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FINANCIAL INNOVATIONS IN THE SMART CITY ECOSYSTEM

ABSTRACT

The widespread adoption of digital technologies in finance has led to the development of new financial instruments. Digital technologies offer benefits such as faster transactions, increased consumer satisfaction, and greater competitiveness of financial institutions. The article examines the latest forms of Fintech and their distribution in smart cities, as well as the implementation of smart projects. It is important to note that any subjective evaluations have been excluded from this analysis. The article systematises the main directions and forms of application of modern financial technologies. These include payments, lending, investing, cryptocurrencies, blockchain, assessment, and analytics. Payment systems and applications that allow online payments, money transfers, and cashless transactions fall under the payments category. Crowdfunding, peer-to-peer lending, and microfinance are forms of lending. Investment robots and smart portfolios are automated platforms that fall under investing. Cryptocurrencies and blockchain are technologies that allow transactions with cryptocurrencies. Innovative methods of assessing the creditworthiness of clients and providing loans fall under the assessment and analytics category. Implementing projects in smart cities requires significant resources. To expand the financial capacity of local authorities, the following tools are used: public financing, partnerships with the private sector, crowdfunding, international programs and initiatives, investment funds, loans, and partnerships with academic and research institutions. Fintech has advantages, but it also poses threats and challenges such as cyber threats, personal data protection, risks of illegal operations, and psychological aspects. Appropriate actions are necessary to prevent and address these issues, and further research is needed.

Keywords: fintech, smart city, crowdfunding, peer-to-peer lending, electronic money, blockchain

JEL Classification: G24, O2, R1, R42

INTRODUCTION

The current stage of economic development is marked by the widespread adoption of information and communication technologies, which are fundamentally transforming all areas of human activity. Revolutionary changes are also occurring in the financial services sector. The use of digital technologies in financial relationships has led to the development of new financial tools, known as Fintech. Fintech, short for 'financial technology', refers to the use of innovative technologies to provide financial services. Digital technologies offer powerful benefits, including accelerated transactions, increased consumer satisfaction, and enhanced competitiveness of financial institutions. Digital technologies, along with Fintech, are powerful drivers of smart city development worldwide. They aid in implementing sustainable development concepts and large-scale smart projects.

Fintech refers to new technologies that aim to improve and automate the provision of financial services. These technologies assist companies and consumers in managing their financial resources and transactions. Fintech involves specialized software or algorithms used on computers and smartphones that combine financial functions with modern information technologies, such as artificial intelligence, blockchain, data analytics, and the Internet of Things (IoT). Additionally, Fintech encompasses the use of cryptocurrencies (Jourdan, 2023).

Fintech is having a significant impact on the financial industry today, as digital solutions replace traditional methods. This stimulates competition, leading to an improvement in the quality of financial services and convenience for users. However, the increased use of technology also requires increased risk controls and the preservation of data privacy protections.

LITERATURE REVIEW

The emergence of the Fintech phenomenon has not gone unnoticed by the scientific community. It is noteworthy that publications on the spread of the latest financial technologies only began to appear in 2015, indicating its high relevance. Studies on the general processes of fintech development, individual directions, technologies and tools are among the works by C. Haddad (Haddad, 2019), R. Hasan (Hasan, 2023), Z. Jourdan (Jourdan, 2023), R. Teeluck (Teeluck, 2021) and many others. It is a topical issue identification of Fintech connection with sustainable development: E. Battisti (Battisti, 2023), F. Campanella (Campanella, 2023), X. Deng (Deng, 2019), C. Vergara (Vergara, 2021), D. Wang (Wang, 2022). The concept of green finance appears, also closely related to the latest financial technologies: V. Bruhl analyzes the need to establish a simplified environmental rating to facilitate the choice of green financial products (Bruhl, 2022); M. Dell'Ebra describes the role of digital finance as a tool for pursuing environmental sustainability, and the way specific policies might contribute to pursuing this goal (Dell'Ebra, 2021), P. Ozili identifies the important themes in the green finance literature: the strategies to increase green financing; efforts to make green investment profitable; promoting green financing using technology and policy, the role of regulators and financial institutions in the green finance agenda, and the challenges of green financing (Ozili, 2022).

Features of Fintech applications in the field of lending, investments, and crowdfunding are investigated by A. Böckel (Böckel, 2021), S. Claessens (Claessens, 2018), G. Cornelly (Cornelly, 2021), V. Kaartemo (Kaartemo, 2017), Y. Sybirianska (Sybirianska, 2018). A. Cheng (Cheng, 2023), G. Kaur (Kaur, 2021), A. Ng (Ng, 2017) investigate the problems of Fintech risks and cyber security. The practice of spreading Fintech in certain regions or countries is also a relevant topic of research: A. Banerjee (Banerjee, 2020) – the government initiatives to attract large private sector investments in the United Arab Emirates (UAE), Bahrain and Saudi Arabia; Y. Han measures the green development efficiency of 30 provinces in China from 2011 to 2020 (Han, 2023); C.-C. Lee analyzes the impact mechanisms of FinTech on the efficiency of commercial banks in China (Lee, 2023); J. Liu analyzes technological innovation impacts urban green economy efficiency in emerging economies (Liu, 2020), G. Zhou studies the impact of fintech and green finance on green growth in China's provinces (Zhou, 2022).

At the same time, the problem of creating and functioning of smart cities is very relevant, the development of which has significantly accelerated with the unprecedented spread of ICT. In the scientific literature, various issues of smart cities are actively investigated by scientists: M. Angelidou (Angelidou, 2017), R. Giffinger (Benchmarking, 2021; Giffinger, 2019), A. Greenfield (Greenfield, 2019), P. Lombardi (Lombardi, 2012), T. Nam and T. A. Pardo (Nam, 2011), I. Uninets (Kalenyuk, 2022), A. Pleshkanovska (Pleshkanovska, 2021), A. Pozdniakova (Pozdniakova, 2017; Pozdniakova, 2019). Implementation of smart city projects, as a rule, requires large capital investments. The application of the latest financial technologies in the practice of functioning of smart cities is being investigated by A. Banerjee (Banerjee, 2020). I. Vasiliu-Feltes explores opportunities and threats of using digital doubles in such areas of smart cities as Healthtech and Fintech (Vasiliu-Feltes, 2023). R. Teeluck investigates a massive disruption of blockchain technology in diverse fields including financial technology (FinTech), Smart Cities, the Internet of Things (IoT), healthcare, governance, global trade and the telecommunication sector (Teeluck, 2021).

At the same time, the modern practice of developing smart cities and applying the latest financial technologies is developing rapidly and provides a lot of space for research. Therefore, this issue needs to be studied, systematized and further developed.

AIMS AND OBJECTIVES

The purpose of the article is to research the latest forms of fintech, and the features of their distribution in smart cities during the implementation of smart projects. To achieve this goal, the following tasks have been set: to define the essence of fintech, to reveal its forms and areas of distribution, and to assess the use of fintech in smart cities, its scale and features.

METHODS

The article systematizes the main directions and forms of application of the latest financial technologies. The existing practices of fintech in establishing the activities of smart cities in the countries of the world have been identified. The results of the ranking of cities according to the data of global fintech companies were summarized, which allowed to identify and confirm the active development of fintech in smart cities and the presence of fierce competition between countries, regions, and the world in general. With the help of graphic visualization methods, the trends of digitization and costs for ICT projects in smart cities were characterized. The methods of system analysis made it possible to generalize the processes of formation of the latest forms of investment, to reveal the peculiarities and advantages of fintech development. The novelty of the article was the definition of the main forms of financing smart city projects.

RESULTS

The term "Fintech" originally appeared and was used to refer to the internal operations of banking institutions. But after 2018, it began to be used in a broader sense, for a relatively wide range of financial services for consumers. In general, by 2020, capital raised by Fintech companies reached 5% of total capital raised in global equity deals, up from less than 1% in 2010 (Cornelli, 2021).

The main goal of Fintech is to facilitate and improve financial processes, provide convenience and efficiency for customers, as well as reduce costs and optimize operations for financial institutions. Naddad distinguishes nine different types of Fintech startups: those involved in financing, payment, asset management, insurance (insurtechs), loyalty programs, risk management, exchanges, regulatory technologies (regtech) and other business activities (Haddad, 2019). The systematization of the developed practice makes it possible to distinguish the following main areas of application of Fintech: payments; lending; investing; cryptocurrencies and blockchain; assessment and analytics. Figure 1 shows examples of Fintech in these areas. (Figure 1).

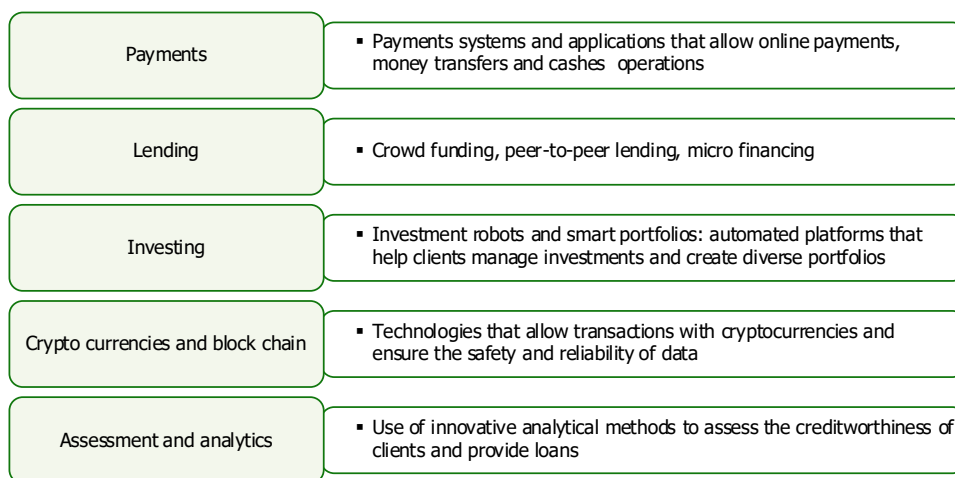


Figure 1. Main areas of application of Fintech.

Digital technologies play an important role in the development of the Fintech ecosystem in smart cities. They make it possible to create innovative financial solutions and improve the convenience and accessibility of financial services for residents. They help improve the availability and quality of financial services, simplify financial management and reduce transaction costs. Mobile applications and Internet banking technologies allow residents to make payments, transfer funds, store money and manage their accounts through convenient interfaces on smartphones. Electronic money and digital wallets allow residents to store funds, make payments and transfers without using traditional banking services. Smart terminals and payment systems provide quick and convenient access to financial services, such as topping up an account, paying for services, buying tickets, etc. The importance of Fintech is evidenced by the dynamics of investments in fintech companies. According to the international portal Statista, despite some fluctuations, investments are growing very rapidly (Figure 2):

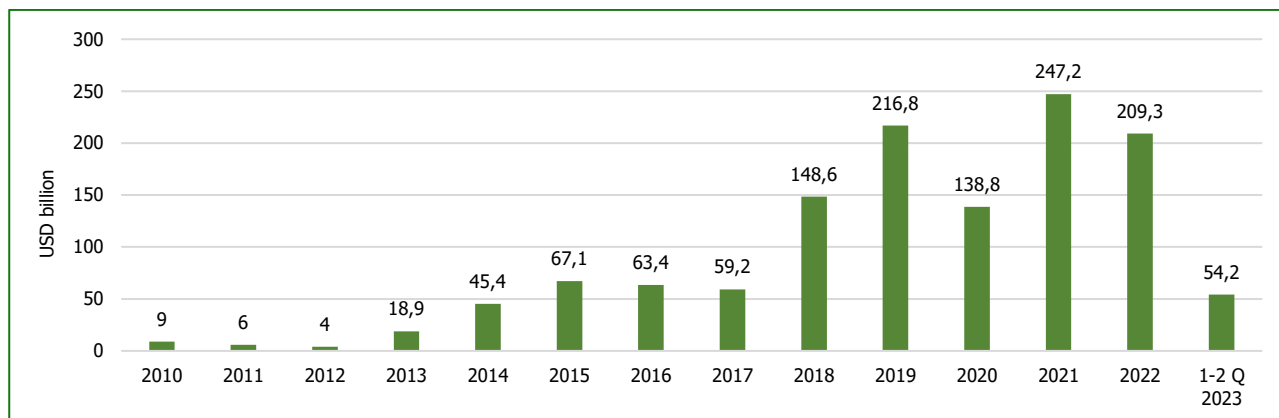


Figure 2. The total value of investments into fintech companies worldwide from 2010 to H1 2023, USD billion. (Source: Statista Research Department (2023))

Smart cities use the following financial technologies:

1. **Electronic money**, also known as electronic means of payment, are digital form of money used for various financial transactions, becoming increasingly popular in smart cities, where technology is used to improve urban life and provide convenient financial services to residents. Electronic money in smart cities is used in the form of cashless payments, contact payments (the use of NFC (contactless connections) technologies allow contact payments to be made by touching devices such as terminals, mobile phones or cards), mobile wallets, payment for public transport, payment cards and bracelets, smart parking, commercial services, etc. The use of electronic money in smart cities helps to improve the efficiency of payments and make city life more convenient for residents. It also promotes the creation of digital services and the improvement of infrastructure for financial services in cities. According to McKinsey, there is a rapid increase in the number of Americans using digital payments, which include online purchases via a web browser or in an app, in-store checkout using a mobile phone and/or QR code, and person-to-person payments (P2P): 2016 - 72%, 2020 - 78%, 2021 -82% (Goel et al., 2021).

New forms of electronic money are becoming increasingly common, such as mobile financial applications (allowing residents to make cashless payments, fund transfers and receive financial information on their smartphones); electronic wallets (allowing residents to store, manage and use their financial assets for various payments and transactions); cryptocurrencies (allow users to transact with cryptocurrencies and ensure their safety and reliability). As of the end of 2020, there were about 2.8 billion mobile wallets in use worldwide, and global mobile payment network Boku in association with Juniper Research predicts that number will grow 74% to 4.8 billion by 2025 (Cole, 2021).

The use of cryptocurrencies and blockchain allows to ensure the safety and reliability of financial transactions, as well as to increase the transparency and efficiency of operations. Blockchain is a distributed ledger technology (DLT) that facilitates peer-to-peer transactions by operating on a consensus mechanism. Each data entry is carefully verified and hashed by all nodes in the networks to reach consensus before being inserted into the appropriate block (Teeluck, 2021). Intelligent analytics and artificial intelligence enable analysis of large volumes of data, forecasting and development of personalized financial solutions.

2. **Payment gateways and integration**: integration of various payment methods and systems is provided to simplify operations and ensure transaction security. Using smart contracts on blockchain technology, Fintech companies can offer secure and transparent financial services, including digital IDs, cross-border payments and supply chain finance, and ensure automated and secure contract execution, increasing the efficiency of a variety of financial transactions. Smart insurance solutions: Smart city insurance can be offered based on the usage of IoT devices, and insurance premiums can be calculated based on actual usage, helping to better manage risks.
3. **Financial analytical and smart solutions**: smart analytics and artificial intelligence are used to predict and develop personalized financial strategies, innovative methods of assessing creditworthiness and providing financial services for customers, managing personal finances (developing programs that help people track their expenses, determine budgets and analyze financial behaviour to improve financial health).

4. *Fintech lending*: defined in a broad sense as all lending activities carried out on electronic (online) platforms that are not managed by commercial banks. This definition of Fintech credit covers all lending activities on platforms that match borrowers with lenders (investors). Depending on the jurisdiction, these platforms are called "peer-to-peer (P2P) lenders", "loan-based crowdfunders" or "marketplace lenders" (Claessens, 2018). Crowdfunding and P2P lending are carried out through the creation of platforms for attracting investments and providing loans from private investors for the development of projects and businesses. Peer-to-peer lending platforms that connect borrowers with individual lenders or investors, providing an alternative financing option for individuals and small businesses.
5. *Investment robots and portfolios*: Development of automated investment and portfolio management systems for clients. Intelligent programs for investments and savings. Fintech companies can provide mobile apps that offer personalized investment advice, automated portfolio management and tools to help residents save and manage their finances more effectively.

Crowdfunding and peer-to-peer lending, also known as P2P lending, is a form of financing in which a group of individuals (investors) lend directly to other individuals or small businesses, without the involvement of traditional financial intermediaries such as banks. In this type of lending, the interaction between the lender and the borrower takes place through P2P platforms, which provide communication between the parties and resolve issues related to loan conditions, interest rates, etc. In peer-to-peer financing, there are no intermediaries such as banks or financial institutions. Investors provide loans directly to borrowers. Investors can spread their investment across (portions of) multiple loans and can often automatically access a portfolio of loans based on the risk category and terms they choose. Among consumer P2P platforms, over 95% in the United States and 75% in Europe use an auto-opt-in process (Claessens, 2018).

P2P platforms assess borrowers' creditworthiness and provide information on risks and interest rates. As a rule, personalized loan terms are offered: borrowers and investors can negotiate loan terms directly, allowing for a more individualized approach to lending. P2P platforms usually provide standard contracts and procedures to protect the interests of both parties and resolve possible conflicts.

Peer-to-peer financing is becoming increasingly popular because it allows borrowers to access credit directly and investors to find alternative ways to invest and generate income. However, it may also have risks related to loan defaults and changes in economic conditions, so it is important to carefully assess the risks before participating in such platforms.

The development of a smart city in practice requires significant financial resources, both for the promotion of large-scale digitization and in the process of implementing individual projects. Global technology spending is projected to more than double between 2018 and 2023, from USD 81 billion in 2018 to USD 189.5 billion in 2023. Figure 3 shows the growth dynamics of smart city expenditures on technological projects (Thormundsson, 2022).

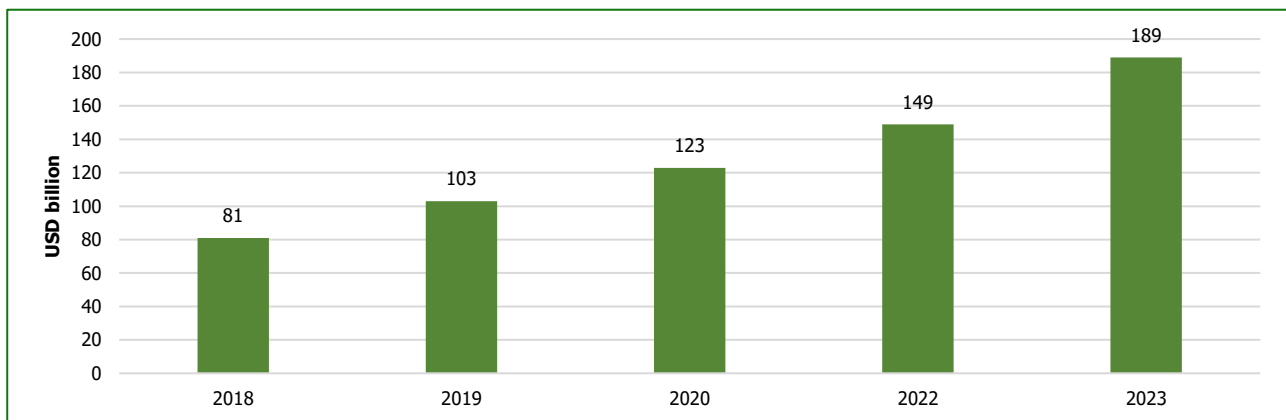


Figure 3. Technology spending into smart city initiatives worldwide, 2018–2023, USD billion. (Source: Thormundsson (2022))

Smart cities use data collected by sensors to automate a range of services to provide better performance and reduce costs or environmental impacts. Digital technologies are used to manage urban transport, waste, energy, utility systems and other areas to ensure comfortable and sustainable living. The implementation of such projects may require significant resources, for which various financial mechanisms and technologies are used because financing smart projects in cities can be a difficult task.

Various ways are being developed that help ensure the necessary investments for the successful implementation of smart projects in cities:

1. Public financing: City governments can allocate funds from the budget for the implementation of smart projects. It can be a certain part of the local budget, subsidies or grants provided by the state or international organizations;
2. Partnership with the private sector: Smart projects can attract investments and partnerships with private companies that have an interest in the development of smart technologies. These can be telecommunications companies, technology giants, financial institutions and others;
3. Crowdfunding: Attracting money from a wide range of subjects through crowdfunding platforms can be an effective way to raise funds for the implementation of smart projects;
4. International programs and initiatives: Some international organizations and programs provide financial support for smart projects in cities, especially those aimed at the development of sustainable urban infrastructure;
5. Investment funds: Cities can attract investments from specialized investment funds that specialize in smart projects and infrastructure initiatives;
6. Bank credits and loans: Cities can raise financing through traditional credits and loans from banks or financial institutions;
7. Partnership with academic and research institutions: Cooperation with universities, research centres and other scientific institutions can help to obtain funding and expert support for the implementation of smart projects.

An example of a public-private partnership is the cooperation between the city of Toronto and the private company Sidewalks Labs on the reconstruction of the waterfront [Google's]. The city of New York actively cooperates with the Link NYC Free WiFi consortium of technology companies in the advertising business [Free] and with Cisco [Flexible] in the city infrastructure financing program. The City Infrastructure Financing Acceleration Program is worth more than USD 1 billion. Cisco Capital offers debt and equity capital for smart city initiatives. [Wray].

Smart city development projects are frequently implemented within the framework of broader central government policies. For instance, the Indian government has launched the Smart Cities Mission [Vision], which seeks to establish 100 smart cities throughout the country as a development model. The program has allocated USD 15 billion to develop 100 smart cities and enhance 500 others over a five-year period. In Australia, the Smart Cities and Suburbs program[Solve] has a total budget of USD 50 million to support innovative urban projects. Grants ranging from USD 100,000 to USD 5 million are provided to cover up to 50% of the costs of eligible projects. The Government of Canada provides up to USD 50 million to cities to fund projects aimed at improving the lives of their residents through innovation, and digital and networked technologies [Backgrounder]. The Department of Transportation in the United States provides grants to support advanced technology transport projects in American cities [Wray].

International organisations and foundations finance smart city projects. In the European Union, the European Investment Bank (EIB) provided over EUR 96 billion directly and through partner institutions for 1,218 urban development projects between 2017 and 2021, which is approximately one-third of all funding. The main priority objectives are urban regeneration, sustainable urban mobility, green and climate smart cities, social inclusion, and the circular economy. Such programs are quite successful for the implementation of certain projects, but they are relatively short-term in nature. The advantage is the participation of specialized companies in the creation of the project, their high level of experience in this area, and the availability of highly qualified specialists and ready-made solutions. An important aspect here is the simultaneous preservation of transparency and confidentiality, the creation of open standards and the provision of project flexibility [EIB].

To finance certain projects, crowdfunding is used quite successfully as a form of co-financing solutions for smart cities [The use]. Crowdfunding is a method of "attracting co-financing by appealing to a large number of people who can provide small amounts of money" [What]. However, studies indicate that the majority of smart cities either do not know about the possibilities of crowdfunding or do not use its possibilities, such a share is more than 90% of smart cities [The UK's]. However, the Connected Places Catapult (Future Cities Catapult) notes that crowdfunding can serve as a "tool to embrace and promote innovation and change" and that it has the potential to "revolutionize local democracy" [The UK's]. The disadvantage of such a financing model is that it is impossible for all possible smart city initiatives, especially for large and long-term ones, but it works well for short-term effective projects (especially with a social orientation), which are quickly implemented and demonstrate good success, which increases public motivation.

Public involvement forms a new generation of citizens who are defined as smartivists [Rise], a socially active population that takes a very active part in the life of the city, its changes and the formation of development plans. On the other hand, a network of human-oriented smart cities is developing [Call]. People are becoming the centre of the development of smart cities of the new generation, and "cities increasingly recognize the importance of citizens and other subjects in the city or community to create solutions adapted to the needs of their main "clients" [Financing].

Crowdfunding is quite effective where there is not always effective state funding, test programs, cooperation with other cities, pilot projects, etc. For example, the city of Atlanta recently launched its North Avenue Smart Corridor [Atlanta's]. The corridor is set to become a "living laboratory" for the deployment of the Internet of Things (IoT), data collection and analytics, connected and autonomous vehicles, and partnerships to transform its transportation infrastructure. The formation of the ecosystem of smart cities can involve the use of different models of urban regeneration, the difficulty lies in finding an effective financing system, "a smart city is an ecosystem of smart solutions, and cities must carefully research to ensure that the result, as well as the financial contribution, meets their needs" [Financing].

Successful financing of smart projects depends on a combination of different funding sources, as well as effective project planning and management. Given the potential to improve residents' quality of life and sustainable development, investing in smart projects can be a profitable investment for cities and their residents.

The dynamic development of fintech processes necessitates analytical and comparative studies of their deployment in countries, regions, and the world in general. The manifestation of this was the appearance of The Global Fintech Index, which is presented in the form of a global database of fintech companies. It is a real-time valuation platform designed to help fintech companies improve their visibility and make it easier for investors and institutions to find them, regardless of their physical location, to help create their innovative fintech strategy. Table 1 shows data on the TOP 25 cities of the world according to the ratings of 2020 and 2021 [Findexable]:

Table 1. The Global Fintech Index, city ranking 1-25, 2020-2021. (Source: [Findexable])

Rank 2020	City	Country	Rank 2021	City	Country
1	San Francisco Bay	United States	1	San Francisco	United States
2	London	United Kingdom	2	London	United Kingdom
3	New York	United States	3	New York	United States
4	Singapore	Singapore	4	Sao Paulo	Brazil
5	San Paolo	Brazil	5	Tel Aviv Area	Israel
6	Los Angeles	United States	6	Berlin	Germany
7	Bangalore	India	7	Boston Area	United States
8	Boston	United States	8	Los Angeles Area	United States
9	Berlin	Germany	9	Hong Kong	China
10	Mumbai	India	10	Singapore	Singapore
11	Hong Kong	China	11	Sydney	Australia
12	Toronto	Canada	12	Amsterdam	The Netherlands
13	Sydney	Australia	13	New Delhi	India
14	Chicago	United States	14	Stockholm	Sweden
15	Paris	France	15	Atlanta	United States
16	New Delhi	India	16	San Diego	United States
17	Tokyo	Japan	17	Beijing	China
18	Tel Aviv	Israel	18	Moscow	Russia
19	Atlanta	United States	19	Tokyo	Japan
20	Miami	United States	20	Bangalore	India
21	Mexico City	Mexico	21	Chicago	United States
22	Seattle	United States	22	Seattle	United States
23	Beijing	China	23	Mumbai	India
24	Amsterdam	The Netherlands	24	Hangzhou	China
25	Austin	United States	25	Melbourne	Australia

The index has a short history, it is calculated only for two years. It represents the first-ever global ranking of fintech ecosystems of countries and cities based on hard data, not subjective judgments. A condition for inclusion in the index is the presence of at least 10 private fintech companies with headquarters in the country or city. The Global Fintech Index covers 264 cities in 83 countries, providing proof (the kind that can only come from a data-driven ranking) that the fintech industry continues to spread across the globe. Among the 10,000 cities worldwide, the 264 ecosystems in the ranking represent only 3% of the total urban population worldwide. At the same time, a comparison of the 2020 and 2021 ratings already proves that the development processes of fintech cities are extremely dynamic. Many new cities are joining the active creation of fintech companies and startups.

DISCUSSION

The advantages of the latest financial technologies, without a doubt, are quite significant. They speed up and facilitate all financial transactions for both business entities and consumers. The latest technologies continue to develop and increasingly enter the everyday life of cities, which requires further serious analytical research and forecasts. Therefore, the study of new forms and directions of the spread of Fintech in smart cities is an urgent problem for further development.

The spread of fintech for inclusive, diverse, and equitable smart cities is generally perceived as positive in the scientific literature and practice. At the same time, certain challenges and possible negative consequences of the spread of new technologies are also noted. Such negatives are related to cyber threats, personal data security, increased dependence on gadgets and other psychological consequences of the excessive spread of ICT. Banerjee (Banerjee, 2020) and Cheng (Cheng, 2023) point to the systemic risks of fintech associated with insufficient financial regulation, and contradictions related to financial inclusion and financial stability. Fintech regulation processes are in their early stages, as there is an urgent need to control and prevent the negative consequences mentioned above. Regulations should not impede digital transformation.

The proliferation of P2P lending is a contentious issue due to the potential risks of illicit transactions and a breakdown of trust between parties. With the increasing prevalence of cyber fraud, including fraudulent transactions, extortion, denial of service attacks, and credit card fraud, Kaur categorizes the motivations for cyberattacks as political, financial, or religious (Kaur, 2021). These pose significant challenges to the fintech industry globally, and Kaur suggests modelling them to mitigate the risks.

The potential for further expansion of fintech in the smart city ecosystem is undeniable. Fintech companies have advantages and opportunities that can drive the development of smart cities. However, it is important to consider and address possible negative consequences and challenges. This requires appropriate action and unbiased scientific research.

In general, both fintech and smart city development are new phenomena with significant potential for scientific research. It is important to study the role of fintech in facilitating the breakthrough development of smart cities and effectively addressing challenges related to inclusivity, digitalisation, and sustainability.

CONCLUSIONS

Thus, modern financial technologies, Fintech act as innovative tools for providing financial services and solutions, and generally contribute to the development and improvement of urban life. The implementation of the smart city concept requires significant investments related to enhanced digitization, and the dissemination of cutting-edge technological platforms and tools in various areas of activity, such as transportation management, waste management, municipal services, monitoring of water and air quality, safety, and public administration. Such investments are not always feasible for municipal budgets and require new solutions. Fintech expands investment opportunities by offering a wide range of digital financial products and services. Fintech is used in various areas such as payments, lending, investing, cryptocurrency trading, and analytics.

Fintech is flexible and adaptable to various sectors and entities, catering to the specific needs of individuals, businesses, and local governments. Accelerating all transactions, including the accumulation of significant financial resources in smart cities; enhancing the accessibility and convenience of financial services to a wide range of consumers. The emergence of fintech companies that offer innovative financial services and implement innovative solutions becomes an important component of the smart city ecosystem. Overall, they contribute to achieving sustainable development goals and building efficient and innovative smart cities.

They offer a wide range of digital financial products and services tailored to the specific needs of individuals, businesses and local governments in smart cities. Fintech companies are becoming important subjects of the active digitalization of smart cities, as they make financial services more accessible, increase their efficiency, and introduce innovative solutions into the smart city ecosystem. These Fintech solutions are integrated into smart city infrastructure to improve financial accessibility, efficiency and convenience for residents and businesses. In general, they contribute to achieving the goals of sustainable development and building efficient and innovative cities.

There are many cities in the world that want to become smart but do not have a clear understanding of how to do it and where to find funds for the implementation of large-scale smart projects. That is why it is extremely important to study and generalize successful global experiences that can be useful for many cities. No less important is the dissemination of information about the latest forms of financing, which are developing and transforming under the influence of ICT.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

Conceptualization: Iryna Kalenyuk, Oleg Kuklin, Yevgen Panchenko

Data curation: Antonina Djakona, Maksym Bohun

Formal Analysis: Antonina Djakona, Maksym Bohun

Methodology: Iryna Kalenyuk, Oleg Kuklin, Yevgen Panchenko

Investigation: Antonina Djakona, Maksym Bohun

Visualization: Maksym Bohun

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ФІНАНСОВІ ІННОВАЦІЇ В ЕКОСИСТЕМІ СМАРТМІСТА

Масштабне поширення цифрових технологій у фінансах призвело до розвитку нових фінансових інструментів Fintech. Цифрові технології приносять потужні переваги, пов'язані з прискоренням усіх транзакцій, більшим задоволенням запитів споживачів, підвищенням конкурентоспроможності фінансових установ тощо. Метою дослідження є вивчення новітніх форм фінтеху, особливостей їх поширення в розумних містах, під час реалізації розумних проєктів. У статті систематизовано основні напрями та форми застосування сучасних фінансових технологій: платежі (платіжні системи й додатки, що дозволяють онлайн-платежі, грошові перекази та безготівкові операції); кредитування (краудфандинг, однорангове кредитування, мікрофінансування); інвестування (інвестиційні роботи й розумні портфелі: автоматизовані платформи); криптовалюти та блокчейн (технології, що дозволяють здійснювати транзакції з криптовалютами); оцінка та аналітика (інноваційні методи оцінки кредитоспроможності клієнтів і надання кредитів). Реалізація різноманітних проєктів у смартмістах потребує значних ресурсів. З метою розширення фінансових можливостей місцевої влади застосовують такі інструменти: публічне фінансування; партнерство з приватним сектором; краудфандинг; міжнародні програми та ініціативи; інвестиційні фонди; кредити; партнерство з академічними та дослідницькими установами. Поряд із безсумнівними перевагами фінтеху існують також певні загрози та виклики: кіберзагрози, захист персональних даних, ризики незаконних операцій, психологічні аспекти тощо. Усі ці явища вимагають відповідних дій для запобігання та вирішення поточних і майбутніх викликів, а також подальшого наукового дослідження.

Ключові слова: фінтех, розумне місто, краудфандинг, однорангове кредитування, електронний гаманець, блокчейн

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