

The Role of Information Technology in Enhancing Financial Markets: A Comparative Study of Global and MENA Experiences

دور تكنولوجيا المعلومات في تعزيز الأسواق المالية: دراسة مقارنة بين التجارب العالمية ومنطقة الشرق الأوسط وشمال أفريقيا

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Abstract:

The development of information technologies has profoundly transformed financial markets worldwide. Arab countries, like many other regions, have witnessed these changes, using technological advances to stimulate the development of their financial systems. This paper aims to explore and analyze these varied experiences, highlighting successes, challenges and best practices in the use of information technology for financial market development. By examining cases on a global scale and focusing specifically on approaches embraced by MENA region countries. This paper aims to provide in-depth perspectives and recommendations for more robust and sustainable financial growth.

Keywords: Information technology, development, financial markets, MENA, financial growth.

ملخص:

أدى تطور تكنولوجيا المعلومات إلى إحداث تحول عميق في الأسواق المالية في جميع أنحاء العالم. وقد شهدت البلدان العربية، مثلها مثل العديد من المناطق الأخرى، هذه التغييرات، مستخدمة التقدم التكنولوجي لتحفيز تطوير أنظمتها المالية. تهدف هذه الورقة البحثية إلى استكشاف وتحليل هذه التجارب المتنوعة، وتسليط الضوء على النجاحات والتحديات وأفضل الممارسات في استخدام تكنولوجيا المعلومات لتطوير الأسواق المالية. من خلال دراسة الحالات على نطاق عالمي والتركيز بشكل خاص على النهج التي تتبناها دول منطقة الشرق الأوسط وشمال أفريقيا، وتهدف هذه الورقة إلى تقديم وجهات نظر متعمقة وتوصيات من أجل تحقيق نمو مالي أكثر قوة واستدامة.

كلمات مفتاحية: تكنولوجيا المعلومات، التنمية، الأسواق المالية، منطقة الشرق الأوسط وشمال أفريقيا، النمو المالي.

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1. Introduction

The evolution of ICTs and their uses is part of a complex societal dynamic. ICTs have transformed our social relationships, our way of life and our way of working. These transformations manifest themselves both at individual level, reshaping our relationship with ourselves and at collective level, influencing our interactions in the public space. This evolution calls for the integration of social issues into the study of ICT, reshaping the foundations and values of our social organization. The study of ICT use is part of a sociological perspective that takes into account the context of use, practices and interactions, highlighting the importance of social anchoring in the use of technologies.

The digital field is a cross-disciplinary field, situated at the crossroads of several disciplines: information and communication sciences, management sciences, human and social sciences, and computer science. As a result, the literature abounds with expressions designed to describe the relationship with digital innovations and devices. These include Information Technology (IT), Information, and Communication Technology (ICT). The adjective "new" is often added to refer to Nouvelles Technologies de l'Information (NTI) or Nouvelles Technologies de l'Information et de la Communication (NTIC). However, it is essential to stress that this term is intrinsically linked to the period of emergence of the technologies in question, as well as to the knowledge and level of expertise in the technological field of the individual using these terms. By using the acronym TIC,

we reduce the risk of confusion while emphasizing the informational and communicational aspect. (Boulaire, 2023)

It is worth noting that, in earlier research under the system-oriented paradigm, the study of information and communication technology (ICT) uses was absent. This paradigm focused more on information representation languages and response mechanisms. This marked the majority of applications developed in the 1970s, which were criticized for the failure of digital projects due to a lack of user involvement, as Chaudiron points out. (Desmarais & Chanut, 2001, p. 120)

The growing development of Information and Communication Technologies (ICT) is largely due to the diversity of information available, the expansion of functional capabilities and the increased accessibility of information capital by individuals. However, this progress would not have been possible without the appropriation of technological tools by users, whose perception of ICT has evolved over time, generating profound changes in their uses.

Initially, the introduction of technological tools was primarily aimed at automating organizational tasks to improve the efficiency of work processes and increase productivity. The focus was on information processing and the automation of industrial processes, without any real consideration for user needs. However, the advent of the activity-oriented paradigm sought to complete the integration of ICT by taking account of the organization's functional, operational and strategic objectives. This paradigm, widely used in the study of the sociology of uses, came to the fore with the advent of the Internet and web technologies, paving the way for the development of tools accessible to a wide range of users. (Kalika, 2006)

Information and communication technologies (ICT) have evolved towards a focus on communication, divided into two main areas: internal communication, fostering cooperation via collective tools, and inter-organizational communication, notably through Electronic Data Interchange (EDI) and networks. This evolution has encouraged the sharing of technological resources and the adaptation of uses in line with advances in ICT. The challenges of ICT and its development are now taken into account by organizations, both public and private, as witnessed by the emergence of "smart cities" which aim to reduce costs while satisfying citizens, emphasizing the concept of "smart sustainable cities" by integrating green technologies. (French Institute of International Relations)

Financial management is both a science and an art, which makes it doubly dependent on the research and analysis of information. As a science, management proceeds according to the experimental approach, which involves a great deal of information gathering and analysis before, during and after the execution of management tasks, in order to validate working hypotheses. As an art, management must first be aware of the realities it wishes to represent, and then self-analyze in order to describe the creative process, so as to better understand its results and make them reproducible.

Over the decades, the fields of business administration and finance have produced an impressive number of theories, all based to varying degrees on the analysis of information, with the aim of helping managers to value certain corporate assets, or to contribute to their appreciation. We also feature famous investors and managers such as Warren Buffet and Paul Desmarais, whose actions and decisions are analyzed to uncover the methods used by these financial gurus. Individual savers and investors managing their personal finances have always been as dependent on access to information as financial professionals. (Guérin & Paturel, 2022, p. 14)

For the majority of individual investors, access to economic and financial information was rather limited before the information technology revolution began, with the emergence of the Internet in 1995. Although many mass information media had been available for several decades, the meteoric rise of information technology was not to be. The meteoric rise of information technology, and above all its accessibility to individuals and households, means that today's savers and individual investors have immediate access to a phenomenal quantity of information, at affordable cost. The challenges of using information in a management

Title : The Role of Information Technology in Enhancing Financial Markets: A Comparative Study of Global and MENA Experiences

process As an intangible asset, the use of information has always presented particular challenges. In today's knowledge-based economy, where the supply of information and technology is growing at breakneck speed, it is essential to analyse the impact of information technology on the development of financial markets, by examining how technological advances have influenced the structure, efficiency and transparency of financial markets, both globally and in MENA countries. Secondly, to assess the experiences of these countries in the use of information technologies in order to understand how they have adopted these technologies to modernize and improve their financial markets, identifying successes, challenges and potential opportunities.

We will also look at this new dimension of ICT understanding, to formulate recommendations for optimizing the use of information technologies in financial markets, and propose concrete actions based on global best practices and MENA country experiences, aimed at improving the efficiency and resilience of financial markets through these technologies.

From all of the above, the main hypothesis or assumption is that the integration and judicious use of information technologies in financial markets promotes increased operational efficiency, transparency and accessibility, thus contributing to more robust financial development, both on the global stage and in MENA countries.

This was followed by the secondary hypotheses, which are broken down as follows:

1-Widespread adoption of information technology improves liquidity in financial markets: By facilitating exchanges, reducing transaction times and increasing the availability of information, information technology promotes greater liquidity in financial markets.

2-Data security and confidentiality are crucial to investor confidence: Investors need guarantees concerning the protection of their personal and financial information to make full use of IT-based financial services.

3-More accessible financial services via IT promote financial inclusion: Financial platforms and services accessible via IT can promote financial inclusion by enabling more people to access banking and financial services.

2. World context of Information Technology in Financial Markets

2.1 Developments in information technology and their impact on financial markets

The development of an efficient banking system relies on the confidence of savers. Historical developments, particularly since the creation of the Bank of Venice in the 12th century, bear witness to this. The same is true of the various banking crises that occurred, for example, in the United States in 1907. (MENDEZ & TUTIN, 2010, p. 42) The role of banks and financial institutions in commercial and consumer transactions is undeniable. Firstly, at the heart of these transactions are the payment operations carried out by these intermediaries, whether for the issue of a cheque, for a transfer of funds or other electronic payments. Secondly, financing operations are carried out by borrowing (credit) or issuing securities (securities).

The meteoric rise of information technology and artificial intelligence has revolutionized the financial landscape. The arrival of new players, such as fintechs, has profoundly altered the relationship between investors, companies and financial institutions; in other words, young or small financial technology companies, commonly referred to as fintechs, (BONNEAU, 2018, p. 779) are moving into the territory once reserved for financial institutions, to which must be added the large financial technology companies (bigtechs). More recently, the phenomenon of open banking has emerged. Artificial intelligence, for its part, is giving rise to a variety of applications in the banking and financial sectors, such as in the field of automated advice (robot advisors).

AI is revolutionizing the banking and financial sector. It is being used to automate tasks, improve decision-making and offer new services to customers. AI has the potential to make banking services more

efficient, accessible and personalized." (Deloitte, p. 12) While the use of automata is less widespread in the banking sector, it is a different story in the financial sector, where it is booming: Automated trading platforms, investment advisor robots and automated risk management tools are becoming increasingly widespread. These technologies enable financial institutions to offer more efficient services. (Le Fur, 2023, p. 28) Digital finance is an ongoing revolution that is profoundly changing the financial landscape. It offers new opportunities, such as increased competition, improved services and lower costs, but it also presents risks, such as cybercrime, money laundering and fraud.

The emergence of digital finance poses major challenges for regulators and supervisors. They must adapt their regulatory frameworks to take account of the specificities of digital finance and guarantee financial stability. They must also ensure that the new players in digital finance respect existing rules and do not undermine consumer protection. Digital finance is a major development that will have a lasting impact on the financial system. It is important to understand the opportunities and risks it presents, so that we can support it responsibly. (Aglietta, 2023, p. 14)

The supervision of financial institutions is particularly strict because of the stakes involved in protecting customers and stakeholders. These issues have become central, as demonstrated by the adoption of a growing number of laws designed to protect them. (Mourlon, 2023, p. 127) The emergence and development of commercial players and new technologies in the financial ecosystem are prompting legislators to reflect on the approach they should adopt. Authorities are trying to measure the impact of these technologies on the banking and financial sectors. More and more work is being carried out on the banking, payment and investment systems.

2.1.1 Open banking system

Open banking is a system that allows third-party financial service providers (TPPs) to access the financial data of a bank's customer, usually via an application programming interface (API). (Hogarth, Teather, & Smith, 2021, p. 177) In practical terms, this could mean a third-party company offering payment services to consumers, which needs to obtain certain bank information, such as the adequacy of the provision, in order to proceed with the transfer of funds. The crux of the matter lies in the idea that the bank must provide this third party with its customer's information. Irrespective of this, the consumer or business can access a wider choice of financial products and services, which are better adapted to their needs.

The Basel Committee on Banking Supervision, which reports to the Bank for International Settlements, has proposed five scenarios that take into account the impact of financial technology companies on banks: (BIS COMMITTEE ON BANKING SUPERVISION, 2018, pp. 11-18)

- First, the current bank metamorphoses into a "better bank» ;
- Secondly, a digital "new bank" may be created, although this will be difficult in some markets, such as Canada, and even drive out of the market those banks that cannot adapt;
- Thirdly, the "fragmentation of the banking landscape" involves the relationship between banks and financial technology companies. This will lead to a collaborative relationship between these companies, whatever its nature (joint venture, partnership, consortium, etc.);
- Fourthly, the "diminished bank" scenario occurs when the role of the bank fades away, while the financial technology company establishes a direct relationship with the customer. However, the Basel Committee on Banking Supervision states that "it is still the responsibility of the authorized bank to ensure the identification of the customer before he can access funds through his payment card or accounts ;
- Fifthly, the "loss of the bank's intermediation function" occurs when a financial technology company, and especially BigTech, offers a complete service. P2P lending illustrates this point.

The Financial Stability Board has indicated that, in principle, the arrival of new companies on the market should increase competition and diversity in payment, lending, brokerage and insurance activities, and even create a more efficient and resilient financial system. Competition from small financial technology

Title : The Role of Information Technology in Enhancing Financial Markets: A Comparative Study of Global and MENA Experiences

companies is usually limited to a particular niche. However, large financial technology companies can offer serious competition to traditional financial institutions, due to their established network and customer base, the possibility of using their customers' personal data from non-financial activities, and access to technologies such as artificial intelligence and cloud computing. (FSB, 2019)

In the UK, the Commission & Markets Authority has highlighted the lack of competition in the UK banking sector. It states that, "essentially, the older and larger banks, which still account for the large majority of the retail banking market, do not have to work hard enough to win and retain customers and it is difficult for new and smaller providers to attract customers. She adds that the cost structure of accounts, and especially bank overdrafts, is complex and disadvantageous for the customer, and that the possibility of changing would be beneficial for many customers. In addition, she notes that "older banks have access to cheaper retail deposits from their existing customers which they can use in their lending businesses. This gives such banks an advantage over new banks and the more customer deposits a bank has the bigger that advantage. The solution proposed by the Commission & Markets Authority is to develop the open banking system. Accordingly, it has created the Open Banking Implementation Entity (OBIE) to create standards for the open banking ecosystem. The third version of the standards presented by this body aims to comply with the revised Payment Services Directive. (COMMISSION & MARKETS AUTHORITY, 2016)

2.1.2 Protection of personal information

Customer information is sensitive data requiring an appropriate level of protection. As the UK's Commission & Markets Authority accurately points out: "when it comes to customer data, privacy and security concerns are paramount." The classic means of protection are well known: cryptography, biometric methods and distributed ledger technology, also known as "blockchain". Simply put, this interface enables various applications to communicate with each other to share data. In practice, the operation is programmed and can be used autonomously via artificial intelligence. (ONG, 2015, p. 209)

By opening a bank account, the customer consents to the collection and use of his or her personal information by the bank for the purposes indicated in the contract. This consent also applies to the disclosure of this information to third parties, such as credit agencies, financial institutions, agents other or service providers. (Marie-Claude, 2013, p. 124) This shows that the customer is considered to have consented to the disclosure of his or her personal information to third parties when opening a bank account. This consent is valid in law, even if the banking contract is a contract of adhesion.

In Europe, Article 98 of the revised Payment Services Directive stipulates that the European Banking Authority must develop regulatory technical standards for payment service providers to specify the requirements for strong authentication under Article 97 of the General Data Protection Regulation.

The latter states, among other things, that an identification code is generated when authentication is based on at least two of the elements belonging to the categories "knowledge", "inherence" and "possession", and control mechanisms must be provided by the payment service provider: these must also ensure data confidentiality and security, and exception measures are possible. Finally, the payment service provider must have access to an interface, which may be reserved, to communicate with the payer. In the event of unavailability or breakdown, payment service providers must have contingency plans in place. (Delegated Regulation (EU), 2018)

2.1.3 Payment and technology

Traditionally, payment methods were under the control of banks, both for issuing and negotiating commercial paper and for issuing credit and debit cards. The opening up of the Internet to commercial relations has paved the way for the arrival of new, non-financial payment service providers. By entering the same arena as banks, these providers are distorting the market, given the inequity between the regulations imposed on traditional financial institutions and those governing financial technology companies.

2.2 Emerging technologies and their influence on global finance

Numerous technological innovations have emerged in recent decades, dramatically changing the way investors access financial services. Whether called "portfolio managers", "online advisors" or "automated advisors", these innovations have enabled investors to benefit from easier, more affordable access to financial services. (Shepherd & McArthur, 2022, pp. 2-3)

2.2.1 Artificial intelligence, robots and legal liability

Artificial intelligence (AI) is no longer science fiction. It is a reality that is taking hold in all areas of our lives. In the banking and financial sector, AI is already widely used, notably for task automation, fraud detection and decision-making. However, the development of AI raises many issues, particularly ethical and legal ones. AI can be used to undermine the integrity of financial markets, to discriminate against customers or to invade privacy. EU member states are currently working on a legal framework for AI. This framework should include rules on the safety, transparency and accountability of AI systems. It should also include mechanisms to protect fundamental rights, such as the right to non-discrimination and the right to privacy. (Gautier & Pontonnier, 2023, pp. 11-12)

Artificial intelligence (AI) is a fast-growing technology. It is currently used in a complementary way to humans, but it is possible that its use will become more widespread in the future. In this case, decisions made by machines will become increasingly important. Machine learning is an important aspect of AI. The question of liability for robot learners is a complex one, raising many legal, philosophical and ethical issues. Legally, the current state of the law does not allow a robot to be held responsible for its actions. Liability is traditionally based on the idea of fault, which presupposes that the perpetrator has committed an error or breached a duty. However, it is difficult to consider that a robot could be at fault, insofar as it acts according to the data on which it has been trained. However, the question of the liability of learning robots is becoming increasingly pressing, as these robots become more autonomous. Indeed, a learning robot is capable of making decisions without human intervention, which means it is increasingly beyond the control of a third party. (Gautier & Pontonnier, 2023, pp. 11-12)

In this context, several solutions have been proposed to adapt the law to the liability of learning robots. A first solution would be to extend liability to robot designers or manufacturers. A second solution would be to create a new category of liability specific to robots, based on the idea of risk. Philosophically, the issue of liability for learning robots raises complex questions about the nature of responsibility and the place of humans in the world. Indeed, if a robot is capable of acting autonomously, does this mean it is capable of making moral decisions? If so, to what extent are humans responsible for the actions of these robots? These questions remain unanswered, and it is likely that thinking on the responsibility of learning robots will continue to develop in the years to come. (Gautier & Pontonnier, 2023, pp. 348-350)

In view of these observations, the European Parliament asked the European Commission to present a proposal for a legislative instrument on the legal aspects of the development and use of robotics and artificial intelligence by 2030 or 2035, combined with non-legislative instruments such as guidelines and codes of conduct. The Parliament also called on the Commission to examine, evaluate and consider the consequences of all possible legal solutions. (European Parliament, 2022, p. 15)

The European Union seems less inclined than in the past to give robots a legal personality. Recently adopted European texts effectively place humans at the heart of technological devices using artificial intelligence. European Union and Member State law on the liability of autonomous tools is thus built around a different purpose: maintaining the responsibility of the human person (and not recognizing the legal responsibility of robots). In a European Commission working paper dated December 18, 2018, the High-Level Expert Group on Artificial Intelligence behind this document includes among the ethical principles raised by artificial intelligence the principle of autonomy: "Preserve Human Agency". This principle states that, "to ensure human agency, systems should be in place to ensure responsibility and accountability. It is paramount

Title : The Role of Information Technology in Enhancing Financial Markets: A Comparative Study of Global and MENA Experiences

that AI does not undermine the necessity for human responsibility to ensure the protection of fundamental rights. Professor Nicolas Vermeys, for his part, has reservations about granting robots legal personality. (Européen commission, 2018, pp. 09-10)

2.2.2 Automation of financial advice

In a study published in 2022 by the Autorité des marchés financiers (AMF), the authors identify the following key regulatory challenges for the automation of financial advice: (Financial market authority, 2022, p. 29)

- Protection of non-professional investors: robo-advisors must be designed to protect non-professional investors from financial risks.
- Transparency: robo-advisors must provide investors with clear and concise information on their products and services.
- Competition: regulators must ensure that robo-advisors are not in a position to create monopolies or harm competition in the financial sector.

2.2.2.1 Automated financial advice

The European regulatory authorities offer an interesting summary of what is encompassed by the automation of financial advice: A website on which an investor (or potential investor) uses an online questionnaire to enter information about his or her specific situation, including risk appetite; investment objectives; and facts relating to the investor's life and circumstances (for example, these may include: the investor's tax situation, marital or relationship status, career and retirement plans, other investments and assets owned, financial resources and commitments, and short- and long-term plans for the family). The tool then uses this information to automatically generate recommended transactions for one or more financial instruments. For example, this may involve (among other things) recommendations for the investor or potential investor to buy, sell, subscribe, exchange, redeem, hold or underwrite particular financial instruments. The recommendation is presented as appropriate. (European Regulatory Authorities, 2021, p. 6)

The robo-advisor is an electronic platform that allows investors to complete an online questionnaire. The answers are then analyzed by an algorithm that determines an investment portfolio suited to the investor's objectives and risk tolerance. The robot can also rebalance the portfolio as required, and perform annual monitoring.

2.2.2.2 Opportunities and risks of automated financial advice

Automated financial advice, also known as robo-advice, is a growing trend in banking and finance. This technology offers undeniable advantages for both consumers and professionals. For consumers, it reduces costs, widens access to financial advice and improves service quality. For professionals, it reduces costs and improves productivity.

However, the automation of financial advice also presents potential risks. For consumers, it can make information and advice difficult to understand, and can lead to inappropriate decisions. For professionals, it can lead to uncertain liability and reputational risks. Dominique Payette stresses the importance of taking into account the potential risks associated with the automation of financial advice. In particular, she warns that this technology can be used to manipulate consumers or provide them with unsuitable advice. She also stresses that regulatory authorities must adapt to this new environment to ensure the protection of consumers and professionals alike. (Dominique, 2023, p. 221)

Financial systems, banking services and non-banking services perform many functions that go beyond simply mobilizing savings and resources. Indeed, evidence suggests that these multiple functions, such as risk sharing, information generation, price determination, governance and oversight, payment systems, etc., are all channels through which financial development can be linked to economic development. It is with these functions in mind that the existing financial system and its contribution to sustainable development in the

MENA region are subjected to an "objective review".

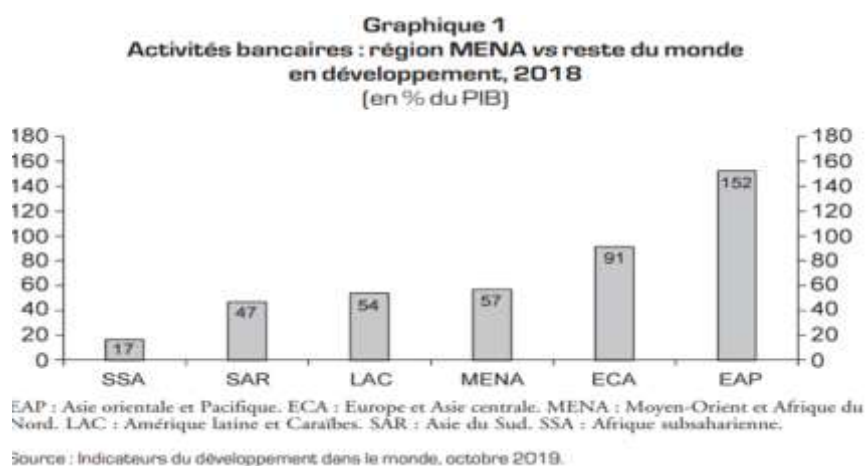
3. MENA countries' experiences in adopting IT for financial development

The MENA region is facing significant challenges in terms of financial inclusion. Only 36% of adults have access to a bank account, and the gap between men and women is particularly large. In addition, the region has a high concentration of informal financial services, which can be expensive and risky. Fintech has the potential to address these challenges by providing affordable and accessible financial services to a wider range of people. (McKinsey & Company, 2022, pp. 1-2)

3.1 Current state of IT use in MENA financial markets

Fin Tech start-ups in Africa and around the world provide mass access to a wide range of financial services - savings, credit, insurance and other digital products. In fact, they have become instruments of innovative financial inclusion, essential to inclusive development. It should be recognized that financial development alone will not suffice to ensure financial inclusion, and that the MENA region would therefore do well to embrace the Fintech movement because of the impact it has, through inclusion, on people's livelihoods. (Senbet & Simbanegavi, 2019, p. 111)

In the study "MENA Financial Services: The Case for Functional Regulation", the authors find that the MENA region is lagging behind in digital financial services. They attribute this lag to bank concentration, the dominant role of banks in the region's financial system, and inadequate regulatory frameworks. The authors recommend a function-based rather than an institution-based approach to regulation. This approach would ensure that all digital financial service providers, whether banks or non-banks, are subject to the same regulatory requirements, irrespective of their legal structure. This approach would have several advantages, including ensuring a similar level of consumer protection for all digital financial service providers and stimulating innovation. (Sheng, Barr, Goodhart, & Schoenmaker, 2023, pp. 22-23)



Title : The Role of Information Technology in Enhancing Financial Markets: A Comparative Study of Global and MENA Experiences

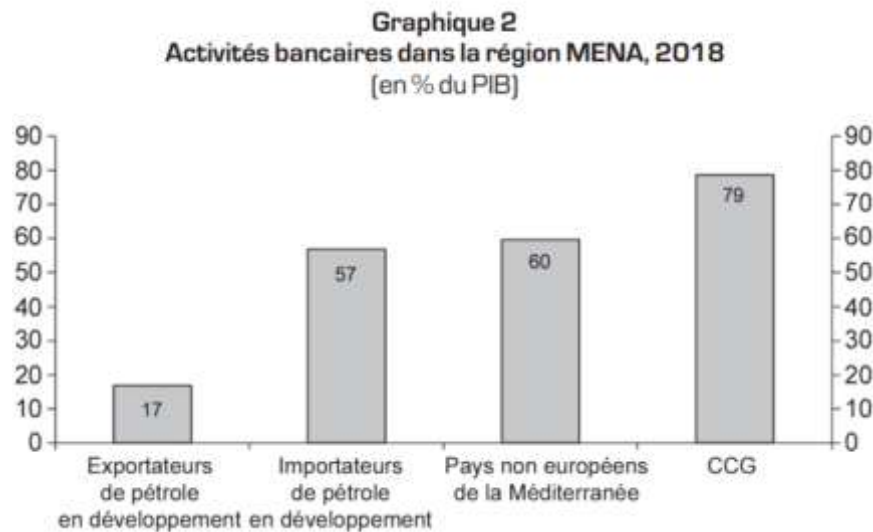


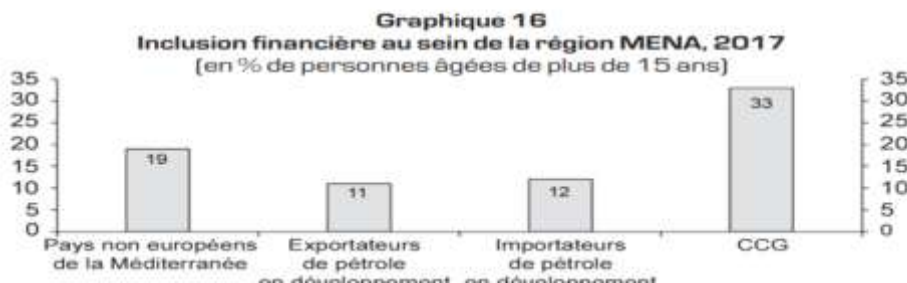
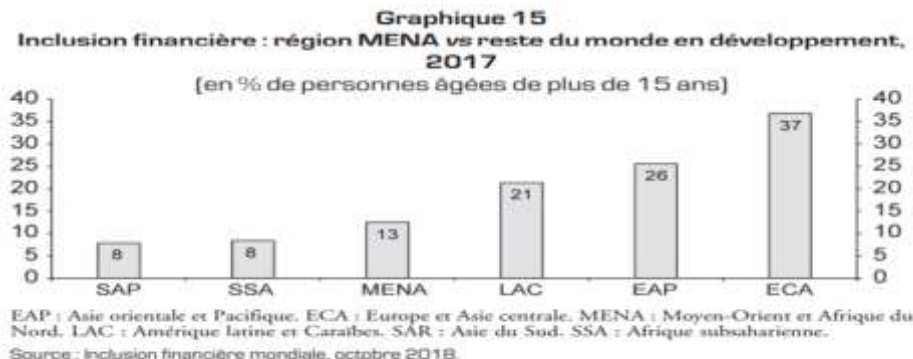
Chart 2: shows the share of banking activities in the gross domestic product (GDP) of countries in the Middle East and North Africa (MENA) region in 2018. It is divided into three categories: oil exporters, developing oil importers and non-European Mediterranean countries. The first finding is that banking activity is higher in oil-importing countries than in oil-exporting countries. The average for oil-importing countries is 57%, compared with 38% for oil-exporting countries. This difference is explained by the fact that oil-importing countries need a more developed banking system to finance their imports. The second observation is that banking activities are more important in non-European Mediterranean countries than in developing countries.

The average for non-European Mediterranean countries is 60%, compared with 52% for developing countries. This difference is explained by the fact that non-European Mediterranean countries have a more developed economy and a more sophisticated financial sector. Banking activities are more important in GCC countries than in other MENA countries. The average for GCC countries is 79%, compared with 55% for other MENA countries. This difference can be explained by the fact that GCC countries have a richer economy and a more developed financial sector, and that banking activities are important in all MENA countries, but more so in some than in others. This difference can be explained by economic and political factors.

Regulation of payment systems in the MENA region is generally restrictive and complex. Banks often have a de facto monopoly on payment services, and regulators are often reluctant to license new entrants. This situation hinders financial innovation and slows the emergence of fintechs in the region. MENA governments should consider reforming their payment systems regulations to make them more innovation-friendly. This could include simplifying licensing procedures, opening up the market to wider competition and putting in place regulatory frameworks that encourage innovation. (World Bank, 2023, p. 124) Of course, regulation must help create a climate of confidence through its mission of financial stabilization, particularly in financial systems, but it must be balanced by policies to stimulate competition, so that start-ups can easily access the market and test new ideas. Start-ups need more space to emerge. In this respect, policymakers should look to the case of China, which, by allowing non-bank operators to provide payment solutions, has introduced competition and challenged a banking landscape dominated by inefficient (and often state-owned) banks, as is currently the case in the MENA region.

This policy has enabled China to take a giant step forward in credit card use and adopt secure, mobile-centric payment solutions, including those offered by digital platforms such as Alipay, which boasts one billion

users. Furthermore, East Asia is a good example of how contestability within the financial sector and other key sectors, such as telecoms, has helped to break out of the middle-income trap. (Arezki, 2019, p. 128)



Despite the dominance of banks in the financial system, the level of financial inclusion in the MENA region is relatively low. As mentioned above, MENA banks tend to lend to governments and politically connected companies rather than to individuals. The lack of available collateral, due to underdeveloped or non-existent mortgage markets in the region, reinforces the bias systematically introduced by banks which, because they hold excess reserves of Treasury bills, can lend risk-free and at high rates to governments. Foreign banks, which traditionally finance import activities, do not challenge the status quo. Charts 15 and 16 show that the MENA region and the non-European countries of the Mediterranean are among the developing regions with the lowest levels of financial inclusion. Graph 16 also shows that GCC countries unsurprisingly performed best in terms of financial inclusion, followed by oil importers and non-GCC oil exporters, with the latter two categories lagging far behind. (BSDC, 2023, pp. 42-43)

Implementing competition policy in key sectors such as finance and telecommunications is an absolute priority for MENA authorities. Indeed, these sectors are essential to the development of the digital economy, which could, through greater financial inclusion, free the region from stagnant growth. The digital economy, a promising economic model, is still in its infancy in the MENA region. Young people, the main players in this new model, face obstacles such as limited access to education and employment.

3.2 Case studies on success stories and technological innovations in MENA financial markets

Although the Internet and mobile devices are ubiquitous throughout the MENA region, they are currently used to access social networks rather than to launch new businesses. There are certainly some success stories). These include Careem, a ride-sharing company operating in over 90 cities in 13 countries, which has been acquired by American ride-sharing giant Uber. Another example is Souq, an e-commerce platform acquired by Amazon for over \$500 million. These success stories demonstrate the enormous potential of digital commerce in the region. But they are few and far between in a region where 66% of the population is under 35. (Arezki, El-Erian, & Makdisi, 2019, p. 17)

To carry out such an ambitious program, countries need to mobilize the political milieu and stimulate the imagination of the population, which they won't be able to do if they continue to implement the traditional approach of gradual change. Without real effort, an entire generation of young people in the MENA region will

Title : The Role of Information Technology in Enhancing Financial Markets: A Comparative Study of Global and MENA Experiences

be condemned to unemployment or to low-productivity, low-paying jobs. And the technology gap between MENA and the rest of the world will continue to widen. (Arezki, El-Erian, & Makdisi, 2019, p. 18)

The creation of modern telecommunications and payment systems is a major challenge, but one that is essential for the economic and social development of the MENA region. The region's young people are already technology-savvy, but the quality of Internet access and payment systems is poor. This is holding back the development of a modern, job-creating economy, particularly for the younger generation. (World bank, 2022, p. 25)

To meet this challenge, it is necessary to set specific and bold targets, establish firm deadlines and promote cooperation between all players in society, including the private sector. Governments need to invest more in digital infrastructure and create a regulatory environment conducive to the development of digital finance. With concerted efforts, it is possible to create modern telecommunications and payment systems that will enable the MENA region to realize its full economic and social potential.

Unnecessarily rigorous and invasive regulation has so retarded the growth of digital payments in the region, particularly in North Africa, that much poorer countries in East Asia are doing better than the MENA region in terms of mobile money diffusion. Policymakers should look to the cases of China and Kenya, where light but effective regulatory models have fostered the rapid growth of mobile-centric payment systems M-Pesa and Alipay. An ambitious financial and digital system project translates into a bold vision. Thus, authorities in the MENA region should define three bold objectives and deploy the necessary efforts to achieve them quickly, say within the next four years: (El-Aynaoui, El-Abassi, & El-Abassi, 2023, pp. 17-20)

- They should ensure the deployment of a modern broadband Internet network covering all countries, including those lagging behind economically;
- Develop an infrastructure that supports digital money transfers via mobile devices and the Internet, and enables the use of technological solutions for a wider range of digital financial services, including savings, credit, insurance, e-commerce, etc. ;
- Develop an infrastructure that supports the integration of financial systems in the region and enables the collective exploitation of technological advances and digitization.

Financial integration is increasingly recognized in other regions, particularly in Africa. The first example is the regional stock exchange in Abidjan, Côte d'Ivoire (BRVM - Bourse régionale des valeurs mobilières), which serves the French-speaking countries of West Africa. More recently, the five-nation East African Community (EAC) has taken important steps towards harmonizing the regulatory environment for financial integration. The impetus for integration is fueled by the historic new Free Trade Agreement, which calls for integration in services, including financial services. Several MENA members have signed this agreement.

To encourage this integration, all MENA countries should consider harmonizing their investment and trade laws, as well as their accounting standards, including the promotion of currency convertibility. The other advantage of financial integration is that it helps foster foreign investment in more developed financial markets, and the integration of the MENA region into the global financial economy. In addition, regional stock exchanges can be a means of privatizing state-owned companies and boosting equity market activity. In addition, privatization through stock exchanges has other potential benefits, such as improved corporate governance and pricing, and diversification of ownership within the economy. (Senbet L. W., 2019, p. 123)

The development of new technologies, particularly FinTech, is revolutionizing the banking and financial sector. This digital transformation poses many challenges for public authorities, who must ensure consumer protection while promoting competition. The banking and financial sector has traditionally been dominated by public institutions. The arrival of new players, such as commercial companies or FinTechs, is likely to stimulate competition and offer consumers new financial services and products. However, this

KHIRREDDINE Hafida

competition can also present risks for consumers, particularly in terms of security and data protection, so public authorities must take care to create a favorable environment for the arrival of these new players, while at the same time protecting consumers. This means putting in place an appropriate regulatory framework that guarantees the transparency, security and reliability of the financial services and products offered by FinTechs.

The rise of FinTech is also calling into question the legal framework of the banking and financial sector. For example, FinTechs are increasingly using artificial intelligence to offer personalized financial services. However, the use of artificial intelligence in financial advice raises legal questions, notably as regards the relevance of the regulatory framework for financial advice, especially when an automaton replaces the human being.

3.3 MENA growth trends and forecasts (2023 - 2028)

The Fin Tech market in the MENA region is growing rapidly, with a compound annual growth rate (CAGR) of 25.18% forecast for the period 2023-2028. This growth is fueled by a number of factors, including: Strong population growth and increasing urbanization: the MENA region has a young and growing population, which is increasingly urbanized. This creates a growing demand for accessible and affordable financial services. (Mordor Intelligence, 2023, p. 10)

Growing adoption of digital technologies: the MENA region is catching up with developed countries in terms of digital technology adoption. This creates opportunities for fintechs to offer innovative and disruptive services.

3.3.1 Segmentation of the MENA Fintech industry

3.3.1.1 Segmentation by service proposition (Mordor Intelligence, 2023, p. 11)

The MENA fintech market can be segmented according to the service proposition offered by fintech companies. The main segments are as follows:

- Money transfers and payments: this segment is the largest in the MENA Fintech market, with an estimated market share of 45% in 2022. Fintech companies in this segment offer digital money transfer and payment services, such as e-wallets, mobile bank transfers and QR Code payments.

- Savings and investments: this segment is growing fast, with an estimated market share of 25% in 2022. Fintech companies in this segment offer digital savings and investment services, such as robo-advisors, crowdfunding platforms and Islamic investment products.

- Digital loans and lending: this segment is also growing fast, with an estimated market share of 20% in 2022. Fintech companies in this segment offer digital loans and lending services, such as personal loans, business loans and consumer loans.

- Online insurance: this segment is smaller than the other segments, but is growing fast, with an estimated market share of 10% in 2022. Fintech companies in this segment offer online insurance services, such as car insurance policies, life insurance policies and health insurance policies.

3.3.1.2 Segmentation by country (Dealroom.co, 2022, p. 2)

The MENA Fintech market is also segmented by country. The most important countries in the market are the United Arab Emirates, Saudi Arabia, Bahrain, Qatar, Iran, Egypt. The United Arab Emirates is the MENA Fintech market leader, with an estimated market share of 25% in 2022. Saudi Arabia is the second largest market in the region, with an estimated market share of 20% in 2022. Bahrain is the third largest market in the region, with an estimated market share of 15% in 2022. Qatar, Iran and Egypt are also important Fintech markets in the MENA region. These countries all present growth opportunities for Fintech, due to the growing penetration of the Internet and smartphones, increasing demand for digital financial services, and the willingness of governments to modernize their financial systems.

3.3.1.3 Segmentation by company type (Global Fintech Hub Federation, 2022, p. 14)

The MENA fintech market can also be segmented by company type. The main types of Fintech companies are as follows:

- Startups:** Fintech startups represent the majority of fintech companies in the MENA region. These companies

Title : The Role of Information Technology in Enhancing Financial Markets: A Comparative Study of Global and MENA Experiences

are generally small and agile, and are at the forefront of fintech innovation.

-Large technology companies: large technology companies, such as banks, telecoms and technology companies, are increasingly investing in Fintech. These companies bring significant resources and industry experience to Fintech.

-Institutional investors: institutional investors, such as venture capital funds and pension funds, are also investing in fintech. These investors bring capital and strategic support to fintech companies.

The Fintech market in the MENA region is a fast-growing market with significant potential. Fintech companies in the MENA region are well positioned to benefit from this growth, thanks to a number of favorable factors, including the growing penetration of the Internet and smartphones, increasing demand for digital financial services, and the willingness of governments in the region to modernize their financial systems. The MENA Fintech market is a fast-growing market with significant potential.

The main hypothesis, that the integration and judicious use of ICT in financial markets promotes increased operational efficiency, transparency and accessibility, is confirmed by analysis of the experiences of Arab countries and global best practices. In terms of operational efficiency, ICT has made it possible to automate many tasks, reducing processing times and the risk of error. Electronic trading systems, for example, have considerably accelerated transaction execution, while online trading platforms have facilitated settlement-delivery operations. In addition, ICT-based market surveillance systems enable anomalies and potential risks to be detected in real time, reinforcing market stability and security.

Improving the transparency of financial markets through ICT is also a key factor in their development. Investors now have access to more comprehensive and up-to-date information on securities, thanks to financial information websites and online trading platforms. This increased transparency encourages more informed investment decisions and reduces the risk of information asymmetry.

In addition, ICT has helped to considerably broaden the accessibility of financial markets. Online financial services, such as online trading and online financial advice, have reduced market access costs for individual investors, particularly those in remote geographical areas. This democratization of access to financial markets promotes financial inclusion and stimulates market participation.

The secondary hypothesis, that the use of ICT in financial markets contributes to more robust and sustainable financial growth, is also confirmed by the analysis. Improving the efficiency, transparency and accessibility of markets helps to reduce transaction costs, stimulate competition and attract more investors. This, in turn, promotes a more efficient allocation of capital, stimulates productive investment and accelerates economic growth.

For example, the use of electronic trading systems has enabled companies to access financing more easily, stimulating investment and economic growth. Improved market efficiency has also enabled companies to reduce their transaction costs, which has also stimulated economic growth. Stimulating market competition led to lower prices for consumers, which also stimulated economic growth.

4. Conclusion

The rise of ICT has profoundly transformed financial markets, both worldwide and in Arab countries. The integration and judicious use of ICT in these markets have helped to significantly improve their efficiency, transparency and accessibility, paving the way for more robust and sustainable financial growth. ICT has made it possible to automate many tasks, reducing processing times and the risk of error. Electronic trading systems, for example, have considerably accelerated transaction execution, while online trading platforms have facilitated settlement operations. In addition, ICT-based market surveillance systems enable anomalies and

KHIRREDDINE Hafida

potential risks to be detected in real time, reinforcing market stability and security.

ICTs have also helped to improve the transparency of financial markets. Investors now have access to more complete and up-to-date information on securities, thanks to financial information websites and online trading platforms. Last but not least, ICT has helped to make financial markets much more accessible. Online financial services, such as online trading and online financial advice, have reduced market access costs for individual investors, particularly those in remote geographical areas. This democratization of access to financial markets promotes financial inclusion and stimulates market participation.

The economic benefits of ICT in financial markets are obvious. Improving market efficiency, transparency and accessibility helps to reduce transaction costs, stimulate competition and attract more investors. This, in turn, promotes a more efficient allocation of capital, stimulates productive investment and accelerates economic growth. This, in turn, promotes a more efficient allocation of capital, stimulates productive investment and accelerates economic growth. MENA countries do, however, face a number of challenges if they are to take full advantage of the opportunities offered by ICT in financial markets. Lack of adequate technological infrastructure, lack of ICT skills and knowledge, and inadequate regulation can hamper the development and adoption of ICT in these markets.

To overcome these challenges, these countries need to invest in modernizing their technological infrastructures, particularly in high-speed networks and cloud computing systems. They must also develop training and capacity-building programs to build the ICT skills and knowledge needed to use these technologies effectively. Finally, they need to put in place appropriate regulatory frameworks that foster innovation and growth in ICT-based financial markets. ICTs have transformed financial markets, offering new opportunities to improve their efficiency, transparency and accessibility. By investing in technology infrastructure, building ICT skills and knowledge, and adapting regulations, MENA countries can take full advantage of these opportunities and stimulate stronger, more sustainable financial growth.

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