

Theoretical and Practical Research in Economic Fields

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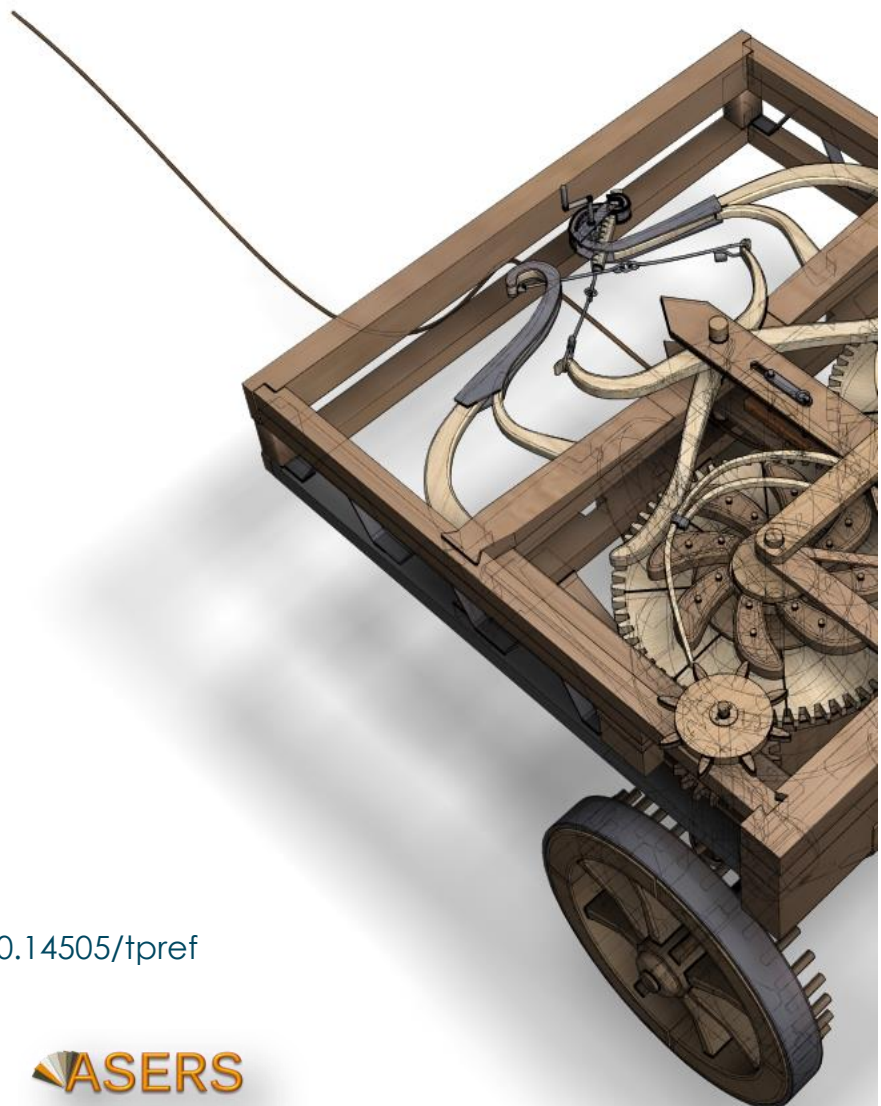
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Many economists today are concerned by the proliferation of journals and the concomitant labyrinth of research to be conquered in order to reach the specific information they require. To combat this tendency, **Theoretical and Practical Research in Economic Fields** has been conceived and designed outside the realm of the traditional economics journal. It consists of concise communications that provide a means of rapid and efficient dissemination of new results, models, and methods in all fields of economic research.

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Trends and Prospects of Financial System Development in the Context of Digitalization

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Abstract: Due to the intensive development of technologies worldwide in the previous years, the issue of the digitalization of the financial and banking sectors is an interesting area for research, as these industries see almost immediate implementation of modern technologies. The purpose of this study is to find out the current trends in the development of the national digital market and identify its priority areas in the future. Using a combined application of multiple scientific methods, the existing financial technology toolkit was examined. As a result of the work, the positive dynamics of the share of electronic sales exceeding 20% of global volumes in 2022 was revealed, the structure of foreign direct investment in the budget of the Kyrgyz Republic was determined, where 20% is occupied by foreign investments in fintech, as well as the constant growth in the period from 2017 to 2023 of such indicators of digital economy development as the number of Internet users and social media users was noted. The Digital Code of the Kyrgyz Republic with its concept of universal codification was considered as a legislative basis for regulating digital processes. Such system-forming phenomena of the modern virtual financial system as cryptographically protected blockchain, cryptocurrencies and non-mutually exchangeable tokens were also studied. Based on the obtained data, the concept of regional leadership of the Kyrgyz Republic in creating an educational cluster was formulated, which may be of interest to the relevant ministries of the country.

Keywords: fintech; digitalization; electronic banking; blockchain; cryptocurrencies; cybersecurity.

JEL Classification: F63; K24; O33.

Introduction

Numerous sectors of society have been profoundly altered by the rapid advancement of digital technologies, with the financial system being one of the most significantly affected. In the past decade, the global financial landscape has been significantly impacted by innovations such as cryptocurrencies, electronic digital signatures, contactless payments, blockchain technology, and tokens. These digital transformations are not merely technological advancements; they are a fundamental shift in the manner in which financial transactions are conducted, providing enhanced security, efficiency, and transparency. To remain competitive in the global economic order, the Kyrgyz Republic (KR) is, like numerous other nations, actively investigating methods to incorporate these digital innovations into its financial system.

The digitalisation of the national economy is acknowledged as a critical factor in the advancement of post-industrial societies. This transformation is especially significant in the context of Kyrgyzstan, as it has the potential to reduce corruption, increase financial inclusion, and lower transaction costs. Nevertheless, the journey to complete digitalisation is replete with obstacles, such as the digital divide between urban and rural populations, the necessity of robust cybersecurity measures, and the necessity of regulatory frameworks that can keep up with technological advancements (Zelisko *et al.* 2024; Oklander *et al.* 2024). The objective of this investigation is to offer a thorough examination of the present trends in the digitalisation of the Kyrgyz financial system, identify the primary obstacles, and suggest strategies for surmounting these impediments to guarantee sustainable growth and development.

This research aims to contribute to the existing body of knowledge and offer practical recommendations for policymakers, financial institutions, and other stakeholders in Kyrgyzstan by comprehending the dynamics of digitalisation and its impact on the financial sector. The results of this study can assist in the direction of the nation's endeavours to capitalise on digital technologies to improve the well-being of its citizens, promote innovation, and increase its economic competitiveness.

1. Literature Review

N. Temirov *et al.* (2023) stressed that the digitalization of the national economy, which implies the replacement of outdated principles of financial transactions, is the key direction of development of post-industrial society. Transparency of transactions, inherent in innovative principles of calculation, is a defence against all kinds of corruption schemes and a guarantor of reducing transaction costs. In their work, the authors considered the synergistic effect arising in the process of digitalization of the financial structure of Kyrgyzstan, proved the necessity of prompt transfer of commercial enterprises to the state accounting system and named the introduction of unified identification principles and unified electronic payments among the priorities.

S.R. Semenov *et al.* (2024) also devoted their work to the readiness of the KR to the challenges of modernization of the financial sector. In particular, the “Action Plan of the Cabinet of Ministers of the Kyrgyz Republic to implement the National Development Programme of the Kyrgyz Republic until 2026” (2021) was studied in detail, and with the help of statistical analysis of time series individual categories of industries were considered and actual trends in the implementation of the Programme were determined. In the process of work, it was noted the presence of positive dynamics in the development of the investment sector, designed to attract additional development funds to the country's economy. At the same time, the authors pointed the need for a more thorough elaboration of mechanisms to respond to crisis phenomena.

Among the negative factors, experts include the so-called digital divide – inequality in access to modern digital technologies (Makhazhanova *et al.* 2022). K.D. Ismailova *et al.* (2023) studied the positions of the KR in such international rankings as the Global Cybersecurity Index, the E-Government Development Index, and the level of e-commerce and were convinced that the country has significant potential in this direction. In particular, there is still a noticeable imbalance between the digital financial literacy of users from the largest cities of Kyrgyzstan – Bishkek, and Osh – and residents of the provinces. The importance of innovations in the financial sector is so important that the international community has even created a separate term – fintech – denoting modern technologies applied in the industry (Shveda *et al.* 2024). As noted by A. Risman *et al.* (2021), it is fintech that plays the most important role in the availability of financial services, thus bi-directional, synergistic effect – the development of national economies and the growth of well-being of individual households and citizens.

Digital banking, which has become the epitome of new financial technologies for most people, is an important media factor in the economy (Ismayil-Zada, 2023). A multivariate factor analysis of consumer reactions using the UK as a case study was conducted by C.I. Mbama and P.O. Ezepeue (2018). They found that respondents ranked functionality, the ability to receive prompt advice, and the perceived value of the product among the most important factors of digital banking. In addition to banking apps for the public, digital money has

come to play an important role in today's financial sector (Kyrychok *et al.* 2023; Niyazbekova *et al.* 2023). These cryptocurrencies, usually created by private entities, have fundamentally overturned traditional views not only on how to calculate but also how to earn money. T. Adrian and T. Mancini-Griffoli (2021), comparing some cryptocurrencies with their more traditional counterparts, have shown that despite the significant risks of holding intangible money, digital funds are winning the competition due to their mobility and relative anonymity.

M. Javaid *et al.* (2022) investigated another digital attribute of the new financial system – blockchain technology. Algorithms based on blockchain principles provide faster and more reliable operations, but, at the same time, exclude any changes in the already formed data blocks. As a consequence, the authors describe the security of credit reporting as an important advantage of blockchain technology compared to traditional digital methods of storing data on servers. Integration of innovative technological solutions into the state banking system is also important (Nurgaliyeva *et al.* 2014). R. Auer and R. Boehme (2021), after calculating the financial and administrative requirements for such an invasive design, proved that the best prospects are for digital money operating as a hybrid currency of a central public bank, but with the possibility of direct requests from private companies. Ideally, such a digital currency should be attractive as a universal medium of exchange, but not functional as a means of accumulation (Kyrychok *et al.* 2020). The further development of fintech and banking will inevitably involve digital innovation. Perhaps, as predicted by D. Broby (2021), an increasing role in the finance market will be played by the desire to attract new customers, or perhaps, as assessed by M. Sharma *et al.* (2022), there will be a merger of payment platforms with social networks.

Despite the extensive research conducted on the digitalisation of the financial sector and its impact on national economies, there is a substantial gap in the literature regarding the specific challenges and opportunities encountered by developing countries such as Kyrgyzstan. There is a lack of a comprehensive analysis of the unique context of Kyrgyzstan, including its digital divide and the specific mechanisms required to address crisis phenomena, even though existing studies emphasise the importance of digital transformation and the necessity of robust regulatory frameworks. Furthermore, even though the digital divide and fintech's potential have been addressed, there are no practical recommendations that are specifically designed for the Kyrgyz context. The objective of this study is to address these deficiencies by conducting a comprehensive examination of the current trends in the digitalisation of the Kyrgyz financial system, identifying the primary obstacles, and suggesting strategies for surmounting them to guarantee sustainable growth and development

2. Materials and Methods

In the process of conducting this study, various trends in the development of digital innovations in the financial system as a whole and in the banking sector of the KR were considered. In order to understand the dynamics of the process of attracting foreign capital for the purpose of innovation development, as well as the structure of foreign direct investment (FDI), the method of statistical economic analysis was applied. Next, trends were identified and compared using the current data with the indicators of previous periods. Such key indicators of digitalization of the Kyrgyz economy as the number of Internet and social network users, the volume of cellular mobile connections was analysed in the dynamics of 2017-2023, and the number of ATMs and point of sale (POS) terminals were displayed in the form of line graphs.

A generalised and comprehensive picture of the future of digital transformation in Kyrgyzstan, including the modernisation of existing facilities, the transition of the majority of banking operations online, and the popularisation of online banking among all categories of the population, was developed through the method of theoretical synthesis, utilising scattered data from professional financial publications, expert opinions, and other open sources. Among the materials used in this study, in addition to those already mentioned, were data from the National Statistical Committee of the Kyrgyz Republic (2023) on the dynamics of attracting foreign capital to the Kyrgyz Republic and their application, “Centralized data bank of legal information of the Kyrgyz Republic” (2024), “Digital 2023: Global overview report” by S. Kemp (2023a), on the number of Internet users and original mobile numbers, as well as statistics “Country data on inclusive digital financial services: Kyrgyz Republic” (2023) from the World Bank.

In the course of the work, the authors also identified the challenges faced by public and private financial structures in the process of digital transformation of the industry – risks of data loss, hacker attacks by intruders, fraud, and loss of remote access due to technical failures. As part of determining the most likely prospects for the development of digital finance and ways to achieve the set goals, a contextual analysis of the current status of regulation of relations between market players was conducted, and the presence of excessive legal barriers to further development of digitalization. The potential for the development of the most widespread and promising cryptocurrencies, tools based on blockchain technology and unique cryptographic tokens non-fungible token

(NFT) in the KR was also assessed. In addition, using the extrapolation method, the conditions for the full-fledged inclusion of fintech in Kyrgyzstan in the global movement of digital capital were predicted on the basis of the obtained and processed data, existing trends and expert opinions. At the same time, the key principles of preserving the financial sovereignty of the state were formulated, as well as the conditions for increasing the attractiveness of the Kyrgyz Republic from the point of view of potential external investors.

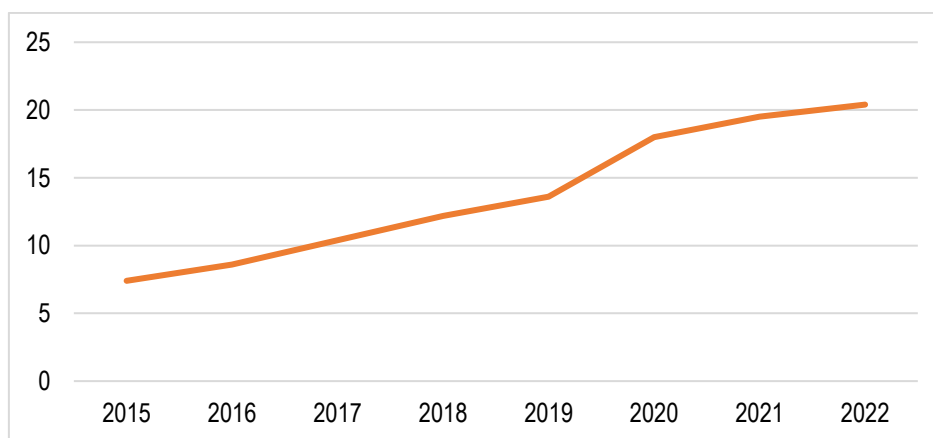
3. Research Results

The total digitalization of the world in previous years has become avalanche-like and irreversible. Of the world's 8 billion people in 2023, 5.2 billion are internet users and 5.44 billion own mobile phones. In addition, 60% of the world's population are social media users. This digital revolution has significantly impacted various sectors, including the financial system, which is a cornerstone of the global economy. Shopping online, transferring money between cardholders, paying for services – all this is becoming a convenient daily routine.

Datareportal's annual report "Digital 2023: Kyrgyzstan" by S. Kemp (2023b) demonstrates that the Kyrgyz Republic has been diligently adhering to these global digitalisation trends. The number of internet users in the country increased from 2.08 million to 5.2 million during this period, while the count of original mobile numbers increased from 7.5 million to 10.8 million. Additionally, the number of regular social media users climbed from 0.6 million to 2.75 million, resulting in an almost five-fold increase. It is important to note that a significant portion of this expansion was fuelled by individuals under the age of 25.

The transition to online financial transactions was significantly accelerated by the COVID-19 pandemic and the subsequent quarantine measures. The level of online purchases increased by 77% during the initial months of the quarantine, as per J. Koetsier (2021). This rapid expansion propelled e-commerce to levels that experts had anticipated would require 4-6 years to achieve. In 2020, numerous individuals discovered the convenience of online payments and continued to utilise them even after the quarantine restrictions were lifted, as they were unable to conduct financial transactions in traditional ways due to the pandemic. More detailed statistics are shown in Figure 1.

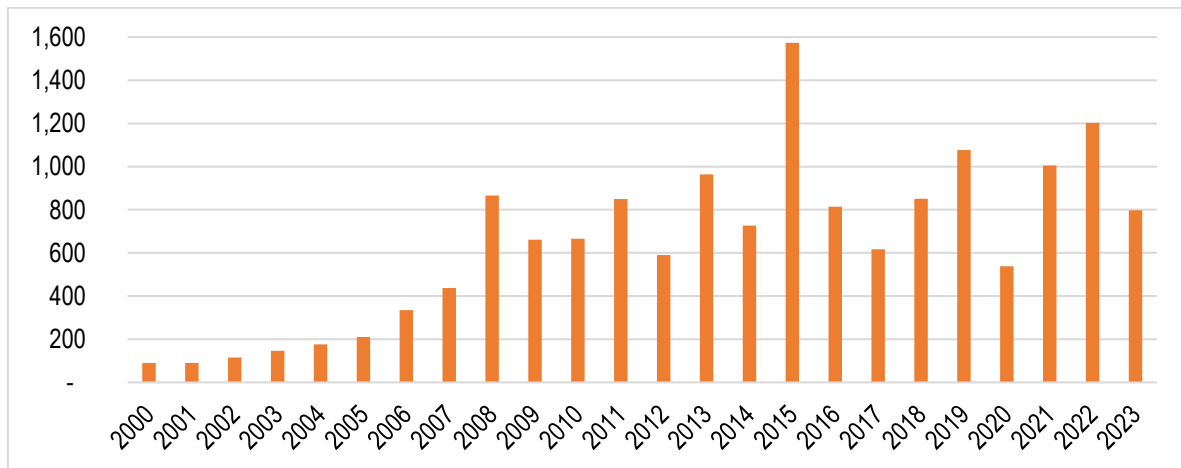
Figure 1. Share of e-commerce in global retail sales, %



Source: compiled by the authors based on "Impact of COVID pandemic on ecommerce" (2022).

The pandemic has resulted in a significant increase in the share of online sales, as illustrated in Figure 1. Despite the relaxation of restrictions, there has been no significant return to pre-pandemic levels. External investments are required as a result of the integration of contemporary technologies into the national financial systems of developing countries. Figure 2 illustrates the dynamics of the Kyrgyz Republic's attraction to foreign capital.

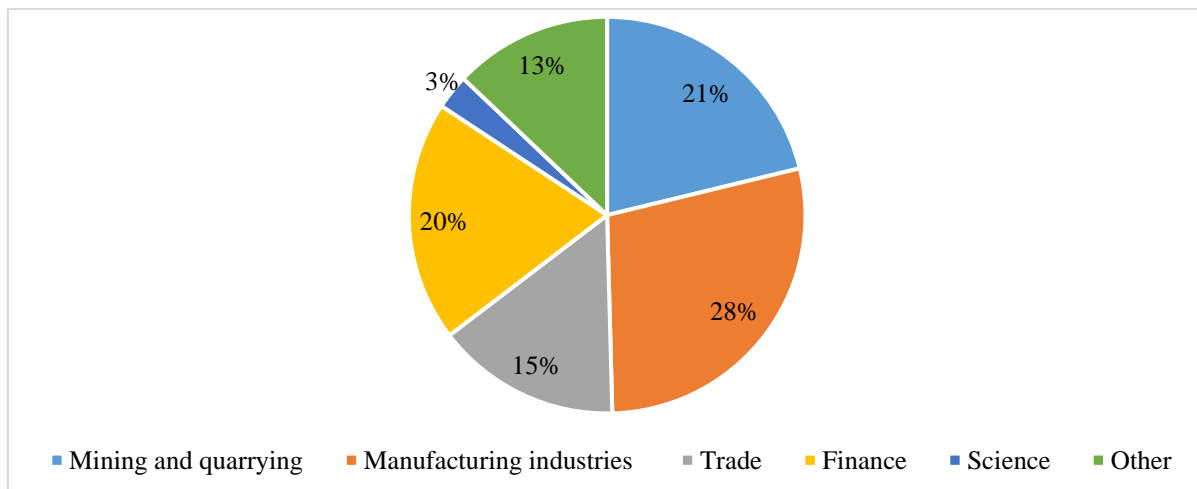
Figure 2. Volumes of foreign direct investment inflows to the budget of the Kyrgyz Republic, million USD



Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2023).

The volume of FDI fluctuates annually without a discernible trend, as demonstrated. The formation of concrete plans for the utilisation and reinvestment of foreign capital in innovative projects within the country is impeded by the unpredictability of foreign capital inflows. Furthermore, the average rate of foreign investment over the past decade and a half has remained relatively stagnant, except for a few blips in 2015 and 2020. This is unfavourable for a developing economy. It is imperative to not only analyse the volume of foreign investment but also its structure to conduct a thorough examination of the FDI situation in Kyrgyzstan. Figure 3 illustrates the sectors that are particularly attractive to foreign investors.

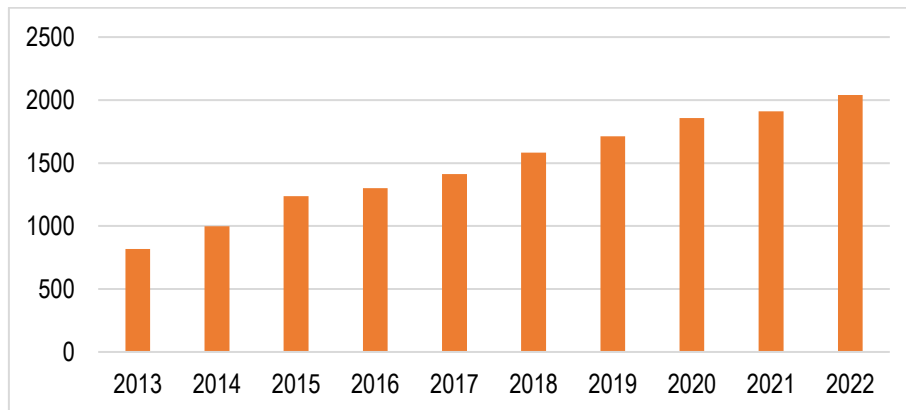
Figure 3. Structure of FDI inflows in 2023



Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2023).

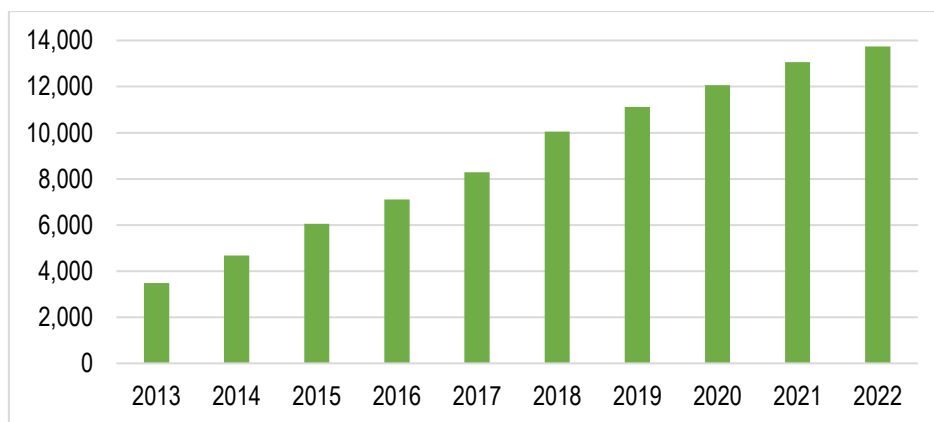
In addition to mining and manufacturing, the financial sector of Kyrgyzstan is among the top three priority areas for foreign investment. The volume of foreign investments in this sector totalled more than 150 million USD in 2023, which emphasizes the understanding of the importance of the prospects of the country's financial market by foreign investors. As for various indicators of financial market development at the level of ordinary consumers, the progress is more tangible. The dynamics of the number of ATMs, POS-terminals and the volume of plastic cards in the Kyrgyz Republic for the previous ten years are presented on Figures 4-6. For all ten years there is a constant, almost linear growth, which indicates the expansion of the country's banking system and the popularization of non-cash transactions.

Figure 4. Number of ATMs by year



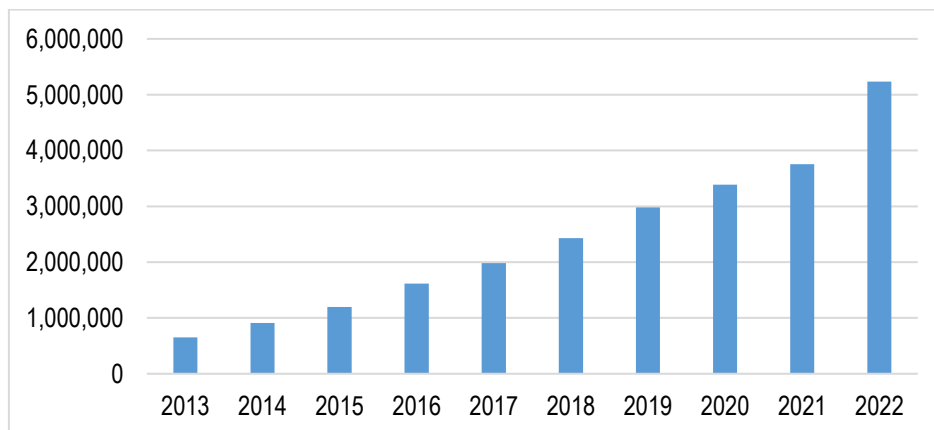
Source: compiled by the authors based on National Statistical Committee of the Kyrgyz Republic (2024).

Figure 5. Number of POS terminals by year



Source: compiled by the authors based on National Statistical Committee of the Kyrgyz Republic (2024).

Figure 6. Number of active bank cards by year



Source: compiled by the authors based on National Statistical Committee of the Kyrgyz Republic (2024).

The number of active bank cards held by the population is another indicator of the digitalisation of monetary settlements in the country, similar to the growth in ATMs and POS terminals. The financial sector's selected development vector is positively reflected in this trend. In addition, Kyrgyzstan's inclusive digital financial services are becoming increasingly popular and accessible each year, as indicated by a special World Bank study titled "Country data on inclusive digital financial services: Kyrgyz Republic" (2023). In 2011, only 4% of the adult population had their own bank account. This figure increased to 40% by 2017, and by 2021, nearly half of all adult citizens had their own financial accounts. In 2014, 15% of Kyrgyz citizens utilised this transaction type; this figure increased to 36% in 2017, and by 2021, 39% of Kyrgyz citizens were regularly conducting digital transactions. Additionally, digital payments have demonstrated substantial advancements. Furthermore, the ratio of households

that pay utility bills online - 5% in 2014 and 15% in 2021 - and the percentage of citizens who receive their salaries in non-cash form to a personal account (25% in 2014 vs. 40% in 2021) are additional factors that contribute to the digitalisation of the financial sector. Kyrgyzstan's financial sector is continuing to undergo a digital transformation, as evidenced by these trends.

Due to trends in the development of digital technologies and the increasing involvement of Kyrgyz citizens in virtual financial innovations, legislative regulation of these processes is required. The concept of the Digital Code of the Kyrgyz Republic (2023) is designed to formulate the basic rules for working with digital innovations in the Kyrgyz Republic and to prevent fraud or speculation on the part of unscrupulous users. The Digital Code of the Kyrgyz Republic, once finalized and approved by J. Kenesh, should become a generalized document that unambiguously declares the system of state governance in the fintech industry and provides a uniform interpretation of the rules of interaction in the digital sphere, as well as the specifics of its regulation. In the process of a comprehensive study of the KR legislation and existing positive global practices, a draft was formulated that includes the principles of digital environment management, systematization of existing terminology and regulations for the digital economy. The creation of such a codified framework is intended to solve a number of urgent tasks – to identify and eliminate existing contradictions; to eliminate unnecessary barriers caused by the obsolescence of some legislative norms; to ensure fair arbitration on the part of the state according to previously known and transparent rules; to ensure responsible behaviour and fair communications on the part of all subjects of the digital economy.

The universal codification proposed in the draft Digital Code of the Kyrgyz Republic (2023) provides an opportunity to use an ecosystem approach to resolving possible conflicts and contradictions – that is, not in relation to individual situations and cases, but in relation to all elements of technological ecosystems at once. Thus, the document is a kind of “digital constitution” declaring the basic principles and rules of interaction in the digital environment and serving as a reference point for the rest of the economy and jurisprudence. Consequently, similar to constitutional law, “virtual law” should include two essential components – the basic principles of interaction between subjects in the digital environment and the rules of formation of objects within the rules of digital governance. Based on existing practices, such “digital management”, in turn, should regulate digital resources (websites, applications), digital services, digital networks and digital logistics. The introduction of such a Code would help to reboot the entire legislative system in the field of digital technologies and eliminate the need for numerous adjustments and amendments to existing regulations. While the Digital Code of the Kyrgyz Republic (2023) has not yet been approved, the Law of the Kyrgyz Republic No. 12 “On virtual assets” (2022) plays an important role in the work with digital finance. At this stage, it is the Law of the Kyrgyz Republic No. 12 “On virtual assets” (2022) that is intended to regulate the circulation of virtual finance, the rules for its issuance, storage, sale, and purchase in the context of the digital economy of the Kyrgyz Republic. According to this Law, such important concepts as blockchain, cryptographic signature, virtual asset, crypto-wallet are legally enshrined in the Kyrgyz Republic.

In the context of modern fintech realities, the initiatives of the Kyrgyz authorities to ensure the security of digital capital deserve special attention. According to the legislation of the Kyrgyz Republic, the activities of virtual asset service providers are classified as licensed activities and are under constant control of the state regulator (Kaparbekov *et al.* 2024). This regulatory attention to the digital economy is primarily due to security concerns. The shift of many transactions to the digital dimension has opened up vast opportunities for speculation, data theft and other fraudulent activities. According to a number of studies and expert surveys of banking executives, the most vulnerable point of any security system is the human factor. Lack of digital literacy among staff or simple negligence of employees causes almost 80% of information security problems (Abdullayev *et al.* 2024). Among the most common mistakes are disclosing the configuration of internal systems to outsiders, following phishing links, passing passwords to unfamiliar people, opening files received from unknown addresses, and accessing service subsystems from personal unprotected gadgets.

Therefore, in order to improve the security of digital financial systems, employees of banks and other relevant institutions should undergo regular training courses, understand the existing risks and receive timely information about new threats. In addition, employees should be held accountable for breaches of their obligations to keep proprietary information confidential, and contracts stating such conditions should be in place for some time after the employee's termination (Stender *et al.* 2024). To effectively confront the challenges faced by the financial sector in the modern world, all employees of the banking system should constantly monitor abnormal situations, pay attention to extraneous connections and non-standard actions of security systems. Also, in order to prevent the loss of or access to official data, it is necessary to regularly create insurance copies of documents, change passwords with a high level of protection, establish access to digital resources exclusively

through two-factor authentication, and categorically prevent the use of personal computing equipment for work purposes (Musayeva *et al.* 2022).

As the experience of developed countries suggests, the most effective system for protecting digital financial data is the creation of a modular data storage configuration (Kerimkhulle *et al.* 2023). In this case, the modules operate autonomously from each other and are protected from data spilled by firewalls. In this way, information entering module “A” is transferred to another module “B” for processing, and the results of this processing can no longer return to the original module out of order. Moreover, a third type of module, “C”, which has no access to external digital communication channels at all, is used for long-term data storage. In order to qualitatively forecast the further development of digital financial processes in Kyrgyzstan in the coming years, it is necessary to pay attention to the current trends of developed countries in this area. Since, due to economic inertia, there is a backlash in technology imports, some technological lag helps the Kyrgyz Republic to see global innovation trends in advance and prepare for them.

According to the regular Digital 2023: Global overview report by S. Kemp (2023a) on the global development of blockchain technology, in 2023 the demand for cryptocurrencies has increased significantly, while NFT tokens have started to lose their position. The existing dynamics give every reason to assume that already in the foreseeable future, blockchain technology will become the basis for the next phase of digital transformation (Smutchak *et al.* 2023). According to the portal's statistics, despite the fact that the share of adult internet users who own at least one form of cryptocurrency has decreased by 3% in 2023, the overall capitalization of digital finance continues to grow steadily, and this decline will be easily recovered in the coming months. Supporting this hypothesis is the fact that within certain national economies, 2023 has shown an increase in the number of crypto wallet owners. Such countries include Turkey, Brazil, Australia and several other countries with quite strong economic positions (Khalegi *et al.* 2024).

If looking at these statistics in relation to individual households, the fact that the average volume of transactions with cryptocurrency is directly correlated with the level of salaries of the population – for example, the average trader in Turkey in 2022 invested 120 USD, in the United States – 635 USD, and a typical Swiss retail crypto investor spent about 1000 USD (Spytska, 2023). This fact supports the observation that at this stage, most crypto market operators do not consider digital currency as a full-fledged means of exchange and trade, but only as an investment asset. At the same time, the phenomenon of non-interchangeable NFT tokens in 2023 has almost completely exhausted itself and brought losses to its owners. According to the global online publication The Register “95% of NFTs are now totally worthless, say researchers” by B. Vigliarolo (2023), dedicated to technology, 95% of unique tokens as of the end of 2023 have zero value and the relevant services of the Kyrgyz Republic need to systematically convey such information to the population to avoid fraudulent actions.

Returning to the prospects for the development of the financial system of the Kyrgyz Republic in the context of digitalization, special attention should be paid to educating the younger generation on current economic trends – this should be done not on the basis of outdated training programmes, but using the experience of modern schools of digital economy. Since a key characteristic of innovative trends is the possibility of local concentration of markets practically from scratch, the unique trade advantages that Kyrgyzstan could use to secure its place in the new economic order should be developed separately. The authors pay special attention to the personnel issue – foreign volunteers with relevant qualifications will be sent to the regional innovation offices to form a strong educational base on site. Thanks to this initiative, rural youth in the Kyrgyz Republic will gain skills in digital financial innovation and ecological production based on advanced technologies. Achieving sustainable development goals in this case can be closely combined with the introduction of digital economy principles and digitalization of the financial system, which, as proven above, Kyrgyz society is steadily striving for. Moreover, with proper government support for the renewal of the higher education system, Kyrgyzstan could in the foreseeable future become a serious international training ground specializing in adapting the principles of the digital economy to the goals of sustainable development.

4. Discussions

The data obtained in the course of the research allow taking a comprehensive look at the trends and prospects for the development of the financial system in Kyrgyzstan in the context of digitalization. The specifics of the sphere under study are such that innovations and improvements of its individual components require constant updating and calibration with respect to global trends.

That is why it is crucial to study also the experience of the world scientific literature in the study of trends in the digital economy. For example, F. Kitsios *et al.* (2021) noted that digital transformation, illustrated in this paper by the example of Kyrgyzstan, is a continuous process that affects the world around us and literally redesigns

familiar concepts. By conducting a survey among 161 employees of Greek banks, the authors used multivariate regression analysis to compile statistics on the acceptance by financial sector employees of the new realities contributing to the transition to the new digital era. Characteristically, even among the direct actors of digital finance, there are still many people who are psychologically unprepared for the transformation (Makedon *et al.* 2020). The unprofessional behaviour of some employees of the financial sector was also noted in the course of this research. This aligns with the observations made in this study regarding the need for ongoing innovation and adaptation in the Kyrgyz financial sector.

L.T. Ha (2022), in his empirical study of the impact of digitalization on the financial sector, developed nine indicators to identify access to and efficiency of modern financial markets. The importance of digital transformation in the education and healthcare sectors was argued, stressing that it is in the public sector that digitalization is essential for the national financial market to enter the foreign economic arena (Trusova *et al.* 2021). The importance of the regulatory function of the state was also noted in this paper. The author has also demonstrated through modelling that digital commerce has a long-term positive impact on the activities of financial institutions. This study also underscores the significance of digital transformation in these sectors and the regulatory function of the state in ensuring the successful integration of digital technologies. É. Pintér *et al.* (2021) studied the impact of fintech on the behaviour of young people. As might be expected, it is this category that is the first to take the risk of using technical innovations and quickly learn digital finance skills at the household level – as this study has emphasized, and in Kyrgyzstan young people are the most active audience. Young people also demonstrate a higher willingness to take risks when it comes to digital investments (Makedon *et al.* 2022).

As it was proved in the process of this research, the most important trend in the development of digital finance is security. C. Calliess and A. Baumgarten (2020), who studied this issue on the example of the banking system of the European Union, analysed the advantages and disadvantages of existing integrated solutions. According to the authors, one of the problems lies on the legal plane and concerns the blurred boundaries of responsibility of individual departments. At the same time, there is a tendency to increase the participation of private companies in overall cybersecurity, which has a positive impact on the security of the financial system against modern threats (Quraish *et al.* 2024). It is important, however, that these private institutions work for the common good on a common basis, without preferential treatment from the state. S. Varga *et al.* (2021), studying risk management in the Swedish banking industry and comparing it with other national systems, found a fairly high level of staff training and readiness to deal with the latest fraudulent schemes. A survey of middle managers, conducted to identify the reasons for this progressive approach, revealed that an important feature of the Swedish cybersecurity structure is the constant exchange of information not only domestically, but also with foreign colleagues. This makes it possible to learn about certain cases of digital fraud in time and be prepared for their emergence in the national financial space – as it was proved above, the problem of virtual offences is relevant for the KR as well.

In the process of studying the digitalization of the Kyrgyz financial system and the challenges it faces; the expert community has noted the predominant influence of the human factor on various kinds of failures and problems. A.S. Villar and N. Khan (2021) devoted their work to the possibility of minimizing human influence on the banking system by maximizing its automation. The example of a European bank, to which the authors referred, demonstrated that writing software scripts for low margin transactions not only eliminates operator error, but also reduces the risk of malicious interventions. Characteristically, a similar study conducted by H.H. Hettiarachchige and N. Jahankhani (2021) in the same year in the UK, demonstrated the same advantage of replacing a bank employee with a software script in a number of cases. It was noted that the absence of human factor has a downside as well, as transactions do not undergo additional security in terms of critical thinking. The solution to this problem is the introduction of two-factor authentication, the need for the installation of which was also emphasized in this study.

E. Btoush *et al.* (2021) devoted their work to researching various fraudulent activities aimed at bank customers, created a list of recommendations for end users of banking services, and created a whole register of known criminal schemes aimed at swindling money from cardholders. Some of these fraudulent activities have been discussed in this paper. In continuation of the topic of digital banking, the growing popularity of which in the Kyrgyz Republic has been proved above, it is worth mentioning also the study of A. Geebren *et al.* (2021) who drew attention to the importance of customer trust in the financial sector. Having conducted a special survey among consumers of banking services and processed their results, the scientists proved that in most cases an average consumer will choose from several financial institutions the one that will be more trustworthy, even if the

material benefit from such cooperation will be less. This finding is quite important and should be considered when developing future communication strategy in the Kyrgyz Republic.

The blockchain protocol, which formed the basis of modern cryptocurrencies and tokens, has repeatedly been the subject of research by leading financiers, which correlates with the importance of the role assigned to this phenomenon in this paper. According to A.S. Rajasekaran *et al.* (2022), this technology has completely changed the usual concept of financial management and the advantages of blockchain such as decentralization, transparency, uniqueness and peer-to-peer communication help to effectively develop the digital economy worldwide. As another group of experts, A.I. Sanka *et al.* (2021), pointed out, the practical use of cryptographically secured blockchain principles creates principles of trust between anonymous users on the Internet and allows them to conduct transactions without resorting to an intermediary. Consequently, when planning the widespread implementation of this protocol in Kyrgyzstan, it is necessary to calculate the possible risks to the national economy posed by the presence of uncontrolled financial transactions.

Similar problems may also be caused by the introduction of new cryptocurrencies – in this study, a trend towards popularization of this new settlement instrument was noted. In this regard, M. Sockin and W. Xiong (2023) warned in their paper that the ability to resell digital money reduces the risk of bankruptcy on new platforms due to the inflated expectations of new users, but at a certain point this advantage is lost due to the activation of speculators. S. Arsi *et al.* (2021), on the other hand, categorized technological failures, fraudulent activities, legal threats, market fluctuations, liquidity problems and, more recently, pandemic risks as the main risks in cryptocurrency settlements between ordinary citizens. A. Trozze *et al.* (2022) noted that the occurrence of technical crises leads to distrust on the part of owners in the mining technology of a particular cryptocurrency, and speculation can cause unjustified rate hikes. In addressing the legal dimension of this issue, while extensively reviewing Kyrgyz legislative documents, it is imperative that all regulations pertaining to cryptocurrencies remain subject to continuous state oversight. Depending on the rapidly changing circumstances of the digital financial market, these laws, and decrees of the Cabinet of Ministers should be subject to revision.

The decline in 2023 of the market for the promising NFT token project, the majority of which became zero-valued, noted in this paper, has received a wide resonance in the scientific literature. P. Szydło *et al.* (2024), after studying the capitalization of several popular token collections, concluded that this new digital market, although driven by innovative trading mechanisms, still bears statistical similarities to traditional capital markets. E.I. De Silva *et al.* (2024) gave some hope for the recovery of NFT positions – they believed that the decline in the value of tokens in 2022-2023 was psychological and due to the “herd behaviour” of operators, the prices for this virtual commodity, having survived the effect of the financial bubble, returned to their objective values. The authors were able to prove this hypothesis thanks to the method of sliding time windows of 10, 20 and 30 days, based on a comparison of the volume of token transactions obtained from open sources with expert forecasts published in the media during this period. M.C. Compagnucci *et al.* (2023) found an important application of NFT-tokens – as a basis for sustainable innovation in pharmaceutical research and development. The specifics of creating medical products are such that almost any data exchange is seen by pharmacists as a threat to intellectual property. Thanks to blockchain technology and non-interchangeable tokens, drug creators can now store, transfer and reuse data from their discoveries without fear of losing rights to it (Spytska, 2024). This fact casts doubt on the thesis of the collapse of the NFT market voiced in this paper and makes us reconsider our position, paying attention to the further development of the tokenization phenomenon.

The findings of this study are supported by the existing literature on digital finance and its impact on national economies. The experiences and insights gained from global studies can significantly facilitate Kyrgyzstan's navigation of the intricate digital finance landscape, ultimately contributing to the nation's economic competitiveness and the well-being of its citizens. In the context of digitalisation, the discussion has offered a thorough examination of the trends and prospects for the advancement of the financial system in Kyrgyzstan. The critical role of digital transformation in reshaping the financial landscape is underscored by the analysis of global and local trends. The significance of regulatory frameworks, digital literacy, and security measures in the successful integration of digital technologies into the financial sector is underscored by the experience of developed countries and the insights from various studies. The necessity of continuously updating and calibrating financial innovations with global trends, the importance of digital transformation in education and healthcare, and the critical role of regulatory oversight are among the key findings of the discussion. The human factor continues to pose a substantial challenge, as research underscores the necessity of consistent training and accountability measures to reduce the risks associated with digital fraud and negligence.

The digital economy is being driven by the blockchain protocol and cryptocurrencies, which have been identified as pivotal technologies. The adoption of these technologies is associated with both opportunities and

risks. A cautious approach and continuous monitoring are required in light of the volatility and unpredictability of digital assets, as evidenced by the decline in the NFT market. In summary, the digitalisation of the financial system in Kyrgyzstan presents both opportunities and challenges. To capitalise on the advantages of digital technologies and mitigate their associated risks, it is imperative to implement effective regulation, digital literacy, and robust security measures. Kyrgyzstan's navigation of the intricate digital finance landscape is significantly facilitated by the experiences and insights gained from global studies.

Conclusions

The study determined that the global digital transformation is facilitating the inevitable digitalisation of the financial system in the Kyrgyz Republic. In recent years, the country has experienced a substantial increase in the number of internet, mobile device, and social media users, which has had a positive effect on the population's use of digital financial services. The expansion of the banking system and the popularisation of cashless payments are particularly evident in the increase in the number of users of online banking, ATMs, and POS terminals.

Nevertheless, the analysis also identified several obstacles that must be surmounted to ensure the sustainable development of the digital financial system. The irregularity of foreign direct investment inflows is one of the primary challenges, as it complicates the long-term planning of innovative projects. A substantial portion of the population is unable to access modern financial technologies due to a persistent digital divide between residents of large cities and rural areas. In the context of an active transition to digital financial transactions, cybersecurity and data protection issues continue to pose a substantial challenge.

The security of the financial system has been exposed to new risks as well as new opportunities as a result of digitalisation. In particular, hacker attacks, data breaches, and fraudulent activities have been identified as challenges that necessitate the implementation of more robust security systems and the provision of training to bank staff to reduce human error.

Consequently, the findings of the investigation indicate that Kyrgyzstan's digital financial system necessitates the implementation of comprehensive measures to achieve its full potential. The adoption of the draft Digital Code, which will systematise and regulate the work with digital innovations, is a critical step in the improvement of the legal and regulatory framework. Equally critical are educational initiatives that educate the populace about potential hazards and enhance their digital literacy. The country will be able to successfully capitalise on the advantages of digital technologies and guarantee sustainable economic development only if these conditions are satisfied.

Credit Authorship Contribution Statement

Edlira Llazo: Conceptualization, Methodology, Formal analysis, Writing – original draft, Supervision.

Ainura Ryspaeva: Investigation, Formal analysis, Writing – original draft, Data curation, Visualization.

Jakub Kubiczek: Conceptualization, Project administration, Software, Writing – original draft, Writing – review and editing.

Vugar Mehdiyev: Methodology, Formal analysis, Validation, Writing – review and editing, Visualization.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Use of Generative AI and AI-Assisted Technologies

The authors declare that they have not used generative AI and AI-assisted technologies during the preparation of this work.

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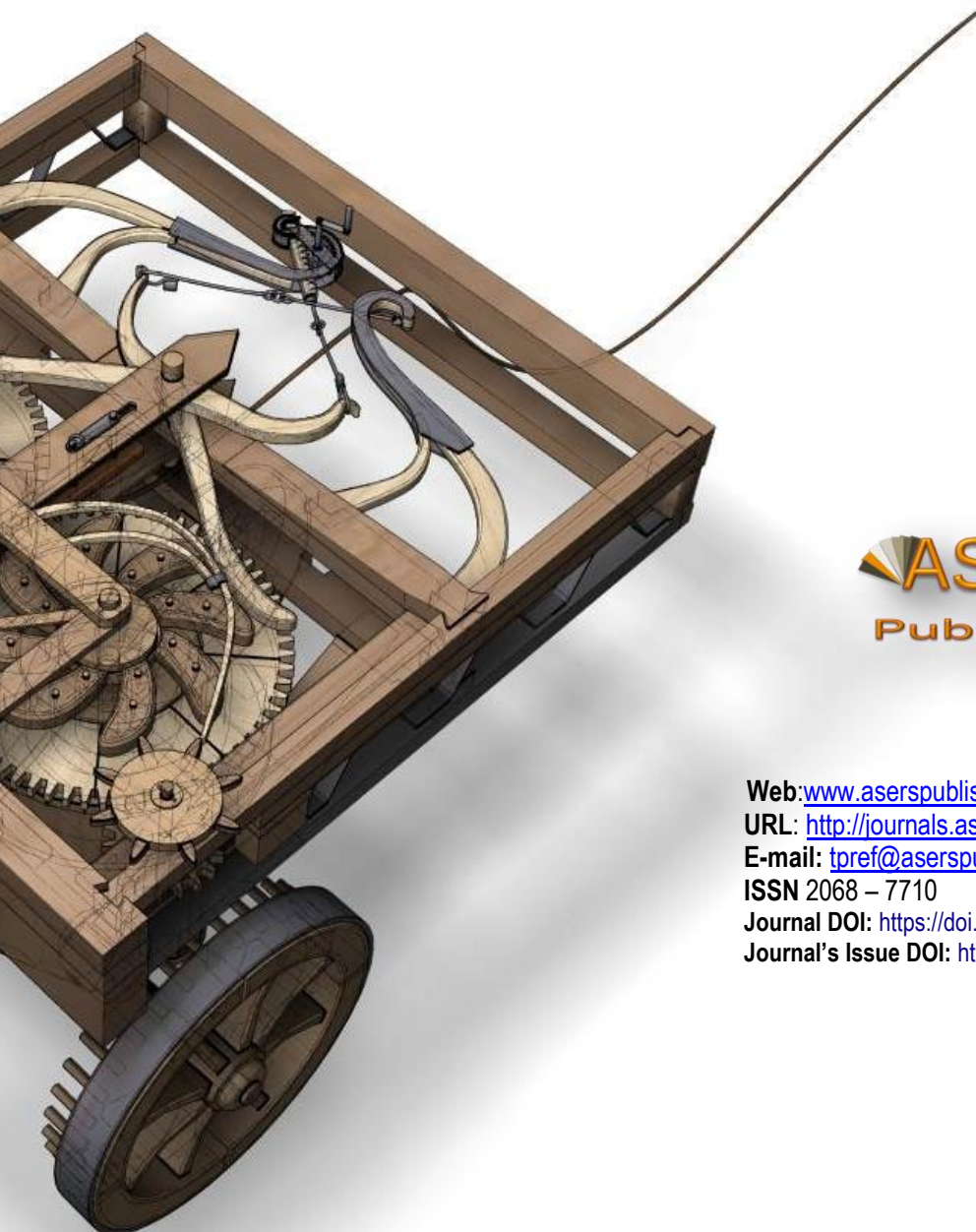
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