

Considerations on Digital Financial Ecosystem

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Abstract

The digital financial ecosystem depends on digital liquidity and has the role of supporting the business environment in terms of maintaining financial stability, integrating financial systems, and reshaping the concept of economic benefits per unit of time. Business models developed by interconnected partners are required in response to user needs. Suppliers, banks, insurers, investment or pension funds, licensed or unlicensed institutions should convey their products and services in digital format. For the products and services to reach the beneficiaries, specific infrastructures, regulations, and policies are necessary to ensure accessibility at reasonable prices. A digital ecosystem must facilitate interaction in high security environment. The aims of this paper are in the first stage to present the components of a digital financial ecosystem, in the second stage to present certain business models and services, and in the third stage to discuss evolution factors and risks. Therefore, our study attempts to identify areas for improvement of the existing legislation and formulate proposals for adapting to new technologies. The research tool is a complex questionnaire used precisely to reflect the opinions of the respondents with regard to the research topic.

Keywords: FinTech, ecosystem, risk analysis, security, impact, responsibility, future directions

Jel Codes: G28, G41, H55, H73, O33, O44

1. Introduction

The scope of digital financial ecosystems is relatively new and partially covered in the literature. Kumaraswamy A. et. all (2018) states that the theory does not adequately address the dynamics of many innovations, such as technology and services such as Apple or Uber's ride. Many of these innovations are systemic, serving as platforms over which others can build or disrupt traditional relationships and actors by developing new separate ecosystems of products or services offered by individual firms. The concept of ecosystem emerged in the 1990s, more as a correlation between biology and economics. Moore J.F (1996). defines the ecosystem as an economic community supported by a basis for the interaction between organizations and people - the actors of the business world. This economic community produces valuable goods and services for customers, who are themselves members of the ecosystem. Member bodies also include suppliers, main producers, competitors and other stakeholders. In the 2000s, Adner R. (2006) proposes an expansion of ecosystems through their coherent customer orientation. Jacobides M.G. et. all (2018) reorients the discussion of ecosystems towards innovation and the change of the value-added paradigm by them, the ecosystems being characterized by complementarities in production and / or consumption which the members of the ecosystem can coordinate without a hierarchical government. Iansiti, M., & Levien, R. (2004) consider that the well-being of each individual member depends largely on the fate of the ecosystem. Christensen C.M. et. all (2018) presents a reasoning that confirms the intersection of emerging innovation with ecosystems, because technological innovations can generate a much greater development potential. If this development does not belong to an individual company, but to an ecosystem, the effect is much stronger. Blajer-Gołębiowska. A. et. all (2018) points out that many established industries such as the financial-banking system, healthcare, insurance, tourism, and transport face the risk of being disrupted by emerging digital technologies. Lee, S. M., & Trimi, S. (2018) appreciate that the FinTech ecosystem together with stakeholders has grown significantly in recent years due to substantial investments.

Globally, according to McKinsey (Atluri V. et. All, 2017), it is estimated that ecosystems will generate revenues of over \$ 60 trillion by 2025. In the first quarter of 2021, only Israeli investment in Fintech increased by 260% compared to the first quarter of 2020, investing \$ 2.33 billion in the first six months, and demand for new payment systems increased by 28% (Cision, 2021). For this reason, the emphasis on improving the consumer experience is growing exponentially. Decisions of major platforms (Apple, Google, Amazon), new non-bank financial actors

such as B2B, B2C (financial or various service marketplaces, such as Alibaba, eBay, Amazon), the emergence of telecom players or retailers, strategies around digital mobility, everything is converging towards the definition of new, complex financial ecosystems in progress at the moment.

Moseson H. & Muqtadar A. (2020) consider that banks reach ecosystems with some strong built-in benefits, including strong customer relationships and the existence of trusted brands. Financial ecosystems can be integrated into other global ecosystems, or they themselves integrate ecosystems of other industries. Rutten T. (2021) mentions that consumer expectations drive digital innovation in every industry and sector. Financial services are no exception, and banking consumers are now much more demanding and selective because they have an unprecedented choice. Backbase researchers (2021) present a financial well-being report that presents the perspectives of over 1,000 business decision makers, along with the opinions of retail banking consumers. Outdated technology is the major challenge facing financial services companies in implementing or developing digital money management tools (67%). Consumers will seek management of their financial well-being using asset, investment and digital currency management applications.

According to ITU-T (Telecommunication Standardization Sector of International Telecommunication Union, 2019), the digital financial ecosystem is defined by the roles and actors involved in it and is based on a new concept - **digital liquidity**. One of the goals of a digital financial ecosystem is to support citizens and businesses to ensure economic and time benefits, financial inclusion, economic health, stability and integrity of financial systems.

An ecosystem is generated by certain needs of users and the interoperability of its products and services. but especially, according to Accenture (Gera P. et. All, 2019), the existence of a new business model of interconnected business partners, customer-centric model, to deliver the best added value to it. Gera P (2019). points out that the success of an ecosystem requires three types of measures: a system of ecosystem partners to create and manage external relations, a business architecture to ensure the success of the approach and finally the technology that must enhance business ideas.

Firstly, we are talking about the users / beneficiaries of this ecosystem, made up of consumers, companies, public administrations and civil society / NGOs (Non-Governmental Organizations). They play a central role in the construction and maintenance of the ecosystem, and their needs and requirements are the ones that shape changes and adjustments within the ecosystem.

This article analyzes the challenges related to the digital financial ecosystem, the advantages and dangers that may arise, the novelty of the research project being the approach from several angles of a current issue. As can be seen from figure no. 1, resulting from our research performed through a questionnaire, the respondent base is heterogeneous, ensuring, among other things, a high-quality level of eloquence of the results. The risk analysis also takes into account the current state of development of digital financial ecosystems, both in terms of research into existing studies on this topic and the vision of the respondents to the questionnaire.

The focus is on two aspects that are increasingly needed within the ecosystem and whose use leads to risks from the perspective of data confidentiality. The first situation is the transfer of customer data within the ecosystem. This is necessary for the interconnection of various ecosystem services and it adds value to ecosystem partners from a business perspective. The second situation is represented by the need to remotely access the services and the implications from the perspective of customer identification and authentication (both at the beginning of the contractual relationship with the service provider and during this relationship).

Regarding the risks, the level of development of the countries promoting the financial ecosystems and the level of income of the users must be considered. According to Achim M.V. et. all (2020), for high-income countries, evidence of a positive coefficient of impact on economic and financial crime has been obtained, which means that the intelligence capabilities of the people in these countries, including knowledge and skills, have increased for the use of technology in obtaining illegal benefits.

Even though we summarized the results in Chapter 6 of Results, we included some of the results in each of the chapters. The components of a digital financial ecosystem - chapter 3. Business models and services - chapter 4. Evolution versus risk factors, together with the literature review, which is specific to each chapter. The theme of the study is particularly challenging, and it was necessary for the authors to approach the construction of the work in a way that unitarily integrates the different concepts that mark a field in a continuous expansion, little documented. at present.

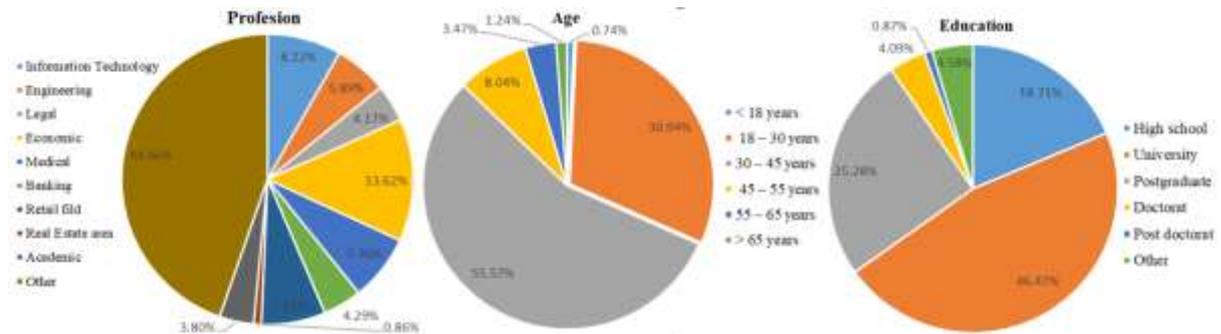


Figure 1. Distribution of sample based on professional, Age and Educational field

Source: Authors' processing

The first component of the ecosystem is the partners who interact either to build products and services together, or to compete in the market with products / services that cover customer needs. To drive products and services in digital format we need their suppliers, banks, insurers, investment, or pension funds, licensed or unlicensed institutions, for example non-banks. Banks use products and distribution channels, each of which can be digitized and can use digital banking or non-banking partners.

To get products from suppliers to beneficiaries, specific infrastructures are needed based on laws, regulations, policies that make them possible, ensuring their trust and accessibility at reasonable prices. This reflects part of the second component of the ecosystem, namely technology. Open-banking, imposed by Payment Services (PSD 2) - Directive (EU) 2015/2366 (European Commission, 2015) is a facilitator of these developments, new participants, third parties being involved. We hope that PSD 3 will clarify many of the issues that remained under discussion at European level on the issues addressed. Duggal Y. (2021) mentions that PSD2 and Open Banking have been around for several years, aiming to reshape and create a new future for the financial services market, and will see in the future an integration with Fin Tech trends and technology developments. mobility.

Digital assets are reflected in products and services, used by their beneficiaries, transported through digital infrastructures. These assets provide digital liquidity consisting of users' financial funds, funds held and used in digital format. The way of managing them and addressing the needs of customers in a new way is the third component of the ecosystem, namely the business architecture.

A digital ecosystem must be an inclusive system, containing a wide range of digital financial services and products, which provide opportunities to hold, access and move funds, develop equity, and reduce risk.

Digital ecosystems, according to the ITU-T Technical Report, are important for financial inclusion because they:

- provide another type of security (no longer requiring physical protection of these assets),
- are fast and transparent (traceability through implemented procedures, elimination of intermediaries, access, and immediate transfers)
- ensure increased flexibility (receiving and using funds faster, in variable amounts, including very small, with low costs and high coverage)
- promote saving (faster interfacing with savings products, automatic warehouses signaling moments of life, developing the desire to save through behavioral algorithms)
- support equal opportunities (through faster access to funds and ensuring the confidentiality of payments, especially for households)

CFA Nathan J. (2017), presents an approach from the perspective of human behaviors in decision making using technology, starting from the idea that financial markets are governed more by the laws of biology than the laws of physics, analyzing financial markets as an ecosystem allows us to understand the relationship between investment performance and the interactions of different types of investors, there is a logic of crises. "It's not necessarily mathematically accurate, but it's biologically accurate."

2. Data & Methodology

The research was aimed at identifying as many elements, angles and aspects that characterize the existing digital financial ecosystem, as well as the needs of users and the interoperability of its products and services. In this sense, starting with the understanding the public opinion (with the assistance of responses to a tailored questionnaire) concerning the concept of digital financial ecosystem, we aimed to find out from a significant number of people the opinions on this concept. The study was anonymous and was based on a questionnaire applied online with the following structure:

- a) 16 questions related to the digital financial ecosystem
- b) respondent identification data (Field of activity; Country; Age; Education)

In carrying out the research, we proceeded methodically to establish the objectives, define the sample to be investigated, prepare the questionnaire, collect the data, process them, analyze the results.

Respondents' responses were quantified, using the SPSS data processing software in specific statistical indicators for:

- descriptive (quantitative) analysis: the share of value judgments on each grouping variable (Field of activity; Country; Age; Studies)
- factorial (qualitative) analysis of factual judgments: scores calculated with converted values according to Rensis Likert's scaling, standard deviation, modulus and median in the statistical sequence of scores corresponding to those questions that signify a certain type of utility of digital financial ecosystem products and services.

These statistical indicators form a complex and rigorous scientific basis for substantiating the conclusions and achieving the objectives:

- identifying the needs and characteristics of consumers in the digital financial ecosystem.
- analysis of consumer perception of the digital financial ecosystem.

The methodological aspects of our cross-sectional research were supported by the survey method, and for discussions and outlining the conclusions we referred to relevant similar research, as well as to the relevant literature.

Sample

Sample size: 823 people

(Target population: 800 people, 95% confidence level and 3% margin of error)

Sampling method: multi-stage sampling (because no information is known about the researched population)

Data collection

The questionnaire was built through <https://www.questionpro.com/> and distributed online on various communication platforms. Participation was voluntary and no personal data was collected. Data collection took place between March 10 and July 10, 2021. The average duration of completing the questionnaire was 10 minutes.

Description of the general population

The distribution of the respondents on social variables of grouping is presented as follows:

- by education: 151 (18.71%) persons with secondary education, 619 (76.71%) with higher education and 37 (4.58%) persons with other education.
- depending on age: 6 people under 18 years (0.74%), 250 people aged between 18 - 30 years (30.94%), 449 people aged between 30 - 45 years (55.57%), 65 people aged between 45 and 55 years (8.04%), 28 people aged between 55 and 65 years (3.47%) and 10 people over the age of 65 (1.24%).
- depending on the field of activity: 67 people in the field of Information Technology (8.22%), 48 people Engineering (5.89%), 34 people Legal (4.17%), 111 people Economic (13.62%), 60 people Medical (7.36%), 35 people Banking (4.29%), 58 people in the field of retail trade (7.12%), 7 people in the real estate area (0.86%), 31 people in Academic environment (3.80%) and 364 people from Other fields of activity (44.66%);

Limits of research

The closed (pre-coded) questions only allow the choice between the answers suggested by the researcher, and the degree of freedom of the respondent is reduced, but this aspect was assumed precisely to focus the answers to the objective of the study.

The respondents should be knowledgeable of the researched topic. Otherwise, there is a risk of not understanding the questions and the impossibility of obtaining additional information. Nevertheless, this risk is mitigated by the level of training declared by the respondents, which is quite high.

3. Business models and services

Business models are the starting point. They are based on customer needs and involve the aggregation of several types of needs in a single application / website. This reflects the expectations of customers to have at hand and easy to compare / understand the services of interest. Another basic principle is that of timely timing, generated by the area of data analysis and online marketing. Thus, the need for customers to receive services at the right time (e.g., financing for purchasing a product - household item). This need has led to the adjustment of ecosystems to be able to anticipate customer needs according to their behavior within the ecosystem.

This section first presents the elements that have generated changes in ecosystems with the implementation of customer needs. Then the types of digital services currently offered to customers are highlighted, followed by a breakdown of banking and insurance services. For banking and insurance services, business models are detailed, with an emphasis on ecosystem development through partnerships and the provision of complementary services.

It is interesting to note that, at European level, the needs of customers in general have transformed the law over time, so that the legislation sets the main rules for ensuring an appropriate level of digital customer service, both from the perspective of consumer law, competition law, information security law, as well as that of the unitary regulation at the level of financial-banking industry.

The September 2021 editorial in *The Economist* (2021) signals the emergence of a new financial services ecosystem, known as decentralized finance or "DeFi", which has the potential to reconnect the way the financial system works, with all the promises and dangers it entails. "The proliferation of innovation in DeFi is like the frenzy of invention in the early stages of the Internet. At a time when people are living more and more of their lives online, the crypto-revolution could even reshape the architecture of the digital economy." DeFi has an alternative role of distributing the power to the participants, not concentrating it. Compared to the need for a large infrastructure in the traditional banking system, blockchain transactions should be reliable, cheap, transparent, and fast. According to the authors, the basic activities that take place through DeFi are the usual ones. "These include trading on the stock exchange, issuing loans and taking over deposits through self-execution agreements called smart contracts. An indicator of the activity is the value of digital instruments used as collateral: from almost nothing at the beginning of 2018, which reached 90 billion dollars." In order to be functional, many aspects need to be further clarified in the field of risks and integration in the social structure, in the way of interaction with the real, physical world and in establishing an external anchor of value. "Cryptocurrencies do not differ from the dollar in that they are based on people who have a common expectation of their usefulness. However, conventional money is backed by states and central banks that are lenders of last resort. Without them, DeFi would be vulnerable to panic. Enforcing contracts outside the virtual world is also a concern. A blockchain contract can say you own a house, but only the police can enforce through eviction. DeFi governance and accountability are rudimentary. A succession of large irrevocable transactions that people cannot overwrite could be dangerous, especially since coding errors are inevitable. Money laundering has thrived in the ungovernable gray area of services located between Bitcoin or Ethereum cryptocurrencies and the banking system. Despite claims of decentralization, some programmers and application owners have a disproportionate influence on the DeFi system. And a malicious actor could even gain control of most computers running a blockchain."

Globally, McKesey (Atluri V. et. All, 2017) identified three major developments that generate ecosystem-type models:

- The emergence and development of marketplaces, which have reshaped retail (e.g. Amazon, Alibaba, eBay, etc.);
- B2B services - outsourced management of support services (e.g. financial, human resources, accounting), which support the development of the digital ecosystem, lower prices, increase transparency, development of new partnerships, introducing innovative products generated by the financial system (e.g.: online factoring, electronic invoicing, crowdfunding or digital loyalty programs developed by banks).

- Personal mobility - supporting the inclusion of mobility in services and products (e.g.: independent vehicles, car-pooling, traffic management, etc.).

Top preferences are, at the time of construction of this article, marketplaces (e.g. Amazon, Alibaba, eBay.), 41.17% expressing their desire to use such a digital ecosystem, 61.60 expressing the preference in this sense, at the opposite pole being placed with 29.57% B2C services (e.g. retail portals,) embedded in a digital ecosystem. When asked what kind of digital ecosystems they want to use, 35.85% voted for open-banking services, 33.19% for B2B service providers (e.g. financial, banking, insurance, resources human resources, accounting) and 24.79% for mobility services (e.g. car-pooling), in the area of intent or preference being 59.04% for open-banking services, 55.21% for providers B2B services and 42.55% for mobility services.

Digital services can be of several types:

- Trading accounts, both classic (e.g. bank accounts) and electronic money.
- Payment services (e.g.: trading solutions integrated or not with the banking system, payment solutions through innovative solutions based on new technologies, especially blockchain and AI, various electronic terminals, etc.).
- Savings accounts.
- Investment services (e.g. different investment opportunities, digital portfolio management solutions, digital trading venues, robotic investment guidance tools, etc.).
- Lending services (e.g. structuring, planning and managing finances through digital means, both for individuals and companies)
- Insurance (e.g. digitization of the entire value chain, from bidding / profiling and electronic intermediation to contract management - intelligent contracting, debt settlement, etc.)

In the study we conducted, we analyzed, among other things, how the level of utility of online services is perceived in everyday life and in this regard, 70.61% of respondents consider it very useful and 85.48 % at least useful time gained / saved, least useful is perceived the identification by the financial-banking institution of moments in personal life (e.g.: marriage, birthday, birth of a child in the family, job change, travel abroad etc.) and the offering of personalized services / products at this time. Access to new services and products is seen as very useful for 55.74% and at least useful for 78.45%, lower costs are very important for 48.50% and at least important for 78.45%, confidentiality is a mandatory condition for 49.53% and required for 68.15%. The presentation in the digital application of a history of transactions interactively through evolution charts is very useful for 43.79% and at least useful 66.28%, the analysis of the payment model in order to be able to offer suggestions for new products and services for the client is important for 34.43% and at least important for 57.26%, the analysis of the investment model in order to be able to offer suggestions for increasing revenue for the client is particularly attractive for 35.60% and at least attractive for 58.20%, while notifications of potential fraud in online transactions are mandatory for 57.03% and required for 75.88%.

All business models tend to integrate into a system without borders and can involve development through partnerships. An example of this is the inclusion of a store in the internet banking application. Within this store there are products / services of some partners at advantageous prices for the customers of the credit / payment institution. This creation of partnerships is also highlighted in studies, such as that of Accenture mentioned below.

In the banking field, Accenture identifies five bank-specific models:

1. orchestrating the moments of life, by building a digital financial ecosystem specific to the moments of life of a client (e.g.: birth, school, marriage, moments of adult life, pension, death).
2. orchestration of centralized markets for goods and services (marketplaces), by joining suppliers of non-banking products, by including the services and products provided by others.
3. participation in third party ecosystems, on digital payment platforms or commercial services, or start-ups.
4. open-banking integration by providing and accessing IT application interfaces (APIs), for the integration of products and services.
5. cooperation as a platform of recommendations for rejected clients, but who may find openness to other partners, non-financial institutions, etc.

These models add value because they extend the primary relationship with that customer, generate new revenue streams / cross-sales, reduce the rate of customer loss, etc. There is an accelerated shift from the classic approach to managing maturity differences between deposits and loans, to providing super-relevant customer experiences, whether the service is banking or not. Accenture identifies six types of actions, according to Fig. 1, along three areas: ecosystem partners, business architecture and technology architecture.

All these models involve partnerships in various forms.

In an ecosystem you must have at least two users (e.g. a customer and a merchant) using the services mentioned. By combining the needs of users and services, several digital products appear (e.g. payments for purchases of goods and services, payment of invoices, sending and receiving funds, loans and repayments of funds, investments on different terms, insurance of assets or life, platforms. trading etc.).

For this reason, PwC (Jugansen H. & Niebudek M., 2019) has identified four models, depending on what the banks want to become in the near or distant future:

- Utility & balance sheet bank - the sale of traditional services, in addition to IT and connectivity. These providers have a banking license, provide their own utility services, at low prices and make a profit through operational excellence and economies of scale

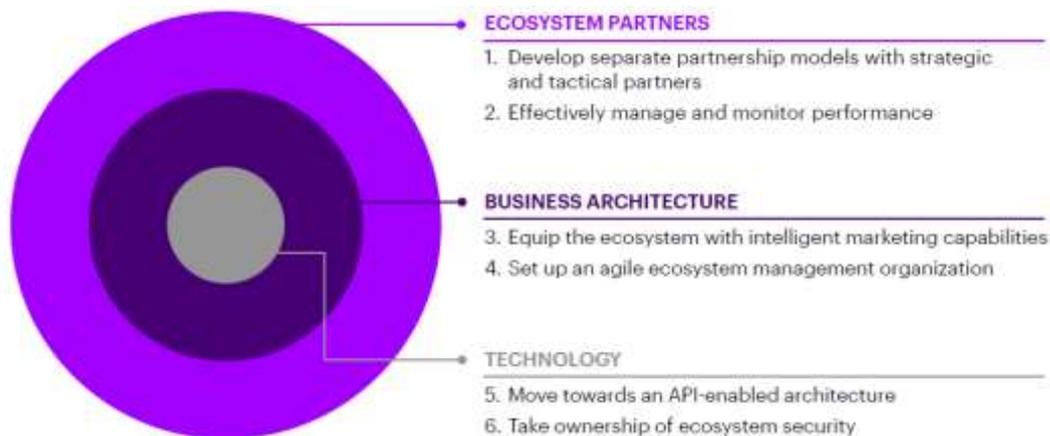


Figure 2. Types of actions for the banking model of the future

Source: Gera P. et. all, (2019)

- Platform-type banking - uses the banking system of another bank, but has its own banking license, having a differentiating transformative function, because they open to third parties through APIs, both as suppliers and as integrators of APIs.
- Ecosystem for a better customer / user experience - is based on the customer experience, which is at the heart of their business and the relationship with it. They do not have a banking license and connect to partner services, including traditional banks. In general, it acts as aggregators and is based on robotics / artificial intelligence, etc..
- Bank seen as a system of customer experiences - maintains the primary connection with the customer, as in the previous model and offers partner services in the context of banking products for which they are licensed

Thus, a vertical integration is noticed, which transforms into a multi-level ecosystem, starting from the banking network, the core-banking system (with the main banking products, the digital transformation components, the provision of APIs), up to external levels where aggregators and third-party service and consultancy providers are found (e.g. e-money wallets, alternative financing providers, crowdfunding / crowd investments platforms, chat-bots / robots, P2P credit or peer-to-peer insurance, payment services, loyalty services, personal finance management, P2P social payments, etc.).

New technologies (Artificial Intelligence, Big Data, blockchain, cloud-computing, robotics / chat-notes, use of APIs, open-source software) completely reshape the banking system, creating a new digital financial ecosystem, accelerating the fragmentation of the traditional value chain, causing implicitly new value chains. Regulations

have prepared this process (e.g. PSD 2 in the banking field, or Insurance Distribution Directive IDD (The European Parliament and The Council, 2016) in insurance). The European Insurance and Occupational Pensions Authority (EIOPA) has published a report (European Insurance and Occupational Pensions Authority, 2020) on the impact of new technologies on the insurance value chain.



Figure 3. The new value chain in insurance

Source: European Insurance and Occupational Pensions Authority (2020)

Thus, in insurance we can now discuss about ecosystems and insurance platforms, insurance on demand, instant insurance, preventive services attached to insurance, etc.

If we analyze the digital ecosystem of travel insurance, we can identify its components according to Fig. 3, which go beyond their own industry, beyond the financial system, ensuring an integrated experience for the consumer, interconnecting several services, covering several different needs of customers.



Figure 4. The digital ecosystem of travel insurance

Source: European Insurance and Occupational Pensions Authority (2020)

Under the stated conditions, the natural question arises regarding liability and possible guilt if problems arise, including cyber security issues, and we understand that the software manufacturer of the digitized service / product is considered categorically responsible or responsible by 52.39%, it is considered possibly responsible by 76.36% and the user is considered not responsible by 36.79%. The cyber security solution installed by the institution / company providing digitized services / products is accepted as being responsible by 46.73% and possibly responsible by 73.91%; the financial service provider, insurance bank (etc.) is considered responsible by 38.15%

and possibly responsible by 64.33%, while the authority supervising a digital financial, banking (etc.) ecosystem is considered very responsible by 48.08% and relatively responsible by 71.33 %.

4. Specific technical requirements in a digital financial ecosystem

A digital ecosystem needs an environment that facilitates interaction and a solid infrastructure that supports new digital products, which is the technology component of the ecosystem. Technology, in turn, can be divided into infrastructure (hardware, virtualization, operating systems, etc.) and software (effective applications developed to address customer needs). The financial system also involves the interaction between financial service providers for the operation of services. Thus, for example, to be able to transfer a sum of money from one person to another, the services must be integrated into the settlement systems (Sent, etc.) according to the legislation and standards in force.

Consequently, if we refer to infrastructure, it must be prepared to facilitate transfers / payments between ecosystem participants, privately or publicly, in an interoperable way. In addition to the above, this implies the existence of a high-performance data transmission system, aside from providing the electricity needed for uninterrupted operation. The same infrastructure must ensure a level of user identification at national or sectoral level (bank account number, mobile phone number, social network account, etc.).

The way to access a mobile application for digital financial, banking, insurance applications (etc.) is very useful for 71.41% of users and useful for 87.15% of them; the most useless being considered, paradoxically, perhaps due to the non-human / unfriendly manner of interaction existing at this early stage of development, call-centers with chat-bots. The applications that can be accessed both web and mobile are particularly important for 59.49%, compared to 25.93% that consider the only web option important; both the web and mobile versions are considered useful by 76.27%, compared to 48.26 % for only web / browser.

In the same context, 48.02% of consumers consider when accessing financial information, insurance banking (etc.) as particularly useful to aggregate information in the digital application of internet banking of the bank, or financial institution and useful for 70.18% among them. It would have been totally inappropriate, paradoxically, perhaps due to the totally different way of presentation and different products / services, the aggregation of information in a digital application of a third party, including all information on financial services, insurance banking (etc.) from several financial institutions, insurance banks (etc.). We consider at least this option of end customers, who opt for simplicity and accuracy in exchange for the ability to navigate a dynamic platform based on Machine Learning, which allows them to compare several products / services and which records / processes visitor preferences to improve its functionality. The desire to obtain information directly from the financial institution providing the services (e.g. bank, IFN, insurance company, pension fund, etc.) is on an average level, with 38.20% clearly speaking in favor of this option, 55.57% also preferring the presented method.

That is why 45.91% consider it imperative that data on the services provided by financial institutions, insurance banks (etc.) be kept on the servers of the respective financial / banking institution, 65.38% considering in turn as this condition to be at least necessary and 31.37% are categorically against the idea that the information be stored on the servers of an IT provider of the financial institution, insurance bank (etc.), not within its premises. On the other hand, 35.34% totally agree with a cloud solution, while 53.61% do not reject this alternative.

The facilitating environment for the digital transformation of the financial ecosystem into a digital financial ecosystem is determined by the relevant laws and regulations, the entities that set standards and standards issued by them (e.g. EMV, ISO, ITU, etc.), industry-specific groups (e.g. of mobile operators), international organizations and NGOs (e.g. World Bank, OECD - Organization for Economic Co-operation and Development, etc.).

This environment and these infrastructures are put at the service of users of the digital ecosystem, citizens, traders, companies, public administrations, all consumers and customers of these services and products provided by traditional digital providers (banks, insurers, investment firms, private pensions, etc.), or non-traditional (operators of electronic money or electronic assets, postal services, technological platforms, other traders). Vendors also purchase services from other vendors, such as processors, technology platforms, hardware and software vendors (e.g. ATM vendors). Roles may be interchangeable between these providers.

In these circumstances, we measured the level of interest related to the usefulness of including certain products / services in the digital environment. The result obtained was not at all surprising: transfers and payments being

appreciated as particularly useful for 72.47% and useful for 88.13%, while real estate loans were considered by 19.70% as unimportant.

Table 1. Distribution of sample based on usefulness inclusion a domain in the digital environment

| Products / Services | Very useful | Useful |
|--|-------------|--------|
| Transfers and payments | 72.47% | 88.13% |
| Bank or non-bank current accounts | 59.68% | 79.03% |
| Assets, bonds and / or other investment portfolios | 32.83% | 54.03% |
| Consumer loans | 41.24% | 59.91% |
| Real estate loans | 40.44% | 57.83% |
| Financial investments | 44.01% | 66.13% |
| Life insurance | 48.96% | 68.89% |
| Auto insurance | 54.84% | 75.00% |
| Health insurance | 56.45% | 76.27% |
| Private pension | 49.31% | 69.93% |
| Management of contributions for state pensions | 50.58% | 70.85% |

Source: Authors' processing

In terms of what has been presented so far, Artificial Intelligence is considered the most successful digital technology for the future, for 49.35% of respondents and at least very successful for 70.40% of them. The most unsuccessful is considered, paradoxically, perhaps due to insufficient information and, implicitly, insufficient understanding, technology based on Block-chain / DLT. This aspect should not be considered positive or negative, but only seen as a possible barometer of the technical level of training of the ordinary population and the perception of the phenomenon. 26.72% believe that Big Data analytics solutions will be very successful and 53.56% at least successful, while 32.11% see a very successful future for cloud computing and 60.02% support this idea. Despite a trend of rejecting technology based on Chat-bots, robotics is seen as a particularly viable solution of 44.83% and at least successful by 71.34%.

Opinions are different and we believe that a heterogeneous development will provide the opportunity to cover most areas of interest for technological developments soon.

From the perspective of the architecture of IT solutions in the context of financial ecosystems, there is an emphasis on microservices and interconnection through APIs. Thus, the rapidity of changing customer needs generates the need to create new applications / new functionalities in a short time. This involves building a modular application, which allows multiple software developers to work in parallel to build the application in a short time. It also offers the possibility to modify in a simple way a part of the application without having an impact on other functionalities. The use of APIs for interconnection allows flexibility for choosing partners and a short time to integrate with their IT systems.

In this context, customer identification and authentication are important. Several methods can be used to identify a new customer from a technical point of view, which must be correlated with the applicable legislation. In general, in order to get to know the clientele remotely, specific measures must be taken which involve identifying the authenticity of the identity document presented, establishing that the person requesting the service is indeed the person whose identity document has been presented. This involves, from a technical point of view, solutions for verifying the existence of a human person in front of the camera, technologies for verifying the authenticity of identity documents, biometric data analysis technology, integration with an electronic signature solution.

Several aspects need to be considered for the authentication area, depending on how the services are distributed, as well as the data security principles. For example, for web and mobile applications, authentication may involve distinct aspects, from single sign-on solutions, federated authentication, to session timeout, resuming an interrupted stream before completion, requesting authentication for certain types of activities within the application

(e.g. transfers larger than x RON). All these aspects must be considered when drawing up the application and must be continuously updated according to the new technologies that appear, the risks of new types of cyber-attacks.

5. Evolution factors versus risks

Bechara M. et. all (2021) identifies unprecedented new challenges facing central banks: distributed registry technology, new methods of data analysis (artificial intelligence and machine learning) and cloud computing, along with a wider spread of mobile access and increased internet speed.

Palmié M. et. all (2020) identifies three waves of emerging technology innovations, namely electronic payments, the first wave by developing the use of the Internet and mobile technologies, blockchain and crypto assets as the second wave along with P2P and microcredit platforms. The third wave is supported by artificial intelligence in the financial sector, which focuses on systems that can interpret and understand tasks and act to complete those financial tasks.

One of the main factors in the rapid evolution of digital financial ecosystems is the increase in performance and use of mobile terminals, possible performance due to the unimaginable increase (so far) in the processing power of microchips and lower costs. Basically, the rich and the poor, in large or small businesses, can communicate and trade digitally, if the necessary skills and competencies in use are cultivated.

However, from the study we conducted, we understand that human interaction, in person, with financial institutions, banking, insurance (etc.) is still very important, being in the top preferences of 38.35% of customers and desired by 54, 85%. At the opposite pole are the interfaces (e.g. Chatbot etc.) on social media agreed with the institution or company providing services / products (e.g. FB, Instagram, WApp etc.), 33.86% opting for interfaces (e.g. Chatbot etc.) on the website of the financial institution (e.g. bank, IFN, insurance company, pension fund, etc.), 53.88% also expressing their preference in this regard, while 29.25% opt for the interfaces (e.g. Chatbot etc.) integrated in the application of the institution or the company providing services / products, 53.16% also expressing their preference in this respect. The difference in percentages demonstrates an at least intuitive, if not in-depth, understanding of the functional differences. In support of the statement related to human interaction or similar processes to human interaction, human interaction in any variant of chat (website, social media, financial institution application (etc.) is appreciated mainly 38.11 % and preferred by 60.68%, the interaction by mail is appreciated mainly by 37.01% and preferred by 59.22%, while, the verbal interaction by telephone, is appreciated especially by 31.92% and preferred by 55.34%.

A second factor is the special capacity of analytical and predictive data processing to identify consumer needs and characteristics, new Artificial Intelligence and Big Data algorithms, new processing capabilities, including quantum, etc. The main idea in this regard comprises two aspects. At the macro level, financial institutions can observe certain customer trends and adjust their products according to their needs, while also ensuring compliance with prudential rules (e.g. degree of indebtedness). At the micro level, certain customer preferences can be observed, and certain needs can be anticipated. From a commercial point of view, it helps the financial institution in promoting products to certain customers at certain points in time, but it also helps the customer to make an informed decision about the options he/she has in terms of financial products. Of course, these types of analysis can generate certain risks in competition, consumer law, security of data collected / analyzed / shared between ecosystem partners, as well as in the area of personal data protection regarding the intrusiveness of data processing.

In addition to these two factors, a third one can be added: the phenomenon of consolidating a network-type society in which everyone becomes interconnected with everyone regardless of industry, and to which consumers connect digitally.

The CV 19 pandemic has had and still has a major enhancing role in the development of the network-type society and in the virtualization of relations between partners.

Analyzing what type of expansion of the financial, banking, insurance (etc.) ecosystem is useful for personalized financial services, banking insurance (etc.), it is very important for 47.68% as digital banking applications (e.g. loans with or without a mortgage, etc.) to include integrated solutions with all the necessary documentation, with direct access for all parties (e.g. notary, seller, appraiser, buyer, etc.), as well as the management of the procedural flow throughout it until completion (e.g. reimbursement total, including restructuring, refinancing, foreclosure, etc.). This is at least important for 68.49%, and in the case of insurance, it is very important for 44.35% that the digital application includes an integrated solution on the acquisition, settlement of damages and alternative dispute

resolution and at least important for 68.01%, considered by the consumer as much less or not at all important as the financial, banking institution, insurance companies (etc.) to receive information from traders on the operations performed on them by customers. Of course, the analysis in this case is truncated, incomplete, it captures only the point of view of beneficiaries and not suppliers, in a future article the authors intend to present a comparison in which to capture on the same levels or the same levels both positions.

According to the same ITU-T report, the phenomenon of mobile top-ups (the ability to convert money into minutes of use) was and is one of the determining reasons in the explosion of the eMoney concept. Mobile operators can create closed systems related to digital financial operations, not only for keeping funds in customer accounts, but also for the field of micro insurance. As they have evolved, the rigidity of closed system interoperability has forced them to take the next step, open networks, or create specialized networks outside the financial system. Depending on the regulators in each country, such systems have been developed at the level of banks, or connected providers, interconnected with banks.

If we analyze the phenomenon from the perspective of trading, the disadvantage is generated by the desire not to keep, but to transform digital assets into physical or monetary assets.

Thus came the idea of the state after cash, the state of digital liquidity, with the preservation of funds in digital format and non-transfer in cash. This step was determined by the emergence of digital wallets, either for digital currencies (e.g. eMoney) or for crypto assets (e.g. Bitcoin).

These developments have raised many questions regarding:

- The way of regulation, at the border between traditional players and the new digital infrastructure operator, whether the regulations should be on a functional basis or on types of providers, etc.
- The business models of the new digital financial service providers, which determine the fragmentation of the current/ traditional ones, with challenges regarding their scalability, transaction costs, etc.
- Digital identification, which requires an operational combination between current customer knowledge and digital identification systems (e.g. video), etc.
- Ensuring the protection of consumers against abuses, incorrect, misleading practices, protection of personal data, etc.
- Risk management by all actors involved (e.g. how we create good practices and how we transpose them into regulations)
- Defining quality standards in the application of regulations.
- General definition of interoperability standards between countries.
- Technological changes following the current technological changes, the way of management and ensuring a healthy development, etc.
- Digital education, necessary along with financial education, in the operation of digital financial services, etc.

In order to develop digital liquidity, answers to the above questions / challenges must be identified. In addition, a critical number of these transactions must be ensured, consumers must accept digital assets, must keep them in this form - have a market to use them, have both enough digitally connected traders and a sufficient number of consumers who agree to operate with these currencies or assets.

In the field of insurance and not only, according to EIOPA, the determining factors could be:

- Technology companies (outside the traditional insurance landscape) demonstrating that certain processes in the value chain of insurance can be performed cheaper and more efficiently by using new technologies.
- Customers, who are increasingly purchasing electronic products and interacting with companies through digital ecosystems / platforms (increased digitization of consumer interactions), where insurance can only be an accessory that is offered alongside a wider service or a purchase of other products.
- The offer of insurance policies is complemented by the provision of other ancillary services for consumers (e.g.: various risk prevention / supplementary services such as geo-location in case of a stolen car, or assistance in health insurance contracts). In some cases, if we refer to insurance, the policy may be part of a complex package of products and services, in which the actual insurance could be a minor component.

Fragmentation poses new risks that need to be considered:

- The sale of product bundles, improved with services, may dilute the responsibilities and the information of the consignors may be more deficient (e.g. in the particular field of insurance, there may be the risk of purchasing a product that has imperceptible exclusions when a risk damage)
- There is a risk that critical activities will exceed the scope of regulation, compliance, legal exposure and affecting the interests of consumers.
- The risk of changing the market structure and power factors.
- Concentration risk, competition issues, including the "blocking" effect at a single supplier.
- Strategic, operational / IT, cyber risk, operational resilience, outsourcing, legal, compliance and reputation risks and other operational risks (which may not be noticeable in the first instance).
- The need to develop comprehension and use skills.

On the part of the consumer, certain risks could be mentioned, which are not new, but which can be amplified by digitization:

- confidentiality and portability of data.
- new sources and conflicts of interest.
- inadequate recommendations.
- difficulty for consumers to understand who incurs risk.
- increased risk of over-insurance or under-insurance.
- financial exclusion.
- ethical issues.

Determining the main triggers of the development of digital ecosystems and naturally has been taken into account in the research. According to the questionnaire responses, consumers are considered very important by 51.28% and at least important by 75.69%, mobile operators being seen as far too important by 14, 87%. The national legal framework, specific to European nations, is very important according to the median of results for 38.07% and at least important for 64.93%. The European integrated market is very important for 42.11% and at least important for 71.44%, technology companies (e.g. research companies, innovation hubs, etc.) are very important for 44.73% and at least important for 72.14%, offers of services and digital products are very important for 44.44% and at least important for 74.67%, European and governmental policies are very important for 35.41% and at least important for 60.49%, while regulatory and supervisory authorities are considered very important for 38.07% and at least important for 63.37%.

Thus, as a commercial purpose, the needs of customers and the simplification of flows and applications through which customers communicate with suppliers within the financial ecosystem must be considered. Given the differences in customer perception of technology, there is a need to develop several types of communication channels with them. This involves correlating risk management across all these channels. Thus, an important risk to be considered in the context of many microservices used by service providers is their proper governance in terms of data appearance, approach and security.

In the area of data security, authentication is important, as mentioned in the previous section that it had to be adjusted according to the device used by the customer and the multitude of computer systems that interconnect and require proper authentication of the customer in each of them.

Moreover, phishing attacks also pose a high risk. Thus, the type of authentication must also take this risk into account. One solution proposed by PSD2 is SCA (strong customer authentication). This type of authentication can be implemented in practice in several ways, allowing the use of newly developed or existing technologies, but not used extensively for this purpose (e.g. biometric solutions on behavior, profiling solutions of the device used by the customer, profiling of customer behavior in the context of using the services, federated authentication, single sign-on).

In addition, the transfer of data to the IT systems of several ecosystem partners must have security measures in place for data in transit. The basis for the processing of personal data for this transfer (the need to provide the

service, the legitimate interest, consent) as well as the steps to be followed for the possibility of the transfer (e.g. informing customers about the processing of personal data, appropriate contracts regarding the transfer of personal data and the liability of each of the parties in this regard).

From the point of view of the supply chain, these aspects of data security and personal data protection for the whole supply chain involved in the provision of services must be considered.

As a pre-conclusion, the determining factor of evolution is the progress made on the graph of maturation of technologies (e.g. cloud computing, APIs, BDA, etc.), with the effect of reducing, among other things, coordination costs and the exchange of information. But probably the most important factor is and will be the one generated by consumer expectations, the need for simplification, the idea of customer-centric products , to avoid problems of use, to build and maintain positive experiences, etc.

6. Results

As mentioned in the introductory chapter, the article analyzes the challenges related to the digital financial ecosystem, the advantages and dangers that may arise, the novelty of the research project being to approach from a different angle a topical issue.

In this context, evaluating the answers of the 823 interviewees aged mainly between 18 and 45 years, with a majority of high school, university and postgraduate training, who work mainly in other fields of activity than those usually nominated, on the benefits of using a digital financial ecosystem, 43.39% consider very important, and 68.84% at least important the improvement of the customer experience. Regarding the integration with other ecosystems (with other services) the weights are 39.86% and 68.39%, and for those regarding the economic and time benefits, 58.53% consider them very important and 79.58% at least important.

The use of a digital financial ecosystem can ensure high security compared to the alternative options, 35.48% of those interviewed being totally in agreement, and 58.71% at least agree with this aspect, offering at the same time, on the one hand, speed and transparency, aspect considered very important in proportion of 54.67% and at least important in proportion of 78.60% of respondents, and on the other hand high flexibility for customers in choosing and using services, very important feature for 49.18% and at least important for 74.45% of respondents.

A digital financial ecosystem can help shape the social behavior of users by promoting the idea of saving and supporting equal opportunities. Thus, 37.11% and 61.07% of the respondents, respectively, consider it very possible and at least possible to promote saving behavior, and 35.12% and 54.41% of the respondents consider it very important and at least important to ensure equal opportunities.

Overall, out of the eight aspects analyzed regarding the benefits of using a digital financial ecosystem, the economic and time benefits have the highest score (58.53%, very important and 79.58% at least important), followed by speed corroborated with transparency (54.67 %, very important and 78.60% at least important) and flexibility (49.18%, very important and 74.45% at least important).

Viewed through the prism of skepticism, the highest (negative) percentages are aimed at equal opportunities and promoting the idea of saving. Thus, 22.02% of respondents consider that the use of a digital financial ecosystem does not contribute to ensuring equal opportunities, and 16.97% consider that the effects on saving behavior are insignificant.

7. Conclusions

From what is presented and analyzed in the article, we conclude that the digitization of the financial ecosystem will lead to economic growth in general and an improvement in various activities with a particular effect on consumer experiences. This conclusion is also supported by the results recorded after completing the questionnaire, 52.63% of respondents being confident and 73.26% being almost certain that the trend of improving activities will be recorded from the perspective of efficiency, 69.11% mentioning clearly against the idea that the digitalization of the financial ecosystem will not contribute, determine, or force an improvement in activities.

At the same time, however, the use of a digital financial ecosystem can induce a risk of concentration, 15.99% considering this risk to be certain, and 34.93% with a high probability of occurring also competitive problems or more precisely problems related to unfair competition, 17.05% considering them inevitable and 34.93% as

imminent. In addition to the above, there are several questions to which end users or consumers are waiting answers, taking into account the fact that 27.83% are sure that online / mobile applications do not have a sufficient degree of information security, and 46, 63% strongly express doubt about this aspect. On the question about errors / bugs existing in the financial application, insurance (etc.) in operation, 39.15% are totally in agreement and 64.38% are at least agreeing with this statement, especially since 34.68% consider that it is not known exactly who is responsible for any problems and 57.42% that it is difficult to establish the responsible entity in a timely manner. Moreover, 35.20% state that a complex application is be technically difficult, and 60.64% that a complex application can be technically difficult for users to understand. For this reason, 36.86% consider that it can be difficult to understand. the steps in the financial application, insurance banking (etc.) if they are not explained very clearly, 60.12% also would prefer the elimination of the interpretable elements or those that are insufficiently explicit.

In this context, as an equally clear conclusion, we believe that there should be cyber security and cyber management solutions capable of quickly identifying risk situations, including cyber-attacks on digitized services / products, and warning the user on the potential imminent danger. In terms of digital service flow, the importance of this aspect begins with the area of customer authentication in different types of customer communication flows (e.g. web applications, mobile applications, chatbots, communication channels using OTT providers, such as WhatsApp). Then, the area of data transfer to other IT systems belonging to the same financial service provider or to its partners in the financial ecosystem is also important. The authors' opinion is also supported by 62.83% of the respondents who consider this aspect very important and 81.76% who consider it at least important. A security mechanism, allowing the transfer to an alternative platform for providing the service / product digitized is not being perceived as important for 7.98% of consumers, end users. In contrast, as evidence of the growing awareness of the population, 58.27% support the idea of conducting periodic audits of the software to identify possible vulnerabilities and 79.25% are in favor of it. Also, 58.15% perceive it as essential to maintain a continuous line of communication with institutions competent in preventing and combating cybercrime and 78.45% as being particularly important.

The field of financial ecosystems is in its infancy, and further research will identify new trajectories generated by the expectations and needs of beneficiaries, but also facilitated by new emerging technologies that will enter a plateau of productivity in the coming years.

Author Contributions: Conceptualization, L.B., M.C.R. and M.C.S.; Methodology, L.B., M.C.R. and M.C.S.; Formal analysis, M.C.R. and M.C.S.; Investigation, M.C.R. and M.C.S.; Resources, M.C.R. and M.C.S.; Data curation and analysis, M.C.S.; Writing—original draft preparation, L.B., M.C.R. and M.C.S.; Writing—review and editing, L.B., M.C.R. and M.C.S.; Visualization, L.B., M.C.R. and M.C.S.; Supervision, L.B.; Project administration, L.B.; Funding acquisition, L.B., M.C.R. and M.C.S..

All authors have read and agreed to the published version of the manuscript.

Funding: This work was part supported by a grant from the Romanian Ministry of Education and Research, CNCS-UEFISCDI, project number PN-III-P4-ID-PCE-2020-2174, within PNCDI III. And is part of own authors contributions.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data used in this analysis is not public but available upon request.

Conflict of Interest: The authors declare no conflict of interest

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