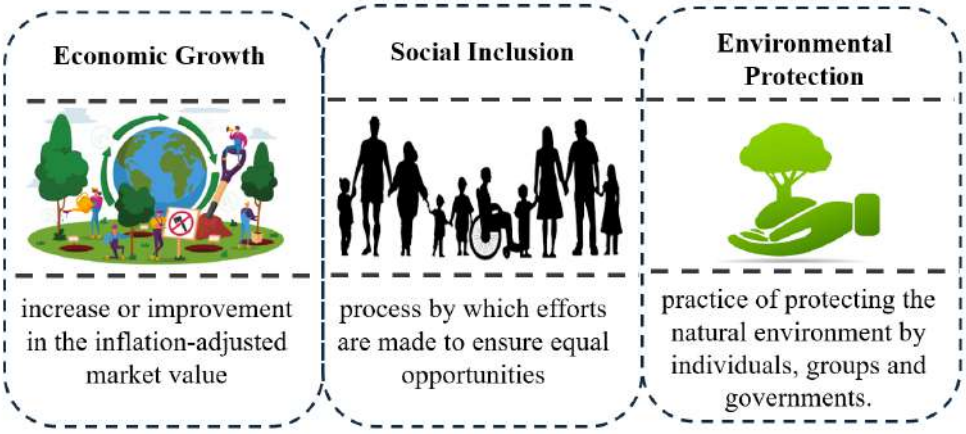
[2] https://www.ibm.com/topics/blockchain

in improving transparency and trust, all supported by the advancement of artificial intelligence[3]. These projects utilize decentralized and immutable ledgers to transform several governmental procedures fundamentally. Blockchain guarantees the integrity of vital governance data by employing transparent and tamper-proof record-keeping (Naji et al., 2024). Blockchain initiatives encompass a wide range of applications, including the development of secure voting systems that guarantee verifiable and unaltered election records, as well as transparent public expenditure ledgers that enable individuals to monitor government spending in real time. Blockchain-enabled governance platforms enhance transparency and security in governance procedures, fostering trust, accountability, and democratic values (Ghafoori et al., 2024).

Adaptive policy models represent a governance method that is sensitive and iterative, adapting to societal requirements as they evolve. These projects emphasize adaptability and promptness by integrating ongoing feedback loops and real-time data analysis into the process of policymaking (Abdurrahman et al., 2024; Shafik, 2024b). Their operations span across several fields, ranging from flexible urban planning frameworks that adjust to shifting demographics and environmental conditions to legislative procedures that utilize agile approaches, facilitating prompt solutions to growing social concerns. These adaptive models represent a shift away from inflexible and unchanging policy structures, favoring flexible and adjustable approaches that are more in line with the changing complexities of modern society (Öngel et al., 2024; Shafik, 2024c). These projects aim to achieve policy outcomes that are more effective and responsive to the changing requirements and preferences of society by incorporating adaptability into governance frameworks incorporating economic growth, societal inclusion and involvement and environmental protection, as illustrated in Figure 1 (Zhang et al., 2024).

[3] https://cloud.google.com/learn/what-is-artificial-intelligence?hl=en

Figure 1. Governance and digital transformation Sustainability requirements



Integrating expert systems such as Artificial Intelligence (AI) into decision support systems[4] is a significant breakthrough in governance procedures. These projects utilize artificial intelligence's prognostic skills and data analytics to provide insights for policymaking. Through the analysis of extensive datasets and the identification of trends, these systems offer policymakers valuable data-driven insights that are essential for making well-informed decisions (Ikhwan & Himawati, 2024). These initiatives, ranging from AI-powered risk assessment tools for public safety to predictive models for healthcare policy formulation, improve the accuracy, effectiveness, and reliance on evidence in governance. Enhancing human decision-making with AI-generated insights, these systems enable policymakers to predict issues, optimize resource distribution, and develop policies that effectively address social demands with more precision and effectiveness (Bilal et al., 2024).

Projects focused on multi-stakeholder collaborative governance represent a shift away from conventional top-down approaches. These projects prioritize inclusion by involving a wide range of stakeholders, including governmental agencies, civil society organizations, corporations, and communities, in collaborative decision-making processes (Siswanti et al., 2024). The strength of collective action and shared responsibility in addressing complex social challenges is exemplified by collaborative efforts in disaster management, sustainable development projects, and policy

[4] https://www.techtarget.com/searchcio/definition/decision-support-system

formulation. These projects aim to provide comprehensive and long-lasting solutions by cultivating collaborations and utilizing the combined knowledge and resources of various stakeholders. They embody a transition towards governance frameworks that promote inclusivity and recognize the interconnectedness of different stakeholders in attaining comprehensive and long-lasting societal results (Salih et al., 2024; Shafik, 2024d).

Projects that investigate post-national identity grapple with the intricacies of governance that extend beyond the conventional borders of nation-states. These projects aim to unify policy across different regions, surpassing cultural and geopolitical barriers. Efforts that prioritize international human rights frameworks or global trade agreements demonstrate attempts to achieve consistency in the face of varied socio-cultural and political environments (Cardoso et al., 2024). These programs aim to recognize and tackle the difficulties that arise from different identities and viewpoints in a globalized world. They work towards creating policy frameworks that promote harmony and accommodate multiple beliefs while also seeking common ground for effective governance across borders (Sallam et al., 2024).

The Chapter Contributions

This chapter provides the following contributions.

- Analyze and evaluate well-established governance theories and their relevance in the context of the digital era, articulating fundamental principles connecting governance with the digital era and globalization.
- Examine novel governance frameworks influenced by technological progress and emphasize the ways in which digital tools enhance transparency, encourage citizen participation, and improve efficiency in governance.
- Examine how globalization reshapes the systems of governance at the local, national, and international scales, analyze the difficulties that arise from the interconnectedness of the world, and provide solutions to tackle them.
- Suggest modifications to governance theories to accommodate swift transformative forces and examine the ways in which governing processes can adjust to ever-changing socio-political environments.

- Provide case studies that showcase the effective application of novel governance solutions in response to the processes of digitalization and globalization.
- Finally, it provides lessons learned and examines the valuable insights gained from unsuccessful attempts at governing in the face of significant disruptive forces, offers practical suggestions for policymakers, and identifies potential areas of further investigation to tackle rising difficulties.

The Chapter Organization

Section 2 commences by presenting pertinent governance theories that are relevant to the subject and elucidates the way these theories are applicable or necessitate modification considering the digital age and globalization. Section 3 examines the impact of technological breakthroughs on governance techniques: present concrete instances or illustrations showcasing inventive governance structures in reaction to digitalization. Section 4 enumerates the various manners in which globalization impacts governance structures and practices. Confront the difficulties presented by globalization and provide tactics to traverse them effectively. Section 5 scrutinizes the different factors influencing governance and its consequences and suggests adaptive strategies or theoretical adjustments to deal with these transformative influences. Section 6 provides concrete examples of when governance strategies effectively or ineffectively responded to the mentioned forces. Analyze these situations and derive conclusions that can be applied to the wider conversation. Finally, section 7 presents the lessons learned and the chapter conclusion.

THEORETICAL FRAMEWORK

Within the current era of digitalization, globalization, and disruptive influences, the theoretical framework functions as a guiding instrument that combines existing governance theories and modifies them to tackle emerging difficulties effectively, as presented below.

Traditional Governance Theories

Democratic theory is a key aspect of modern governance, focusing on the involvement of citizens, the requirement of responsibility, and adherence to the rule of law. The growth of citizen involvement in the digital era entails the exploration of opportunities to promote participation

using digital platforms. Public Choice Theory[5], derived from economics, examines the decision-making processes within governance (Ivan & Ivan, 2024). It analyzes the impact of technical improvements on public decision-making and policy results in the digital era.

Adaptations for the Digital Age

Network Governance Theory examines governance beyond traditional hierarchical structures, considering the growing interconnection of systems. The primary emphasis is on the utilization of digital networks to allow collaboration, information exchange, and collective decision-making. Theories of E-Governance[6] and Digital Government[7] largely state that these theories analyze the incorporation of technology into governance processes (Rana et al., 2024). Their focus lies in leveraging digital tools to enhance administrative efficiency, improve service delivery, and foster citizen engagement.

Globalization and Governance Theories

Transnational governance (dependence) theory[8] examines the systems of governance that extend beyond national borders in response to the blurring of boundaries caused by globalization. This analysis focuses on the influence of international organizations, global agreements, and networks on the formation of governance. Within the framework of globalization, dependence theory examines the unequal distribution of power between developed and developing countries, emphasizing the influence of globalization on governance systems and the formulation of policies (Abdul et al., 2024).

Responses to Transformative Forces

The Adaptive governing Theory promotes the use of flexible and resilient governing frameworks in response to transformational processes that create civilizations. The strategy stresses the use of iterative methods, incorporating input, and adjusting policy to accommodate changing situations.

[5] https://www.thoughtco.com/public-choice-theory-6744655

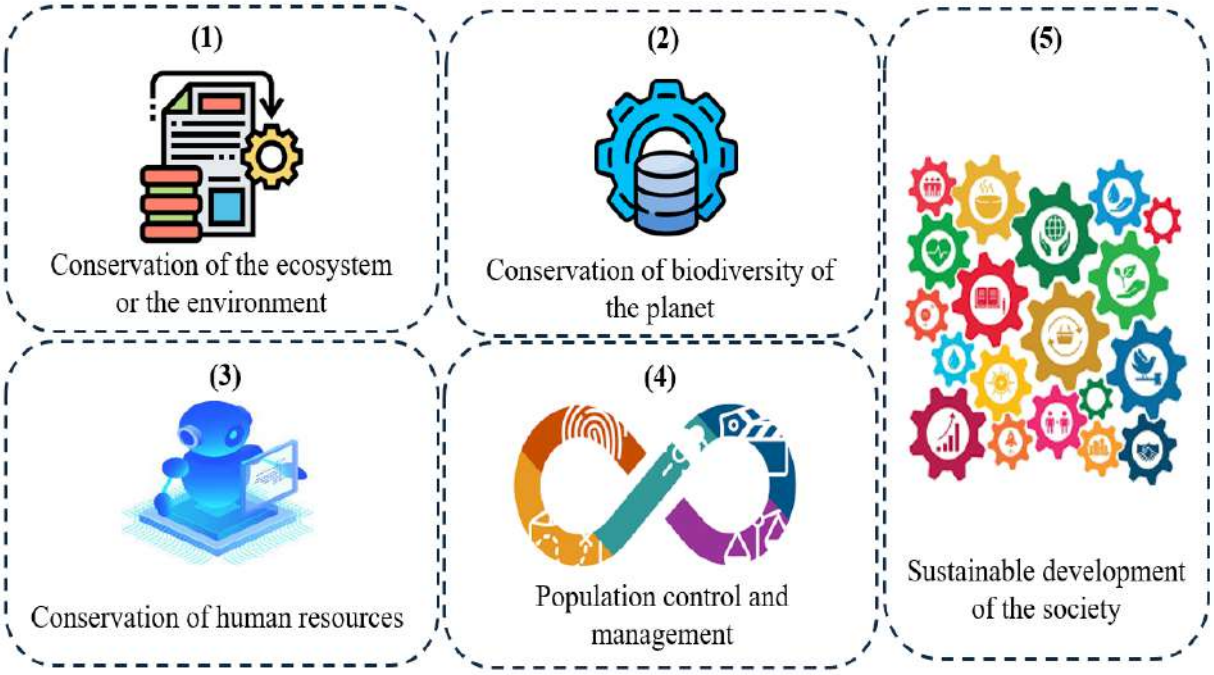
[6] https://www.coe.int/t/dgap/democracy/Activities/GGIS/E-governance/

[7] https://www.oecd.org/governance/digital-government/

[8] http://assets.cambridge.org/052184/5033/excerpt/0521845033_excerpt.htm

Furthermore, Complexity theory in governance theory recognizes the intricate and interrelated character of contemporary situations (Aldoseri et al., 2024). It investigates the non-linear, emergent behaviors that arise in governance systems and emphasizes the necessity of adaptive responses to tackle unpredictability.

Figure 2 Technological and governmental sustainability Approaches



Integration and Synthesis

Hybrid Governance Models: Hybrid models use components from different theories to address a range of difficulties. They advocate for adaptability, recognizing the necessity for both conventional and groundbreaking methods in governance. Interdisciplinary approaches include integrating knowledge from political science, economics, sociology, and technological studies, interdisciplinary approaches provide thorough viewpoints on current governance difficulties and answers (Ghafoori et al., 2024). Figure 2 illustrates some technological and governmental sustainability approaches to realize developmental sustainability.

Responsive Governance Theory

This theory centers on the capacity of governance to effectively address and meet the needs and desires of society. The text highlights the significance of governing frameworks and procedures that promptly adjust to shifting conditions, technological progress, and evolving public demands. The theory of responsive governance emphasizes the importance of using up-to-date data, channels for public input, and including citizens in decision-making processes to ensure that governments can quickly adapt and respond to the changing requirements of their people (Öngel et al., 2024). In the era of digitalization, this notion becomes more prominent as technical progress provides governments with instruments to gather and analyze data, enabling them to respond quickly and knowledgeably to societal shifts.

Ethical Governance Frameworks

The ethical aspect assumes growing significance in modern governance theories. Ethical governance frameworks analyze the ethical principles that guide governance practices in a quickly changing environment. These theories explore the ethical consequences of technology-driven governance, global interconnectivity, and policy choices on various people (Zhang et al., 2024). Their exploration encompasses ethical questions related to the adoption of AI, data privacy, implementation of policies across different cultures, and the ethical obligations of governments in a globalized world. Incorporating ethical principles into theories of governance is crucial for promoting trust, transparency, and legitimacy in decision-making processes among the intricate and frequently ethically demanding conditions presented by transformative forces in the 21st century (Bilal et al., 2024). Ethical governance frameworks strive to guarantee that governance processes conform to ethical norms, moral duties, and societal values.

GOVERNANCE STRATEGIES IN THE DIGITAL AGE

In the digital age, governance initiatives involve utilizing technical breakthroughs to improve transparency, efficiency, and citizen engagement, as demonstrated.

Open Data Initiatives

Open data projects entail governments disseminating public information in easily accessible

formats to promote openness and foster innovation. An example of this is the "data.gov.uk[9]" platform in the United Kingdom, which grants access to a range of government information. This allows people, researchers, and businesses to make use of the data for a variety of purposes (Cardoso et al., 2024). This approach promotes openness, strengthens public confidence, and stimulates creativity by enabling stakeholders to examine and create solutions using data that is accessible to the public.

E-Participation Platforms

E-participation platforms utilize digital tools to involve citizens in policy-making processes. The "Estonian Citizens' Initiative Portal[10]" in Estonia facilitates residents' proposals of ideas and collection of online support. This approach facilitates inclusiveness in the process of making decisions, allowing a broader spectrum of perspectives to participate in governing and cultivating a feeling of ownership and empowerment among individuals (Sallam et al., 2024).

Blockchain for Transparency and Security

Governments are employing blockchain technology to augment transparency and security in diverse procedures. As an illustration, Dubai's "Blockchain Strategy" is designed to safeguard government records and transactions, guaranteeing the accuracy of data and minimizing administrative complications (Bogea Gomes et al., 2024). Through the utilization of blockchain technology, this approach enhances confidence in governmental processes and mitigates the potential for fraudulent activities or tampering.

Smart City Initiatives

Smart city programs incorporate technology into municipal governance to optimize effectiveness and promote the well-being of citizens. Singapore's "Smart Nation Initiative[11]" utilizes data analytics and IoT devices to enhance the efficiency of transportation, energy consumption, and

[9] https://www.data.gov.uk/

[10] https://tropico-project.eu/cases/administration-costs-for-bureaucracy/participatory-parliamentarism-the-case-of-the-estonian-citizens-initiative-portal/

[11] https://www.smartnation.gov.sg/about-smart-nation/transforming-singapore/

public services (Barba-Sánchez et al., 2024). This approach promotes the long-term growth and effective management of cities by utilizing technology to tackle urban issues and improve the quality of life for citizens.

Cybersecurity and Data Protection Frameworks

In a time characterized by prevalent digital engagements, governments must prioritize the implementation of strong cybersecurity measures and data protection frameworks. The General Data Protection Regulation[12] (GDPR) of the European Union serves as a prominent illustration. This rule enforces rigorous data protection measures, guaranteeing the privacy rights of individuals and putting precise guidelines on how corporations manage and manipulate personal data (Weritz et al., 2024). These frameworks protect sensitive information and inspire confidence in government and business organizations that handle citizen data, which is essential in the context of digital governance.

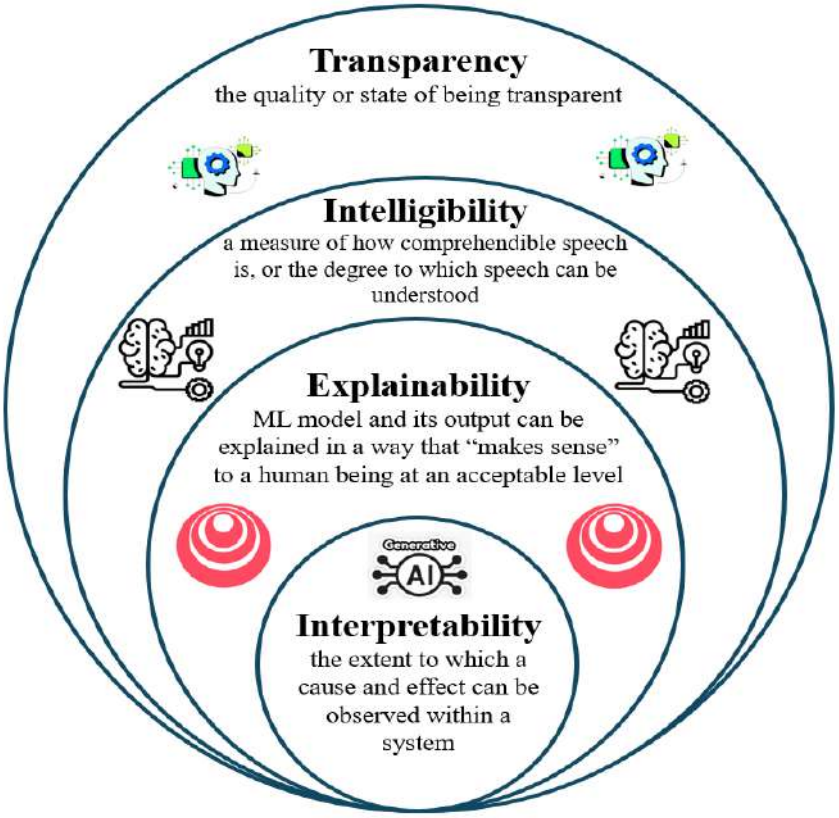
Crowdsourced Problem-Solving Platforms

Crowdsourcing systems facilitate collaborative problem-solving by involving a wide range of talents and viewpoints. The "NASA Solve[13]" effort of NASA serves as a prime example of this approach, as it encourages worldwide involvement in addressing intricate scientific problems. By harnessing the combined intellect of a wider population, governments can access inventive solutions and specialized knowledge, expediting the resolution of issues in diverse fields ranging from science to public policy (Sallam et al., 2024). All these advances have been achieved because of the AI and its recent development, as illustrated in Figure 3.

[12] https://gdpr-info.eu/

[13] https://blogs.nasa.gov/solve/20-2/

Figure 3 Artificial Intelligence and its recent development



AI-Powered Decision-Support Systems

Governments are progressively implementing AI-powered decision-support technologies to improve policy-making procedures. The "AI-powered Policy Insights Platform" developed by the Canadian government utilizes advanced algorithms to examine extensive datasets and discern recurring trends, thereby equipping policymakers with empirically grounded insights (Bogea Gomes et al., 2024). These technologies empower governments to make well-informed decisions, anticipate results, and develop efficient policies by utilizing the predictive and analytical capacities of artificial intelligence. These supplementary governance tactics highlight the various methods by which governments utilize digital innovations to strengthen security, promote collaboration, and utilize technology for informed decision-making and problem-solving in today's governance environment (Kusuma et al., 2024).

GLOBALIZATION'S INFLUENCE ON GOVERNANCE

This section presents identified globalization issues that significantly impact governance structures and processes, fundamentally altering the way states and institutions engage with each other and make choices.

Interconnectedness and Interdependence

Globalization promotes unparalleled interconnectivity among nations, economies, and societies. The European Union[14] (EU) serves as a prominent illustration of regional integration and the restructuring of government. The EU's supranational framework exemplifies how globalization fosters cooperative governance by consolidating sovereignty to tackle shared issues such as trade, security, and environmental policy among member states (Ivan & Ivan, 2024). Given the interdependence between different entities, it is essential to have effective systems of governance that can address global concerns and promote collaboration across conventional borders.

Regulatory Challenges and Harmonization

The wide nature of globalization gives rise to regulatory issues as policies collide across national borders. The World Trade Organization[15] (WTO) exemplifies endeavors to achieve policy harmonization among nations. The primary objective of the WTO's trade agreements is to establish equitable conditions for international trade through the harmonization of rules, the resolution of conflicts, and the promotion of collaboration. Nevertheless, the task of managing many national regulations and maintaining equitable trade practices highlights the governance difficulties that arise from the influence of globalization on regulatory systems (Naji et al., 2024).

Power Shifts and Multilateralism

Globalization reshapes power dynamics, enabling the ascent of non-state players and transnational businesses that exert influence over governance. The Paris Agreement[16] on climate change

[14] https://european-union.europa.eu/index_en

[15] https://www.wto.org/

[16] https://unfccc.int/

exemplifies the collaborative endeavors in the face of globalization. This agreement demonstrates a dedication to cooperative governance by uniting states, industry, and civil society. It acknowledges the shared need to tackle a worldwide problem (Zhang et al., 2024). Nevertheless, managing the impact of various stakeholders in decision-making procedures presents governance intricacies in an interconnected society.

Cultural and Ideological Influences

Globalization facilitates the dissemination of ideas, cultures, and values beyond national boundaries, influencing philosophies of governance. The global dissemination of democratic principles and the promotion of human rights demonstrate the significant impact of culture on government. Organizations such as Amnesty International[17] or Human Rights Watch serve as examples of transnational advocacy networks, exerting influence on governance through their advocacy for universal human rights norms (Salih et al., 2024). However, integrating contrasting cultural norms and ideas into governance frameworks presents difficulties in a globalized context.

Global Economic Integration and Financial Governance

The process of globalization has resulted in heightened economic interconnectedness between countries, hence requiring the establishment of governance institutions to oversee global finance. The International Monetary Fund[18] (IMF) exemplifies an institution that influences the formation of financial governance (Sallam et al., 2024). The primary objective of the IMF is to promote international monetary cooperation, extend financial aid, and provide policy guidance, with the goal of safeguarding global financial stability. Nevertheless, the task of resolving conflicting economic objectives and managing financial emergencies in a globally integrated society presents governance obstacles, underscoring the necessity for synchronized economic strategies (Barba-Sánchez et al., 2024).

Technological Advancements and Digital Governance

Globalization expedites technology progress, necessitating governance structures that tackle digital

[17] https://www.amnesty.nl/encyclopedie/human-rights-watch

[18] https://www.imf.org/en/Home

developments. The Internet Governance Forum[19] (IGF) serves as a prime example of endeavors to influence global digital governance. The multi-stakeholder forum facilitates discussions on policy matters pertaining to the Internet, promoting communication among governments, civil society, and companies to tackle difficulties such as Internet accessibility, cybersecurity, and digital rights (Öngel et al., 2024). Nevertheless, the management of fast-advancing technologies exposes deficiencies in governance and raises moral quandaries, highlighting the need for flexible and responsive frameworks for digital governance.

Migration and Transnational Governance

Globalization drives the growth of migration, which requires governance measures to handle cross-border problems. The Global Compact for Migration[20] represents a kind of cooperative governance regarding migration. The framework facilitates global collaboration with the goal of tackling migration difficulties while safeguarding the rights of migrants and advocating for secure, organized, and lawful migration (Salih et al., 2024). Nevertheless, the task of governing migration necessitates the delicate management of national interests, humanitarian considerations, and the different populations of migrants, demanding sophisticated governance strategies that go beyond national boundaries.

ADAPTATIONS AND RESPONSES TO TRANSFORMATIVE FORCES

To effectively address the transformative forces forming the 21st-century political landscape, it is necessary to develop new techniques and adaptable solutions in governance frameworks, some as presented.

Agile Policy Formulation and Iterative Governance

Adopting agility in policy-making entails using iterative methods that can adapt to changing problems. The "Project Open Data[21]" project of the United States demonstrates effective and adaptable governance. This effort employs a standardized format to provide government data and

[19] https://www.intgovforum.org/en

[20] https://www.iom.int/global-compact-migration

[21] https://project-open-data.cio.gov/

actively solicits ongoing comments from stakeholders. As a result, policies are adjusted in real time depending on this input (Bogea Gomes et al., 2024). This agile methodology allows for rapid adaptations and enhancements, hence improving the pertinence and efficacy of government responses to ever-changing social demands.

Participatory Decision-Making and Citizen Engagement

Involving citizens in decision-making processes improves the legitimacy and responsiveness of governance. The "Crowdsourced Constitution[22]" initiative in Iceland exemplifies the practice of participatory governance (Salih et al., 2024). Utilizing an internet-based platform, individuals collectively participated in the formulation of a fresh constitution, thereby cultivating a feeling of possession and openness in the constitutional procedure. Enabling citizens to actively participate in shaping governance guarantees that policies incorporate a wide range of viewpoints and social ambitions, thereby reinforcing democratic government (Barba-Sánchez et al., 2024).

Resilience and Adaptive Capacity Building

Constructing robust governance frameworks entails proactively anticipating and flexibly adapting to unexpected disruptions and uncertainty. The "Resilient Cities Initiative " by the Rockefeller Foundation[23] serves as a prime example of endeavors to strengthen the resilience of governance (Christmann et al., 2024). This effort enhances governance structures and promotes adaptive ability by aiding cities in formulating strategies to endure and rebound from diverse shocks, such as natural calamities or economic crises (Weritz et al., 2024). Durable governance methods guarantee the ability to persist and adjust in response to unexpected obstacles.

Innovation Labs and Experimental Governance

Creating innovation laboratories promotes the exploration of new ideas and the implementation of novel methods of governance. The "Innovation Labs for Public Services[24]" in Sweden promotes the exploration of new ideas and approaches in governance (Kusuma et al., 2024). These

[22] https://www.e-elgar.com/shop/gbp/constitutional-crowdsourcing-9781786430502.html

[23] https://www.rockefellerfoundation.org/

[24] https://oecd-opsi.org/innovations/the-service-innovation-lab/

laboratories function as experimental sites for evaluating novel policies and services, enabling governments to trial and improve concepts prior to widespread application. Adopting experimental governance promotes the willingness to take risks, nurtures creativity, and identifies efficient solutions, hence facilitating the adaptability of government to evolving societal demands (Zhang et al., 2024).

Adaptive Governance Networks

Adaptive governance networks are collaborative frameworks that effectively address complex challenges by being flexible and responsive. The Mekong River Commission[25] (MRC) serves as a prime example of this methodology. The MRC is an organization that promotes the management of water resources among numerous countries that share the Mekong River (Cardoso et al., 2024). The adaptive governance model incorporates adaptive planning and decision-making procedures that include evolving environmental conditions and the different requirements of stakeholders. This network-centric strategy enables adaptable modifications in policies and tactics, prioritizing collaboration and collective accountability in tackling regional concerns that transcend national boundaries (Barba-Sánchez et al., 2024).

Foresight and Future-Oriented Governance

Utilizing foresight approaches allows governments to predict and prepare for forthcoming difficulties. The governance model of Singapore's "Centre for Strategic Futures[26]" exemplifies forward-thinking. The center engages in scenario planning and strategic foresight to investigate potential future trends, risks, and opportunities (Weritz et al., 2024). By visualizing several feasible futures, governments can proactively formulate policies that are resilient, flexible, and prepared for the future. Anticipatory governance enhances resilience by proactively dealing with developing concerns and strategically positioning governing systems to traverse unpredictable futures (Nicolás-Agustín et al., 2024).

CASE STUDIES

[25] https://www.mrcmekong.org/

[26] https://oecd-opsi.org/air/case/strategic-futures-singapore/

This section presents here selected case studies that exemplify governance systems and their effects in addressing current concerns.

Estonia's E-Governance Transformation

Estonia's e-governance initiatives exemplify innovative endeavors in the field of digital government. Estonia achieved greater efficiency in government services with the use of digital ID cards and the X-Road[27] data exchange platform. These initiatives facilitated the deployment of digital services that are safe, efficient, and citizen centric (Ba et al., 2024). As a result, bureaucracy was greatly reduced, and interactions between citizens and the government were improved. Estonia's adoption of e-government has established it as a prominent global pioneer, highlighting the significant influence of digitalization on improving governance efficiency and empowering citizens (Naji et al., 2024).

New Zealand's Collaborative Disaster Management

New Zealand's cooperative governance strategy in the aftermath of the Christchurch earthquake serves as evidence of successful disaster management. A multi-agency, multi-stakeholder coordination framework was established to enable prompt reaction and recovery activities (Öngel et al., 2024). By involving affected communities in the decision-making process and promoting collaboration, we were able to allocate resources effectively, restore infrastructure quickly, and provide extensive support services. This study exemplifies the effectiveness of inclusive governance methods in reducing the consequences of disasters and promoting resilient communities (Ikhwan & Himawati, 2024).

South Korea's Open Data Initiatives

The open data efforts in South Korea demonstrate the profound impact of a data-driven government. South Korea has made a range of datasets available to the public through the "Open Government Data (OGD) Portal[28]." This project enabled individuals, businesses, and researchers to utilize data for the purpose of fostering innovation and promoting development (Salih et al.,

[27] https://x-road.global/

[28] https://data.gov/

2024). The use of open data in South Korea resulted in the development of many apps, which in turn stimulated economic expansion, enhanced transparency, and encouraged citizen participation in governance procedures (Barba-Sánchez et al., 2024).

Uruguay's Sustainable Development Policies

Uruguay's sustainable development policies prioritize the incorporation of environmental considerations into governance. Uruguay's dedication to renewable energy and environmental conservation efforts has established it as a prominent global figure in sustainability (Kusuma et al., 2024). Uruguay achieved a substantial reduction in its carbon footprint by making investments in renewable energy sources and enacting forward-thinking environmental laws. This case study highlights the significance of proactive governance strategies in tackling urgent global issues, such as climate change, while simultaneously fostering sustainable growth.

Rwanda's Health Sector Transformation

Rwanda's governance practices in the health sector exhibit notable advancements in enhancing healthcare accessibility and outcomes. The nation's Community-Based Health Insurance[29] (CBHI) program, also referred to as "Mutuelles de Santé[30]," serves as a prime example of a prosperous health financing endeavor. Rwanda achieved a significant improvement in healthcare access for its inhabitants by implementing nearly universal health coverage. This resulted in better health indicators and a decrease in financial obstacles to healthcare services (Salih et al., 2024). This case study demonstrates the profound influence of comprehensive health policy in attaining fair and impartial healthcare for everyone.

Brazil's Participatory Budgeting

The introduction of participatory budgeting in Porto Alegre, Brazil, serves as an exemplary government model that fosters citizen involvement in determining public expenditure. This program enables residents to directly engage in the allocation of a portion of the municipal budget. By means of community assemblies and consultations, citizens determine the order of importance

[29] https://www.who.int/news-room/fact-sheets/detail/community-based-health-insurance-2020

[30] https://en.wikipedia.org/wiki/Mutuelle_de_Sant%C3%A9

and make decisions regarding local initiatives and public investments (Nicolás-Agustín et al., 2024). Participatory budgeting has improved transparency, accountability, and social inclusion, empowered communities and promoting trust in government institutions. The widespread implementation of this effort in several communities worldwide demonstrates the effectiveness of inclusive governance in local decision-making processes (Aldoseri et al., 2024).

LESSONS LEARNED FROM THE CHAPTER

As we draw to the end of the chapter, these lessons highlight the significance of flexible, collaborative, and data-driven governance techniques in tackling current challenges and promoting inclusive, sustainable growth in many sectors and locations, as summarized below.

- Strategies that give priority to inclusion, such as involving everyone in decision-making and creating policies that include everyone, generally lead to more successful and long-lasting results. Involving a wide range of individuals and groups with different interests and perspectives promotes a sense of responsibility, improves openness, and raises the chances of effectively carrying out a plan.
- Governance models that prioritize adaptability and flexibility in policy development and reaction mechanisms are more capable of effectively addressing complex situations. Agile governance models facilitate prompt adaptations to evolving conditions, promoting the development of resilience and responsiveness.
- The utilization of data in governance, as exemplified by open data initiatives and evidence-based policymaking, fosters innovation and facilitates well-informed decision-making. Open and clear data empower stakeholders to create inventive solutions and ensure governments are held responsible.
- Collaborative governance methods, as seen in crisis management and international agreements, showcase the effectiveness of joint endeavors in tackling intricate problems. Collaboration among many stakeholders promotes holistic solutions that go beyond limits and tackle different viewpoints.
- Participatory budgeting initiatives bolster citizen engagement and foster trust in government institutions. Facilitating citizen participation in resource allocation enhances

openness and accountability and fosters social cohesion.

- Adopting sustainability-focused policies, such as renewable energy initiatives and inclusive health programs, helps to advance long-term development objectives. Progressive governance strategies empower nations to tackle current obstacles while promoting sustainable development and adaptability.
- Renewable energy initiatives and inclusive health programs help to advance long-term development objectives. Progressive governance strategies empower nations to tackle current obstacles while promoting sustainable development and adaptability.
- Frequent evaluations of policies and programs enable modifications based on up-to-date data and input from stakeholders. The iterative approach allows for the analysis and incorporation of both successful and unsuccessful outcomes, enabling governments to refine plans for enhanced efficacy and impact.

CONCLUSION

To summarize, the wide range of governance models and case studies highlight the significant potential of inclusive, adaptive, and data-informed approaches in tackling current difficulties. These lessons highlight the crucial importance of including people in decision-making, being able to adjust to new circumstances, and working together in governance models. They demonstrate how innovative initiatives can effectively bring about beneficial transformations. The examples of successful initiatives, such as the digital transitions in Estonia and participatory budgeting in Brazil, highlight the importance of inclusive government in promoting transparency, empowering citizens, and efficiently allocating resources. Nevertheless, within these achievements, there are obstacles related to the long-term viability, limitations in resources, and the urgent requirement for ongoing assessment and enhancement. This requires an innovative mindset that values learning from past experiences, welcomes the ability to bounce back from challenges, and consistently seeks new ways to negotiate the intricacies of the global world of the 21st century. In conclusion, these acquired insights emphasize the necessity for governments to embrace adaptable, collaborative, and proactive governance approaches to address changing obstacles and facilitate comprehensive, enduring progress for everyone.

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ARTIFICIAL INTELLIGENCE: A NEW FRONTIER FOR CORPORATE FINANCE

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Abstract

Objective: This article examines the influence of artificial intelligence on corporate finance, by investigating how companies are reacting to the adoption of artificial intelligence in their financial operations.

Methods : Qualitative research methodology, and more specifically content analysis, is applied in this research. Semi-structured interviews were conducted with six companies that have integrated artificial intelligence into their structures, in order to gather the data required for this study.

Results : The integration of artificial intelligence into corporate finance offers significant benefits, such as improved efficiency, in-depth analysis, optimized risk management and strengthened governance. By fully embracing this technology, companies can position their finance functions at the heart of innovation, helping to drive their success.

Conclusion : Artificial intelligence is proving to be a major strategic lever for corporate finance. By fully embracing this new technological frontier, companies can position their finance at the heart of innovation, thereby promoting value creation.

Keywords : Artificial Intelligence, Corporate Finance, Financial Innovation.

INTRODUCTION

Artificial intelligence (AI) has emerged as a major transformative force in a variety of sectors, and corporate finance is no exception to this technological revolution. Over the years, the increasing use of AI has significantly disrupted traditional practices within this crucial field (E. Brynjolfsson et al., 2021). This convergence between technology and finance is redefining the way companies manage their operations, make strategic decisions and adapt to an ever-changing economic environment.

Indeed, AI has radically reshaped the nature of corporate finance process skills, automating accounting processes and providing crucial information through direct alerts that can hinder the occurrence of errors (M. Sallam 2023). This artificial intelligence simplifies operations such as data management, reconciliations and financial analysis, enabling finance professionals to focus more on strategic decisions. Artificial intelligence brings comfort to the finance department by eliminating routine tasks through instant automation (Weber Patrick et al. 2023). Through AI, the company can perform reconciliations between various functions, enabling desirable performance to be achieved. These advances are of paramount importance in the corporate finance sector, where accuracy and speed are indisputable imperatives (Gill, S. S., et al. 2024).

Indeed, the fusion of AI and corporate finance has led to significant benefits, such as improved operational efficiency, maximized productivity, automated processes, rapid communications, and secure documents (Belhaj, Y. 2023).

In this context, the company can fully exploit AI in its financial aspect. Indeed, AI's predictive capabilities are transforming the way financial forecasts are made (Tom C.W. Lin, 2019). Using machine learning models, AI can analyze huge groups of data, identify trends, and provide more accurate forecasts of expected profitability, costs, and financial performance (Minzhen Xie, 2019). Among other things, AI can automate many manual and repetitive tasks, such as data entry, transaction verification and report generation, which can free up employees to focus on more complex, value-added tasks.

What's more, AI can be used to analyze massive, complex data, enabling businesses to make more informed decisions. For example, AI can be used to predict financial risks, identify investment opportunities or design more effective financing strategies.

In risk management, AI brings speed and accuracy to the detection of anomalies and suspicious

actions (N. Rane, 2023). Sophisticated AI systems can identify potentially fraudulent activities in real time, strengthening companies' financial security.

On the other hand, AI facilitates regulatory compliance by automating the monitoring of legislative changes and ensuring financial reporting compliance. This enables companies to stay up to date with ever-changing regulations and minimize the risks associated with non-compliance.

In accounting, AI is revolutionizing the way financial reports are generated. Automated systems can simplify the creation of accounting-compliant reports, reducing human error and ensuring greater accuracy.

In order to enrich the literature in the field of corporate finance, our study aims to provide empirical evidence and elucidate the importance of using artificial intelligence in corporate finance, by answering this fundamental question: To what extent does artificial intelligence effectively influence corporate finance?

To answer this question, the first section of this paper presents a literature review explaining the theoretical underpinnings of AI and corporate finance. Section 2 then looks at our research methodology. Section 3 will present the research results. Section 4 will be dedicated to discussing the results of the empirical study, and finally, Section 5 will summarize and provide conclusions.

LITERATURE REVIEW

The rich literature on artificial intelligence in corporate finance has already been the subject of several scientific studies. As an example, Cao (2022) assesses the challenges of financial companies and provides a comprehensive overview of solutions through classical and modern AI in finance and economics. De Prado et al (2016) evaluate studies on credit risk and bankruptcy, noting a growing trend in financial research moving towards the use of hybrid models that combine traditional modeling (e.g. discriminant analysis, logistic regression) with artificial intelligence.

Indeed, AI represents a constantly evolving discipline that uses sophisticated algorithms and computational models to simulate intelligent processes, such as learning, problem solving and decision making (Ranjan, S., et al. 2020). In the financial context, AI has attracted growing interest due to its potential to transform traditional methods of risk analysis, forecasting and management. Looking at the existing literature, we can observe various applications of AI, including in predictive analytics, fraud detection, credit risk assessment, and other critical areas that shape the corporate

financial landscape.

Indeed, businesses are fields in which the adoption of technologies is increasingly necessary to transform and improve the efficiency of production factors effectively. The integration of artificial intelligence in companies is not limited to operational processes, but also extends to other dimensions linked to the decision-making process (El Idrissi, S. E. K., & Jabraoui, S. 2021).

Artificial intelligence has the potential to revolutionize corporate finance by offering significant benefits, including greater efficiency, deeper analysis, improved risk management with the aim of providing data and assistance to managers for effective decision-making. Companies that embrace AI can position themselves as innovative leaders in a constantly evolving market.

In this context, AI offers finance and accounting professionals the opportunity to focus on higher value-added activities. Advanced algorithms can automate many repetitive tasks that consume time and effort, such as data entry, bank reconciliation, invoice management and more. This addition of AI frees finance and accounting professionals to focus on more complex and strategic tasks, such as data analysis, risk management and decision-making (Milana, C. and Ashta, A. 2021). Indeed, AI algorithms can be used to automatically read and process data from a variety of sources, such as invoices, bank statements and performance reports, stock status and more. This saves time and reduces errors for the company's accountants and financial officers. They can also be used to automatically compare bank transactions with accounting records, enabling agents to quickly detect errors and anomalies. In addition, AI can be used to automatically file invoices, check them for errors and approve them for payment.

What's more, AI is revolutionizing financial forecasting by offering unrivalled predictive capabilities. Thanks to machine learning, AI can analyze massive data, identify trends and complex patterns, and generate more accurate forecasts than traditional methods (N. Rane 2023). Indeed, AI can be used to analyze historical business cost data, market trends and sourcing factors to generate accurate forecasts of projected costs.

In the financial sector, risk management is essential to protect corporate assets and value. Artificial intelligence is a powerful technology that can help improve risk management by assisting the risk manager in detecting anomalies and risk areas (Minzhen Xie 2019). AI systems can analyze massive data, identify complex patterns and generate alerts in real time. This enables companies to detect potentially fraudulent activities faster and more effectively than traditional methods, a situation that

leads to more effective risk management.

In finance, understanding market trends is essential to making sound investment decisions. Investors can use artificial intelligence to analyze historical market data, current economic data and other sources to identify general market trends. AI can be used to analyze massive data faster and more accurately than humans. This enables investors to identify trends earlier and make more informed decisions (Milana, & Ashta, A. 2021). In practice, AI can be used to identify stock price trends, which can help investors determine which stocks are likely to rise or fall in value. This addition of AI can offer better decision-making, reduced risk and higher returns on invested capital. AI can use sophisticated valuation methods such as EVA (Faiteh, A., & Aasri, M. R. 2023) to predict value creation and whether or not a company is performing well.

In addition, artificial intelligence is a powerful technology that can be used to facilitate regulatory compliance for companies in the financial sector. AI can be used to automate the monitoring of legislative changes. This enables companies to stay up to date with ever-changing regulations without having to devote human resources to researching and analyzing new laws and regulations (Weber, et al. 2023). AI can also be used to ensure financial reporting compliance, this can be done by using machine learning to identify errors and anomalies in reports, enabling companies to minimize the risks associated with non-compliance, such as financial penalties and tax adjustments. This enables companies to concentrate on other, more strategic activities and minimize the risks associated with non-compliance.

In accounting, artificial intelligence is revolutionizing the way financial reports are generated. Traditionally, the generation of financial reports has been a tedious, manual task requiring considerable accounting expertise (N. Rane 2023). Accountants must manually enter data, apply accounting standards and produce reports that are both accurate and compliant. AI can automate many of the tasks involved in generating financial reports, including data entry, applying accounting standards and producing reports. This addition enables the company, and more specifically small businesses and startups that don't primarily have expert accounting staff, to have greater efficiency in processing accounting information, greater accuracy and compliance. Artificial intelligence has even entered the auditing field. Indeed, external auditing, as a function involving the verification of the fairness of a company's financial statements to ensure their accuracy and compliance with accounting standards (Faiteh, A., & Aasri, M. R. 2022), can use AI to improve its effectiveness,

efficiency and performance. Several ways of integrating AI into the audit process are conceivable, automating manual tasks such as data collection, account reconciliation, testing and more. The use of AI also enables errors and anomalies in financial statements to be identified more effectively, helping to detect potential risks of fraud or error. In addition, AI improves efficiency by enabling auditors to process data more quickly, promoting faster conclusion of audits and reducing the costs associated with their assignments. Finally, AI can improve communication by generating clearer audit reports and more effective communication of findings (N. Rane 2023). The increasing use of AI in auditing is a growing trend, offering audit firms that adopt it a competitive edge.

At the level of internal auditing, which represents a major player within organizations (Faiteh, A., & Aasri, M. R. 2022), artificial intelligence has brought about a significant transformation by enhancing monitoring, analysis and decision-making capabilities within this function. Indeed, AI uses algorithms that can rapidly process large sets of financial and operational data, identify potential anomalies, and generate detailed reports, all of which improve the efficiency of the internal audit department. In addition, AI enhances the analytical capacity of internal auditors by enabling in-depth data mining. AI can detect unusual trends, complex patterns, and fraudulent relationships in financial and operational data. This advanced analysis capability gives auditors a deeper understanding of potential risks, making it easier to formulate recommendations and improve internal control. Furthermore, AI facilitates the implementation of internal auditing on an ongoing basis, enabling internal auditors to monitor company activities in real time. Automated alerts can be generated to report anomalies or deviations from established standards, offering internal auditors greater responsiveness to sudden changes and emerging risks.

Ultimately, artificial intelligence represents an unprecedented opportunity for corporate finance, offering efficiency gains, deeper analysis, enhanced risk management, and improved governance. By fully embracing this new technological frontier, companies can position their finance and accounting at the heart of innovation, propelling their success in an ever-changing business world.

METHODS

In order to respond to our research problem, we are framing our work within the framework of a study based on a qualitative approach, as this is particularly suited to the exploratory nature of our subject. This approach is frequently chosen for its ability to collect and describe data of a qualitative nature (G. Morgan, 1980), offering an in-depth understanding of research questions that

encompass the perspectives of the population studied and the context in which they evolve (Y. Laajaj 2022). With regard to data collection, we favoured semi-structured interviews, considered a technique contributing to the development of knowledge and favouring qualitative approaches. In this respect, our interview guide is organized along six main lines. Our population is mainly made up of six major companies in Morocco that use artificial intelligence. To analyze the results, we opted for a content analysis. Indeed, content analysis is based on the principle that the frequency of appearance of analysis units in the discourse such as words, expressions, sentences or paragraphs, highlights the central themes and concerns of the discourse authors (Thietart et al. 2014). Finally, lexical analysis, assisted by Nvivo software, was employed to reinforce our research. Table 1 summarizes the characteristics of the sample interviewed.

Table 1 Description of the study participants.

Companies	Business sector	The role of the respondent	The year of AI integration	The respondent's level of experience
1	The automotive sector	Chief Executive Officer	2023	21 years
2	Civil engineering	Accounting Manager	2019	11 years
3	Gas production	Informations Systems Manager	2023	9 years
4	Public services management	Accounting Manager	2022	16 years
5	Maritime transport	Management Controller	2019	13 years
6	Civil engineering	Accounting Manager	2023	16 years

Source : Author.

RESULTS

The results of our study are grouped around six axes linked to the use of artificial intelligence in corporate finance. The content analysis technique enables us to identify the following results:

Theme 1: Artificial intelligence and strengthening the financial and accounting aspects of business.

Examination of the respondents' discourse through textual analysis led us to identify several frequently used concepts, as shown by the word cloud (Figure1).

Figure 1 AI and financial reinforcement.

Source: Author.

Textual analysis reveals that the terms most commonly used by respondents are: artificial intelligence, accounting and finance. Furthermore, our content analysis grid allows us to conclude that all the interviews affirm that artificial intelligence strengthens the accounting and financial aspects of their organizations.

Theme 2: Artificial intelligence and strategic decision-making.

The aim of this axis is to understand the role of artificial intelligence in strategic decision-making within the company. The results of the content analysis and evaluation grid are as follows:

Figure 2 AI and strategic decisions.

Source: Author.

According to the results, artificial intelligence played a key role in strategic decision-making. By analyzing complex data, it has provided valuable insights that have contributed to more informed and proactive decision-making for the companies in our study. Indeed, the most frequently used terms are "decision", "AI", "strategy" and "data".

Theme 3: Artificial intelligence and the automation of repetitive tasks.

This area aims to understand the contribution of artificial intelligence to the automation of repetitive tasks such as data entry, bank reconciliation and invoice management within the companies studied in our research. The conclusions of the content analysis and evaluation grid are as follows:

Figure 3 AI and task automation.

Source: Author.

Textual analysis reveals that the terms most frequently used by respondents are "Data",

"Management" and "Tasks". Indeed, artificial intelligence has radically transformed the automation of repetitive tasks. According to all respondents, data entry, bank reconciliation and invoice management are assisted by AI.

Theme 4: Artificial intelligence and risk management.

Figure 4 AI and risk management.

Source: Author.

Textual analysis reveals that the terms most frequently used by respondents are "risk", "management" and "AI". Indeed, respondents claim that artificial intelligence is proving to be a valuable tool for risk management in a complex field. By performing real-time analysis of data collected at operational level, it facilitates the identification of unusual trends and strengthens risk management strategies.

Theme 5: Artificial intelligence and the investment selection process.

Figure 5 AI and the investment selection process.

Source: Author.

Textual analysis reveals that the terms most frequently cited by respondents are "investment", "process" and "AI". Indeed, the use of AI in the investment process is still in its infancy for the majority of respondents, but they are convinced of its potential to improve the analysis of investment opportunities.

Theme 6: Artificial intelligence and financial reporting

Figure 6 AI and financial reporting

Source: Author

Textual analysis reveals that the terms most frequently mentioned by respondents are "Reporting",

"AI" and "Data". Indeed, artificial intelligence has revolutionized financial reporting. By automating the analysis of financial data, it has accelerated the generation of reports, making them more accurate, thus enhancing transparency and financial communication.

DISCUSSION

The rapid evolution of AI has opened a new frontier, where businesses integrate this advanced technology to optimize their operations, make informed decisions, and create value. In this results discussion, we delve into how AI has influenced and reshaped the landscape of corporate finance. Through our content analysis, we highlight the challenges and advantages that AI brings to finance. We identify how companies are reacting to this new technological frontier.

Theme 1: Artificial Intelligence and the Enhancement of Financial and Accounting Aspects of the Company.

The content analysis of companies' responses reveals a consensus on the significant benefits that AI brings to financial and accounting aspects. Firstly, AI's contribution to automating manual tasks, such as data entry, bank reconciliation, and invoice management, is praised for its positive impact. This automation frees up time for finance professionals to focus on more complex and strategic tasks. Increased accuracy is also emphasized as a key advantage of AI; respondents affirm that AI reduces accounting errors. This improved accuracy helps strengthen the reliability of financial data.

AI is also perceived as a powerful tool for proactive financial management, providing real-time visibility into elements such as inventory, payment delays, and discrepancies between receipt and disbursement timelines. This predictive ability helps prevent cash deficits and provides an advantage in decision-making. The early integration of AI not only captures operational benefits quickly but also anticipates and effectively addresses emerging challenges, ensuring a continuous competitive advantage.

In conclusion, the content analysis of companies' responses portrays AI as a catalyst for positive transformation in the financial and accounting domain, enhancing efficiency, accuracy, proactive management, compliance, and competitiveness for adopting businesses.

Theme 2: Artificial Intelligence and Strategic Decision-Making.

The content analysis of respondents' answers highlights how artificial intelligence significantly

impacts the strategic decision-making process within organizations. For respondents 1 and 3, AI introduces a proactive dimension by analyzing vast datasets, enabling a thorough evaluation of possible scenarios and anticipation of emerging trends. Visualizing complex scenarios promotes a comprehensive understanding of potential impacts across the entire business, thus improving transparency and collaboration within decision-making teams. Respondent 2 emphasizes that AI acts as a catalyst in the strategic decision-making process by providing in-depth analyses from complex data, enlightening strategic choices such as identifying growth opportunities, risk assessment, and optimizing investments. In contrast, Company 6 indicates that AI is not fully utilized in its strategic decision-making process, although it recognizes the potential of this technology and assesses its future integration.

Theme 3: Artificial Intelligence and Automation of Repetitive Tasks.

Respondents unanimously highlight the significant benefits of AI in simplifying and accelerating processes such as data entry, bank reconciliation, and invoice management. The automation of these tasks, often time-consuming and prone to human errors, is facilitated by AI. Data entry, once manual and laborious, is now partially or fully automated by AI, leading to a significant acceleration of the process and a considerable reduction in error risks. The impact of this automation is noticeable, freeing up time for teams to focus on higher-value tasks, promoting optimization of human resources, and reducing costs associated with manual process management.

Theme 4: Artificial Intelligence and Risk Management.

The content analysis of respondents' answers shows the impact of artificial intelligence in strengthening risk management within their organizations. Respondents converge towards a positive perspective of AI as a predominant tool, offering a proactive and accurate approach to anticipate, assess, and mitigate potential risks. The introduction of AI allows real-time analysis of vast datasets, facilitating the effective identification of unusual trends and providing warning signals related to operational and financial risks. This predictive ability offers a clearer view of future scenarios, enabling preventive measures to mitigate negative impacts. The respondent from Company 6 highlights practical applications of AI in public works, including the analysis of large amounts of data to detect patterns invisible to the human eye, thus anticipating risks such as equipment failures, project delays, and accidents on construction sites. Additionally, the use of real-

time smart sensors and cameras monitors activities on construction sites, detecting hazardous behaviors of workers and contributing to accident prevention.

Theme 5: Artificial Intelligence and the Investment Decision-Making Process.

Responses from respondents regarding the integration of artificial intelligence into the strategic investment decision-making process highlight a diversity of adoption stages and approaches. The first company emphasizes a gradual implementation of AI, primarily in financing policies, with current usage at 10% in investment policy. This gradual approach aims to test and refine AI capabilities in analyzing investment opportunities and maximizing returns. The second company expresses a more cautious approach, exploring the integration possibilities of AI while carefully evaluating potential benefits and operational requirements. The third company follows a similar trajectory, initiating its use of AI in financing policies while seeking to optimize investment decisions. Other companies, although not fully using it yet, express confidence in the potential of AI to improve investment opportunity analysis. These responses reveal a growing awareness of the potential benefits of AI in the financial domain, with approaches tailored to each company's specific needs and technological maturity.

Theme 6: Artificial Intelligence and Financial Reporting.

Responses from respondents regarding the use of artificial intelligence in financial reporting highlight strong benefits in this area. Companies 3 and 4 testify to a successful integration of AI, emphasizing the significant transformation of the reporting process. The automation of key steps, from data collection to financial data analysis, has considerably reduced the time required, allowing for a faster and more efficient generation of reports. Indeed, the accuracy and reliability of reports are also enhanced through AI, minimizing the risks of human errors. In contrast, Company 2, while benefiting from automation in management report production, has not yet implemented AI in financial report design, indicating selective adoption. Other companies present different stages of AI adoption, ranging from current non-use to gradual integration. These responses illustrate a trend towards increased AI automation in financial reporting production, highlighting its positive impact on speed and accuracy.

CONCLUSION

In conclusion, this in-depth study on the role of artificial intelligence in the field of corporate

finance highlights a convergence of positive opinions among respondents. Indeed, AI emerges as a major asset, automating repetitive tasks, enhancing data accuracy, and enabling proactive financial management. This positive transformation contributes to strengthening operational efficiency, the reliability of financial data, and the competitiveness of companies adopting this technology.

Simultaneously, AI's contribution to the strategic decision-making process proves to be significant. AI's ability to analyze vast datasets, anticipate emerging trends, and visualize complex scenarios acts as a crucial catalyst in improving transparency and collaboration within decision-making teams. Companies fully embracing this technology benefit from a better understanding of strategic issues and optimization of strategic choices.

Furthermore, the automation of repetitive tasks and risk management reinforce the progressive integration of AI into the investment process and the improvement of financial reporting. Lastly, this study underscores the central role of AI as a driver of positive transformation, urging companies to judiciously explore and integrate this technology to remain competitive and innovative in an ever-evolving business environment. By fully embracing this new technological frontier, companies can place their finances at the forefront of innovation, fostering financial performance and value creation.

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THE DIGITALIZATION: A CATALYST FOR DEVELOPMENT FOR TAKAFUL INSURANCE COMPANIES, CASE STUDY OF MOROCCO

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Abstract

Objective : Digital transformation has become imperative for enhancing the competitiveness of businesses, including insurance companies, particularly with the emergence of Insurtech. In Morocco, participative finance has advanced with the operationalization of Takaful insurance in 2022.

Although Fintech plays a significant role in the development of Takaful, research and studies on this integration remain limited. Hence, there is a need to explore the potential use of Fintech in the Takaful insurance industry, especially regarding future opportunities and challenges.

Methods : Two fundamental questions are posed: What are the potential applications, benefits, and challenges of integrating Fintech into the Takaful insurance industry? How can Takaful operators effectively adopt Fintech solutions in Mourabaha contracts to maintain competitiveness in a rapidly changing business environment? By employing qualitative exploratory methodology, incorporating expert opinions from interviews, collecting and analyzing secondary data from relevant sources, a comparative study of regulatory and incentive frameworks between Morocco, Gulf countries, Indonesia, and Malaysia has been conducted. Subsequently, a model examining smart contracts for Murabaha financing, inclusive of Takaful insurance, will be studied.

Results : Takaful operators in Morocco can remain competitive and enhance the use of mourabaha products for Islamic banks. Effective utilization of technologies like blockchain smart contracts,

big data analytics, and robo-advisors will foster transparency, efficiency, and customer satisfaction. However, successful implementation requires supportive factors such as regulation, customer acceptance, and continuous technological adjustments to navigate the evolving financial landscape.

Conclusion : The study reveals the opportunity presented by digitalization for the development of Takaful insurance companies in Morocco and emphasizes the essential support required to establish a regulatory framework conducive to promoting innovative technologies.

Keywords: Digitalization, Insurance, Takaful, Assurtech, Takafultech.

Introduction

Digital transformation has become imperative for enhancing the competitiveness of businesses, including insurance companies, particularly with the emergence of Insurtech. In Morocco, participative finance advanced with the operationalization of Takaful insurance in 2022. However, participative banks faced significant challenges, including uncovered risks associated with granted finances and limited funding sources. This situation resulted in considerable revenue loss compared to Gulf and Southeast Asian countries, where the Takaful insurance industry has been established for decades.

The integration of Fintech into Takaful insurance presents a significant opportunity for growth and innovation. However, research and studies on this integration remain limited. Hence, there is a need to explore the potential use of Fintech in the Takaful insurance industry, especially regarding future opportunities and challenges. Two fundamental questions are posed: What are the potential applications, benefits, and challenges of integrating Fintech into the Takaful insurance industry? How can Takaful operators effectively adopt Fintech solutions in Murabaha contracts to maintain competitiveness in a rapidly changing business environment?

To address these questions, a qualitative exploratory methodology was employed. This involved incorporating expert opinions from interviews, collecting, and analyzing secondary data from relevant sources. A comparative study of regulatory and incentive frameworks between Morocco, Gulf countries, Indonesia, and Malaysia was conducted. This comparative study aimed to identify best practices and strategies that could be implemented in Morocco to enhance the Takaful insurance sector.

One of the key areas of focus was the examination of smart contracts for Murabaha financing, inclusive of Takaful insurance. Smart contracts can automate and streamline various processes, reducing administrative costs and enhancing transparency.

The digitalization of the Takaful insurance sector in Morocco presents a significant opportunity for growth and innovation. However, realizing this potential requires a concerted effort to create a supportive regulatory environment, address the challenges faced by participative banks, and foster a culture of innovation and collaboration. By learning from the experiences of other countries and leveraging the potential of Fintech, Morocco can enhance the competitiveness of its Takaful insurance sector and better serve the needs of its customers.

Literature Review

Digitalization, embodied by the expansion of the use of mobile technologies and the internet worldwide, has changed our relationship with several services in different industries. These technological advances have also disrupted the financial sphere through Fintech companies that offer a multitude of services covering the scope of financial transactions through technological applications. The insurance sector, part of the financial industry, is experiencing the emergence of Assurtech, a combination of the words "insurance" and "technology," which refers to the innovative use of technology in the value chain of insurance products. This encompasses all phases, including promotion, negotiation, contractualization, execution, and even post-transaction issues such as default management and dispute resolution. The Covid-19 pandemic has helped accelerate the dynamics of digitalized services, customers are looking for mobile, fluid insurance solutions that include several forms of assistance on a single platform. Morocco is not immune to this strong trend of digitalization, and at the same time is experiencing a remarkable evolution of Islamic finance, supported by participatory banks, whose outstanding financing exceeded 27 billion dirhams in 2022. Since their launch in 2017, these participatory banks were the only operators in the participatory finance ecosystem in Morocco. They suffered from both the impossibility of covering the risks related to the financing granted to their customers and the absence of sources of financing. Today, the participatory finance ecosystem in Morocco is strengthening after the granting of approvals by the Insurance and Social Security Supervisory Authority (ACAPS) in 2022, to four Takaful insurance operators and one reinsurance operator. The significant delay in the operationalization of Takaful insurance in Morocco has constituted a handicap in the participatory finance ecosystem. Our objective is to explore the potential of digitalization for the development of Takaful insurance companies in Morocco, aiming to catch up by developing a comparative study of the regulatory framework and incentives for the digitalization of these Takaful operators between Morocco, the Gulf Cooperation Council countries, Indonesia, and Malaysia.

Currently, despite the uncertainty that hangs over geopolitical instability, tensions in energy demand, and high inflation, the Assurtech sector, which has experienced a decline as a result, still

maintains good performance indicators. There were 8 billion euros of investment via 470 financing agreements in 2022. The regions of North America, Europe, and Asia continue to outpace and pull the Assurtech sector towards growth. A report by DinarStandard and Elipses highlights that while Islamic Fintech has seen sustained growth in the Organisation of Islamic Cooperation member countries, there are still untapped opportunities in many areas such as Insurtech. Financial authorities and regulators must keep pace with technological innovation to ensure a safe and fair environment for consumers and businesses.

The use of advanced technologies such as smart contracts, artificial intelligence, and blockchain can bring more transparency and awareness to Takaful insurance. The Gulf Cooperation Council countries, in addition to Indonesia and Malaysia, are ahead in incorporating Takaful insurance. In Malaysia, the central bank Bank Negara Malaysia (BNM) is the regulator in charge of the insurance sector. The insurance penetration rate was 4.8% in 2021. The Malaysian market has 32 Insurtechs, which are evolving thanks to the "Financial Technology Regulatory Sandbox" program, which provides a regulatory framework conducive to the development of financial technology. This program allows the deployment and testing of fintech solutions. BNM has committed all conventional and Takaful insurers, to digitalize the entire process of motor insurance and claims settlement before the end of 2026.

In Indonesia, the insurance penetration rate was 3.18% in 2021, and the Indonesian market had 15 Insurtech in 2020. The Financial Services Authority (OJK) is responsible for the regulation and supervision of financial services including insurance, it has set up a test mechanism called "Regulatory Sandbox" to assess the reliability of digital solutions offered by Fintech including Insurtech, with a strategic plan launched in 2020 which is based on five axes which are: Acceleration, regulation and supervision, collaboration, talent and consumer protection. In Saudi Arabia, the Saudi Central Bank (SAMA) is the regulator of the insurance sector, the insurance penetration rate was 1.28% in 2022, with a total premium of 14.47 billion Dollar in 2022. In accordance with Vision 2030, SAMA has provided Insurtech with a sandbox regulatory framework that hosts the initiatives and prototypes of Insurtech operators. The Saudi market had 147 Fintechs including 4 Assurtechs in 2022, and aims to transform the country into an innovative Fintech hub with a strong and thriving ecosystem. In the United Arab Emirates, the central bank (CBUAE)

regulates the insurance sector, advancing the digitalization of financial services and the transition to a sustainable economy. The total premiums recorded in 2022 are $12.8 billion, and the insurance penetration rate was 3.2% in 2020. The CBUAE strengthens the country's position as a global digital economy hub, with its financial infrastructure development program including a center of excellence for innovation and digital transformation. Takaful operators are also adhering to and adopting the digitalization of their operations to optimize their operating costs. In Qatar, the insurance sector is regulated by the Qatar Financial Center Regulatory Authority (QFCRA) and the Qatar Central Bank (QCB). Total premiums in 2022 amounted to $3.8 billion, and the insurance penetration rate was 1% in 2020. In addition to the platform (Sandbox) developed by QCB, the latter incorporates an exclusive section that serves as a one-stop shop dedicated to regulatory requirements related to FinTech. QCB is pursuing a Fintech infrastructure development strategy, including Assurtech, to address the low insurance penetration rate in the country and positively impact the daily lives of its citizens.

In Bahrain, since 2002, the Central Bank (CBB) has acted as the regulator of the insurance sector. The total premiums collected in 2022 were $577 million, and the insurance penetration rate was 2.1% in 2020. The CBB supports digitalization through its platform (Regulatory Sandbox) made available to Fintechs for a phased implementation approach. With its FinHub973 initiative, the CBB contributes to further consolidating Bahrain's position as a financial center in the region by providing a solid technical infrastructure and accelerating innovation and collaboration across the region In Kuwait, the Insurance Regulatory Unit is the regulator of the insurance business. The total premiums for the year 2022 amounted to $3.89 billion, and the insurance penetration rate in Kuwait was 1.1% in 2020. The Central Bank of Kuwait (CBK) is the major player in the development of the digitalization of financial services. It has set up an experimental framework (Regulatory Sandbox) that allows innovations to be tested without compromising the financial system. The government is also participating with a fund of $200 million to finance technological investments by promising Fintechs. In Oman, the Capital Market Authority regulates and supervises the insurance sector, the total premiums generated in 2021 were $1.04 billion, and the insurance penetration rate in Oman is 1.9% in 2020. The Capital Market Authority is working with the country's central bank to boost a financial ecosystem that is conducive to the digitalization of financial services. The main initiatives that we have noted from the Fintech roadmap developed in

2022 by the central bank (CBO) revolve around regulation, the test environment, the construction of an innovation center, and professional training. In Morocco, insurance operators are governed by the Insurance and Social Security Supervisory Authority (ACAPS), the total premiums issued in 2022 amounted to 5.24 billion dollars, and the insurance penetration rate was estimated at 4.2%. ACAPS has initiated the development of a guide for electronic devices for online sales of insurance products, which came into force on July 1, 2022. A roadmap is being developed, aimed at promoting the digitalization of the insurance sector in favor of consumers by ensuring the prerequisites in terms of training, infrastructure and supervision. Several insurance operators have made progress in the digitalization of health claim declarations, and the amicable report will also be digitalized via an application for the declaration, processing, and settlement of automobile claims. It is only very recently that ACAPS has looked into Assurtech by creating a new dedicated unit, called "Innovation & Insurtech", whose role is to support Assurtech, to offer them a collaborative ecosystem with opportunities for access to financing and partnerships, and to implement the regulatory reforms necessary for their development, the deployment of which should begin at the end of 2023.

Takaful insurance is growing while being backed by technological progress. We note this for Malaysia, a pioneer with 32 Insurtechs, followed by Indonesia and the United Arab Emirates with around ten Insurtechs each, with considerable development potential. The six countries of the Gulf Cooperation Council are all mobilized to increase the integration of digitalization in their respective economies and have all drawn up medium and long-term development visions, including Insurtech as well as Fintech.

Methods

The primary objective of this research is to understand the current state of Fintech adoption among Takaful operators and to identify the key opportunities and challenges associated with integrating Fintech solutions in their operations. Additionally, the study aims to explore the regulatory and compliance issues faced by Takaful operators in the adoption of Fintech solutions. Furthermore, it seeks to assess the impact of these solutions on the performance and competitiveness of Takaful operators. By achieving these objectives, the research will provide valuable insights into the

effective adoption of Fintech solutions and offer practical recommendations for Takaful operators to enhance their competitiveness in a rapidly changing business environment.

We will conduct the qualitative method in the form of a semi-structured interview to validate the smart contract model. According to Jamshed (2014) Qualitative research methodology is considered suitable when the researcher or the investigator either investigates a new field of study or intends to ascertain and theorize prominent issues.

Semi-structured interviews are those in-depth interviews where the respondents have to answer preset open-ended questions and thus are widely employed by different healthcare professionals in their research. Semi-structured, in-depth interviews are utilized extensively as interviewing format possibly with an individual or sometimes even with a group. These types of interviews are conducted once only, with an individual or with a group, and generally cover 30 min to more than an hour.

The target population for this study was experts in Fintech, Islamic banking and finance. The selection of the participants was based on purposive sampling, meaning that the people are selected because they were considered to be good sources of information for the study. Sample size is not an issue, as Robson & McCartan (2016) pointed out that a flexible design study does not require a fixed number of interviews. The interview questionnaire is mainly composed of open-ended questions, which are considered appropriate because they allow respondents to express their thoughts and opinions more freely (Stein & Mankowski, 2004).

To gain a comprehensive understanding of how Takaful operators can effectively adopt Fintech solutions to maintain competitiveness in a rapidly changing business environment, a set of semi-structured interview questions was developed. These questions are designed to explore various aspects of Fintech adoption, including the current state of implementation, opportunities, challenges, regulatory and compliance issues, impact on performance, and future outlook. The following table outlines the key questions used in the interviews, categorized by theme:

Table 1 : Essential Interview Questions, Organized by Theme

Theme	Question
Current State of Fintech Adoption	Describe the current level of Fintech adoption within your organization. What types of Fintech solutions are currently being utilized?
Opportunities and Benefits	What opportunities do Fintech solutions present for your organization? How have these solutions impacted your operations and services ?
Challenges and Barriers	What challenges have you encountered in adopting Fintech solutions?
	How do regulatory and compliance issues affect the adoption process?
Regulatory and Compliance Issues	Describe the regulatory environment for Fintech adoption in your region.
	How do you ensure compliance with Shari'ah principles while implementing Fintech solutions?
Impact on Performance and Competitiveness	How has the adoption of Fintech solutions affected your organization's performance?
	In what ways have Fintech solutions helped you maintain competitiveness in the market?
Future Outlook	What are your future plans for integrating Fintech solutions?
	What trends do you foresee in the Fintech and Takaful industry?

Fonte: Authors

Results

The study involved interviews with two key stakeholders from Takaful insurance companies in Morocco. Participant 1 is a senior manager at Company W, which is one of the leading Takaful operators in the region. Participant 2 is an IT and Fintech specialist at Company W, another prominent Takaful operator in Morocco. Both participants have substantial experience and knowledge regarding the adoption of Fintech solutions within their organizations.

State of Fintech Adoption

Now, about the current state of Fintech adoption, one of the representatives from Company W mentioned that the organization has only recently been exploring new potentials for Fintech, and current use is strictly on subscription processes for insurance at the bank branches relevant to Murabaha contracts. They agreed that the adoption of more advanced Fintech, such as blockchain or big data analytics, is still rare. Similarly, Participant 2 from Company W concurred with this opinion and added that the Fintech integration of their company is quite low and is mainly limited to basic digital tools to support customer subscriptions at the physical banking branches.

Opportunities and Benefits

Both respondents agreed on the potential opportunities and benefits related to the Fintech solutions even in the light of relatively low usage. For example, in the words of Participant 1, even the basic implementation of digital tools in subscription procedures increased efficiency and improved customer experience to a certain extent. The trend, thus, can be seen to reach an end benefit of integrating technologies like blockchain in further transparency of operations and cost reduction at the final stage, but this cannot be claimed in their operational processes at the moment.

Problems and Barriers

A large number of problems in the implementation process of Fintech solutions has been identified by the participants. Another huge challenge in the way of wider uptake, according to Participant 1, is the state of unpreparedness in both technological infrastructure and expertise. It also remains a big challenge to navigate the regulatory environment, which ensures compliance with Shari'ah principles. High initial costs and a lack of a supportive regulatory environment were also cited by

Participant 2 as key obstacles. Both interviewees indicated that more regulatory clarity and investment in the technological infrastructure are required to enable wider adoption.

Regulatory and Compliance

The current regulatory condition for Fintech adoption in Morocco is at a very early stage. According to Participant 1, the existing regulatory framework is not exhaustive enough to appreciate and handle the apparent intricacies advanced Fintech solutions possess, thus raising questions on conformity and non-conformity risks. Participant 2 said that adherence to the principles of Shari'ah during the integration of new technologies needs regular auditing and development of new standards, which may be very expensive. Both participants mentioned that the regulators must provide clear and supporting guidelines for firms to innovate in Fintech.

Impact on Performance and Competitiveness

So far, the integration of Fintech solutions has been limited, thus the impact on performance and competitiveness is minimal. Participant 1 stated that while such improvements in efficiency and customer satisfaction had been made in basic digital tools for subscription processes, the overall performance was not affected. Participant 2 commented that the Fintech integration within the organization had not yet reached its peak level of benefit realization, consisting of cost reduction and added enrichment to service offerings. Both the participants also agreed that wider acceptance of Fintech solutions would have the potential of being competitive in the future.

Future Perspective

On being asked how optimistic they would be for the integration of Fintech solutions into the future, both stated to be cautiously optimistic. Participant 1 added that their company is currently looking into technologies such as blockchain and artificial intelligence but knows that much must be invested in infrastructure as well as regulatory support. Participant 2 sees this happening in incremental steps toward the adoption of more sophisticated Fintech solutions, as the regulatory environment and the technological acumen of the people in the business develop. Both participants emphasized the importance of making customer-oriented solutions that are compliant with Shari'ah to face competition and compliance with a fast-changing business environment.

Discussion

The Takaful insurance industry, which operates by the Shari'ah Islamic law, is continually seeking ways to remain competitive in the fast-evolving financial landscape through Fintech solutions. Among the various Islamic financial instruments, Murabaha a prevalent Islamic financing structure has much to gain from technological advancements. While adopting Fintech solutions, some opportunities and challenges are surrounded by the successful adoption of Fintech solutions by Takaful operators. This section discusses how Takaful operators can use Fintech solutions in Murabaha contracts and become competitive within the marketplace.

The most significant barriers include how to adapt to the regulatory environment. As shown in the work of Fisher and Taylor (2011), regulation barriers provided with the necessary favorable legal regime constitute one of the main obstacles. They believe that effective Fintech provisioning will be based on two factors, namely regulatory clarity and support. Fintech service provision may not be fully taken advantage of by Takaful operators in a weak regulatory environment. Regulatory authorities have to design enabling regulatory frameworks that foster innovations while, at the same time, maintaining compliance with Shari'ah precepts. On striking the right balance in this direction, there will be an effective environment where Fintech would flourish in Takaful.

Adoption of Fintech solutions depend on user acceptance. In their work, Hassan et al. (2023) have underlined that the user-friendliness of interfaces and perceived usefulness and trust significantly impact the acceptance of Fintech solutions; hence, Takaful operators must ensure that their solutions are not only technically robust but user-friendly. This is best done through intuitive interfaces and building solutions that respond to the individual needs and concerns of the users. Trust is specifically essential to be built in the Takaful industry as it has great importance attached to transparency and compliance with Islamic rules and regulations. High operational costs are the biggest challenge to Takaful operators. Integrating blockchain and Fintech solutions will significantly cut down these costs by automating routine transactions and minimizing the roles played by the intermediaries.

Faqih & Nurhayati (2023) Explore the potential of Fintech in Takaful with a particular focus on big data analytics and robo-advisory to improve customer experience, collect competitive intelligence, and cost-efficiency optimization for the Takaful operators. Big data analytics can be

applied for multiple functions like marketing, customer service, and fraud detection. The Takaful operators could, at the same time draw insights into customer behavior and preferences, hence more personalized services that might lead to enhanced satisfaction and loyalty.

Robo-advisors or automated financial advisors provide objective and low-cost financial advice. Tools such as these will improve customer service and reduce operational costs. However, some disadvantages come with robo-advisors: no personal touch and customization. To eliminate such hitches, Takaful operators can go for a hybrid approach involving both robo-advisory and human advisors. This would help in gaining advantages related to efficiency and cost-effectiveness with automation, yet at the same time, customers could still hold on to the touch of personalization. This is a vital ingredient to consider when discussing blockchain applications in insurance regarding intelligent contracts, which are self-executed regarding the agreement terms that are coded directly.

Using blockchain technology and smart contracts would significantly increase the transparency and efficiency of Murabaha transactions. Blockchain is decentralized technology in a ledger where all parties have real-time access to similar information. This makes all the transactions carried out on it very transparent, minimizing any cases of fraud; further, it becomes easy to correct any mistakes made, which are familiar with traditional financial systems. Blockchain can, therefore, cut banks' operational costs by mitigating the reliance on manual processing and intermediaries while speeding up transactions. Smart contracts are "self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code" that can execute Murabaha contracts. The automation ensures contracts are carried out precisely as specified and adhere to Shari'ah, thus reducing administrative costs.

According to Radwan et al. (2020), blockchain technology reduces the operational expenses of Takaful companies significantly through increased efficiency and low reliance on manual processing. Using a decentralized approach helps Takaful operators eliminate duplication of efforts and thereby simplify their work. This has the effect not only of a reduction in expenses but also an increase in the organization's efficiency as a whole. Besides, blockchain implementation can result in increasing economies of scale.

Takaful operators can save significant costs by reducing duplication of efforts and increasing operational efficiency. Its ability to provide a decentralized ledger in the tracking of all transactions in real time significantly reduces the chances of fraud and errors. The technology would assist in streamlining the process of managing the Murabaha contract, ensuring all parties work with similar information so that transactions are implemented as previously agreed upon. This transparency and efficiency are beneficial in Takaful, where trust and adherence to Islamic principles are critical.

Smart contracts are considered very effective, according to Gatteschi et al. (2018), as they automate claims processing by ensuring that an operation needs little overhead during administration and limited human-induced errors. This is achieved, thus, one of the requirements that people suggest as necessary for insurance services to be provided, rendering faster and more reliable operations than the current traditional models. Takaful operators can enhance customer satisfaction and cut delays by automating claims processing. Meskini & Aboulaich (2020) simulate six scenarios that model the bright insurance impact in the market. The evidence they portray supports that competent insurance attracts customers through transparency, speed, and ethical appeal; moreover, all of these are attached to blockchain and Takaful. However, the authors note that blockchain technology also needs further testing and enhancement to make it robust and scalable.

As technology is an evolving one, it requires constant improvement and changes to not only conquer new threats but also respond to changing environments or even settings. The attributes and the perceived benefits highly influence the success of Takaful products in Malaysia. According to Idham et al. (2013), Customers seek from the products an extensive range, competitive pricing, and religious conformance. The large variety of Takaful products, including family and general Takaful, fulfills the vast class needs of customers. Similarly, in Morocco, the Takaful products have taken off with the same precipitants as above; however, the business is still searching for the correct set of products that will align with Moroccan consumer wants. Products that give the much-needed financial protection as well as social and community value are secure with significant potential to benefit under this setting and subsequently emanate with the deeper meaning of Islamic fundamentals in mutual help and solidarity.

Malaysia's Takaful regulatory structure is mature, with a growing stable climate. The industry is supervised by Malaysia's central bank, Bank Negara Malaysia, which ensures compliance and

adherence to Sharia principles and total protection for the consumer. This, on the other hand, provides regulatory solid support for the industry. Contrastingly, the framework has continued to be developed in Morocco; However, the country has made much headway in having regulations at par with international standards, continued development must be ensured to take care of the growth experienced in the sector. The government of Morocco and the financial regulators are working towards providing a favorable environment for Takaful, which, among other things offers clear guidelines and ensures Sharia compliance.

Incorporating Fintech solutions into Murabaha contracts for Takaful operators can indeed lead to a more complex regulatory environment, increasing the challenges of compliance and legal adherence. One of the primary regulatory hurdles is the lack of clarity and a supportive legal framework, as noted by Fisher & Taylor (2011). Existing regulations may not fully encompass the intricacies of Fintech solutions, leading to ambiguities and potential non-compliance risks. Additionally, the integration of advanced technologies such as blockchain and smart contracts demands new regulations that can address these technologies' specificities while ensuring they align with Shari'ah principles.

The complexity of compliance is further compounded by the need to adhere to Shari'ah principles. Takaful operators must ensure that all technological advancements comply with Islamic law, necessitating continuous Shari'ah audits and the potential development of new Shari'ah standards for emerging technologies. Furthermore, operating in multiple jurisdictions can complicate compliance, as each country may have different regulatory standards and interpretations of Shari'ah principles.

CONCLUSION

Morocco is lagging behind in supporting Assurtech due to the absence of a dedicated environment. ACAPS and other stakeholders must accelerate the pace and capitalize on the experiences of countries that are ahead in implementing regulations promoting the emergence of digital players such as Assurtech. These countries include the Gulf Cooperation Council, Indonesia, and Malaysia.

Morocco should build exchange partnerships with them on regulatory, training, and investment aspects.

Conclusion: From the above, with the proper adoption of Fintech solutions, Takaful operators in Morocco can stay competitive and enhance the use of Murabaha products for Islamic banks. The effective use of these technologies in developing blockchain smart contracts, big data analytics, and robo-advisors is bound to foster transparency, efficiency, and customer satisfaction.

However, such changes need influential supporting variables on the ground: regulation, customer acceptance, and continuous technological adjustments to face dynamic challenges in a changing financial landscape. By exploring these intricacies and utilizing unique Fintech solutions, Takaful companies are likely to establish an avenue for long-term growth and competitive success in the financial industry.

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BALANCE BETWEEN TRADITION AND INNOVATION: THE CRUCIAL ROLE OF AMBIDEXTERITY IN THE DIGITAL TRANSFORMATION OF BANKS IN MOROCCO

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Abstract

Objective: This study investigates the role of organizational ambidexterity in aiding Moroccan banks through the challenges of digital transformation. It aims to understand how banks balance the need to maintain efficient existing operations while adopting innovative digital strategies to remain competitive. **Methods:** A qualitative approach was adopted, involving semi-structured interviews and focus groups across a purposive mixed sample of six Moroccan banks. These banks were chosen for their varied ambidextrous strategies and stages of digital transformation. Data were analyzed using thematic analysis supported by NVivo software.

Results: The findings reveal that Moroccan banks are reshaping their organizational architectures to incorporate ambidexterity, facilitating a smoother transition to digital operations. These banks employ diverse ambidextrous strategies such as online banking development, AI for personalized services, fintech partnerships, and internal digitalization, each presenting unique successes and challenges in process optimization, customer satisfaction, specialized skill requirements, and data security.

Conclusion: The study provides valuable insights for decision-makers in the Moroccan banking industry, underscoring the importance of a balanced approach between exploitation and exploration to thrive in the evolving banking landscape. It suggests that organizational flexibility and a culture of innovation are essential for adapting to and capitalizing on the digital era.

Keywords: Organizational Ambidexterity, Digital Transformation, Moroccan Banks, Innovation Strategies, Operational Efficiency.

1. INTRODUCTION

In the rapidly evolving global economic landscape of the 21st century, digital transformation has emerged as a critical imperative for businesses across all sectors and scales. This paradigm shift is particularly pronounced in the financial services industry, where traditional banking models are being disrupted by technological innovations, changing customer expectations, and new competitive pressures. Within this global context, the Moroccan banking sector finds itself at a crucial juncture, compelled to navigate the complex terrain of digital transformation while maintaining its pivotal role in the national economy.

Morocco, with its unique position as a gateway between Europe and Africa, has long been a hub of economic activity and financial innovation in the region. The country's banking sector, deeply rooted in its historical and cultural context, has played a significant role in shaping the nation's economic trajectory. From the establishment of the first modern banks during the French protectorate era to the post-independence nationalization and subsequent liberalization of the sector, Moroccan banks have demonstrated resilience and adaptability. However, the current wave of digital disruption presents challenges and opportunities on an unprecedented scale, requiring a delicate balance between preserving traditional strengths and embracing technological innovation.

The concept of digital transformation in the Moroccan banking context goes beyond mere technological adoption. It encompasses a holistic reimagining of banking operations, customer interactions, and business models. As Lahlou and Haouata (2021) point out, this transformation is driven by several factors unique to the Moroccan landscape, including the country's young, increasingly connected population and the government's push for financial inclusion and economic diversification.

The Moroccan government has recognized the importance of digital transformation and has launched several initiatives to promote it across various sectors of the economy. The "Morocco Digital 2020" strategy, followed by "Morocco Digital 2025," aims to accelerate the country's digital transformation, including in the financial sector (Ministry of Industry, Trade and Digital Economy, 2020). This governmental push provides a supportive framework for banks to innovate and digitalize their services.

However, the path to digital transformation in Morocco's banking sector is fraught with significant challenges. Benazzi et al. (2022) highlight that a major hurdle is the shortage of digital skills in the labor market, particularly in specialized areas such as data science, cybersecurity, and digital product development. This skills gap poses a significant obstacle to the rapid implementation of digital initiatives within banks.

Furthermore, as El Idrissi and Alami (2022) note, many Moroccan banks operate on legacy IT systems that are not easily compatible with new digital technologies. Upgrading these systems requires significant investment and carries operational risks. The challenge lies not only in implementing new technologies but also in ensuring their seamless integration with existing systems and processes.

In this complex context, the concept of organizational ambidexterity emerges as a crucial strategic approach for Moroccan banks. Organizational ambidexterity, defined as an organization's ability to simultaneously exploit its current competencies while exploring new opportunities, offers a framework for banks to balance their traditional strengths with the need for digital innovation (O'Reilly and Tushman, 2013).

The theory of organizational ambidexterity has gained renewed relevance in the context of digital transformation. Raisch and Birkinshaw (2008) suggest that successful organizations must be able to both exploit their existing resources and capabilities (exploitation) and explore new possibilities and innovations (exploration). In the banking context, this translates to maintaining and improving core banking services while also developing new digital products and channels.

The application of organizational ambidexterity in Moroccan banks manifests in various ways. Some banks have established separate digital innovation labs or subsidiaries that operate with greater autonomy and agility. These units serve as incubators for new ideas and digital initiatives, while the core bank continues to focus on operational excellence and customer service. For example, Attijariwafa Bank, Morocco's largest bank, launched its "Open Innovation" program in 2020, aimed at collaborating with startups to develop innovative financial solutions (Attijariwafa Bank, Annual Report 2020).

Other banks have adopted a more integrated approach, fostering a culture of innovation across the entire organization while maintaining rigorous risk management and compliance practices. This approach often involves cross-functional teams that bring together traditional banking expertise with digital skills. As Benbya et al. (2020) argue, this integrated approach can lead to more sustainable innovation and better alignment between digital initiatives and core business objectives.

The importance of organizational ambidexterity in facilitating digital transformation is underscored by recent research in the field of management and innovation. Studies have shown that organizations that successfully balance exploitation and exploration tend to outperform their peers in terms of innovation output and financial performance, particularly in rapidly changing environments like the current digital landscape (Junni et al., 2013).

However, achieving and maintaining organizational ambidexterity is a complex challenge, particularly in the Moroccan context where traditional banking practices are deeply ingrained. It requires a fundamental shift in organizational culture, leadership approaches, and resource allocation strategies. Senior management must champion a vision that values both stability and innovation, creating an environment where employees feel empowered to experiment with new ideas while maintaining the rigor required in financial services (Smith and Tushman, 2005).

The unique socio-economic landscape of Morocco adds another layer of complexity to the ambidexterity equation. Banks must navigate the dual challenges of serving a diverse customer base that ranges from urban professionals demanding cutting-edge digital services to rural communities where basic financial literacy is still a concern. This diversity necessitates a nuanced approach to digital transformation, one that respects cultural sensitivities and addresses varying levels of technological readiness across different segments of the population (El Idrissi and Alami, 2022).

In response to these challenges and opportunities, Moroccan banks are employing a range of strategies to balance exploitation and exploration. Many are forming strategic partnerships with fintech companies, tech startups, and even telecommunications providers to quickly access new technologies and digital capabilities. These collaborations allow banks to explore innovative solutions without completely overhauling their existing systems (Benazzi et al., 2022).

Banks are also making significant investments in upgrading their core banking systems, data analytics capabilities, and cybersecurity infrastructure. This foundational work enables them to exploit their existing customer relationships and data assets more effectively while laying the groundwork for future digital innovations (Lahlou and Haouata, 2021).

Recognizing the skills gap, Moroccan banks are investing heavily in training programs to upskill their existing workforce in digital competencies. Additionally, they are actively recruiting tech talent and creating more attractive work environments to compete with tech companies for skilled professionals (El Idrissi and Alami, 2022).

As Moroccan banks navigate the complex landscape of digital transformation through organizational ambidexterity, several key research questions emerge:

How does organizational ambidexterity facilitate digital transformation in the Moroccan banking sector, and what are the specific mechanisms through which it operates in this context?

What strategies do Moroccan banks employ to balance the exploitation of existing resources with the exploration of new digital opportunities, and how do these strategies vary across different types of banks?

How are organizational architectures being adjusted to incorporate ambidexterity and enable digital transformation, and what are the challenges and success factors in implementing these structural changes?

How does the unique socio-economic and cultural context of Morocco influence the application of organizational ambidexterity in the banking sector, and what lessons can be drawn for other countries in the region?

To address these questions and gain a deeper understanding of the role of organizational ambidexterity in the digital transformation of Moroccan banks, this study employs a qualitative research methodology. Through in-depth interviews with bank executives, IT leaders, and front-line employees, as well as case studies of specific digital transformation initiatives, we aim to uncover the nuanced ways in which Moroccan banks are balancing tradition and innovation.

2. LITERATURE REVIEW

2.1. Digital Transformation in the Banking Sector

Digital transformation, a term extensively debated and explored in academic literature, is considered an integral process that redefines how companies use technology to revolutionize their operations, business models, and the way they create value for their customers. Hess et al. (2016) describe this phenomenon as a profound integration of digital technologies across all facets of a business, fundamentally altering its operations. This definition is echoed by Westerman, Bonnet, and McAfee (2014), who highlight the transformative impact of digitization on businesses by emphasizing its potential to enhance competitiveness in the global market.

Thus, Berman and Bell (2011) emphasize the importance of digital transformation, noting that it is essential for companies seeking to increase their competitiveness. They argue that without effective adoption of digital technologies, businesses risk losing their relevance in the market. This perspective is particularly relevant for the banking sector where digital transformation is no longer an option but a necessity. Banks are faced with the pressure to meet the constantly evolving expectations of customers, improve operational efficiency, and innovate in their financial products and services to stay competitive.

However, digital transformation in the banking sector is fraught with numerous challenges. Kane et al. (2015) identify several barriers to this transformation, including the modernization of aging information systems, organizational resistance to change, and the urgent need to develop digital skills among employees. These challenges are exacerbated by the regulated and traditional nature of the banking sector, where innovation must be carefully balanced with security and compliance.

In this complex context, organizational ambidexterity emerges as a multidimensional concept that plays a crucial role. Defined by O'Reilly and Tushman (2013) as the ability of an organization to effectively exploit its current operations while actively exploring new opportunities, ambidexterity underscores the importance of a strategic balance between maximizing current efficiency (exploitation) and investing in future innovation (exploration).

Gibson and Birkinshaw (2004) have delved deeper into this concept, showing how organizational ambidexterity allows for better adaptability and innovation within organizations. They argue that

this duality fosters an environment where businesses can be both efficient in their current operations and agile in responding to market changes and emerging opportunities. This flexibility is particularly relevant in highly competitive and technologically dynamic sectors, where the ability to innovate rapidly becomes a key competitive advantage.

The importance of ambidexterity in organizations is also highlighted by Tushman and O'Reilly (1996), who were among the first to explore how companies can successfully balance the demands of exploitation and exploration. They contend that this capability is essential not only for organizational performance but also for the long-term survival of the company, as it enables organizations to effectively respond to changing environments while continuing to innovate.

Furthermore, March (1991) contributes to this body of research by distinguishing between exploration, characterized by activities such as research, experimentation, and risk-taking, and exploitation, which includes activities like refinement, efficiency, and execution. Managing the tension between exploration and exploitation is central to the theory of ambidexterity, as it involves strategic choices about resource allocation and priorities within the company.

In the specific context of banks and other financial institutions, organizational ambidexterity takes on additional significance due to the regulated nature and rapid pace of technological innovations in the sector. Banks must proactively manage current operations while integrating new technologies and approaches to meet customer demands and stay competitive. Thus, the ability to be ambidextrous can facilitate digital transformation in the banking sector by helping institutions navigate the complex landscape of regulatory requirements while exploiting opportunities for innovation to enhance customer experience and operations.

The intersection between organizational ambidexterity and digital transformation is garnering increasing interest in academia, revealing the potential of ambidexterity to facilitate the transition to more digitized and innovative operations. Bharadwaj et al. (2013) highlight how ambidexterity, through the exploitation of existing skills and resources while exploring new technologies, can be a powerful lever for digital transformation. This ability to juggle current activities and the integration of digital innovation is crucial for maintaining competitiveness and responding to rapid market changes. Hess et al. (2016) add that organizational ambidexterity provides companies with

the necessary flexibility to adapt and effectively respond to the challenges and opportunities posed by digitization. In this context, companies capable of maintaining this strategic balance are better positioned to leverage the benefits of digital transformation, particularly in terms of operational efficiency and product innovation.

However, the banking sector presents specificities that make the application of ambidexterity in the context of digital transformation particularly complex. Kane et al. (2015) and Westerman et al. (2014) have explored digital transformation in banks, highlighting the many challenges, such as strict regulation, data security, and the need for a smooth transition for customers. Nonetheless, the literature on the specific link between ambidexterity and digital transformation in this sector remains limited, indicating a need for further research to understand how banks can effectively balance operational requirements and digital innovation.

A study on transitional ambidexterity in the financial sector by Callegari and Rai (2021) suggests that combining different forms of ambidexterity—structural, contextual, and sequential—could provide a more realistic picture of how financial firms adapt and innovate. This approach is seen as necessary for large enterprises looking to develop innovative capabilities, highlighting the importance of both top-down reforms and bottom-up responses in cultivating sector-specific innovative capacities. Additionally, the research highlights the challenges and opportunities that small and medium-sized enterprises (SMEs) face in the context of digital transformation. A study presented by Figueroa et al. (2019) and Randhawa et al. (2021) underlines the necessity for SMEs, including those in the financial sector, to develop managerial capabilities and reconfigure resources and competencies to overcome barriers to digital transformation.

2.2. Organizational Agility and Resilience in the Digital Banking Sector

Digital transformation in the banking sector represents a paradigmatic shift, marking a significant evolution from traditional methods to modern practices influenced by technology. Consequently, this digital metamorphosis is not only an adaptation to new technologies but also a complete overhaul of operational, commercial, and customer service models in banks.

Furthermore, technological advancements such as artificial intelligence (AI), blockchain, and cloud computing have played a crucial role by acting as catalysts for this transformation. These

technologies have enabled banks to optimize their operations, enhance customer experience, and offer innovative new financial services. In this regard, Miceli et al. (2021) emphasize the importance of digitalization for organizational resilience, showing how banks can not only survive but also thrive by integrating sustainability and agility into their digital strategies.

Moreover, the evolution of customer expectations, marked by a growing demand for more accessible, fast, and personalized banking services, also pushes banks to adopt digital solutions. This shift is evident in today's customers, influenced by digital experiences in other sectors, who expect a seamless interaction with their banks, accessible 24/7 and across various digital platforms.

However, competitive pressures, exacerbated by the emergence of innovative fintechs and other non-traditional players in the financial sector, have forced traditional banks to accelerate their digital transformation to remain relevant. According to Wang et al. (2020), digital transformation strategies influence business performance by highlighting the role of cognitive conflicts that may arise during the adaptation to these new approaches.

On the other hand, organizational agility and resilience have become indispensable qualities for banks in the digital age, allowing them to adapt quickly to changes and maintain operational continuity despite disruptions. Indeed, organizational agility refers to a bank's ability to move swiftly and efficiently in response to market developments, technological innovations, and shifting consumer preferences. Concurrently, resilience is the ability to resist, recover, and grow in the face of challenges, ensuring stability and long-term sustainability.

According to Miceli et al. (2021), digitalization, agility, and resilience intertwine to form a solid foundation that allows organizations to prosper in uncertain times. They highlight that organizational resilience, strengthened by agile digital strategies, is crucial for navigating disruptions and seizing opportunities in the evolving banking landscape. This perspective suggests that banks that integrate sustainability into their business models are better prepared to face future challenges while leveraging the benefits of digital transformation.

In parallel, Wang et al. (2020) discuss the effect of digital transformation strategies on performance, emphasizing the moderating role of cognitive conflict. In the banking context, this means that institutions must not only adopt new technologies but also manage internal perceptions and

attitudes towards these changes. It is crucial that cognitive conflict, or the tension between old methods and new innovations, is carefully managed to ensure a smooth transition to digital practices. Thus, banks that successfully navigate this cognitive conflict while implementing agile and resilient digital strategies demonstrate improved performance, as they are able to respond more effectively to evolving market demands.

It is important to note that the role of information technology (IT) in the digital transformation of businesses is fundamental, acting as a central pillar that supports, facilitates, and accelerates the necessary changes to navigate the current digital environment. Furthermore, IT is not limited to adopting new technologies; it also encompasses revising business processes, organizational culture, and strategic alignment to foster a coherent digital ecosystem.

According to Leonhardt et al. (2017), the importance of IT agility and IT ambidexterity is crucial in supporting digital transformation. IT agility refers to the organization's rapid capability to respond to technological changes and opportunities, while IT ambidexterity manifests in the ability to balance and simultaneously exploit existing technologies while exploring new digital innovations. This duality allows businesses to maintain stable performance while adapting to changing market dynamics.

Furthermore, IT ambidexterity supports banks in digital transformation by enabling a dual focus: exploiting existing systems and technologies to ensure operational efficiency and stability (exploitation) and simultaneously exploring and integrating new technologies to innovate and capture new market opportunities (exploration). This approach allows banks to remain competitive and relevant in a rapidly evolving financial sector.

In the same vein, technological innovations such as artificial intelligence (AI) and blockchain are revolutionizing the banking industry, transforming operations, services, and risk management. Significantly, these technologies bring new dynamics that enable significant improvements in the efficiency, security, and personalization of banking services.

In particular, the integration of artificial intelligence in the banking sector has led to a profound transformation in how services are designed and delivered. Kitsios and Kamariotou (2021) highlight how AI is integrated into business strategies to foster digital transformation. Thus, AI

allows banks to analyze large amounts of data for improved decision-making, personalize services for clients, detect and prevent fraud more effectively, and automate operational processes. For example, AI systems can offer personalized financial advice, optimize investment portfolios, and enhance customer experience through intelligent conversational interfaces like chatbots.

On the other hand, blockchain offers significant disruptive potential in the banking sector. Frizzo-Barker et al. (2020) examine how blockchain acts as a disruptive technology, redefining financial transactions and data security. By facilitating a decentralized and secure distribution of information, blockchain reduces intermediaries, improves transparency, and increases the security of financial transactions. This can revolutionize areas such as international payments, identity verification, asset management, and regulatory compliance. Indeed, the ability of blockchain to provide a single, unalterable truth for each transaction makes it a valuable tool for strengthening trust and reducing costs in banking operations.

Exploring further, the convergence of blockchain and the Internet of Things (IoT) in the banking sector opens innovative horizons, proposing solutions that combine enhanced security, increased transparency, and intelligent automation. Viriyasitavat et al. (2019) explore this intersection, highlighting the challenges and business opportunities arising from this integration. The application of blockchain in IoT can transform banking services by enhancing the security of transactions and optimizing asset management through secure, connected sensor networks. However, this convergence also presents challenges, particularly in terms of managing massive data, the need for interoperable standards, and privacy protection.

Faced with this reality and the increasing competition from fintechs, traditional banks are compelled to reevaluate their strategies to remain competitive. Anand and Mantrala (2019) discuss how traditional banks respond to innovations from fintechs, underscoring the importance of ambidexterity in promoting innovation and adaptability. For banks, this means balancing the exploitation of their existing assets with the exploration of new digital financial service avenues to meet changing consumer needs and counter the competition from fintechs.

3. METHODOLOGY

Our study adopts a qualitative approach to explore the role of organizational ambidexterity in the digital transformation of Moroccan banks. This methodology was chosen because of its ability to provide a nuanced understanding of the experiences and perceptions of individuals (Denzin & Lincoln, 2011). Unlike quantitative methods, the qualitative approach allows for an in-depth exploration of the subjective meanings that actors attribute to their experiences, offering rich and detailed insights that are essential for understanding the complex dynamics of ambidexterity and digital transformation within organizations (Bryman, 2012).

3.1. Selection of Banks

Our sample consists of six Moroccan banks selected through a mixed purposive sampling to reflect a variety of ambidexterity strategies and stages of digital transformation. These banks were chosen for their notable commitment to adopting organizational ambidexterity and their investment in digital transformation, aiming to cover a broad spectrum of approaches and challenges associated with these phenomena. The diversity of the selected banks allows us to explore the nuances of ambidexterity and digital transformation processes across the sector.

Table 1: Selection of Banks for the Case Study

Bank	Selection Criteria	Commitment to Digital Transformation	Ambidexterity Initiatives
Attijariwafa Bank	Market leader, wide range of digital services	High	Development of new online and mobile banking services
Banque Centrale Populaire	National presence, investment in information technology	Medium	Adoption of AI for risk management and customer service improvement
BMCE Bank	Innovation and technological partnerships	High	Digital transformation initiatives and collaboration with fintech startups

Crédit Agricole du Maroc	Specialization in the agricultural sector, digitalization initiatives	Medium	Integration of digital solutions for agricultural services
Société Générale Marocaine de Banques	Strong customer orientation, digital initiatives	High	Digitalization of internal processes and improvement of customer experience
Banque Marocaine du Commerce Extérieur (BMCE)	Internationalization, digital banking services	Medium	Digital innovation projects and development of new service channels

Source: Author

3.2. Data Collection and Analysis

Data were collected through semi-structured interviews and focus groups. The interviews lasted an average of 60 minutes and were structured around open-ended questions designed to encourage participants to freely share their experiences and perspectives. The questions covered themes such as the implementation of ambidexterity, challenges of digital transformation, and innovation strategies. To ensure the reliability and validity of the data, all sessions were recorded (with the consent of the participants) and transcribed verbatim. The transcriptions were then rechecked by the participants to validate the accuracy of the information collected (Lincoln & Guba, 1985). Data analysis followed a thematic approach, where data were carefully coded and analyzed to identify recurring themes (Braun & Clarke, 2006). NVivo software was used to facilitate the coding and organization of the data. This iterative process ensured a systematic and rigorous analysis, ensuring that emerging themes were solidly anchored in the data.

Table 2: Data Collection - Interviews and Focus Groups

Bank	Number of Interviews	Number of Focus Groups	Key Participants
Attijariwafa Bank	4	2	Executives, IT Managers, Frontline Employees
Banque Centrale Populaire	3	2	Executives, Risk Analysts, Customer Advisors
BMCE Bank	3	2	Digital Project Managers, IT Employees, Customer Service Agents
Crédit Agricole du Maroc	2	1	Executives, Digitalization Specialists, Agricultural Support Employees
Société Générale Marocaine de Banques	3	2	Executives, Innovation Managers, Private Banking Employees
BMCE (Banque Marocaine du Commerce Extérieur)	3	2	Executives, Digital Product Developers, Client Relationship Managers

Source: Author

This table provides a methodical overview of the data collection conducted with six notable Moroccan banks as part of our study on organizational ambidexterity and digital transformation. Each bank is scrutinized through a series of interviews and focus groups, targeting a variety of key participants from executives and IT managers to frontline employees and digitalization specialists. This approach to data collection is crucial for several reasons.

Firstly, the number of interviews and focus groups indicates a rigorous and comprehensive research approach, aiming to capture a deep understanding of the perceptions and experiences related to ambidexterity and digital transformation within these institutions. The mix of qualitative methods allows for a detailed exploration of the strategies adopted, the challenges encountered, and the

successes achieved in the digital transformation process, as well as how ambidexterity is perceived and implemented in various organizational contexts.

Secondly, the diversity of key participants underscores the importance of engaging a wide range of perspectives within the banks. By including executives, IT managers, risk analysts, customer advisors, and other specific roles, the study embraces a holistic view of the ambidexterity and digital transformation processes. This enables not only the capture of strategic decisions at the higher level but also the day-to-day perceptions and experiences of those directly involved in the implementation and adoption of digital technologies.

Thirdly, the attention to different roles and functions within the banks reflects the importance of understanding how ambidexterity and digital transformation affect and are influenced by various organizational levels. This enriches our understanding of interdepartmental dynamics and the role of communication and collaboration among different actors in the success of these initiatives.

4. RESULTS

The analysis of data collected from the six participating Moroccan banks has highlighted a marked trend towards adjusting organizational architectures in response to the challenges and opportunities of digital transformation. These adjustments are essential for effectively integrating ambidexterity within existing structures, thereby enabling a transition to more digital operations while preserving operational efficiency.

4.1. Adjustment of Organizational Architectures

Moroccan banks unanimously recognize that digital transformation requires more than just the adoption of new technologies; it necessitates a fundamental revision of their organizational structures. This adjustment aims to create an environment conducive to innovation while optimizing current operations. The integration of ambidexterity, that is, the ability to efficiently exploit current activities while exploring new opportunities, is seen as a central element of this transition (Table 3).

An executive from Attijariwafa Bank shared, "The integration of advanced digital solutions has forced us to revise our organizational architecture. We have adopted a more flexible model that fosters innovation and interdepartmental collaboration." This observation underscores the

importance of flexible organizational structures that facilitate both the exploitation of current resources and the exploration of new opportunities.

At BMCE Bank, a digital project manager expressed, "The key to our success lies in our ability to balance rapid digital initiatives with traditional banking operations. This requires an architecture organized around agility and responsiveness."

Indeed, in their transition to the digital era, Moroccan banks have realized the urgent need to revise and make their organizational structures more flexible. This transformation goes far beyond merely integrating the latest technologies. It involves a profound redesign of work models, greater flexibility in hierarchies, and a valuation of the culture of innovation within institutions. The aim is to break down silos between different departments to encourage cross-functional collaboration and foster agile and rapid innovation.

Interviewed managers highlight several concrete initiatives implemented to achieve these goals. Among them, the creation of multidisciplinary teams operating in project mode stands out as a common practice. These teams bring together talents from various backgrounds, thus enriching the diversity of perspectives and increasing efficiency in solving complex problems. The adoption of agile methodologies is also mentioned as an important lever to accelerate the development of innovative solutions, allowing for greater responsiveness to changes and continuous improvement of processes.

Furthermore, the establishment of dedicated innovation centers is emphasized as a central pillar of the digital transformation strategy. These spaces are designed to stimulate creativity and experimentation, providing teams with the resources and autonomy necessary to explore new ideas and develop prototypes. This approach promotes an open culture of innovation, where employees are encouraged to experiment and share their ideas without fear of failure.

Through these discussions, it is clear that Moroccan banks are engaged in a process of profound transformation, where the revision of organizational structures plays a key role. By adopting more flexible work models, promoting a culture of innovation, and facilitating cross-functional collaboration, they aim to position themselves advantageously in an increasingly competitive and digitized financial landscape. These efforts reflect an awareness that, in a rapidly evolving world,

the ability to innovate and quickly adapt to new challenges is essential to maintain their competitiveness and relevance.

4.2. Ambidexterity Strategies

The ambidexterity strategies employed by the banks show a diversity of approaches, each adapted to its specific context. For example, Banque Centrale Populaire has focused on adopting artificial intelligence to improve risk management and customer service, illustrating a strategy that combines technological innovation (exploration) and enhancement of existing processes (exploitation). A risk analyst from this bank noted, "The use of AI has allowed us to significantly improve our efficiency while exploring new ways to serve our clients. It's a delicate balance between innovation and reliability." At Crédit Agricole du Maroc, a digitalization specialist revealed, "Our focus on digital solutions for farmers represents a unique challenge. We must innovate while ensuring that these innovations remain accessible and useful to our clients in rural areas."

Table 3: Organizational Adjustments and Ambidexterity

Bank	**Organizational Adjustments**	**Impact on Ambidexterity**
Attijariwafa Bank	Creation of units dedicated to digital innovation	Facilitates exploration while supporting exploitation
Banque Centrale Populaire	Reorganization of IT processes for greater agility	Improves the balance between digital initiatives and routine operations
BMCE Bank	Partnerships with fintech startups	Encourages external innovation and adaptability
Crédit Agricole du Maroc	Integration of digital solutions in the agricultural sector	Strengthens exploitation through targeted innovation
Société Générale Marocaine de Banques	Digitalization of internal processes	Improves operational efficiency while exploring new working methods
BMCE	Development of new digital service channels	Expands exploration capabilities while maintaining service quality

Source: Author

4.3. Ambidexterity Strategies

As part of the shift towards an increasingly prevalent digital era, Moroccan banks have undertaken profound transformations of their organizational structures. Recognizing the imperative to adapt,

these financial institutions have opted for a strategic revision and flexibilization of their hierarchies to better navigate the current digital landscape. This metamorphosis goes far beyond the simple integration of advanced technologies; it involves a reorganization of work models, fostering a culture of innovation and increased cross-functional collaboration. At the heart of this dynamic is the desire to break down departmental silos, allowing for unprecedented agility and speed in innovation. The practical implementation of these principles is reflected in the formation of multidisciplinary teams engaged in specific projects, the adoption of agile methodologies, and the establishment of dedicated innovation centers.

An innovation director at Attijariwafa Bank emphasized, "Our ambidexterity strategy relies on the continuous launch of innovative mobile banking services. This has significantly increased our customer satisfaction while keeping us competitive in an expanding digital market."

At Banque Centrale Populaire, a data analyst stated, "Using artificial intelligence to personalize our services has been a real success. Not only has it improved our operational efficiency, but it has also strengthened our customer relationship by providing a more tailored and relevant experience."

The head of partnerships at BMCE Bank added, "Our collaboration with fintech startups has allowed us to rapidly inject innovation into our service offerings. This has given us a competitive edge by introducing innovative solutions to the market more quickly than our competitors."

Organizational ambidexterity, illustrated by the various strategies adopted by the banks, reflects this multiplicity of approaches and the ability to juggle between exploring new avenues (innovation) and efficiently exploiting existing processes. Banque Centrale Populaire, for example, has embraced artificial intelligence to improve its risk management and customer services, skillfully balancing technological innovation with the consolidation of routine operations. A risk analyst from the bank testifies to the significant impact of AI on operational efficiency and the ability to innovate in customer service offerings, highlighting the importance of maintaining a balance between innovation and reliability.

Meanwhile, Crédit Agricole du Maroc focuses on developing digital solutions for farmers, a challenge that requires innovation while remaining grounded in accessibility and utility for clients

in rural areas. This example illustrates the bank's commitment to supporting its clients while adopting cutting-edge technologies.

The summary table of organizational adjustments and their impact on ambidexterity shows how each bank has adapted its structure and processes to foster both innovation and operational efficiency. Attijariwafa Bank, through the introduction of digital innovation units, and Société Générale Marocaine de Banques, through the digitalization of its processes, demonstrate the importance of these adjustments for better exploration while strengthening exploitation.

In conclusion, Moroccan banks, through their ambidexterity strategies, embody a forward-thinking approach to digital transformation. By balancing technological innovation and the optimization of existing processes, they manage to adapt and thrive in an ever-changing banking environment. These efforts reflect a deep understanding that success in the contemporary financial landscape requires a delicate balance between exploring innovation and efficiently exploiting existing resources.

Table 4: Ambidexterity Strategies and Their Impacts

Bank	Ambidexterity Strategies	Success	Challenges
Attijariwafa Bank	Launch of innovative mobile banking services	Increase in customer satisfaction	Complex technology integration
Banque Centrale Populaire	Use of AI for service personalization	Significant improvement in operational efficiency	Need for specialized AI skills
BMCE Bank	Collaboration with fintech startups	Rapid introduction of innovative solutions	Strategic alignment with partners
Crédit Agricole du Maroc	Digital solutions for agriculture	Strengthening of client relationships in the agricultural sector	Adaptation to sector-specific challenges

Société Générale Marocaine de Banques	Internal digitalization	Optimization of processes	Management of cultural change
BMCE	Development of online platforms	Expansion of service reach	Data security and regulatory compliance

Source: Author

5. DISCUSSION

The results of our study highlight how Moroccan banks navigate the landscape of digital transformation through organizational adjustments and the adoption of ambidexterity strategies. These findings strongly resonate with existing literature supporting the importance of organizational ambidexterity for innovation and competitiveness in rapidly evolving environments (O'Reilly & Tushman, 2013; Teece, 2007). Specifically, our study confirms the argument by Tushman and O'Reilly (1996) that successful organizations are those that can effectively exploit their current operations while actively exploring new opportunities. Moreover, our results extend the understanding of the mechanisms through which banks can integrate ambidexterity into their strategy and operations, underscoring the role of organizational flexibility and a culture of innovation (Gibson & Birkinshaw, 2004).

The organizational adjustments implemented by the banks, such as the creation of units dedicated to digital innovation and the reorganization of IT processes for greater agility, reflect a commitment to fully embrace the potential of the digital age. These initiatives align with the observations of Gibson and Birkinshaw (2004), who argue that organizational ambidexterity enables better adaptability and innovation. In particular, the adoption of artificial intelligence by Banque Centrale Populaire to enhance risk management and customer service illustrates a pragmatic approach that combines technological innovation with the enhancement of existing processes, thus highlighting the delicate balance between innovation and reliability noted by O'Reilly and Tushman (2013).

The focus on digital solutions for farmers by Crédit Agricole du Maroc demonstrates a nuanced understanding of the need to innovate while making these innovations accessible and useful for

clients in rural areas. This approach aligns with the principles of contextual ambidexterity described by Gibson and Birkinshaw (2004), where the organization strives to meet diverse needs while pursuing innovation.

The diversity of ambidexterity strategies employed by Moroccan banks, ranging from internal digitalization to collaboration with fintech startups, shows a willingness to explore various avenues to remain competitive. This exploration of new opportunities while maintaining operational efficiency is essential in an ever-changing banking environment, as suggested by Tushman and O'Reilly (1996). The development of innovative mobile banking services by Attijariwafa Bank and the adoption of AI for service personalization by Banque Centrale Populaire are eloquent examples, which highlight the ability to balance innovation with operational reliability.

However, these transformations are not without challenges. The need for specialized AI skills, management of data security, and regulatory compliance remain significant hurdles, as pointed out by Kane et al. (2015) and Westerman et al. (2014). The collaboration with fintech startups, while offering a fast track to innovation, also requires rigorous strategic alignment to ensure that new solutions integrate smoothly with existing banking operations.

In conclusion, the results of this study underscore the importance of organizational ambidexterity in facilitating the digital transformation of Moroccan banks. Through their ability to adjust organizational structures and adopt diverse ambidexterity strategies, these banks demonstrate remarkable adaptability and resilience in the face of the challenges and opportunities of the digital era. This dynamic reflects a deep understanding that success in the contemporary financial landscape requires a delicate balance between exploring innovation and efficiently exploiting existing resources.

6. CONCLUSION

Our study has revealed valuable insights into digital transformation within the Moroccan banking sector, focusing on how banks adopt organizational ambidexterity to balance the exploitation of current resources with the exploration of new opportunities. By adjusting their organizational structures and adopting flexible and innovative strategies, Moroccan banks demonstrate a deep

commitment to innovation and operational efficiency, which is crucial for their competitiveness in a rapidly evolving digital environment.

This research enriches the understanding of digital transformation dynamics by highlighting the importance of ambidexterity as a key success factor. The adoption of flexible work models, the promotion of a culture of innovation, and the integration of new technologies are identified as essential practices for successfully navigating the digital landscape. These findings offer significant practical implications for managers and policymakers, suggesting that success in the digital era requires a profound revision of organizational models and a strategic approach to innovation and change management.

The originality of our contribution lies in highlighting the application of organizational ambidexterity in the specific context of Moroccan banks. By providing a detailed analysis of the strategies and organizational adjustments adopted by these institutions, our study offers a unique perspective on how ambidexterity can be integrated into management practices to facilitate digital transformation. This approach provides a potential model for other sectors and regions, underscoring the universality and adaptability of organizational ambidexterity in modern management.

However, our research is not without limitations. The focus on large Moroccan banks limits the generalizability of the results to smaller institutions or other geographic contexts. Additionally, the qualitative methodology, while rich in insights, could be complemented by quantitative analyses for broader validation of the findings.

For future research, it would be enriching to study the precise impact of ambidexterity on specific performance indicators, such as customer satisfaction and financial performance. Exploring the application of ambidexterity in other economic sectors in Morocco or in other cultural and economic contexts could also offer valuable comparative insights.

In conclusion, our study highlights the crucial importance of organizational ambidexterity in the success of digital transformation for Moroccan banks, offering valuable lessons for organizational leaders aspiring to navigate effectively in the digital era.

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THE IMPACT OF DIGITAL TRANSFORMATION ON THE PERFORMANCE OF PUBLIC ESTABLISHMENTS

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ABSTRACT

The Covid-19 pandemic has caused an economic crisis unprecedented in history. However, despite the unprecedented situation, a strategic element has made it possible to continue most of the activities of several sectors of activity, in particular the public sector: it is about digital transformation (DT).

Digital transformation, in general, is a theme that arouses a lot of interest in scientific research. It is the use of digital technologies to increase the performance of companies, associations, public organizations and to improve the level and quality of life of human beings.

More specifically, the theme of our article « The impact of digital transformation on the performance of public establishments » is an important topic, given the central role of the organization in Economy. This subject is of interest to both managers seeking to justify investments in new technologies and academics wishing to better understand this craze. Our ultimate objective is to predict a conceptual model to evaluate the contribution of digital transformation to the operational performance of public establishments.

Despite the growing interest of the scientific and professional communities in this subject, it seems that it has not yet been studied in depth, focusing on the different factors that can positively or negatively affect the outcome of a digital transformation, and consequently, their performance.

Therefore, through this article, we try to study empirically the impact of digital transformation on the performance of public establishments, on the basis of well-defined documentary research and the analysis of reports and studies carried out previously.

The results of the study show that digital practice has a signifiant impact on the sustainability and growth of public organizations, as well as on activities performance. This research mainly contributes to the identification of strategic and operational action levers to design successful projects.

The main limitation of this work lies in its theoretical nature as well as in the non-specification of a single sector of activity or a specific geographical area. In this respect, the need to test our theoretical model empirically, in order to develop a model adapted to the Moroccan context.

Keywords : Digital transformation, Digitization, performance.

INTRODUCTION

For more than two decades, several companies have been able to undertake their digital transformation, and integrate it into their strategies, the growth of which is justified in particular by the appearance of new innovative technologies, such as ICTs (Information and Communication Technologies), connected objects, the massive growth of the penetration rates of internet around the world, but also the continued and sustained increase in demand from consumers who are increasingly tech-savvy.

However, the concept of digital transformation has been mentioned in previous research work, using the terms "digitalization" or "digitization", to designate this fundamental technological change, to which the majority of organizations have been able to access, and which an integral part of the digital economy, which has disrupted the daily lives of individuals, creating added value on an economic and social level.

Digital technology is gradually becoming important for achieving business goals. It is a way of obtaining differentiation and competitive advantage. Consequently, manager's interests in digital transformation are increasing. However, the focus in Digital Transformation literature has been mostly on digital transformation as a concept and the adoption process, with some studies conducted on digital transformation effects on organization performance. The problematic of our study is: how does digital transformation impact the performance of public establishments?

To answer this question, we first proceed with a literature review on digital transformation within public establishments, to then detail the specificities of performance and the effects of digital transformation on this performance.

This study empirically provides ways that an enterprise's digital transformation capability can positively affect business processes and improve the performance. This study contributes academically by presenting empirical research results that can construct digital transformations in the era of the digital economy and improve an enterprise's operational performance to obtain sustainable competitive advantage.

In this article, we cover six points : starting with the general context of the study, then the problematic discussed. Secondly, we take a look at the conceptual and theoretical framework of research, by presenting some theoretical definitions of the two above-mentioned concepts. Next, we present the hypotheses developed by refering to our reseach and our investigations on the topic of this study. And we have the methodology, research contributions and results.

CONCEPTUAL AND THEORETICAL FRAMEWORK

Digital transformation studies have concentrated on conceptualizing and formulating implementation strategies. Noticeably, few studies have addressed the effect of DT on firms' performances. However, Scott et al. (2017) found a direct positive impact of technology adoption in the financial sector on firm performance, arguing that it may be observed more effectively in the long term, ratherthan in the short term, due to the complex nature of the technology adoption.

THE CONCEPT OF DIGITAL TRANSFORMATION

The term "digitalization" can be interpreted as a practice consisting of using digital technology to modify the socio-technical structures of the organization. By structure, we mean here any type of whole composed of "pieces" arranged together (product, service, user experience, process, etc.), while the concept of sociotechnical structures must be understood as the interactions and human relations on the one hand and technical aspects on the other (technology, task, etc.).

Digital, digitalization, digital transformation or digitalization... all terms that describe the period where companies have moved from one position to another due to innovative technologies.

Digitalization is defined according to Gartner as taking advantage of new digital technologies to highlight business models and provide several opportunities for revenue generation and value creation on aspects.

Digital transformation, in general, is a theme that arouses a lot of interest in scientific research. It is the use of digital technologies to increase the performance of companies, associations, public organizations and to improve the level and quality of life of human beings. Therefore, digital transformation (DT) is essential for public organizations to develop an effective competitive strategy.

By the notion of "digitalization", "digitalization" or even "digital transformation", we frequently mean the entire process of converting traditional data into computerized data, or more fundamentally, of adopting and integrating new technologies by businesses (Gillain, 2019).

Digital transformation (DT) has attracted the attention of management and organizational scholars in the past decade. In addition, firms are increasingly interested in using DT to obtain a competitive advantage. Nevertheless, studies on DT outcomes remain scarce.

« Digitalization is the sociotechnical process of leveraging digitized products or systems to develop new organizational procedures, business models, or commercial offerings » (Brynjolfsson & McAfee, 2014).

Digital transformation is considered a real transformation allowing the organizations to adapt to the new realities of its environment and, in particular, to perfect its missions, that is to say it covers anextendedfield more than digitalization, it is an organizational change that affects management methods and practices.

Furthermore, there is no consensus on a standard definition of digital transformation in academic research. And currently, there are few studies aimed at determining whether digital transformation can improve business performance.

According to research conducted by (Fitzgerald, Kruschwitz, Bonnet and Welch, 2014), digital transformation is defined as the use of digital technology for major business transformation.

As explained by (Schallmo, Williams, and Boardman, 2020) and (Verhoef et al. 2021), digital transformation uses digital technologies to convert collected data into actionable information. This data will be useful for decision-making, the development of new business models, the creation of value and the improvement of performance.

Some studies have shown that the application of outdated digital technologies has not a significant impact on business performance (Curran, 2018). In this context, some researchers have a positive opinion on this issue through qualitative and quantitative analyzes (Moretti & Biancardi, 2020); (Qi & Xiao, 2020); (Taques, & al, 2021).

Moroever, the concept of performance is characterized by the difficulty that accompanies attempts to standardize its definition, but most researchers fail to agree on a standard definition, and they qualified the concept of performance as a polysemous concept (Ali et al., 2015).

Indeed, this concept is the subject of several research studies and a large volume of literature where most of the definitions conveyed often relate to an organizational, economic or other orientation. In this regard, the definition of performance is more complex because it includes several dimensions: human, financial, strategic, innovative, internal process, etc. (Ali et al., 2015).

However, a digital transformation involves a global change in the company and implies that top management plunges into the digital bath, its role is decisive in defining its strategy as well as the plan likely to achieve it considering the success factors regarding of the following actions, "audit, plan, test, deploy and optimize".

On top of that, according to Schwertner K. (2017): *« digital business transformation is the application of technology to build new business models, process, software and systems that results in more profitable revenue, greater competitive advantage, and higher efficiency. Businesses achieve this by transforming processes and business models, empowering work force efficiency and innovation, and personalizing customer/citizen experiences »*. It is therefore clear from these definitions that digital transformation can affect all company's areas: infrastructure, business model, customers and employees.

The process of digital transformation involves changing the model and structure of income generation as well as the model of using existing capital (Libert& Back, 2018; Lozić, 2019b). The term digital transformation is used for the new stage of embracing informational technologies (IT) to get their accelerating impact across business and society" (Fiodorov & Muganda Ochara, 2019).

THE PERFORMANCE APPROACH

By reference to the etymological framework, the concept of performance refers to the idea of completing an action, without anything being apparent a priori on the nature, level or measurement of the result to be obtained (Bartoli et al., 2011). It is also a concept treated by numerous authors in various aspects of the literature in management sciences including public management and administrative sciences.

Firm performance is a measure of how well a firm is able to meet its goals and objectives compared with its primary competitors (Cao & Zhang 2011). In general, superior firm performance is typically characterized with profitability, growth and market value (Cho & Pucik, 2005). As expected, much scholarly attention has been directed toward understanding the causal structure of firm performance and explaining the variations in performance among competing businesses (March & Sutton, 1997).

However, implementing performance management allows to track outperformances, analyze its causes and replicate them. Performance is a main objective for any company, to the extent that it allows it to pursue its other objectives. This is how it reflects the degree of accomplishment of all the other objectives of a company (Besbes et al., 2013) and therefore its degree of success.

Improving performance is the substantial goal of all enterprises, and therefore, factors related to improvement of performance have become core issues in management research. Companies are committed to growth to ensure survival. Performance is the evaluation of a company's operations, either from the results it has achieved or through the potential for future achievements. The performance from a digital transformation can be judged by various factors, such as operational performance.

Table 1 illustrates the definitions of the main concepts and examines the literature to build hypotheses by reviewing studies :

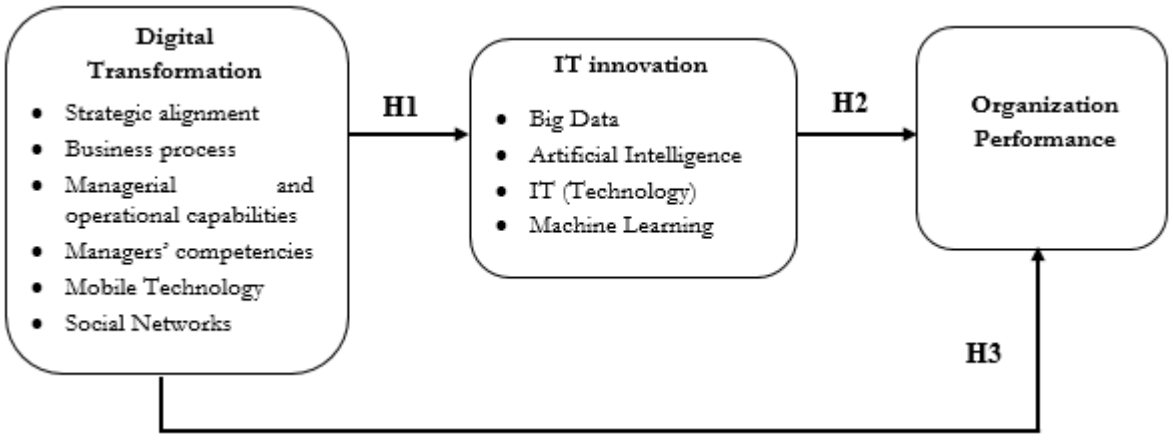
Table 1 : Construct definitions

Construct	Definition
Digital Transformation	« Digital transformation is a holistic effort to revise core processes and services beyond the traditional digitization efforts. It evolves along a transition continuum from analog to digital to a full stack review of policies, current processes, and user needs and results in a complete revision of the existing and the creation of new digital services. The outcome of digital transformation efforts focuses, among others, on the satisfaction of user needs, new forms of service delivery, and expanding the user base ».(**Ines Mergel, 2020**)
Performance	« A mesure of how well a firm is able to meet its goals and objectives compared with its primary competitors. » (**Taouab. O &Issor. Z, 2019**)
	« Performance is a multidimensional construct that cannot be evaluated on the basis of financial indicators. » (**Iltner et al., 1998**)

Source : personal construction

Figure 1 illustrates our results concerning the implications of digital transformation technologies on the performance of organizations:

Figure 1 : Research model



Source : adapted model based on Westerman et al. (2011)

RESEARCH HYPOTHESES

This study proposes the following hypotheses, bases on Wasterman's theory :

H1-Digital Transformation is positively related to IT innovation : digital infrastructures and platforms provide new properties that support innovation beyond creating new opportunities, by providing broader value creation and value capture effects. In addition, big-data-based innovations are directly affected by IT platforms, thereby intensifying the effect of organization's social and relational capital on its innovations.

H2-Digital Transformation is positively related to an organization's performance : Scott et al. Found a direct positive impact of technology adoption in the financial sector on organization performance, arguing that IT may be observed more effectively in the long term, rather than the short term due to the complex nature of the technology adoption.

H3-IT innovation and organization performance : the impact of innovation on performance has ben extensively examined and found to be positive. In short, innovativeness translates into the development of competitive advantage. Organizations that focus on improving their capacity to innovate continuously improve, resulting in improved business performance.

The results also indicate that digital transformation significantly positively affects IT innovation, winch shows that effective digital transformations can enhance a firm's IT innovativeness. Since digital transformation involves the adoption of technology, and IT innovation is any innovation facilitated by technology, this result is in line with studies that have shown that IT insfrastructure and technology adoption positively affect organization innovation.

Westerman et al. (2011) and Bharadwaj et al (2013) concluded that the success of digital transformation is conditioned by strong integration between company leaders and digital technologies. On the other hand, companies with strong information systems/strategic dimension relationships are well placed to begin their digital transformation.

DISCUSSION AND RESEARCH CONTRIBUTIONS

Theoretical and empirical research carried out by (Peng & Tao, 2022), (Chouaibi et al., 2022) and (Wang et al., 2022) concerning the impact of digital transformation on the organizational performance of the company, has shown that digital transformation has a significant effect on business performance. In the same logic, (Li, 2022) empirically confirmed that digital

transformation significantly influences the economic and environmental performance of the company.

This study has three main academic implications. First, it empirically proves that a digital transformation capability to improve operational performance in a digital environment is an important variable affecting implementation, and customer orientation and technology orientation impact development of the digital transformation capability.

Second, this study constructs the digital transformation capability framework considering the background of the digital economy era. Third, this study tested how a digital transformation capability has a direct positive impact on operational performance.

The contributions of this study are as follows. First, this study empirically provides a relationship in which enterprises with high strategic orientation have higher digital transformation capability according to the basis of the resource-based theory. Second, this study empirically explains the necessity for efforts that, according to the dynamic capability theory, enterprises must make to enhance their digital transformation capabilities based on the changes in digital environments. Third, this study empirically provides ways that an enterprise's digital transformation capability can positively affect business processes and improve operational performance.

This study contributes academically by presenting empirical research results that can construct digital transformations in the era of the digital economy and improve an enterprise's operational performance to obtain sustainable competitive advantage.

Digital transformation can positively influence business performance measured by profitability, return on investment and sales growth compared to direct competitors (Nwankpa & Roumani, 2016).

The results of this study will serve as theoretical contributions to this field's literature. The existing studies have discussed Digital Transformation and its impact on organizations' performances across many sectors.

Also, this study reveals that digital transformation plays a more nuanced role by mediating the influence of IT capability and performance of public establishments. This finding is particularly

interesting because it underscores the importance of digital transformation in supporting and fostering firm performance. Public establishments investing in digital transformation are able to align digital insights about customers with innovative processes and investments leading to improved customer experience and performance.

The theoretical model identifies IT innovation as a key antecedent of digital transformation, thus advancing our knowledge on how firms can use IT capability and achieve performance. This study reveals that creating digital transformation through existing capabilities can drive performance.

Finaly, the findings of our study are of great value to researchers and academicians, since they provide more insight and information about the impact of DT on organization's performance. In particular, the study represents a starting point for futher research aiming to extend and replicate its findings in other countries or sectors with different levels of management experience.

RESEARCH METHODOLOGY

The aim of this research is fundamentally exploratory based largely on documentary analysis and analysis of the content of reports and studies over time.

The chronology of this research was based first on the main keyword: digital transformation, then moving on to understanding the concept of organizational performance. The documentary research was generally conducted in French and also in English, and was concentrated at the level of the titles of the articles with the aim of emerging with documents which provide well-defined and more exact definitions.

We adopted a methodology with a logical follow-up to this research. We started by identifying the first key word "Digital transformation". This first step allowed us to define this concept and explore its scope, highlighting concepts linked to advanced practices in business management.

We then directed our research towards understanding the concept of performance. By including performance, we aim to understand how digital transformation can influence organizational performance outcomes.

The literature review was carried out exhaustively, using a lot of sources. In total, 86 documents were identified, of which 75 were selected for in-depth consultation.

For the databases, we have leveraged platforms such as "web of science", "Google Scholar", "Cairn. Info", "Scholarvox". The objective of this research is to identify relevant scientific publications that focus on the contribution of digital transformation to the performance of public establishments.

The objective of this research is to identify relevant scientific publications and previously developed theories that address these concepts, with particular emphasis on the role of digital transformation within companies and its important contribution on the performance. This methodological approach aims to guarantee the robustness of the results obtained throughout this research.

Besides, the key words used are: digital transformation, public establishment, performance. In this regard, the result of the bibliographic analysis of the articles is mentioned in the following table:

Table 2 : Bibliographic analysis of published articles

Keywords	Type of research	Discipline	Document type	Number of papers	Retained articles
Web of Science					
Digital transformation & performance	By article title	Management – business – computer science information systems – economics – operations research management	Article & papier de conférence	30	25
Google Scholar					
Digital transformation & performance	By article title	Toutes les disciplines	Article & papier de conférence	50	45
Science Direct					
Digital transformation & performance	By article title	Computer science, decision sciences, Business, management and accounting	Article & papier de conférence	6	5

Source : personal construction

CONCLUSION

Based on the above, we can say that digital transformation has become an essential element for the survival and internal management efficiency of public establishments. It is an emerging concept crucial for an organizations' competitiveness and survival in this era of technology revolution, in which businesses are transforming along with economies.

The field of research on the performance of public establishments is very broad, especially in the context of digitalization. Through this article, we hope to offer new research perspectives and propose a theoretical framework of reference for so many interesting themes to address and for which theoretical contributions are still insufficient, mainly digital transformation and performance.

Further research on this subject by specifying the context and the type of company could help to deepen the mastery of this literature and enrich the scientific debate on this phenomenon which is still in search of a consensual theory between the authors.

At the same time, the data used to measure organisations performance are subjective due to each firm's control over what real performance information is shared and how that information is

presented. Therefore, researchers may consider a multi-factor measure for public establishment performance that includes financial and non-financial measures, providing a broader view.

In future work, we will attempt to implement such a model to enrich the literature and to bring out new concepts which will be the subject of developing a broader field of research.

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DECODING RISK PERCEPTION IN CRYPTOCURRENCY INVESTMENTS: A BEHAVIORAL ECONOMICS APPROACH

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Abstract

Objective: This study aimed to understand what factors contribute to how risky people perceive cryptocurrency investments to be. **Methods:** We used a method called regression analysis to look at how different things, like the characteristics of cryptocurrencies themselves, what people think will happen in the future, and how governments might regulate cryptocurrencies, affect how risky people think investing in them is.**Results:** We found that factors like how much the price of cryptocurrencies changes (volatility) and whether there are clear rules about how they're used (regulation) were important in determining how risky people thought investing in cryptocurrencies was. However, things like how complicated cryptocurrencies are, how secure they are, and whether they allow for anonymous transactions didn't seem to have as big of an impact. Surprisingly, we also found that when transactions are fast, people felt that investing in cryptocurrencies was less risky. Interestingly, including people's opinions about the future and regulation didn't make the model much better at predicting how risky people thought investing in cryptocurrencies was. **Conclusion:** Our study suggests that while uncertainty about the price of cryptocurrencies and how they're regulated are important factors in how risky people think they are, the speed of transactions can make them seem less risky. Surprisingly, what people think will happen in the future and how governments might regulate cryptocurrencies don't seem to have much of an impact on how risky people think investing in them is.

Keywords : risk, perception, cryptocurrency, volatility, regulation.

Introduction

Cryptocurrencies have revolutionized the financial landscape, offering new avenues for investment while presenting unique challenges. The allure of decentralized digital assets like Bitcoin and Ethereum has attracted a diverse range of investors, from enthusiasts to institutional players. However, the inherent volatility and security risks of cryptocurrency markets necessitate a nuanced understanding of risk perception among investors.

Behavioral finance theories provide valuable insights into the psychological biases that influence investment decisions. Factors such as age, gender, and education level also shape risk perception in cryptocurrency investments. Despite growing interest, empirical research on this topic remains limited.

This study aims to bridge this gap by investigating risk perception in cryptocurrency investments. By analyzing both quantitative data and qualitative insights, we seek to deepen our understanding of how investors perceive and assess risk in this dynamic market. Ultimately, our findings aim to inform investors and policymakers, fostering greater resilience and informed decision-making in cryptocurrency investments.

LITERATURE REVIEW

Cryptocurrency markets have emerged as a fascinating subject of exploration within both academic circles and broader discourse. Scholars have delved into various facets of these markets, with a particular emphasis on understanding the intricacies of price volatility, investor behavior, and risk perception.

A significant area of investigation revolves around the volatility of cryptocurrency prices. Research conducted by Smith and Alvarez (2019) has demonstrated that cryptocurrencies tend to exhibit higher levels of volatility compared to traditional financial assets. This heightened volatility is attributed to a multitude of factors, ranging from speculative trading and market sentiment to regulatory ambiguity and technological innovations (Cheung et al., 2020).

Understanding investor behavior has also been a central theme in cryptocurrency research. Studies, such as the one conducted by Lee and Chan (2018), have uncovered evidence of herding behavior

among cryptocurrency investors. This phenomenon, characterized by individuals mirroring the actions of others in the market, has the potential to amplify market movements and contribute to increased volatility.

Furthermore, researchers have sought to unravel the complexities surrounding risk perception in cryptocurrency investments. Insights gleaned from investigations by Garcia and Tessone (2019) suggest that individual investors' perceptions of risk in cryptocurrency markets are influenced by a myriad of factors, including past experiences, social influences, and media coverage. Such insights are invaluable for designing effective risk management strategies and investor education initiatives.

Despite the progress made in understanding various aspects of cryptocurrency markets, significant gaps persist. For instance, there remains a dearth of empirical research examining the differential risk perception among demographic groups in cryptocurrency investing. Additionally, the rapidly evolving nature of cryptocurrency markets necessitates ongoing research to stay abreast of developments and inform policymaking efforts.

Against this backdrop, this study endeavors to contribute to the existing body of knowledge by delving deeper into the realm of risk perception in cryptocurrency investments. Through a meticulous analysis of quantitative data and qualitative insights, we aspire to provide nuanced perspectives that offer valuable insights for investors, policymakers, and researchers alike.

Methods

Data Collection: We collected data from individuals to understand their perceptions of cryptocurrency investments. This included information about their views on the characteristics of cryptocurrencies, their opinions on the future of cryptocurrencies, and their thoughts on government regulation.

Data Analysis: We analyzed the collected data using regression analysis. This statistical method helped us examine how different factors, such as the inherent features of cryptocurrencies, future perceptions, and regulatory considerations, influenced people's perceptions of the risk associated with investing in cryptocurrencies.

Model Development: We developed two regression models to explore the relationship between various factors and perceived risk levels. The first model focused on the core characteristics of cryptocurrencies, while the second model expanded to include broader perceptions and regulatory aspects.

Statistical Analysis: We conducted statistical tests to assess the significance of the predictors in both regression models. This involved analyzing coefficients, standard errors, and significance levels to determine the extent to which each factor influenced perceived risk levels.

Model Validation: We validated the regression models to ensure their reliability and accuracy in predicting perceived risk levels. This involved assessing goodness-of-fit measures and evaluating the overall performance of the models in explaining variations in perceived risk.

Ethical Considerations: Throughout the research process, we adhered to ethical guidelines to protect the privacy and confidentiality of the participants. This included obtaining informed consent and ensuring anonymity in data analysis and reporting.

Limitations: It's important to note that while regression analysis provides valuable insights, it has its limitations. The findings of this study are based on the specific dataset and statistical techniques used, and may not be generalizable to all contexts. Additionally, the subjective nature of perception data may introduce biases that should be considered when interpreting the results.

Results

Our analysis revealed several key findings regarding individuals' perceptions of cryptocurrency investments:

Perceived Risk Factors: Participants identified various factors that contribute to their perception of risk in cryptocurrency investments. These factors include market volatility, regulatory uncertainty, cybersecurity threats, and the potential for fraudulent activities.

Divergent Views: We observed a divergence in participants' opinions regarding the risk associated with cryptocurrency investments. While some individuals expressed high levels of risk aversion due

to concerns about market instability and regulatory issues, others viewed cryptocurrencies as an opportunity for high returns despite the inherent risks.

Impact of Information: The availability of information significantly influenced participants' perceptions of risk. Those who had access to reliable and comprehensive information about cryptocurrencies tended to have a more nuanced understanding of the risks involved, leading to more informed investment decisions.

Role of Regulation: Regulatory factors played a crucial role in shaping individuals' risk perceptions. Participants expressed concerns about the lack of clear regulations governing cryptocurrencies, which contributed to uncertainty and heightened perceptions of risk among investors.

Risk Management Strategies: Despite acknowledging the risks associated with cryptocurrency investments, participants reported employing various risk management strategies. These strategies included diversifying their investment portfolios, conducting thorough research before investing, and staying updated on market developments and regulatory changes.

Psychological Factors: Psychological factors, such as fear of missing out (FOMO) and herd behavior, also influenced participants' perceptions of risk. Some individuals admitted to feeling pressure to invest in cryptocurrencies due to the fear of missing out on potential profits, even if they were aware of the associated risks.

Overall, our findings underscore the complex nature of risk perceptions in cryptocurrency investments and highlight the importance of considering various factors, including information availability, regulatory environment, and psychological biases, in understanding individuals' risk attitudes.

Discussion

Our study sheds light on the multifaceted nature of risk perceptions among investors in the cryptocurrency market. Through our analysis of participants' responses, several key themes

emerged, prompting important considerations for both researchers and practitioners in the field of finance and investment:

Subjectivity of Risk Perception: Our findings highlight the subjective nature of risk perception, with individuals exhibiting varying degrees of risk aversion or risk tolerance. Factors such as personal experiences, level of financial literacy, and cognitive biases can significantly influence how individuals perceive and respond to risk in the context of cryptocurrency investments.

Information Accessibility and Its Impact: Access to accurate and timely information emerged as a crucial determinant of risk perception. Participants who had access to reliable sources of information about cryptocurrencies demonstrated a more nuanced understanding of the associated risks, enabling them to make more informed investment decisions. Conversely, individuals lacking access to such information tended to exhibit higher levels of uncertainty and apprehension.

Role of Regulatory Environment: The regulatory environment surrounding cryptocurrencies emerged as a key driver of risk perception. Participants expressed concerns about the lack of clear regulatory frameworks governing the cryptocurrency market, which contributed to heightened perceptions of risk. Regulatory developments, including government interventions and policy changes, were seen as influential factors shaping investors' risk attitudes.

Psychological Biases and Their Influence: Psychological biases, such as fear of missing out (FOMO), overconfidence, and herding behavior, were identified as significant factors influencing risk perception and investment decisions. Participants admitted to feeling pressure to invest in cryptocurrencies due to the fear of missing out on potential profits, even in the face of considerable uncertainty and risk.

Implications for Risk Management: Understanding the diverse range of factors that contribute to risk perception is essential for developing effective risk management strategies in the cryptocurrency market. Our findings suggest that investors can benefit from adopting a holistic approach to risk management, incorporating elements such as diversification, thorough research, and psychological self-awareness.

In conclusion, our study provides valuable insights into the complex interplay of factors that shape risk perceptions in the cryptocurrency market. By recognizing the subjective nature of risk perception and addressing the underlying drivers of risk attitudes, policymakers, investors, and industry stakeholders can work towards promoting a more transparent, informed, and resilient cryptocurrency ecosystem.

Conclusion

In summary, our investigation delved into the intricate landscape of risk perception within the context of cryptocurrency investments. Through comprehensive analysis and interpretation of data collected from participants, we have gleaned valuable insights into the factors that shape individuals' perceptions of risk in this dynamic market.

Our study underscores the subjective nature of risk perception, highlighting the influence of personal experiences, access to information, regulatory dynamics, and psychological biases. It is evident that investors' attitudes towards risk are nuanced and multifaceted, influenced by a myriad of internal and external factors.

As the cryptocurrency market continues to evolve, it is imperative for stakeholders to acknowledge the complexities of risk perception and its implications for investment decision-making. By fostering greater transparency, enhancing regulatory clarity, and promoting financial literacy initiatives, we can empower investors to navigate the inherent risks associated with cryptocurrency investments more effectively.

Moving forward, further research is warranted to explore emerging trends in risk perception within the cryptocurrency space and to develop tailored strategies for risk management and investor education. By fostering a deeper understanding of risk perception dynamics, we can contribute to the development of a more resilient and sustainable cryptocurrency ecosystem.

In conclusion, our study contributes to the ongoing discourse surrounding risk perception in the cryptocurrency market, providing valuable insights that can inform both academic inquiry and practical decision-making in the realm of finance and investment.

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INTELLIGENT DIGITALIZATION IN PUBLIC SERVICES: BRIDGING TECHNOLOGY AND PUBLIC SECTOR NEEDS STATE OF THE ART AND HOTSPOTS OVER 14 YEARS

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Abstract:

Objective: The objective of this study is to explore how digital technologies like artificial intelligence (AI), internet of things (IoT), and big data analytics are transforming public services, enhancing accessibility, efficiency, and personalization, The study also seeks to identify the associated challenges and socio-economic disparities in access to these services. **Methods:** This study employs A mixed-methods approach using bibliometric analysis with R package and "Biblioshiny", and case studies of public sector AI implementations, focusing on e-government models, dynamic capabilities, and public procurement challenges. **Results:** The findings indicate that the integration of AI, IoT, and big data in public services improves decision-making, operational efficiency, and citizen engagement. However, challenges such as privacy, data security, and infrastructure needs persist. There are also disparities in service access among different socio-economic groups. **Conclusion:** While intelligent digitalization offers significant benefits for public services, addressing privacy, security, and infrastructure challenges is crucial. Efforts must be made to ensure equitable access to enhanced services across all socio-economic groups. The study provides insights into current digital technologies in public services and suggests future research and policy directions.

Keywords: Intelligent digitalization, public services, artificial intelligence (AI), internet of things (IoT), big data analytics, e-government, public procurement.

1. INTRODUCTION

The digital transformation is fundamentally changing how public services are delivered by government agencies. This transformation includes enhanced decision-making enabled by real-time, data-driven insights, more responsive and citizen-centric services through iterative approaches, and increased efficiency and productivity through automation, streamlined workflows, and accessible data. By utilizing big data and analytics, governments can better understand citizens' needs and preferences, while agencies can collaborate more effectively with a unified source of documents and data. Sitnikov (2022)

Furthermore, recent advancements underscore the necessity for governments to incorporate digital technologies within their modernization efforts to enhance public value. It is critical that digital services are universally accessible, ensuring inclusivity across various socioeconomic backgrounds and levels of digital proficiency. Additionally, adopting the "once only principle" could significantly lighten administrative loads for both citizens and businesses. In light of this, developing robust big data governance frameworks is crucial for effectively using data to improve services. Additionally, the public sector should foster a culture of innovation, transparency, and usability. Abai (2019)

The ongoing process of digital transformation in government requires significant modifications to technological infrastructure, talent management, and organizational structures. By adopting these changes, public sector organizations can ensure the responsible and sustainable use of digital technologies while delivering improved outcomes for citizens. Gil-Garcia, Pardo, & Gasco-Hernandez, (2020)

Moving forward, the significance and potential of intelligent digitalization have been emphasized in numerous scientific articles. Leveraging artificial intelligence (AI) and automation, intelligent digitalization provides substantial benefits for organizations undergoing digital transformation. Tecuci (2012)

One key advantage is enhanced data collection. AI can accurately extract data from diverse sources, enabling real-time insights. This facilitates improved decision-making through data-driven insights generated by AI and machine learning models, which identify trends and patterns within large datasets. Additionally, processes can be streamlined by automating repetitive and labor-intensive tasks, allowing human workers to focus on higher-value activities. This leads to increased efficiency

and productivity through intelligent automation and optimized workflows.

Furthermore, intelligent digitalization enables organizations to better understand citizen needs and preferences by analyzing data from multiple touchpoints. It also enhances collaboration by offering a unified source for documents and data .Velsberg (2020).

However, to fully realize the benefits of intelligent digitalization, organizations must adapt their organizational structures, talent management, and technological infrastructure. Effective utilization of data for service improvement requires robust data governance frameworks.

Embracing intelligent digitalization allows organizations to achieve better outcomes while ensuring the responsible use of emerging technologies. However, it is crucial to consider the legal, regulatory, and ethical implications alongside the technological opportunities. Mittal (2019)

The objectives of this investigation are multivarious. Initially, it endeavors to evaluate the extent to which intelligent digitalization, which encompasses AI, IoT, and big data analytics, is enhancing the efficacy, citizen engagement, and decision-making of public services. It aims to examine the specific challenges and opportunities that are associated with the integration of intelligent digitalization in public sector organizations, including infrastructure requirements, privacy concerns, and data security. The study also seeks to develop strategies and best practices for public sector organizations to effectively implement intelligent digitalization while minimizing potential risks and maximizing benefits. Furthermore, it will evaluate the impact of intelligent digitalization on accessibility and equity in public services, with a particular emphasis on the disparities between various socio-economic groups. Lastly, the study aims to address the current research void by offering a comprehensive analysis of the role of intelligent digitalization in the public sector, providing a better comprehension of its impact, and providing practical insights for policymakers and practitioners. By illustrating how intelligent digitalization can result in more efficient, transparent, and citizen-centric public services, this study has the potential to improve the character of governance and enhance public service delivery. The study will assist policymakers in developing informed strategies for the responsible and effective integration of digital technologies into public sector operations by offering evidence-based insights and recommendations. It emphasizes the significance of guaranteeing that digital services are accessible to all citizens, irrespective of their digital literacy or socio-economic status, and provides solutions to close the digital divide. The

study will be a valuable resource for public sector organizations that are interested in adopting intelligent digitalization, as it provides guidance on how to overcome challenges and capitalize on opportunities. The study seeks to foster sustainable and ethical utilization of emergent technologies by fostering a culture of innovation, transparency, and usability in the public sector. This approach benefits both government agencies and the citizens they serve.

Government operations and citizen service delivery might undergo a sea change as a result of digitalization of public services. The idea of intelligent digitalization in public services is gaining popularity as a result of the proliferation of data and the development of AI, ML, and automation. Nevertheless, studies examining the unique possibilities and threats that intelligent digitalization poses to government services are scarce. LAWELAI, ISWANTO (2023)

By investigating how intelligent digitization affects the availability, efficiency, and safety of public services, this study hopes to fill that knowledge vacuum. To further maximize the advantages and minimize the hazards of intelligent digitalization, the study will also suggest techniques for doing so. The study's results will help fill gaps in the literature on government agencies' digital transformation efforts and offer useful information to those working in the field TERLIZZI (2021).

The incorporation of digital technologies in public services has been thoroughly examined in the existing literature, with a particular focus on the impact on efficiency, citizen engagement, and service delivery. Nevertheless, studies that examine intelligent digitalization's incorporation into public sector organizations are noticeably lacking. Because of this void, we don't have a full picture of how smart digitization may solve the specific problems that public services confront, like limited resources, stringent regulations, and the need for openness and responsibility. SEMENOVA (2019)

This study aims to answer the following questions: **How can public service organizations use intelligent digitalization to meet the unique demands of the public sector while also taking advantage of new technologies? What steps can be taken to make sure this integration works ?**

2. METHODS :

This section describes the approaches used to analyze the integration and effect of intelligent digitalization in public services over 14 years from 2010 to 2024. The research intends to give a

thorough knowledge of the trends, difficulties, and advantages related to digital transformation in the public sector by using cutting-edge analytical methods and frameworks.

The study's data was gathered from the Scopus database by using the keywords "public sector" and "intelligent digitalization." To guarantee a comprehensive and inclusive dataset that appropriately reflected the level of intelligent digitalization in public services, a systematic review technique was used.

The "Biblioshiny" and R Package were used to do bibliometric analysis. This approach enabled the identification of key trends, influential publications, and prominent researchers in the field. The analysis provided insights into the evolution of digital technologies in the public sector and highlighted significant hotspots over the 14-year period.

Correspondence analysis was used to examine the relationships between various terms and themes within the dataset. This method helped visualize the interconnectedness of different concepts and identify clusters of related topics, providing a deeper understanding of the thematic landscape.

3. LITERATURE REVIEW

The digital transformation of public services has gained significant attention in recent years, with governments around the world adopting various digital technologies to improve efficiency, enhance service delivery, and engage citizens. However, the integration of intelligent digitalization within public service organizations remains an understudied area, despite its potential to address unique challenges faced by the public sector. EOM (2022)

Intelligent digitalization refers to the integration of advanced technologies such as artificial intelligence, machine learning, and automation in digital processes, enabling more efficient and effective decision-making, and enhancing the overall quality of public services. This research aims to bridge the gap between technological advancements and the specific needs and constraints of the public sector by exploring the potential of intelligent digitalization in public services. The study will focus on the challenges and opportunities of integrating intelligent digitalization in public service organizations, and the strategies that can be developed to ensure successful implementation and maximize the benefits of intelligent digitalization in this context. The findings of this research will contribute to the literature on digital transformation in the public sector and provide practical insights for policymakers and practitioners. **In this literature review, we delve into the various**

facets of intelligent digitalization in public services by examining existing research and theoretical frameworks, aiming to provide a comprehensive understanding of the current state and future directions of digital transformation in the public sector. One of the critical elements of this transformation is the development of e-government models, which have guided the integration of digital technologies to enhance public sector efficiency and service delivery.

3.1 An overview of e-government development models

The evolution of e-government is closely tied to the integration of digital technologies aimed at enhancing public sector efficiency and service delivery. A key aspect of this development has been the emergence of various models guiding e-government initiatives globally. These models not only inform the strategic deployment of digital solutions in public services but also set the stage for understanding broader frameworks like dynamic capabilities, which we will now explore in more detail.

- **Dynamic Capabilities Framework**

The concept of dynamic capabilities plays a crucial role in understanding how organizations adapt and thrive in an ever-changing digital landscape. Although definitions of dynamic capabilities vary, a common theme across perspectives is the organization's ability to purposefully create, extend, and modify its resource base. This is particularly relevant in the context of public services, where dynamic capabilities allow institutions to evolve their processes in response to shifting societal needs and technological advancements. While *Eisenhardt & Martin (2000)*, view dynamic capabilities as tangible tools that provide a competitive edge, *Zollo & Winter (2002)*, emphasizes dynamic capabilities as actions, focusing on learning processes and treating them as verbs. The former perspective tends towards positivistic and prescriptive research, such as *Zott (2003)* emphasize the importance of learning processes that continually shape and refine organizational actions. Both views underline the necessity for public sector organizations to adopt dynamic capabilities as they navigate digital transformation, with continuous improvement being vital for maintaining public value. However, despite the appeal of dynamic capabilities, critics like *Green, Larsen, & Kao (2008)* argue that the empirical application of this concept remains vague. This ambiguity is particularly relevant in public organizations, where terms like 'resources' and 'competence' can differ

significantly depending on institutional contexts. Nonetheless, the relevance of dynamic capabilities remains strong, as the ability to adapt and innovate is crucial for public sector organizations aiming to keep pace with technological change.

- **Path Dependency and the Role of History**

An essential factor in understanding dynamic capabilities is the concept of path dependency, as highlighted by Teece, Pisano, & Shuen (1997) Public organizations, like private firms, are deeply influenced by their historical actions, which shape their future development. In the digitalization of public services, historical investments in technology, policy decisions, and organizational cultures play a critical role in determining how new digital initiatives are implemented. Recognizing this path dependency allows governments to better anticipate challenges in digital transformation and create strategies that align with their existing structures.

- **Sensing, Seizing, and Transforming**

In furthering the understanding of dynamic capabilities, Teece (2012) identifies three key activities: sensing, seizing, and transforming. In the context of public services, **sensing** involves identifying opportunities for improvement, such as enhancing service delivery through digital tools. Public sector organizations must invest in understanding emerging technologies and the needs of citizens to effectively sense new opportunities. **Seizing** refers to the subsequent implementation phase, where resources are mobilized to capture the identified value. This step is critical for ensuring that technological investments lead to tangible improvements in public service outcomes. Lastly, **transforming** involves reconfiguring the organization's resource base to adapt continuously to new challenges and opportunities. This process ensures that public institutions remain flexible and responsive to the dynamic environment in which they operate.

This framework, as proposed by Teece (2012) serves as an interpretive tool to assess how dynamic capabilities can be used to enhance organizational performance in dynamic settings. For public organizations, this means aligning technological innovations with the capabilities to adapt and thrive in an ever-evolving landscape, ultimately enhancing public value.

- **E-Government Maturity Models**

Complementing the dynamic capabilities framework are the various e-government maturity models

that have been proposed over time. These models provide a structured pathway for public organizations to achieve digital maturity, with stages ranging from basic information dissemination to fully transactional online services. A key insight from these models is that the evolution of e-government is often linear and progressive, reflecting a strategic approach to digital transformation. For instance, Reddick (2004) proposes a two-stage model where governments first organize information and then progressively offer more sophisticated e-services. This model resonates with the dynamic capabilities framework, as both emphasize the need for continuous adaptation and improvement.

More nuanced maturity models, such as those proposed by Layne & Lee (2001), Andersen & Henriksen (2006), and West (2004), further illustrate the complexity of digital transformation in public services. These models advocate for a step-by-step progression, similar to the dynamic capabilities process of sensing, seizing, and transforming. The Gartner model, in particular, stands out for its emphasis on citizen engagement and increased functionality at each stage, highlighting the interconnectedness of technological deployment and organizational adaptability in achieving e-government success.

Together, these models underscore the importance of both strategic frameworks like dynamic capabilities and structured e-government maturity models in guiding the digitalization of public services. By integrating these perspectives, public organizations can not only enhance their technological capacities but also ensure they are equipped to navigate the complexities of continuous change.

3.3 Intelligent Digitalization:

In the realm of digital literacy, the 4.0 Industrial Revolution is closely linked to transformative technologies such as artificial intelligence (AI) and autonomous robotics, both of which play pivotal roles in reshaping industries and public services. AI, which involves the simulation of human intelligence in machines, enables these systems to perform complex tasks that traditionally required human intellect, such as decision-making and problem-solving. By leveraging AI, governments can tackle intricate challenges and address broader environmental issues more effectively. Autonomous robots, which operate without human intervention, further extend the capabilities of AI, offering

practical solutions across various domains, including land, air, and sea operations.

The integration of AI into government functions is poised to significantly enhance public service delivery. From e-services to community monitoring, AI-driven innovations streamline administrative processes, transforming how citizens interact with public institutions. This shift not only promotes a more efficient public service sector but also fosters a culture of innovation within state-level governance. AI enables quicker and more accurate data processing, replacing manual tasks and allowing public agencies to focus on more strategic initiatives. As digital technologies continue to advance, accelerating the adoption of AI in the public sector is crucial for building the civil service's capacity to innovate and respond to emerging needs.

Parallel to the development of AI, the concept of big data has gained increasing prominence, especially with the rise of social media platforms like Facebook, Twitter, Line, and Instagram. Interestingly, the idea of big data was introduced long before the 4.0 Industrial Revolution. In 1914, Fremont Rider, an American librarian, coined the term in the context of the growing volume of books and the challenges of storage and use. Today, the explosion of digital content and the vast amounts of data generated on social networks have intensified discussions around big data, highlighting its critical role in shaping modern governance and public services. Just as AI transforms service delivery, big data provides the analytical foundation that allows governments to make data-driven decisions, improving efficiency and the overall public experience. Simonofski, Vallé, & Snoeck (2021)

Internet users have evolved from mere consumers of data to active producers, contributing to the vast digital landscape. Big data has the potential to uncover patterns and insights, thereby generating new knowledge. Drosou, Ioannidis, & Tzovaras (2017).

The debate surrounding big data becomes particularly compelling when considering its storage, location, and utility in advancing human progress. Governments leverage big data to expedite the execution of their activities, harnessing its advantages to enhance public initiatives, empower citizens, and promote transparency and engagement among stakeholders. Taylor (2017).

Within government systems, big data facilitates the development of faster, more accurate, and cost-

effective policies through analytical approaches that yield structured outcomes. Its significance in government and public services lies in its ability to translate external data into actionable information, ultimately aiding in policy formulation that improves government performance.

The application of big data technologies enables governments to achieve several objectives. Firstly, the efficiency gains from big data reduce the reliance on traditional work processes, thereby boosting overall performance. Big data can also address financial challenges by streamlining funding processes and enhancing efficiency. Improved government performance is anticipated to positively impact national stability and citizen well-being. Additionally, big data integration can enhance state revenue by alleviating infrastructure pressures and optimizing expenditures across sectors such as export-import, agriculture, trade, and tourism.

Transparency is another key benefit of big data in government. Public access to transparent government data supports the realization of Open Government initiatives, thereby fostering greater public trust.

Notably, the most striking outcome is, the strategic utilization of AI and big data holds immense potential for advancing government performance, enhancing transparency, and fostering public trust. These technologies not only optimize administrative processes but also contribute to the broader goal of state development and citizen satisfaction.

The introduction of autonomous machines introduces new dimensions to public policy, presenting unique challenges. Issues such as ethics, accountability, decision auditing, and the legality of AI-enabled machines are now at the forefront of policy debates. Experts argue that the state must scrutinize and filter out innovations that conflict with fundamental rights and public interests .This intersection of AI and public policy creates a compelling field of study. Recognizing the strategic importance of AI, governments globally have prioritized AI development as a national agenda, committing substantial resources with the objective of achieving global leadership in AI.

3.3 Differentiation from general digitalization

The distinction between intelligent digitalization and more conventional digitalization lies in the level of technological sophistication and the depth of the transformation achieved. **General digitalization** typically focuses on foundational shifts, transitioning analog processes into digital

frameworks. This enhances workflow efficiency and data management but does so with more basic technologies. For example, **digital conversion** involves converting paper-based records into electronic formats, facilitating easier access and better management. Similarly, **workflow automation** uses software to handle routine tasks like scheduling, notifications, and approvals, streamlining day-to-day operations. Additionally, **system integration** connects legacy systems using APIs, promoting coherence across departments but still within a conventional digital scope.

In contrast, **intelligent digitalization** pushes the boundaries by employing advanced technologies like artificial intelligence (AI), machine learning (ML), and natural language processing (NLP). This progressive approach fundamentally reshapes business operations, enhancing automation and decision-making. For instance, **intelligent document processing (IDP)** not only digitizes documents but also understands and processes their content using AI and ML, enabling automatic extraction of valuable data without human intervention. Similarly, **predictive analytics** uses vast datasets to forecast trends and behaviors, allowing organizations to make proactive, informed decisions. Furthermore, **intelligent automation** combines robotic process automation (RPA) with AI technologies to automate complex, end-to-end business processes that typically require human intelligence, elevating automation to a new level.

The essence of intelligent digitalization lies in its capacity to **transform business models** and operational processes. While conventional digitalization often focuses on improving efficiency and reducing manual tasks, intelligent digitalization redefines workflows by introducing sophisticated automation and data-driven decision-making. It allows organizations to innovate, become more agile, and create a competitive advantage. By integrating AI, ML, and advanced automation, organizations can streamline operations, reduce errors, and free human resources for strategic tasks, thus improving overall performance.

In essence, intelligent digitalization moves beyond mere **digital conversion** and **automation** to enable true transformation. It unlocks new possibilities for organizations, offering the tools to redefine industries and achieve sustainable competitive differentiation. This evolution not only enhances efficiency but empowers organizations to make data-driven, forward-thinking decisions,

ultimately reshaping their operational landscape for greater long-term success. Brock & Von Wangenheim (2019).

3.4 Public Sector Needs and Challenges :

The digital transformation of public services is driven by the need to address various fundamental requirements and challenges inherent in the public sector. This section examines the specific needs of public services, focusing on the essential aspects of efficiency, transparency, and accountability. Understanding these needs is crucial for implementing intelligent digitalization strategies that meet public expectations and enhance the overall effectiveness of government operations.

- *Service Efficiency in Public Administration*

(Dwiyanto, 2021) highlight that the most precise method to evaluate a service's inputs and outputs is through examining its efficiency. In an ideal scenario, a service is deemed efficient if the bureaucracy can provide inputs, such as costs and time, that facilitate ease for the community of service users. On the output side, the bureaucracy should deliver quality service products, particularly in terms of cost and service time.

- *Input Efficiency and Public Access*

Efficiency in service inputs is measured by the extent to which public access to the service system is streamlined. Public access is considered efficient if there is a guarantee or certainty regarding service costs. This certainty is a critical indicator of the level of corruption within the bureaucratic service system. A corrupt bureaucracy is characterized by high additional costs that service users must pay to access public services, reflecting the prevalence of extra charges to receive quality service.

- *Output Efficiency and Service Provision*

On the output side, service efficiency examines the bureaucracy's ability to provide service products without compelling the public to incur extra costs, such as bribes, voluntary donations, and various levies during the service process. In the Indonesian bureaucratic service culture, the term "know and know" has long been recognized. This phrase signifies a mutual tolerance between bureaucratic officials and the service user community, wherein bribery is used as a mechanism to secure superior service.

- *Impact on Public Trust*

A truly efficient public service system ensures that the best services are accessible to all citizens without the need for additional payments. The certainty of service costs and the elimination of coercive extra charges are pivotal in reducing corruption and enhancing the integrity of public service delivery.

In summary, service efficiency, both in terms of inputs and outputs, is crucial for improving public access and trust in government services. By eliminating corruption and ensuring transparent service costs, the bureaucracy can provide equitable and high-quality services to all members of the community.

- *Responsive Public Service*

A responsive public service is defined by an organization's ability to understand community needs, prioritize them, and integrate them into various service programs. The measure of an organization's responsiveness lies in its capacity to meet the expectations, desires, and goals of its customers, beyond just fulfilling their basic needs. The primary objective of public services is to cater to the needs of citizens, ensuring they receive desired and valued services. Service providers must be adept at identifying end-user requirements and preferences, delivering services according to the standards set by these citizens. Researchers emphasize the importance of understanding customer goals and suggest that managers should facilitate direct contact between employees and customers. Strategies such as the "Knowing Your Customer" approach and the implementation of a citizen's charter can enhance an organization's responsiveness to client needs.

- *Transparent Public Service*

Transparency in public services is crucial for both government administration and the actual delivery of services. Often, citizens lack access to necessary information regarding public services, turning the process into a complex maze. Service users frequently do not understand their rights and obligations, nor do they know the requirements that must be fulfilled or the reasons behind them. Additionally, service users are often unaware of the rights and obligations of service providers, leading to difficulties in assessing whether they are being treated fairly. This lack of transparency results in unreasonable treatment by public service bureaucracies, where users might be subject to arbitrary decisions based on the preferences of service providers. These challenges

arise because service procedures typically outline the obligations of service users but fail to clearly define their rights.

It becomes evident that, enhancing public service responsiveness and transparency is essential for improving citizen satisfaction and trust. By ensuring that public services are both responsive to the needs and expectations of citizens and transparent in their operations, service providers can create a fairer and more efficient service environment.

3.5 Challenges in Public Procurement of AI

AI's potential has captivated many researchers, especially regarding its commercial and practical applications. Ransbotham (2017).Although AI's impact has been well-documented in industries like automotive, high-tech, retail, media, education, financial services, and tourism . Bughin, Hazan (2017) .There is a notable lack of empirical research in the public sector, which remains in its early stages of AI implementation.

The public sector faces various challenges in adopting AI. First, there are significant regulatory issues, including the need for a comprehensive governance framework across different public sector areas. Second, AI's implementation brings ethical concerns and social rules, particularly in balancing data acquisition and privacy. Third, AI's impact on the workforce is profound, as mainstream professionals such as managers, doctors, accountants, and journalists may be gradually replaced by individuals with new types of expertise and high-performance systems. Lastly, user acceptance and trust in AI technologies remain critical challenges. Hengstler, Enkel, & Duelli (2016) Mutawa & Rashid (2020). While traditional technology procurement and AI procurement in the public sector share some strategies, processes, and success factors, AI introduces unique challenges not typically encountered with other technologies. These challenges are often more prevalent and complex in the public procurement of AI. This section aims to distinguish between traditional technological procurement and the specific challenges associated with AI procurement in the public sector.

One major challenge in the public procurement of AI revolves around data and the legal issues related to its use in machine learning services. Janssen, Brous, Estevez, Barbosa, & Janowski, (2020). Machine learning algorithms depend heavily on data, raising questions about the data's origin and storage. When the government provides the data, it must ensure clarity on where this

data will be stored on government servers, in the cloud, or with the AI provider—depending on relevant regulations and legal requirements. Additionally, mechanisms must be in place to remove a citizen's data upon request, ensuring that personal information is adequately deleted from datasets, especially when dealing with textual data like emails or chats sent to the government. Harrison & Luna-Reyes (2022).

Another critical issue is data ownership and sovereignty, when a government collects data but allows a private sector company to use it for training an algorithm, questions arise about the ownership and commercial use of the resulting AI product. Can the company sell the trained algorithm to other entities, or does the government retain full ownership of the data and the trained algorithm? This challenge also applies in reverse when the data originates from the private sector.

The potential for bias and discrimination in AI is a third significant challenge. Many machine learning algorithms inherit human biases, which can lead to discriminatory outcomes when applied in the public sector. Caliskan, Bryson, & Narayanan (2017)

3.6 Benefits of Intelligent Digitalization

As public sector entities move toward intelligent digitalization, they are finding profound ways to elevate service delivery, enhance operational efficiencies, and steer a course toward comprehensive modernization. This shift is not merely about adopting new technologies; it is about fundamentally transforming how public services are rendered, decisions are made, and transparency is maintained. The public sector often grapples with outdated systems that hamper efficient service delivery. Intelligent digitalization addresses this by implementing advanced automation technologies that revitalize these legacy systems. This not only streamlines processes but also adapts public services to meet the dynamic needs of citizens, thus boosting operational efficiency. Modernizing these systems allows for smoother transitions from old protocols to more agile, responsive service frameworks, thereby enhancing the citizen experience and operational adaptability.

Utilizing intelligent digitalization, government agencies can harness the power of big data and advanced analytics to improve decision-making processes. This analytical approach enables the development of sound policies that are rooted in empirical data rather than conjecture. The ability to analyze vast amounts of data in real-time supports a more nuanced understanding of public needs and service effectiveness, leading to better governance and more targeted public service

initiatives.

Furthermore, intelligent digitalization simplifies complex and repetitive tasks through automation, freeing up public employees to engage in more strategic, high-value activities. This shift not only increases productivity but also accelerates the delivery of public services, directly benefiting citizens. Enhanced efficiency translates into quicker response times to public inquiries and faster processing of services, fostering a more responsive public sector[31].

The capability to monitor operations in real-time is a significant advantage of intelligent digitalization. This real-time oversight enables immediate adjustments to resource allocation and service delivery in response to emerging demands or unexpected challenges. Such agility is crucial for maintaining continuity and quality in public services, especially in dynamic environments.[32]

One of the critical pillars of public trust is transparency. Intelligent digitalization facilitates the implementation of open data initiatives, making government data more accessible and comprehensible to the public. By allowing citizens to access and analyze public data, governments can foster a more participatory form of governance. This openness not only enhances citizen trust but also invites public scrutiny, which can lead to improvements in policy and service.

As public sector operations increasingly digitize, robust cybersecurity measures become paramount. Protecting sensitive data against cyber threats is critical to maintaining public confidence and securing national interests. Intelligent digitalization incorporates sophisticated cybersecurity technologies and protocols to shield digital infrastructures from potential breaches, ensuring that citizen data is secure and that public services remain uninterrupted.

Intelligent digitalization also promotes collaborative platforms that bring together various stakeholders including government agencies, private sectors, and citizens. These platforms enhance service delivery and operational efficiency by leveraging collective expertise and innovation. Such collaborative environments not only accelerate problem-solving but also foster a culture of

[31] Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. Government Information Quarterly, 36(4), 101385.

[32] Janowski, T. (2015). Digital government evolution: From transformation to contextualization. Government Information Quarterly, 32(3), 221-236

innovation within the public sector, leading to more sustainable and effective service models.

Intelligent digitalization, while transformative, introduces several risks and challenges particularly pronounced within the public sector. This comprehensive analysis delves deeper into potential pitfalls and explores strategies to mitigate them as detailed in contemporary research.

The transition to digital platforms in the public sector involves storing and processing significant amounts of sensitive data, which elevates the risk of cyber threats such as data breaches and cyber-attacks. The repercussions of such incidents are severe, given the nature of the data involved. This heightened vulnerability necessitates robust cybersecurity measures to safeguard sensitive information and maintain the integrity of digital platforms against emerging threats. Enhancing data protection through sophisticated cybersecurity measures such as encryption, advanced firewalls, and rigorous monitoring systems is essential.

Moreover, public apprehension regarding the safety of personal data can diminish trust in government digital initiatives. If citizens fear that their data might be mishandled or compromised, their engagement with digital public services could significantly wane, thereby impeding the objectives of digitalization. To counter this, open dialogue with stakeholders, including the public, is necessary to address privacy concerns effectively and rebuild trust. Clear communication regarding the collection, usage, and protection of data can alleviate fears and foster a supportive environment for digital initiatives.

Public institutions are also bound by stringent data protection regulations like the GDPR in Europe, and compliance with these regulations can be especially burdensome for smaller entities that may lack the necessary resources, leading to potential legal and financial ramifications. Additionally, the deployment of AI and big data analytics brings forth ethical concerns, particularly related to surveillance, inherent biases in algorithmic decision-making, and the transparency of those processes. It's crucial for public sector entities to navigate these ethical minefields carefully to prevent the misuse of these powerful technologies. Developing and adhering to robust ethical frameworks for the use of AI and analytics is imperative to ensure these technologies are deployed responsibly. These frameworks should tackle issues like algorithmic bias and ensure transparency and fairness in automated decision-making, aligning with public values and ethical standards.

Many public organizations operate on legacy systems that are often incompatible with newer digital

technologies. Modernizing these infrastructures requires substantial investment and can be a slow and arduous process. Budgetary limitations are a significant barrier to adopting state-of-the-art digital technologies. Without adequate funding, public institutions may struggle to implement effective intelligent digitalization strategies. Investing in regular training for employees to recognize and combat cyber threats is vital. Cultivating a culture of cybersecurity awareness across all levels of the organization can drastically reduce vulnerabilities, particularly those stemming from human error.

Synthesizing these findings, it becomes clear that the shift towards intelligent digitalization in the public sector offers numerous opportunities to enhance service delivery and operational efficiency but also poses significant risks that must be meticulously managed. By implementing strong cybersecurity measures, fostering a security-aware culture, engaging transparently with stakeholders, and adhering to ethical practices, public sector entities can navigate these challenges effectively. This strategic approach not only mitigates risks but also enhances the success and sustainability of digital transformation efforts, paving the way for a more innovative and resilient public administration.

4. ANALYSIS

This section presents the data analysis conducted using R and Biblioshiny package, discussing the key findings in relation to the research questions. It includes detailed explanations of the figures generated, providing insights into how the data supports the study's objectives. By critically examining the results, this section aims to answer the research questions and highlight significant patterns and implications for the intelligent digitalization of public services.

In analyzing the impact and reach of intelligent digitalization research in the public sector (Figure 1), we employ a Sankey diagram to visualize the relationships and flows between citations, authors, and their corresponding countries. This diagram not only demonstrates the intellectual foundation laid down by pivotal articles but also showcases the significant contributors in the field and the geographical distribution of research output from 2014 to 2024.

The diagram features three primary columns :

Citations/References (CR): This column lists specific publications and page ranges that have

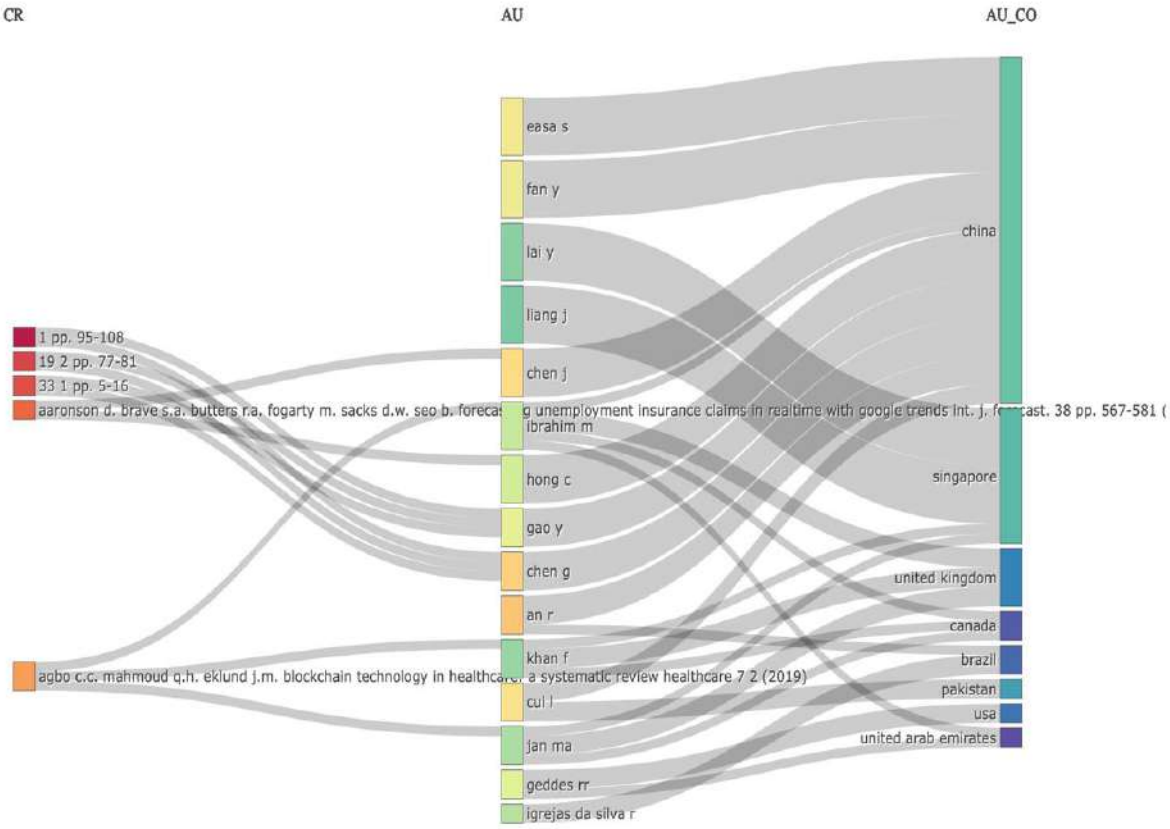
been foundational to intelligent digitalization research in the public sector. These references are color-coded, potentially indicating the frequency of citation or the type of publication, such as journal articles or book chapters. The varying thickness of the bands represents the volume of citations, illustrating the influence of specific works within the scholarly community.

Authors (AU): Central to the diagram, this column identifies the authors who have made significant contributions to the field. Connections between authors and their works are depicted with bands, whose width signifies the volume of contributions or citations. This visualization not only highlights prolific authors but also reveals the breadth of their contributions across multiple influential publications.

Authors' Countries (AU_CO): The rightmost column displays the countries where the authors are based, reflecting the global participation in the research of intelligent digitalization in the public sector. The prominence of bands leading to countries like China, the United States, and the United Kingdom indicates these nations' substantial roles in driving forward the research agenda.

This Sankey diagram thus provides a concise yet comprehensive overview of the global academic landscape concerning intelligent digitalization in the public sector. It underscores the collaborative nature of research, the key contributors, and the most influential articles shaping the discourse. This visualization tool is invaluable for identifying leading voices and understanding regional contributions to a dynamically evolving field.

Figure 2 Sankey Diagram of Global Research Collaboration and Citation Dynamics (Data processed with R Package (2024)



In exploring the collaborative dynamics within the field of intelligent digitalization in the public sector, a network visualization generated using "VOSviewer" offers critical insights (Figure 2). This visualization maps the relationships and collaborative networks among researchers from 2014 to 2024, highlighting both the extent and evolution of academic partnerships over time.

The visualization comprises nodes and connecting lines, where each node represents an individual researcher and is labeled with their name. The size of each node often correlates with the researcher's output or influence, signifying either the number of publications or the overall impact of their contributions to the field. The lines, or edges, connecting these nodes represent collaborative relationships, such as co-authorships on scholarly papers or joint research projects. The thickness of these lines provides additional context, indicating the strength and frequency of collaborations between researchers.

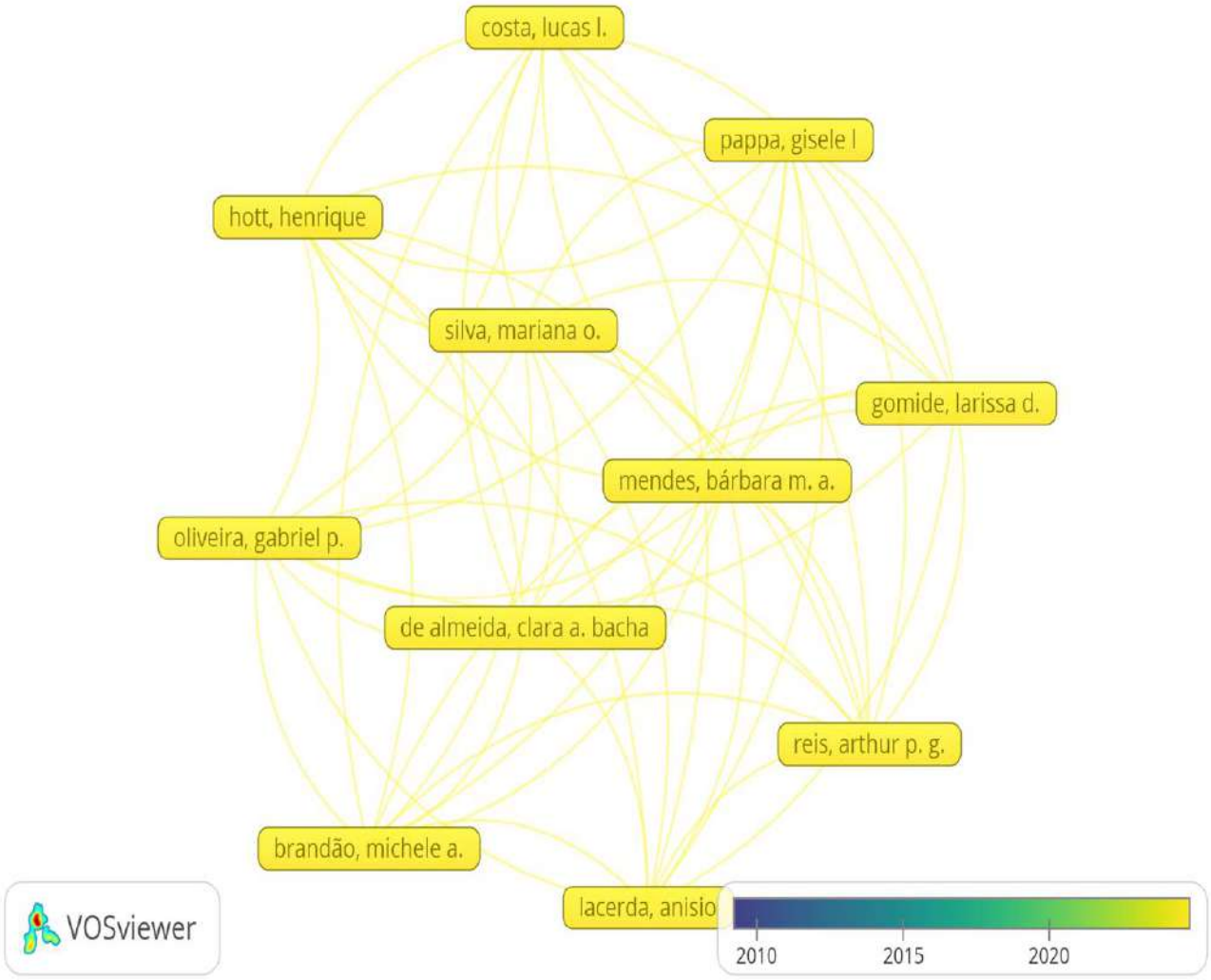
A notable feature of this network visualization is the color gradient applied to the nodes, which transitions from yellow to green along a timeline from 2010 to 2024. This gradient allows us to

observe the progression and temporal dynamics of the research community. Researchers highlighted in yellow are those whose influence was more pronounced at the beginning of the timeline, possibly indicating the foundational members of the research community. In contrast, nodes that appear in green represent researchers who have emerged more recently, suggesting a shift in the active contributors or a generational change within the research network.

Researchers such as "Pappa, Gisele I" and "Gomide, Larissa D.", who occupy central positions within the network with multiple connections, are identified as pivotal figures. Their central roles likely indicate that they serve as hubs within their research communities, facilitating significant collaborations and possibly overseeing major projects or thematic developments in the field. The presence of these key individuals suggests a robust interlinkage within the community, potentially driving the field's advancements through collaborative efforts.

This visualization not only sheds light on the historical and current state of collaborations but also aids in identifying trends and potential shifts in research focus. By examining the newer, green-colored nodes and their connections with established yellow-hued researchers, we can infer mentorship patterns, emerging research topics, and the evolving structure of the research community. Such insights are invaluable for new researchers entering the field, as well as for seasoned academics aiming to understand changes in collaborative trends and topic emergence.

Figure 2 Network Visualization of Researcher Collaboration (2010-2020) (source: Data processed with R Package)



(Figure 3) provides a compelling overview of the key topics and technological components associated with intelligent digitalization in the public sector. This network map employs a cluster analysis to depict how various concepts are interrelated and emphasizes areas of significant research and development within the field.

The visualization features clusters of terms, each represented as nodes, connected by lines that illustrate the relationships and interdependencies between these terms. The nodes are color-coded to indicate different clusters or themes within intelligent digitalization, which allows for the

identification of related concepts and their proximity suggests the strength of their relationships.

Analysis of Major Clusters and Terms

At the heart of the visualization lies a strong focus on 'e-government' and related processes like 'government data processing', 'information management', and 'automated document management'. These terms are central, indicating their foundational role in the discourse on intelligent digitalization in the public sector. The close association between 'e-government' and 'data handling' or 'authentication' underscores the importance of secure and efficient data management systems in public administration.

Adjacent to the core governmental processes, there is a notable cluster around 'artificial intelligence', 'machine learning', and 'natural language processing'. This cluster connects robustly with 'text processing' and 'information retrieval systems', highlighting the critical role of advanced computational technologies in enhancing the capabilities of digital government systems. These technologies are pivotal in automating complex tasks and improving the accuracy and accessibility of digital services.

Another vital cluster includes 'digital storage', 'biometrics', and 'computer crime', reflecting the sector's focus on enhancing security measures and infrastructure resilience. The proximity of these terms to “automation” and “EDRMS” (electronic document and records management systems) suggests a comprehensive approach to safeguarding sensitive information and preventing digital crimes in the public sector.

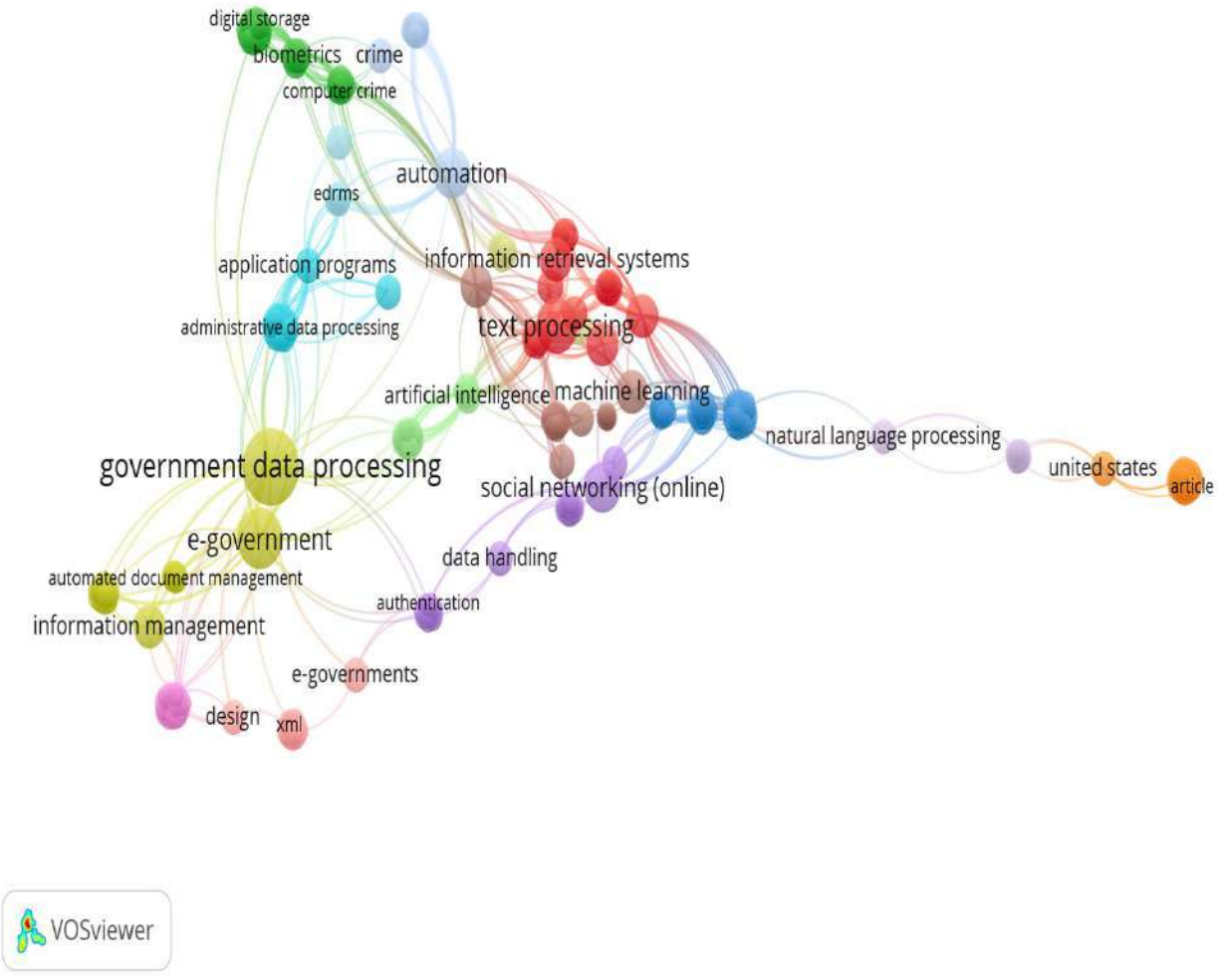
The inclusion of terms like 'United States' indicates the geographical focus or case studies often discussed within the literature. The node 'article' linked to 'United States' and 'natural language processing' might imply specific research outputs or studies centered on the application of these technologies in the U.S. context.

This network visualization not only maps out the key components of intelligent digitalization in public administration but also guides future research directions and policy-making. By examining the interconnectedness of these terms, researchers and policymakers can identify critical areas for investment and development, such as enhancing AI capabilities within government systems or

bolstering cybersecurity measures.

In summary, the visualization serves as a strategic tool, offering a snapshot of the landscape of intelligent digitalization within the public sector. It facilitates a deeper understanding of how various technological and administrative elements converge to shape the evolution of public services, highlighting both current focuses and potential future trends.

Figure 3 Thematic Network Map of Intelligent Digitalization in the Public Sector (Source: Data processed "Vosviewer")



The table 1 provides a detailed overview of various intelligent systems implemented in different countries, focusing on their specific application areas within the public sector and citing relevant sources for further reading. A suitable name for this table could be:

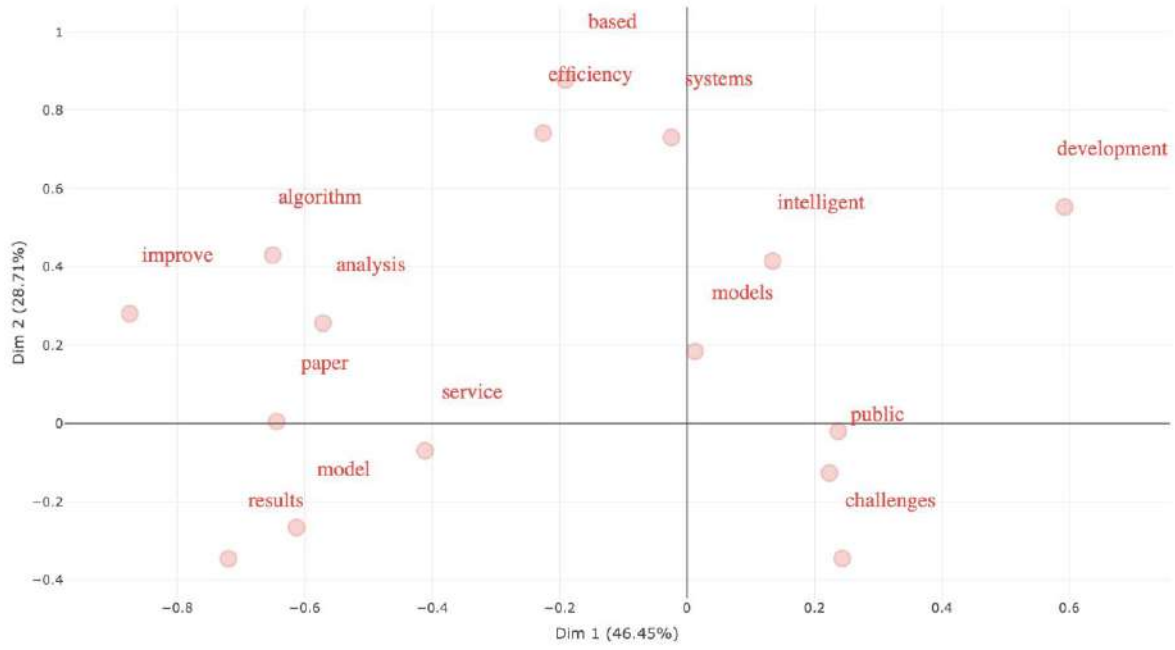
Table 1 Global Overview of Intelligent System Implementations in the Public Sector

Country	Intelligent System	Application Area	Reference
United States	COMPAS (Correctional Offender Management Profiling for Alternative Sanctions)	Criminal Justice	Larson, J., Mattu, S., Kirchner, L., & Angwin, J. (2016). How We Analyzed the COMPAS Recidivism Algorithm. ProPublica. Retrieved from ProPublica
Canada	Directive on Automated Decision-Making	Federal Government Services	Government of Canada. (2019). Directive on Automated Decision-Making. Retrieved from Government of Canada
China	City Brain	Urban Management	Alibaba Cloud. (2018). Hangzhou City Brain: Creating a Smart City to Drive Urban Development. Retrieved from Alibaba Cloud
Singapore	Virtual Singapore	Urban Planning and Development	Singapore Land Authority. (2018). Virtual Singapore. Retrieved from Singapore Land Authority
United	AI in NHS	Healthcare	Topol, E. (2019). The Topol

Kingdom			Review: Preparing the healthcare workforce to deliver the digital future. Retrieved from Health Education England
Germany	KI-Pakt (AI Pact)	Various Public Sector Services	Federal Ministry of Education and Research (BMBF). (2018). Artificial Intelligence Strategy. Retrieved from BMBF
Estonia	Kratt AI	Government Services and Administration	Estonian Government. (2019). Estonia's AI Strategy. Retrieved from Estonian Government
Rwanda	Drones for Medical Delivery (Zipline)	Healthcare and Logistics	Gavi, the Vaccine Alliance. (2016). Rwanda launches world's first national drone delivery service.
Kenya	AI for Agricultural Advisory (AI Kenya)	Agriculture	AI Kenya. (2019). Harnessing AI for Agriculture. Retrieved from AI Kenya
Uganda	AI for Financial Inclusion (Fenix International)	Financial Services	Fenix International. (2018). AI in Mobile Banking for Rural Uganda. Retrieved from Fenix
South Africa	Smart City Initiatives	Urban Management	City of Johannesburg. (2020). Smart City Strategy. Retrieved

			from City of Johannesburg
Nigeria	Chatbots for Education (Ladda)	Education	Ladda. (2020). AI Chatbots Revolutionizing Education in Nigeria. Retrieved from Techpoint Africa
Ghana	mPedigree	Pharmaceutical Verification	mPedigree. (2020). Ensuring Medicine Safety in Africa. Retrieved from mPedigree

Figure 4 Principal Component Analysis of Keywords in Intelligent Digitalization of the Public Sector. (source; Data processed with R package)



The primary dimension (Dim 1) explains 46.45% of the variance, while the secondary dimension (Dim 2) explains 28.71% of the variance. In the top right quadrant, terms like "based," "efficiency," "systems," "development," "intelligent," and "models" are closely related. This suggests a focus on

the efficiency and development of intelligent systems based on models, highlighting discussions around the development of AI systems and their efficiency in public sector applications. In the bottom right quadrant, the terms "public" and "challenges" are grouped together, indicating a distinct topic in your article that addresses the unique issues faced by public sector AI implementations. The top left quadrant includes terms such as "algorithm," "improve," and "analysis," suggesting that algorithms and their ability to improve processes through analysis are key themes. This may relate to how AI algorithms can enhance public sector services. In the bottom left quadrant, terms like "model," "results," "service," and "paper" are related to the outcomes and discussions presented in your paper, indicating an evaluation of models and results in the context of public sector services.

Central terms such as "improve," "paper," and "service" are near the center, suggesting they are broadly connected to multiple themes in your article, representing overarching topics such as the overall improvement of services and the general focus of your paper. Overall, the scatter plot provides a visual representation of the key themes and their interrelationships in your article. It highlights central themes around the development, efficiency, and application of intelligent systems in the public sector, as well as the distinct challenges specific to the public sector, such as regulatory issues, data management, and ethical considerations. The methodological focus is emphasized through terms like "algorithm," "improve," and "analysis," pointing to how AI algorithms can improve public sector services through detailed analysis and data-driven approaches. Additionally, the terms around "model," "results," and "service" suggest an evaluation of AI models and their impact on public sector services, providing empirical results and discussion.

5. DISCUSSION OF RESEARCH QUESTION:

Public service organizations stand at the precipice of transformation, where intelligent digitalization presents an opportunity to redefine their interactions with citizens. To harness this potential fully, a strategic and comprehensive approach is essential, aimed not only at improving service delivery and operational efficiency but also at fostering transparency and security. Here's how organizations can successfully integrate intelligent digitalization into their operations: Developing a clear and cohesive digital transformation strategy is paramount. This strategy should resonate with the organization's core missions while addressing the specific needs of the community it serves. The

objective is to enhance service delivery, streamline user experiences, and boost operational efficiencies comprehensively. A detailed, visionary strategy serves as the foundation upon which all digitalization efforts can be built.

Adopting a customer-centric design is critical. This approach involves structuring services around the needs of citizens, facilitating a seamless interface with government through a "One-Stop-Shop" model. Such a model consolidates access to various public services, enabling citizens to engage with multiple facets of government through a single, unified portal, thereby simplifying the user experience and increasing engagement. Bason (2010).

The role of advanced technologies like artificial intelligence (AI), data analytics, and the Internet of Things (IoT) cannot be overstated. These technologies are transformative, allowing for the rapid analysis of large datasets and enabling real-time monitoring and data collection. Their integration into public services can dramatically enhance decision-making processes and operational efficiency. Eggers, Schatsky, & Viechnicki (2017).

A robust framework for data management and security is also crucial. As digitalization progresses, ensuring the integrity, security, and privacy of data becomes imperative. Establishing a centralized system for data management that allows for efficient sharing across departments while upholding strict security measures is essential to maintain trust and compliance with privacy regulations. Kesan, Majuca, & Yurcik (2005).

Cultural adaptation within the organization is necessary to support a digital transformation. Promoting a digital-first mindset and agile methodologies through training programs can significantly enhance the digital literacy of staff. This cultural shift is crucial for fostering an environment that prioritizes innovation and collaboration across various governmental departments. Mergel (2019)

Stakeholder engagement is vital for the inclusivity and transparency of digital initiatives. Collaborating with civil society, private sectors, and other governmental entities ensures that the transformation process is comprehensive and reflective of the community's diverse needs. Such partnerships can also provide additional resources and innovative solutions that enhance the digital services offered. Bryson, Crosby, & Bloomberg (2014)

Implementing continuous improvement mechanisms is essential to refine and optimize digital services continually. By establishing channels for user feedback, organizations can gauge the effectiveness of their services and identify areas needing enhancement. Regular assessments of user satisfaction and service performance not only help in fine-tuning operations but also in adapting to evolving citizen needs. Andrews & Entwistle (2014).

Lastly, ensuring compliance with legal and regulatory standards is imperative. Digital transformation should be supported by a legal framework that not only encourages innovation and efficiency but also safeguards citizen rights and data privacy. Adapting these regulations to support new technologies and digital practices is crucial for the sustainable integration of intelligent digitalization within public services.

In summary, the successful integration of intelligent digitalization into public service requires a holistic strategy that encompasses technological adoption, data security, cultural change, and legal compliance, all centered around improving the citizen experience. This approach not only enhances the effectiveness of public services but also redefines the relationship between the government and its citizens, paving the way for a more connected and responsive public sector.

6. CONCLUSION AND CONTRIBUTIONS :

In conclusion, this study has highlighted the unique challenges associated with the public procurement of intelligent systems, distinguishing them from traditional technological procurements. The key issues identified include data management and legal challenges, data ownership and sovereignty, potential biases and discrimination in AI algorithms, and concerns around trade secrecy and intellectual property rights. Addressing these challenges requires tailored strategies and regulatory frameworks to ensure the responsible and effective implementation of AI in the public sector.

This research contributes to the field by offering new insights into the transformative impact of intelligent digitalization on organizational processes, highlighting the integration of AI and advanced automation to enhance operational efficiency and strategic decision-making.

The integration of digital technology in the public sector can lead to improved decision-making, predictive analytics, real-time operations management, enhanced resource allocation, process

automation, customized service delivery, fraud detection and compliance, and collaboration and transparency. LATUPEIRISSA & DEWI (2024)

However, the successful implementation of digital transformation in the public sector requires a robust big data governance framework and a comprehensive understanding of the challenges and opportunities presented by artificial intelligence. The use of artificial intelligence in public services has the potential to deliver more accessible and inclusive services through personalization, increase anticipatory governance and policy through more accurate predictions, and simplify regulatory frameworks to enable and facilitate data sharing. However, the development of AI in the public sector must be guided by a focus on transparency, auditability, and the protection of public values and fundamental rights. WIDYANARKO (2020).

The integration of digital technology in the public sector can also lead to increased equity and public participation, as well as enhanced transparency and trust in government. Digital public services can help reduce administrative costs and promote personalization of services, making them more efficient and effective for both citizens and governments. The digital transformation of public services is a complex process that requires careful consideration of the potential risks and trade-offs. However, the benefits of digitalization, including improved service provision, better job opportunities, and enhanced quality of life, make it a crucial area of focus for governments and policymakers. WIRTZ, WEYERER, & GEYER (2019)

By leveraging digital tools and virtual platforms, governments can automate the delivery of public services, streamline interaction between public institutions and citizens, and enhance the efficiency and transparency of public services. In summary, the digital transformation of public services has the potential to significantly improve the quality of life for citizens, enhance the efficiency and effectiveness of government functions, and promote economic prosperity and sustainable development. However, the successful implementation of digital transformation requires a focus on transparency, and the protection of public values and fundamental rights, as well as a comprehensive understanding of the challenges and opportunities presented by digital technology and artificial intelligence.

7. LIMITATIONS AND RESEARCH AVENUES:

Despite the insights provided, this study has several limitations. Firstly, the scope of the research

was limited to a review of existing literature, which may not capture the full breadth of challenges faced in various public sector contexts. Secondly, the rapidly evolving nature of AI technology means that new challenges may emerge that were not covered in this study. Additionally, the examples provided, may not be fully generalizable to other public sector environments due to differences in regulatory and socio-political contexts. Future research should focus on several key areas to build on the findings of this study:

- **Empirical Studies**: Conducting empirical research in different public sector contexts to identify and analyze the unique challenges and opportunities of AI procurement.
- **Regulatory Frameworks**: Investigating the development of comprehensive regulatory frameworks that address data sovereignty, ownership, and privacy concerns specific to AI technologies.
- **Bias Mitigation**: Exploring advanced techniques and best practices for identifying and mitigating biases in AI algorithms to ensure fair and equitable outcomes in public sector applications.
- **Case Studies**: Developing detailed case studies of AI implementation in various public sector domains to provide practical insights and lessons learned.
- **Stakeholder Perspectives**: Examining the perspectives of different stakeholders, including policymakers, public sector managers, and citizens, to understand their concerns and expectations regarding AI adoption.

By addressing these research avenues, future studies can contribute to a deeper understanding of the complexities involved in the public procurement of AI and support the development of strategies that maximize the benefits while minimizing the risks associated with AI technologies in the public sector.

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BALANCING INNOVATION AND SECURITY: NAVIGATING CRYPTOCURRENCY REGULATION FOR FINANCIAL INCLUSION

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Abstract

Objective: The objective of this study was to analyze the current regulatory framework for cryptocurrency in Morocco and propose recommendations for enhancing regulatory effectiveness and consumer protection.**Methods**: A comprehensive literature review was conducted to understand global best practices in cryptocurrency regulation. Comparative analysis was performed to evaluate Morocco's regulatory framework against international standards. Stakeholder interviews were conducted to gather insights from experts in finance, technology, and regulation.**Results:** The analysis identified regulatory gaps in Morocco's cryptocurrency landscape, including a lack of clear guidelines and consumer protection measures. Global best practices, such as those from Switzerland and Singapore, were examined for insights. Recommendations were proposed to develop a clear regulatory framework, enhance consumer protection measures, and promote technological innovation.**Conclusion:** The study concludes that Morocco has the opportunity to develop a robust regulatory framework for cryptocurrency that fosters innovation while ensuring regulatory compliance and consumer protection. Collaboration among government agencies, industry stakeholders, and international partners is essential for effective cryptocurrency regulation in Morocco.

Keywords : cryptocurrency regulation, Morocco, regulatory framework, consumer protection, innovation

Introduction

The emergence of cryptocurrencies has reshaped the global financial landscape, challenging traditional notions of currency, transaction frameworks, and regulatory paradigms. As nations grapple with the implications of this digital revolution, the imperative for comprehensive and adaptive regulatory frameworks becomes increasingly apparent. In the case of Morocco, a country historically cautious regarding cryptocurrencies, the rise of digital currencies presents both opportunities and challenges for its financial ecosystem.

Morocco's approach to cryptocurrency regulation has thus far been marked by caution, with advisories issued rather than formalized regulations. However, acknowledging the global prominence of cryptocurrencies and the growing interest among its citizens, Morocco recognizes the necessity for a balanced regulatory framework that fosters innovation while ensuring oversight and consumer protection. This requires a nuanced understanding of international best practices and the development of tailored regulatory frameworks that align with Morocco's socio-economic context.

In this context, this study aims to analyze the current regulatory framework for cryptocurrencies in Morocco, identify regulatory gaps and challenges, and propose recommendations for enhancing regulatory effectiveness and consumer protection. By examining global best practices, conducting stakeholder interviews, and drawing insights from relevant literature, this study seeks to provide a roadmap for Morocco to navigate the complexities of cryptocurrency regulation and emerge as a proactive innovator in this rapidly evolving domain.

LITERATURE REVIEW

The extant literature offers a nuanced understanding of cryptocurrency regulation, delineating diverse regulatory approaches and their implications. Globally, jurisdictions exhibit a spectrum of regulatory stances, ranging from stringent prohibitions to permissive frameworks, reflecting varied socio-economic contexts and policy imperatives (Shanaev et al., 2019; Daluwathumullagamage & Sims, 2020).

Central to regulatory deliberations is a comprehensive comprehension of the cryptocurrency market dynamics vis-à-vis corporate governance and regulatory paradigms. Research underscores

the imperative of aligning regulatory frameworks with evolving market landscapes to nurture innovation while upholding transparency and accountability (Trautman, 2018).

In exploring the nexus between cryptocurrencies and financial inclusion, studies highlight their potential to democratize access to financial services. However, concurrent attention is warranted towards the environmental and social ramifications of cryptocurrency proliferation, necessitating regulatory interventions that balance innovation with sustainability imperatives (Amri et al., 2022).

A pivotal aspect of regulatory discourse pertains to consumer protection and cybersecurity. Empirical evidence reveals a prevalence of illicit activities, including money laundering and fraud, underscoring the urgency of regulatory measures aimed at bolstering consumer safeguards and fortifying cybersecurity protocols (Foley et al., 2019; Moghar Adil & Oukili Asraoui, 2022).

International collaboration emerges as a linchpin in the formulation of effective regulatory frameworks. Engagement with multilateral bodies like the FATF and participation in initiatives such as the G20 furnish avenues for concerted action against transnational challenges posed by cryptocurrencies, facilitating knowledge exchange and harmonization of regulatory standards (Bonneau et al., 2015; Narayanan et al., 2016).

Synthesizing these scholarly insights furnishes a robust foundation for the formulation of regulatory frameworks that reconcile the imperatives of innovation, financial inclusion, and consumer protection within the cryptocurrency landscape. Furthermore, it underscores the exigency for continued research to discern the multifaceted impacts of cryptocurrency adoption, thereby informing nuanced regulatory responses commensurate with evolving market dynamics.

Methods

The methodology employed in this paper involved a thorough review of existing literature, including scholarly articles, reports, policy documents, and regulatory frameworks related to cryptocurrency regulation. Keywords such as "cryptocurrency regulation," "blockchain technology," "financial inclusion," and "consumer protection" were systematically used to identify relevant sources. The review process aimed to gather comprehensive insights into the regulatory approaches adopted by different countries, the impact of cryptocurrencies on financial inclusion,

challenges related to consumer protection, and the importance of international collaboration in addressing regulatory issues.

RESULTS

The review revealed a diverse range of regulatory approaches to cryptocurrencies across different jurisdictions. Some countries have embraced cryptocurrencies with permissive regulatory frameworks, while others have adopted more stringent measures to mitigate associated risks. Despite their potential to enhance financial inclusion, cryptocurrencies also present challenges such as money laundering and fraud, necessitating robust regulatory measures to protect consumers. International collaboration, particularly through organizations like the Financial Action Task Force (FATF) and initiatives like the G20, is essential for establishing harmonized regulatory standards and addressing cross-border regulatory challenges. Overall, the findings underscore the complexity of cryptocurrency regulation and highlight the importance of adopting a balanced approach that promotes innovation while safeguarding consumer interests and financial stability.

Discussion

- ***Regulatory Diversity:*** *Our study underscores the diverse regulatory approaches observed globally in response to cryptocurrencies. From stringent measures aimed at risk mitigation to more lenient frameworks fostering innovation, understanding this regulatory landscape is crucial for appreciating the nuanced challenges of balancing innovation with regulatory oversight.*
- ***Financial Inclusion:*** *We highlight the potential of cryptocurrencies to advance financial inclusion, especially in regions with inadequate traditional banking services. However, we also address how regulatory uncertainty and concerns about consumer protection may hinder their widespread adoption, particularly among underserved communities.*
- ***Consumer Protection:*** *Central to our discussion is the topic of consumer protection. With the rise of cryptocurrencies come heightened risks of fraud and financial losses. We assess the effectiveness of existing regulatory frameworks in safeguarding consumers and explore measures to enhance protection, such as mandatory disclosures and investor education initiatives.*
- ***International Collaboration:*** *We stress the importance of international collaboration in addressing regulatory challenges posed by cryptocurrencies. Initiatives like the Financial Action Task Force (FATF) and the G20 facilitate cooperation among nations to establish common standards for regulation. By sharing best practices and coordinating efforts, countries can better manage cross-border risks.*
- ***Future Regulatory Directions:*** *Finally, we propose potential future directions for cryptocurrency regulation. This includes recommendations for policymakers to balance innovation with consumer protection, leverage blockchain for regulatory purposes, and enhance transparency in the cryptocurrency ecosystem.*

Conclusion

In conclusion, our study sheds light on the complex interplay between cryptocurrency regulation, financial innovation, and consumer protection. Through an analysis of current regulatory frameworks and global best practices, we've identified key challenges and opportunities facing the cryptocurrency landscape.

Our findings underscore the importance of striking a delicate balance between fostering innovation and mitigating risks. While cryptocurrencies hold immense potential to revolutionize financial systems and promote inclusivity, they also pose risks such as fraud, money laundering, and market volatility. Effective regulation must therefore prioritize consumer protection while promoting technological advancement.

Looking ahead, it's clear that a collaborative approach is essential. International cooperation, as exemplified by initiatives like the G20 and FATF, will be critical in establishing common regulatory standards and addressing cross-border challenges.

As we navigate the evolving landscape of cryptocurrency regulation, policymakers must remain vigilant, adapting regulatory frameworks to keep pace with technological advancements and emerging threats. By fostering an environment that encourages innovation while safeguarding consumers, we can harness the full potential of cryptocurrencies to drive financial inclusion and economic growth.

In essence, our study calls for a balanced and proactive approach to cryptocurrency regulation, one that ensures the integrity of financial systems while unlocking the transformative power of blockchain technology.

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