DIGITAL ECONOMY AND FINANCIAL RISK MANAGEMENT

ECONOMIA DIGITAL E GESTÃO DE RISCOS FINANCEIROS

Nadya Velinova-Sokolova*
*Sofia University "St. Kliment Ohridski", Faculty of Economics and Business Administration, Sofia, Bulgaria
Orcid: https://orcid.org/0000-0003-3367-6587
nadya.sokolova@feb.uni-sofia.bg

The authors declare that there is no conflict of interest

Abstract
The purpose of this paper is to analyse and systematize the key challenges to understand the role of digital economy and the relationship with financial risk management. The author put forward the provision on the valuation and measurement of financial risk in contexts of digital economy in Bulgaria. The paper mainly aims to examine the influence of digital finance on enterprise financial risk and its mechanism. The results of the study are presented in Figure 2. Moreover, it attempts to analyze whether digital finance corrects the distortion of traditional financial elements and whether it can effectively improve enterprise financial risk and further verify the inclusion and transmission mechanism of digital finance.

Keywords: Digital Economy, Challenges, Risk Management, Innovation, Digitalization.

Resumo
O objetivo deste artigo é analisar e sistematizar os principais desafios para a compreensão do papel da economia digital e sua relação com a gestão de riscos financeiros. O autor propõe uma abordagem para a valoração e mensuração do risco financeiro no contexto da economia digital na Bulgária. O artigo visa principalmente examinar a influência das finanças digitais sobre o risco financeiro empresarial e seu mecanismo. Os resultados do estudo são apresentados na Figura 2. Além disso, busca-se analisar se as finanças digitais corrigem as distorções dos elementos financeiros tradicionais e se podem efetivamente melhorar a gestão do risco financeiro empresarial, verificando ainda o mecanismo de inclusão e transmissão das finanças digitais.

Palavras-chave: Economia Digital. Desafios. Gestão de Riscos. Inovação. Digitalização.

1 INTRODUCTION

"Sustainable finance refers to the process of incorporating environmental, social and governance (ESG) considerations into investment decisions in the financial sector, leading to more long-term investment in economic activities and sustainable development projects," the European Commission states on its dedicated page dedicated to sustainable finance. The concept of sustainable finance represents measures and proposals to attract the financial sector to the green transformation: how to prioritize capital to investments for the development of a new type, a green economy, as well as for the greening of the traditional economy, including industrial production and the energy sector.
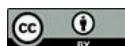
In the investment world, sustainability is generally represented by the environmental, social and governance pillars (ESG) (UN Global Compact, 2004). Despite the two terms being used interchangeably, sustainability is rather focused on the impact humanity has on the planet and society while ESG frames the notion in terms of material risks posed by the environmental and social factors to businesses. In the management domain, the discussion is concentrated around the topics of corporate sustainability performance (CSP) and the triple bottom line theory (Popescu, 2021). Impact measurement in the context of sustainable investing can be defined as "the process of measuring and monitoring the amount of change created by an organization's or an investor's activities" (OECD, 2020). Existing measurement and reporting tools do not reflect in totality the direct contribution of financial investments to sustainability goals. A recent working paper from the OECD suggests four categories for impact measurement in sustainable investment at large: "(1) principles and guidance, (2) frameworks and methodologies, (3) standards, certifications and ratings and (4) metrics and indicators" (OECD, 2020).

The concept of "digital economy", associated with information and network technologies development (Negroponte, 1995). Digital economy is a kind of activity in which the key production factors are the data presented in digital form, as well as the provision of information and communication services. Digital economy as an economic category is associated with the beginning of the process of all-over informatization of the second generation. Information and network technologies themselves served as the basis for the emerging VI technological mode. In fact all sectors of economy and society in terms of digital economy have undergone fundamental changes (Vovchenko *et al*. 2017). New tools are necessary to implement a model of digital economy. Such tools, for example, can be modern sensors having characteristics of energy efficiency, accuracy, as well as rather small sizes and low manufacturing cost. Digital economy contributes to effective business modernization, but at the same time it has negative effects associated with personnel reductions as a result of general business processes automation.

In the industrial economy the innovation managers appeared only in high-tech companies; and in digital economy the specialists having such competencies appeared in large state-owned companies, commercial banks, construction corporations. In digital economy the innovation can be divided into several types: innovation in processes, innovation in services, innovation in products and strategic innovation. The blockchain technology use based on the

contracts' information transparency provides the financial and technology companies with competitive power, as well as reduces the costs of economic agents' contracting, allows managing the companies' operational risks and controlling costs on the network and financial transactions.

Digitalization affects the company's financial risk management in different ways. On the one hand, innovative digital technologies significantly simplify processes, develop tools and methods for detecting and preventing the occurrence of financial risks, but on the other hand, they also provoke the emergence of new risks that are particularly dangerous in the commercial sphere due to possibilities of direct financial losses.

2 METHODOLOGY

The methodology used is based on general scientific methods of scientific knowledge - analysis, synthesis, induction and deduction, as well as on specific methods, specifically applying the systematic approach, the historical approach, the method of comparison and the abstract-logical method. Research is based on the review of relevant and available professional and academic literature. The research outlines the trends of (1) Risk management and information technology actually used in risk management; (2) Future perspectives about the use of Big Data; and (3) New risk manager skills.

3 FEATURES OF MODERN GLOBAL ECONOMIC

With the rapid development of the digital economy, digital finance, as a financial innovation combining Internet information technology with traditional finance, plays an essential role in the financial risk of microenterprises and macroeconomic operations. Financial and credit and insurance institutions are currently suffering these risks. Introduction of remote banking systems leads to job cuts, federal chains narrowing, offices shutdown, partial dismissal of experienced operational personnel and reduction of offices. The introduction of information and communication technologies of the digital economy changes the commercial banks business processes. For example, banking systems of risk management are developing, tools of borrowers' creditworthiness assessment based on the use of big data are improving, and risk assessment scoring systems are being upgraded in the new format of business processes

automation. A comprehensive analysis of the borrowers' economic activity allows predicting possible credit risks and determining more accurately the borrowers' creditworthiness on the basis of information and network tools (Vovchenko *et al*. 2017).

High differentiation of countries and their macro regions in terms of their technical and technological development level raises rather sharply the issue of the role and place of digitization in the functioning of modern socio economic systems, markets and business entities. "Fashionable" tendencies and trends dictated by digitization start turning digitization into a goal, leading the control loop from the content of the management process to its organizational characteristics. Certainly, the business processes algorithm development and their further digitization contribute to increased productivity; however, digitization itself cannot serve as a source of growth. Undoubted ly, digitization acts as a driver, improves communication efficiency, and can provide efficient use of resources. However, digital technologies introduced into economic circulation should be relevant to the business systems'

goals and objectives. "Digitization for the sake of digitization" creates objective risks of management systems destabilization, which naturally leads to the control loop blurring and reduced potential for sustainable development (Vovchenko *et al*.2019).

A special feature of the digital economy concept is the use of information and network technologies and innovative methods of e-business in financial sector, government control sector, education system and a number of other spheres. Members of the European Commission rely in their work on the use of South-East Asian countries best practices in the economic system digitalization process development on the basis of the design of information exchange general system on a number of activities with other countries, e.g. Russia, Norway, Switzerland and other countries. In digital economy the tasks of information support for making managerial decisions are aimed at predicting human behavior. The robots-consultants can evaluate informationally all customer's actions and financial operations: savings, loans, early repayment of a mortgage loan, car purchase, securities trading, etc. On the basis of this analysis the robots-consultants can establish connection between the client's actions and economic situation. Based on the information analysis the computer can predict a model of the client's economic behavior in a particular combination of circumstances.

Data transparency in the digital economy era makes it possible to search for and find reliable information about the probability of risk occurrence and its possible consequences, which affects the efficiency of response and the ability to predict risks. Another advantage of

digitalization is a significant reduction in the degree of influence of the human factor on the results of risk analyses. The mathematical and statistical analysis of the possibility of risk occurrence and the extent of caused damage, carried out by robots and artificial intelligence, is carried out using computer technologies that have significantly greater accuracy of the results obtained (Gasparian *et al*., 2021).

First of all, theoretically speaking, digital finance is a new type of financial innovation which exerts extensive influence on real life and subverts the traditional financial system to some extent. Digital finance uses technologies such as artificial intelligence to establish a data warehouse by improving algorithms and evaluation mechanisms, construct a transparent and information-based credit system, introduce innovative models or tools to enhance the efficiency of capital allocation in the financial sector, and strengthen risk warning and management capabilities. Furthermore, as a key factor affecting the investment and cash flow of enterprises, financing constraint plays an important role in enterprise financial risk. The existing literature holds that financing constraints can reduce enterprise financial risk and digital finance can reduce information asymmetry, thus alleviating financing constraints. Then, financing constraints may be the mechanism of digital finance affecting financial risk (Wang, 2022).

The extended definition of enterprise financial risk is the process in which the probability of enterprise financial distress is constantly expanding. Among them, financial distress is generally depicted as the situation when enterprises are unable to repay their debts. Financial risk derivation mainly comes from the changes of two internal factors, namely, the capital structure and the value creation ability of enterprises. The competitive environment and regulatory environment are external factors of enterprise value creation, naturally constraining or improving the changes in its financial risk. In addition, transaction constraints, information constraints, and political or administrative constraints can also cause enterprise managers to encounter obstacles when implementing their preferred policies (Wang, 2022).

Digitalization of financial activities also contributes to the strengthening of two standard risks for the financial system, namely, liquidity risk and credit risk. Liquidity risk is associated with the evolution of enterprises engaged in high-frequency trading. Credit risk may be associated with the development of crowdfunding. The main problem consists in the amount of funds raised in this way. At the moment, these are small financial flows, but in the future, the volumes may grow due to the popularization of crowdfunding platforms. Regulatory agencies will have to ensure that the development of these financing channels does not pose a threat to

financial stability, as well as to the legal security of individual investors. For example, future risks may lie in the lack of guarantees of the security and sustainability of crowdfunding platforms through which financial payments are transferred. Consequently, platforms will be required to provide Internet users with all the information necessary to evaluate investments (Gasparian *et al.*, 2021).

Big Data already existed at the end of the 1990s and has spread enormously in the 21st century, becoming, in the current context, a key element for modern business. Companies all over the world are exploring these large volumes of highly detailed data to discover previously unknown information that is useful in improving the decision-making process (Hasnat, 2018 and Dicuonzo *et al.*, 2019). In 2015, the United Nations Department of Economic and Social Affairs classified Big Data into three categories according to the different sources from which it derives: Data from social networks, including information from social media, messages and research conducted on the internet; data from traditional systems of business, such as that generated by commercial trade transactions, e-commerce, credit cards and medical records; and data from the so-called Internet of Things (IoT), referring to machine-generated data, such as that concerning weather and pollution, data from GPS satellites and data from computer-based registers. Many researchers note that technologies relating to Big Data are applicable in many areas of the banking sector, including retail (bank collections, credit cards, private banking), commercial (credit risk analysis, customer and sales management, middle market loans), capital markets (negotiation and sales, structured finance) and asset management (wealth management, management of capital investments, global asset reporting, analysis of investment deposits) (Dicuonzo *et al.*, 2019).

Digital technologies, tools, and new methods of data analysis are gradually being implemented into all types of economic relations. The ambiguity of the digitalization process lies in the fact that, along with the convenience and benefits, it brings new risks to the business that entails the possibility of adverse consequences for the company which may lose its income or assets. It is impossible to completely avoid the risks that appear in the course of the digitalization of the economy since digitization penetrates more actively and fully into various spheres of life of society and business over time. Innovations in the field of technology have a great impact on the development trends of the financial system. In recent years, the largest percentage of global innovation has been associated in one way or another with the development of digital technologies. An increase in new applications being developed from year to year

simplifies the possibility of making contactless, instant, mobile payments, investment consulting, data management and information storage, asset management, and informing various participants in financial and economic relations about the status of their assets (Gasparian, 2021).

The recent financial crisis and the continual modifications made to the regulatory framework have led to the diffusion of new models of risk management in the financial sector, especially in light of the move from strategies based on the observation only of losses that have already occurred (incurred loss) to those characterised by the preventive evaluation of risks with a forward looking approach based on expected losses (IFRS 9 – Financial Instruments).

Thus, the measure of financial risk in this paper is the change of return on assets. Financial risk is treated as a negative change (reduction) of return on assets (in the considered period compared to the previous period). The essence of investment according to the existing approach to financial risk management amid the economic crisis is shown in Table 1.

Table 1

Elements of financial risk management

Parameters of investments	Manifestation of the existing approach to financial risk management
Mechanism of investing	venture investing
Object of investing	technological innovations
Type of investments	commercial investments
Period of investing	short-term
The scale of investment projects	small-scale investments
Supported SDGs within the investment projects	SDG 8 (economic growth) SDG 9 (industry, innovations

Source: Prepared by author on the base Yankovskaya *et al*., 2022

As shown in Table 1, according to the existing approach to financial risk management, the parameters of investments that have to ensure the crisis resolution are preference is given to venture investments in technological innovations since they have the highest potential to increase the rate of economic growth and Investment projects are of a small scale since investors do not possess large financial resources and/or reduce financial risks through the diversification of the investment portfolio. The consequences of investments, according to the existing approach to financial risk management amid an economic crisis and taking into account the theory of investments and the theory of sustainable development, are shown in Figure 1.

Figure 1

Financial Risk Management and sustainable economy in digital era
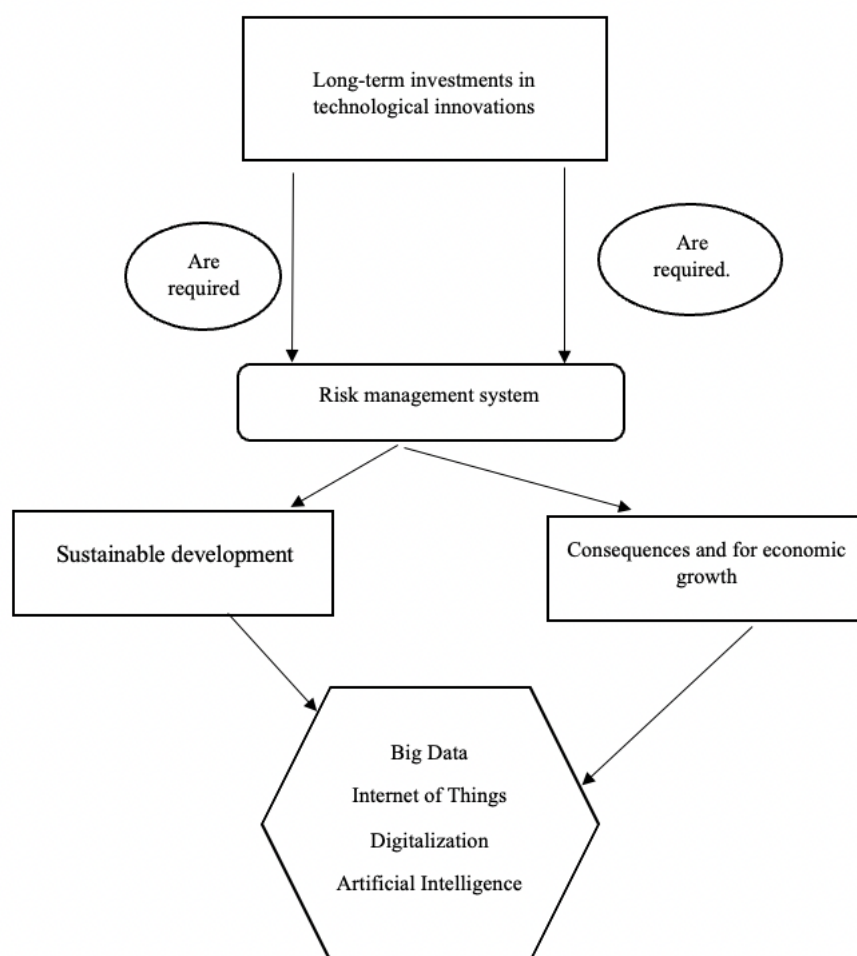
Source: Author

According to Figure 1, during the new (alternative) approach to financial risk management amid the economic crisis, which is based on corporate social responsibility, long-term, large-scale investments in social and ecological innovations are made, which require positive consequences for sustainable development. One of the most probable scenarios with the new approach is the combination of positive consequences for sustainable development and economic growth, which is a sign of high effectiveness and preference of the proposed new (alternative) approach.

4 DIGITAL ECONOMY IN BULGARIA– CHALLENGES

The most effective ways to reduce risk in the context of instability of the economic and political situation in Bulgaria are the scenarios method and the method of analyzing hierarchies, as well as diversification, i.e. the distribution of risks among several business participants. The existing need to ensure continued growth in the efficiency of companies' performance during the period of active digitalization of financial activities creates the need for timely detection, identification, minimization, and reduction of financial risks to ensure their manageability at all organization's levels. The general public all in all less digital skills than the European average with only 29% having basic skills compared to 56% EU-wide. Quite often, the use of digital services almost always depends on the amount and quality of the digital services which are being offered. On that account, Bulgaria unfortunately has a lot of catching up to do with the European average. Hardly any companies in Bulgaria are using digital services, platforms and channels (Waack, 2022). The main challenges facing the digital economy in Bulgaria and results are presented below.

4.1 Basic characteristics and challenges

The digital transformation has huge potential for economic growth. Bulgaria can build on its strengths in advanced digital technologies and its strong presence in traditional sectors, to take advantage of the opportunities offered by technologies such as 5G networks, Internet of Things, big data, robotics and artificial intelligence, blockchain, 3D printing, and others. This will enable us to take a share of emerging markets for the products and services of the future.

Currently, companies in Bulgaria do not take full advantage of new digital technologies and innovative business models. The state of industry digitalisation varies in different sectors, especially between high-tech and traditional sectors. In order to ensure rapid digitalisation of the economy, every enterprise should be able to implement solutions that support the development, testing and experimentation of new products and services based on digital technologies, including artificial intelligence. Particular attention should be paid on improving the access to advisory services and financing for high-risk innovative start-ups, both in the early stage of their development and in their scalability /growth.

The Bulgarian industry's future is in the digital transformation, which is the essence of the current industrial revolution. The digital technologies enter in an intensive manner in all sectors of the world economy and society, and traditional relationships in the physical world are largely characterized by a digital dimension. The rapid development and innovation in the digital field create economic opportunities for innovation, growth and employment and make people's lives easier.

Industry and its interaction with the services sector occupies a large share and plays an important role in the development of Bulgaria's economy. This synergy should be supported by facilitating investment in new technologies and accepting the changes that have taken place as a result of the increased digitalisation and the transition to a low-carbon and circular economy.

The concept for digital transformation of the Bulgarian industry (Industry 4.0), as well as other documents under development such as the National Strategy for Small and Medium Enterprises (SMEs) in Bulgaria for the period 2021 - 2027, provide goals and measures to support industry and small and medium enterprises for implementation of products, technologies, business models and processes from Industry 4.0.

In the draft National Strategy for Small and Medium Enterprises (SMEs) in Bulgaria for the period 2021 - 2027, one of the 6 priority areas in it is "Digitalisation and skills". The envisaged measures are focused on supporting the digitalisation of enterprises, including onmastering advanced digital technologies and related technologies. SMEs should also be supported to digitize their products and services, to develop new ones, to train the entrepreneurs and employees to develop digital skills. The indirect measures for digitisation of enterprises are the support for builging and development of the environment and infrastructure for SMEs, such as incubators, accelerators, hubs and clusters.

The main directions for reaching the average European level for the penetration of digital technologies in the Bulgarian economy and society, set in the draft Strategy for Digital Transformation of the Economy are[1]:

- ✓ Improving the cooperation between businesses in the field of ICT, industry, science and government, by orienting research to the Industry 4.0 technological trends and fostering

---

1 This area of impact corresponds to priority 3 "Intelligent Industry" in the National Program "Bulgaria 2030". The actions envisaged will contribute to the implementation of certain aspects of Goal 8 "Stimulating sustainable, inclusive and sustainable economic growth, full and productive employment and decent work for all", as well as Goal 9 " Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" from the UN Sustainable Development Goals.

opportunities for participation in various international initiatives in the field of digitalisation;

✓ Technological renewal of the Bulgarian industry, by establishing models for exchange of experience, good practices and implementation of new business models;

✓ Building human, scientific, organizational and institutional capacity for the development of Industry 4.0 in Bulgaria, by increasing the digital skills and adapting the qualification systems to the new technological challenges;

✓ Fostering the use of artificial intelligence technologies in the Bulgarian industry (MTC, 2020).

Since 2014, the European Commission has monitored Member States' progress in digital and published annual Digital Economy and Society Index (DESI) reports. Each year, the reports include country profiles, which help Member States identify areas for priority action, and thematic chapters providing a EU-level analysis in the key digital policy areas. The DESI Index ranks Member States according to their level of digitalisation and analyses their relative progress over the last five years, considering their starting point. Bulgaria ranks 26th of the 27 EU Member States in the European Commission Digital Economy and Society Index (DESI) in 2022. Bulgaria's DESI score grew at an annual average of 9% over the past five years. Given the positioning of Bulgaria, this growth rate is not sufficient for the country to catch up with the other EU Member States (EC, 2022). On the business side, the adoption of digital technologies by SMEs remains almost half the EU average. Only 6% of Bulgarian enterprises use big data, 10% cloud and 3% artificial intelligence (AI), as opposed to the EU 2030 targets of 75% for each technology. To support business digitalisation, Bulgaria is making use of European Digital Innovation Hubs. Four European Digital Innovation Hubs proposed by the country received a successful evaluation result and another eight proposals got a Seal of Excellence. The Integration of digital technology in business activities remains a weakness for Bulgaria as it ranks 26th among EU countries. The adoption of cloud services (10%), AI (3%) and big data (6%) by enterprises are all among the lowest in the EU. Only 25% of SMEs have a basic digital intensity. They are lagging behind also in online selling as only 10% of SMEs sell online, around half the EU average.

The challenges, confronting the digital economy in Bulgaria are:

✓ The development of the digital technologies and their penetration into all spheres of the economic and social life enforces a rethinking of the approach to exploiting their

exceptional potential to increase the competitiveness of the Bulgarian economy, increasing demand and supply and efficiency of public services and successfully overcoming the main social challenges in the period up to 2030.

✓ The accelerated digital transformation is a prerequisite for the anticipated development of industry production, for economic growth, and increasing incomes.

✓ The digital transformation, along with the European Green Deal, is also a key priority at European level.

✓ The integration of modern technologies with simple solutions is the ideal combination that will make our country intelligent, competitive and sustainable. The adherence to technological neutrality trough regulatory actions ensures citizens and consumers interests protection Cybersecurity at the design stage.

4.2 Results and discussion

Lackovic *et al*. (2016) develop a framework in which they suggest the use of Big Data in each of the four key risk management activities (identification, assessment, management and control, and reporting). The framework can be articulated as follows:

1. Risk identification: Identification of new sources for the early identification of risks and in-depth knowledge of customers;

2. Risk assessment: Analysis of underlying information through the calculation of various risk indicators, real-time simulation of risk indicators and predictive analysis for all typologies of risk;

3. Risk management and control: Reputational risk management, operational loss forecasting, compliance management and real-time control of financial risk; and

4. Reporting: Real-time creation of reports, calculation of risk exposure on request, increased transparency and real-time stress tests (Dicuonzo *et al*., 2019).

The adoption of Big Data in risk management can create an important competitive advantage. However, the management of a highly variable amount of data in real time requires not only new tools and methods, but also the broadening of IT, statistical and mathematical knowledge, mainly oriented to quantitative analysis of data to interpret and transform it into high added-value information. Recent investments in technological infrastructure have modified the activities of the risk managers and the IT staff who deal with the new software

and computer systems. This has required the development of new knowledge and skills essential to the conversion of data into a strategic resource.

The risk management function developed, on the basis of the available information, innovative internal predictive models (predictive analytics) of the evolution of the economy, financial stability and the measures that are characteristic of banking and other financial activity, such as default and credit. Such estimations are reported in official documents provided to the supervisory authorities with a detailed indication of the calculation methods. The data analysis tools available to the bank support the decision-making process as they can propose operational and strategic solutions (prescriptive analytics). This data management is more developed than was originally intended and it has a very wide range of uses and is the basis of all the typical quantitative analyses: Risk assessment, forecasting analysis, stress tests and testing and development of models of whatever nature and form. The greatest benefits of such sophisticated data architecture are mainly found in credit, operational and financial risk management and in the controls in the Markets in Financial Instruments Directive (MiFID).

Regarding organisational changes, the adoption of BDA is still at an embryonic stage, even though data management systems with better analytical capabilities—especially predictive and textual analysis—have been introduced. From the case study, it emerged that the adoption of innovative technologies for the acquisition and monetisation of all sources, both internal and external, and the subsequent construction of a shared platform first affected the risk management area, as it is important to capitalise on the information in the formulation of strategies and techniques for the management and coverage of risky events and to exploit possible opportunities.

Figure 2 provides an illustration of a linkage for a distributed object-oriented database system for managing global portfolios. The system has four possible intermediate production processes from which business value can be realized indirectly. These four production processes are: data hiding control operations, data integrity control operations, portfolio management operations, and data mailing operations.

To manage risk, a firm typically has to incur several types of costs, including faed, variable and opportunity costs. Fixed costs include investments in systems. If a new risk management system involves complete replacement of existing hardware, it may not be preferred over one which uses existing equipment, even if the latter system does not provide as good performance.

Figure 2

Algorithm for introducing risk management system.
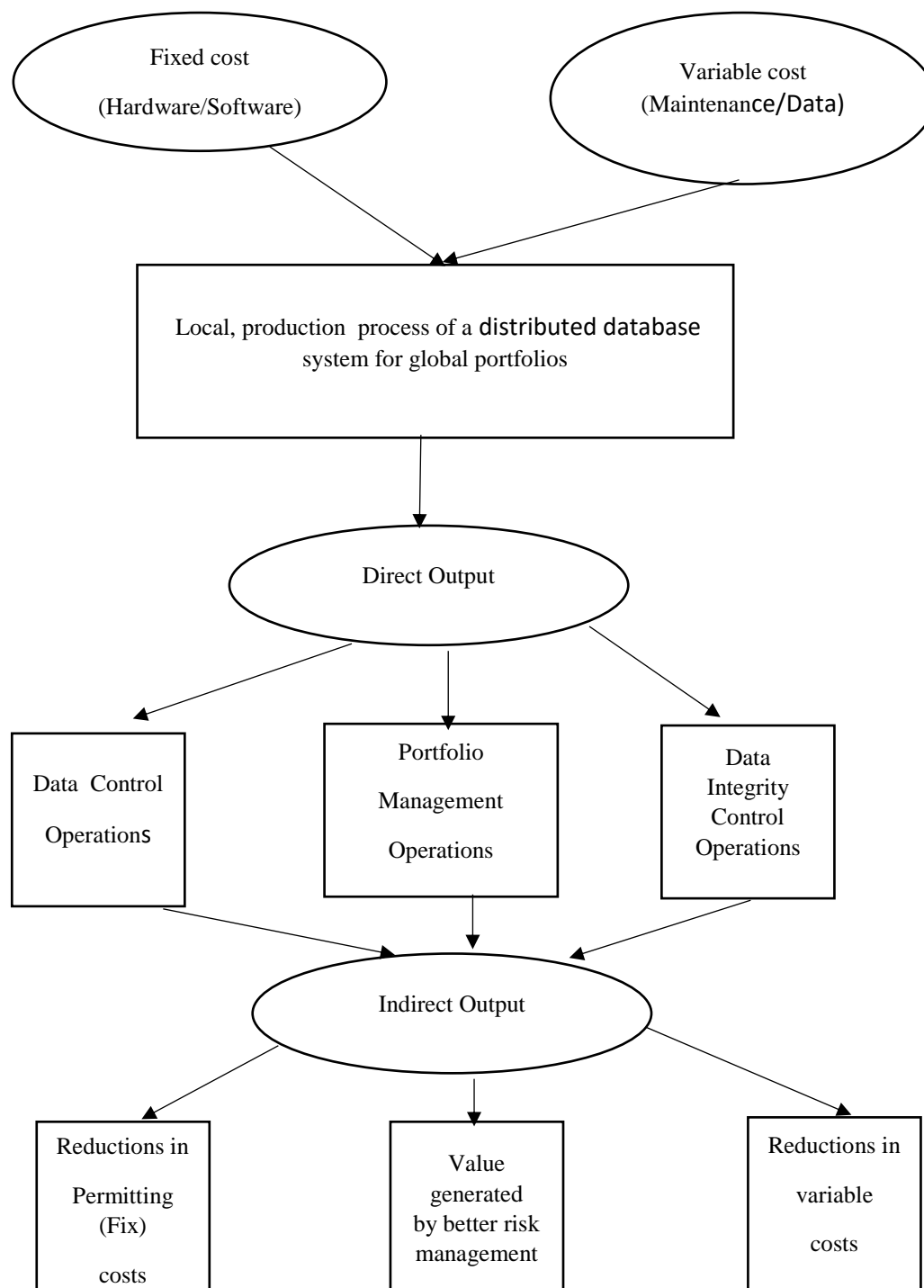
Source: Author

Variable costs include costs of periodic input data feeds, preventive and break-down maintenance, and of software updates, etc. Variable cost is dependent on the amount of service requested. For example, data feeds may be available in several forms: on-line reports; batch reports; daily reports; and monthly or quarterly reports. The actual cost of the data will usually vary (Bansal *et al*. 1992).

5 CONCLUSION

The digital transformation affects all aspects of the economy, society and government. Its success and full opportunities utilization depend on the existence of a comprehensive state approach in the making, implementation and monitoring of the policy in this area. The coordination of efforts between state institutions at all levels of government, as well as the active involvement of all key stakeholders, including the business community, trade unions, civil society and the technical Internet community, in this process, is crucial. Thus, a conclusion can be made that the ratio of risks and expansion prospects of the digital economy is determined by the level of development of core competencies for the digital economy, which means that the focus is naturally shifted to the centers of competencies and their ability to ensure formation of the desired constructs of the human capital proper ties within research groups.

The sectoral and horizontal policies affected by the digital transformation and the relevant strategic documents concerning their implementation should be linked, updated where necessary and closely coordinated in order to ensure their mutual assistance and maximum synergy. This document offers an effective policy framework for the development of the digital transformation in Bulgaria.

With the rapid development of the digital economy, the changes brought about by digital finance have had a huge impact on the development of traditional finance. The main conclusions are as follows. First, the development of digital finance can significantly reduce enterprise financial risk. Second, digital finance reduces enterprise financial risk by alleviating the financing constraint, which is a crucial mechanism for digital finance to reduce enterprise financial risk. Third, for enterprises with low debt levels and enterprises in the eastern region, digital finance plays a more significant and stronger role in reducing their financial risk.

ACKNOWLEDGMENTS

REFERENCES

Bansal, A., Kauffman, R., Mark, R., Edward, P., (1992). Financial Risk and Financial Risk Management Technology (Rmt): Issues and Advantages (August 1992). NYU Working Paper No. IS-92-31, Available at SSRN: https://ssrn.com/abstract=1289015

Bebchuk, L. A., & Tallarita, R. The perils and questionable promise of ESG-based compensation. SSRN Working Paper. Available from https://papers.ssrn.com/sol3/papers.cfm?abstract_id54048003. 2022

Desalegn, G.; Tangl, A., Enhancing Green Finance for Inclusive Green Growth: A Systematic Approach. Sustainability, 14, 7416. https://doi.org/, 10.3390/su14127416, 2022

Dicuonzo G., Galeone G., Zappimbulso E., Dell'Atti V., (2019). Risk Management 4.0: The Role of Big Data Analytics in the Bank Sector. International Journal of Economics and Financial Issues, 2019, 9(6), 40-47. ISSN: 2146-4138, Retrieved from https://www.econjournals.com/index.php/ijefi/article/view/8556

Edmans, A. (2023). The end of ESG. Financial Management, 52(1), 3–17. https://doi.org/10.1111/fima.12413

Ehlers, T. *et al*., (2021). BIS Papers No 118 A taxonomy of sustainable finance taxonomies. ISSN 1682-7651 (online), ISBN 978-92-9259-512-8 (online). Bank for International Settlements. Available at: https://www.bis.org/publ/bppdf/bispap118.pdf

EC. (2022). Digital Economy and Society Index (DESI) 2022 - Bulgaria. Available at: https://digital-strategy.ec.europa.eu/bg/library/digital-economy-and-society-index-desi-2022

Gasparian M., Kiseleva, I., Titov, V. and Olenev, L., (2021). Simulation and risk management of financial activities in the digital economy era. ISSN E 1995 9516. Universidad Nacional de Ingeniería. Nexo Vol. 34, No. 04, pp.1388 -1395 /Septiembre 2021, https://doi.org/10.5377/nexo.v34i04.12684

Hasnat, B. (2018), Big data: An institutional perspective on opportunities and challenges. Journal of Economic Issue, 52(2), 580-588. DOI: 10.1080/00213624.2018.1469938

Lackovic, D.I., Kovska, V., Lakovic, V.Z. (2016), Framework for Big Data Usage. Risk Management Process in Banking Institutions. Central European Conference on Information and Intelligent System. p49-54. Available at: https://urn.nsk.hr/urn:nbn:hr:211:427403

Liu, C., Shuo Wu, S., Green finance, sustainability disclosure and economic implications. Fulbright Review of Economics and Policy Emerald Publishing Limited. e-ISSN: 2635-0181. p-ISSN: 2635-0173. DOI 10.1108/FREP-03-2022-0021, 2023

MTC (2020). Digital Transformation of Bulgaria for the Period 2020-2030. National Program "Digital Bulgaria 2025".Sofia. available at: https://www.mtc.government.bg/sites/default/files/digital_transformation_of_bulgaria_for_the_period_2020-2030_f.pdf

Negroponte, N. 1995. Being Digital / N. Negroponte. - NY: Knopf, 256 p. available at: https://web.stanford.edu/class/sts175/NewFiles/Negroponte.%20Being%20Digital.pdf

OECD (2020). Measuring and Managing the Impact4 of Sustainable Investments - a Two Axes Mapping, available at: OECD Development Co-operation Working Papers, No. 74, OECD Publishing, Paris, https://doi.org/10.1787/2ff2b2f4-en.

Popescu, I. *et al*, (2021). Measuring the sustainability of investment funds: A critical review of methods and frameworks in sustainable finance. Journal of Cleaner Production 314, 128016. https://doi.org/10.1016/j.jclepro.2021.128016

UN Global Compact. (2004). Who Cares Wins: Connecting Financial Markets to a Changing World Connecting Financial Markets to a Changing World, available at: https://www.unepfi.org/fileadmin/events/2004/stocks/who_cares_wins_global_compact_2004.pdf

Vovchenko N., Andreeva O., Orobinsky A, Sichev R. (2019). Risk Control in Modeling Financial Management Systems of Large Corporations in the Digital Economy. International Journal of Economics and Business Administration. Volume VII, Special Issue 1, 2019. pp. 3-15, available at: file:///C:/Users/febadmin/Downloads/Risk%20Control%20in%20Modeling%20Financial%20Management%20Systems%20of%20Large%20Corporations%20in%20the%20Digital%20Economy.pdf

Vovchenko *et al*, (2017). Competitive Advantages of Financial Transactions on the Basis of the Blockchain Technology in Digital Economy. European Research Studies. Volume XX, Issue 3B. pp. 193-212. DOI: 10.35808/ersj/778

Waack, J., (2022). Spotlight Bulgaria: The digital future lies in AI, DIGITALL, available at: https://blog.digitall.com/spotlight-bulgaria-the-digital-future-lies-in-ai

Wang, Z. (2022). Digital Finance, Financing Constraint and Enterprise Financial Risk. Hindawi. Journal of Mathematics. Volume 2022, Article ID 2882113, 9 pages. https://doi.org/10.1155/2022/2882113

Yankovskaya, Veronika V., Timur A. Mustafin, Dmitry A. Endovitsky, and Artem V. Krivosheev. 2022. Corporate Social. Responsibility as an Alternative Approach to Financial Risk Management: Advantages for Sustainable Development. Risks 10:106. https://doi.org/10.3390/risks 10050106

Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Velinova-Sokolova, N. (2026). DIGITAL ECONOMY AND FINANCIAL RISK MANAGEMENT. Veredas Do Direito, 23(2), e234347. https://doi.org/10.18623/rvd.v23.n2.4419