

**Digital innovations in accounting
as economic growth factors of an enterprise**

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Abstract. The study aimed to analyse the impact of digital innovations on accounting and the efficiency of the financial processes of enterprises. The methodology included an analysis of the financial performance of Kernel, one of the leaders in Ukraine's agricultural sector. The key financial indicators of the company were compared before and after the introduction of digital innovations, such as the automation of accounting processes, the use of optical character recognition and the introduction of electronic consignment notes. The study analysed how modern accounting automation technologies, machine learning, data analytics, forecasting algorithms, artificial intelligence (AI) for anomaly detection, cloud technologies and blockchain have changed approaches to accounting, reducing costs, and increasing the accuracy and transparency of financial reporting. The study results demonstrated that the introduction of digital tools allowed Kernel to significantly improve its key economic indicators. Revenues grew from USD 2168.9 million in 2017 to USD 3581 million in 2024 (+49% compared to 2018). The company's earnings before interest, taxes, depreciation and amortisation increased from USD 319.2 million to USD 381 million (+71%), and net profit in 2024 was USD 168 million. The use of electronic consignment notes ensured efficient management of logistics processes, minimised risks and improved product transportation management. The use of digital technologies has helped to increase the efficiency of operations, reduce costs and improve economic performance. The study established that automation of accounting operations through the introduction of digital platforms, such as the system of electronic consignment notes and integration of cloud technologies, has reduced the time for processing financial data, reduced the probability of errors and increased the accuracy of financial reporting. Recommendations for Ukrainian enterprises included the introduction of accounting process automation, which included the use of accounting software, including QuickBooks, as well as the integration of blockchain to increase the security and transparency of financial transactions. The study confirmed that digital innovations in accounting were not only a technological necessity, but also an important factor in the economic growth of enterprises, which reduced costs, improved management decisions, optimised budget control and increased the competitiveness of companies in the market

Keywords: digitalisation; automation; financial technology; efficiency; data analysis; competitiveness

Introduction

The economic growth of businesses largely depends on the implementation of innovative methods in various aspects of their operations, especially in accounting. Companies are forced to adapt their accounting systems to new challenges due to increased competition, globalisation, digitalisation and changes in legislation. Often, traditional accounting methods do not provide the accuracy, efficiency and analytical flexibility required for strategic decision-making. Innovations in accounting, such as artificial intelligence (AI), automation of accounting processes, blockchain technologies and big data analytics, help companies optimise costs, reduce the risk of errors and improve the accuracy of accounting data. These methods also help optimise management decision-making and improve the accuracy of financial forecasting, which ensures more efficient planning and management of company resources.

The need to integrate innovations into the accounting and reporting system is to adapt accounting processes to modern digital technologies such as automation, cloud platforms and blockchain (Danieliene *et al.*, 2024). This ensures an accurate, timely and transparent reflection of financial transactions, which is a key factor in effective management in a globalised world. S. Semenova *et al.* (2020) emphasised the importance of introducing new approaches to accounting for innovations, as traditional methods do not allow for a full consideration of their impact on the company's value. The study highlighted the importance of integrated reporting that covers the results of innovation activities. At the same time, the valuation of intangible assets and the impact of innovations on financial statements remain insufficiently studied.

Insufficient determination of the economic characteristics of innovations in the context of accounting is inherent in the financial sector. S. Glaeser & M.H. Lang (2023) noted that innovations posed unique challenges to accounting information due to their novelty, uneven use, and partial exclusivity. The study addressed the need to develop accurate methods for measuring innovation and its impact on economic growth. At the same time, issues related to the adaptation of financial reporting systems to the introduction of the latest digital technologies, such as blockchain, cloud platforms, and automation of accounting operations, remained unresolved. The main challenges were ensuring the cybersecurity of data, integrating new solutions with existing accounting systems, standardising electronic documents, and training qualified personnel to work with new technologies. These issues required the development of unified approaches to the digitalisation of reporting and significant investments in staff training and infrastructure modernisation.

Accounting was redefined as a multidimensional practice, including social and moral aspects, with the potential to contribute to the United Nations Sustainable Development Goals (SDGs) (Kurhan *et al.*, 2023). G.D. Carnegie *et al.* (2024) noted that current trends in accounting open new perspectives for professional development, through the introduction of digital technologies and process automation. The authors noted that insufficient attention was paid to the SDGs, despite the deterioration of the social and natural environment. The authors suggested that accounting approaches should be rethought to help achieve the SDGs, by integrating environmental, social and economic aspects

into financial reporting. There was also a need to further explore the integration of accounting into sustainability strategies, both at the individual company and public policy level. This included the development of mechanisms to ensure that financial indicators are aligned with the SDGs, such as conservation of natural resources, emissions reduction and social responsibility.

Insufficient integration of innovations into accounting practice has limited the development of this area. M.E. Barth & K.H. Gee (2024) studied accounting for innovations, particularly the issues of reflecting intangible assets, technological developments and intellectual property in financial statements. The authors noted that the introduction of innovations creates new challenges for accounting standards, including the need to develop approaches to the valuation of such assets, their amortisation and compliance with international financial reporting standards.

Innovations have influenced accounting and auditing in the US, significantly changing traditional practices. G.U. Ebirim *et al.* (2024) noted that automation, data analytics, machine learning, and AI were improving the accuracy of financial reporting and reducing the risk of errors while posing challenges for staff training and integrating technology into existing systems. The authors emphasised the importance of adapting accounting practices to new conditions to ensure the competitiveness of enterprises. However, the integration of innovations in small and medium-sized businesses remained under-researched.

Digital innovations significantly changed accounting, increasing the efficiency, accuracy and transparency of financial reporting (Llazo *et al.*, 2024). V. Fedun *et al.* (2024) and I. Nykyforak *et al.* (2024) noted the functionality and effectiveness of big data, blockchain, AI and cloud computing in accounting business processes. The introduction of these technologies reduced the risk of errors, improved access to financial information, and improved the quality of reporting. However, the key challenges remained the need to change organisational culture, train staff, integrate technology into existing systems, and comply with legal requirements. Aspects of innovation in small and medium-sized businesses in Ukraine, in particular their impact on competitiveness and financial management efficiency, remained insufficiently studied (Zhurakovska, 2024). The lack of research in this area pointed to the need to develop a new regulatory framework tailored to the specifics of small businesses, as well as a more detailed analysis of the use of modern technologies, such as blockchain, data analytics, and AI, to increase their availability and effectiveness in these sectors.

Digital transformation has significantly changed modern accounting in Ukraine, increasing its efficiency and accuracy (Lytvynenko *et al.*, 2024). O. Ievsieieva *et al.* (2024) noted that automation, cloud technologies, AI, and blockchain opened new opportunities for cost optimisation and control of financial transactions. The introduction of innovative digital solutions reduced the risk of errors and improved the quality of financial reporting. At the same time, digitalisation was creating new challenges for Ukrainian

businesses that required a comprehensive approach. The authors emphasised that digital technologies contributed to the transparency, security and accuracy of financial information, allowing companies to adapt to market changes and improve management efficiency.

The study aimed to analyse the impact of innovative digital data processing technologies on accounting in Ukraine and to assess their impact on the efficiency of financial processes in enterprises.

Materials and Methods

The study covered the period from 2018 to 2024, which made it possible to trace the dynamics of changes that occurred due to the introduction of digital technologies during this period. Kernel was used to assess the impact of innovations as it was one of the leaders in the Ukrainian market in the agricultural sector and actively implemented digital technologies in all aspects of its activities, including accounting (Information about Kernel, 2024). The company was also selected due to its extensive experience in implementing automation of accounting processes, using cloud technologies and digital platforms, which was an example of the impact of digital innovations on the financial performance of the enterprise.

The research was based on publications, reports and analyses related to digital technologies in accounting, such as the digitalisation of production. Digital weighing scales have been launched at Kernel plants, Kernel was one of the first on the market to implement the eTTN system (2020), Global digitalisation (Litvinchuk, 2019), as well as financial statements of Kernel (2018; 2024) for the periods of 2018 and 2024, which was used to compare key financial indicators before and after the introduction of digital innovations. Kernel started actively implementing digital innovations in 2018, after preliminary testing of technologies in 2016-2017. The company's reports were used to evaluate the effectiveness of accounting process automation.

To study the digital technologies used in accounting, data on the automation of accounting operations, cloud technologies, and the use of AI and blockchain in financial processes, collected from open sources, were used. Publications, articles, and research studies that examine the most relevant trends in the digitalisation of accounting were studied. To study in detail the impact of digital innovations on the company's accounting, the case study method was applied. This method was used to assess the effectiveness of implementing automation and digital platforms in financial and accounting processes, the impact of innovations on reducing costs, increasing accounting accuracy, and improving the transparency of financial statements using Kernel as an example.

In addition, the introduction of electronic document management through PrivatBank and DepositSign was studied, which helped to improve the efficiency of accounting departments and automated the process of signing documents. To evaluate the effectiveness of digital innovations in accounting, the Group used the method of

analysing financial indicators. This included a comparison of key financial indicators such as revenue, Earnings before Interest, Taxes, Depreciation and Amortisation (EBITDA), net profit and operating profit to assess the overall financial position of Kernel before and after the introduction of digital technologies. The analysis of these indicators was used to determine the impact of digitalisation on the company's financial results, as well as assess changes in the effectiveness of management decisions.

Accounting technologies were considered: cloud solutions for data storage and processing, systems for automating the collection and processing of financial data, and AI for detecting anomalies or trends in financial activities. Automated accounting and reporting in the cloud environment is studied on the example of M.E.Doc. The application of accounting platforms for automating accounting and reporting processes is also studied: SAP, Oracle NetSuite, Xero, and QuickBooks. Systems based on Microsoft Azure and Google Cloud were used to process big data and identify trends.

The SAP S/4HANA AI algorithm was used to identify anomalies in financial transactions (Singh, 2024). Specialised software such as Sphera and Carbon Footprint Manager were used to analyse the environmental impact. Methods of staff training in the field of accounting digitalisation were also considered. The use of online courses and training on the Coursera and Udemy platforms, such as the Introduction to Generative AI in Finance course (Vailaya, n.d.) on Coursera and the Artificial Intelligence for Finance, Accounting & Auditing course (2020) on the Udemy platform, was analysed. Recommendations for Ukrainian enterprises on the digitalisation of accounting have been developed.

Results

The economic impact of digital innovation

The effectiveness of digital innovations was studied in the example of Kernel (Ukraine). The case study analysed the latest technologies implemented at Kernel's production sites to optimise accounting processes and production-related operations. The introduction of weighing systems that automated weighing, loading and shipment control was one of the key steps in the company's digitalisation in 2024. The digital system ensured automatic vehicle recognition, reading data from the scales, and operational queue management, which increased the company's throughput. Automation helped minimise the impact of the human factor on operational processes, reduce the risk of errors inherent in manual data entry, and improve the accuracy of financial reports (Digitalisation of production..., 2024).

The system was integrated with the company's accounting system, which substantially reduced data processing time, optimised logistics management and ensured transparency of management reporting. Video surveillance with automatic matching of vehicle licence plates with the registration database was used for real-time display of control indicators on a tablet, which facilitated prompt management decision-making (Bochko *et al.*, 2022). Additionally,

the volume of paperwork was reduced, and employees were able to focus on production processes, which had a positive impact on the company's efficiency. The automation of accounting processes optimised accounting and logistics costs and ensured the accuracy of weighing and data processing. The automated system became an assistant to drivers and staff, as the special vehicle identification cards used simplified process control and management.

Thus, digital innovations in accounting significantly improved the company's financial performance. They reduced operating costs, shortened transaction times, and improved data accuracy, which positively affected the company's overall financial performance. The introduction of the electronic waybill system was an important step in Kernel's digitalisation, significantly improving its accounting processes. All eB/Ls were registered in a central database, and the signature status was automatically reflected in the company's internal accounting systems. This ensured automatic data updates in real-time and integration with accounting operations, which contributed to increased transparency and speed of information processing (Kernel was one..., 2020).

One of the key components of the eTTN implementation was the use of a mobile application developed with truck drivers in mind. The simple and intuitive interface allowed more than 600 drivers to actively use the eTTN. To make registration easier, the app offered phone number authentication and support for multiple cloud-based electronic signature keys (ESKs). This facilitated overcoming challenges related to the human factor, such as resistance to innovation and low digital literacy among users (Litvinchuk, 2019). Before the introduction of eB/L, paper waybills went through several stages of verification, which took 20-30 minutes per transaction. With electronic waybills, these processes became automatic: the system immediately received a link to the waybill and confirmation of its signature. This significantly reduced document processing time. During the season, the company processed about 140,000 eB/Ls, which was a significant step towards optimising administrative costs and improving accounting efficiency.

In addition, the introduction of eB/L has minimised risks associated with the human factor, eliminated the need for long-term storage of paper documents and ensured prompt settlements with carriers. Integration with platforms for obtaining digital signatures, such as PrivatBank and DepositSign, has simplified the process of signing documents, which also improved the speed and transparency of accounting operations.

Digital technologies reduced the probability of fraud and errors in accounting data, as automated systems provided more accurate and faster processing of information. This not only reduced operating costs but also improved their reputation in the market, increasing the trust of partners and customers. A striking example of Kernel's openness policy was the Open Agribusiness project launched in 2018. As part of the project, the company initiated a new format of relations with agricultural partners. Using a specially created IT platform, the programme participants

could study the production results of other participants online, implement successful experiences in their fields and share their results. This approach not only helped to increase business transparency but also created conditions for a long-term partnership based on mutual trust and openness.

As a result, accounting processes were significantly improved. Electronic documents signed by the CEP from mobile devices received a legitimate status with the signature of the responsible person. The grain accounting project was fully implemented, and each tonne loaded into a truck in the field was automatically entered into the accounting system, bypassing paper, which significantly increased the accuracy and efficiency of accounting data. A yield forecasting algorithm based on the analysis of satellite monitoring results was also implemented to predict gross grain production with high accuracy and optimise logistics and sales management. This algorithm was tested on all of the company's fields, and its high efficiency in planning and managing production processes was confirmed.

Digitalisation also improved the monitoring of production processes. All processes were centrally controlled through the control centre, where in 2019 Big Data

technologies were introduced to process data in real-time. This made it possible to automatically highlight events that required prompt action. All operations with inventory were carried out according to pre-created task cards that were downloaded to the equipment, which significantly increased the efficiency and accuracy of operations. These initiatives helped Kernel reduce costs, improve accounting efficiency and ensure sustainable development through the introduction of the latest information technology. Thus, the results pointed to the significant benefits of automating accounting processes and integrating modern technologies into the company's business processes.

The introduction of digital innovations in Kernel's accounting and production processes has contributed to significant changes in the company's financial performance. By integrating the latest technologies, such as accounting automation, digital weighing systems and the eTTN system, the company was able to significantly reduce data processing costs, improve financial results and increase the efficiency of management decisions. The impact of these innovations on key financial indicators for 2018 and 2024 is shown in Table 1.

Table 1. Dynamics of Kernel's financial performance in 2018-2024 (million USD)

Indicators	2017	2018	2024	Growth rate in 2024 compared to 2017 (%)
Income	2168.9	2403	3581	65.11
EBITDA	319.2	222.5	381	19.36
Net profit	176.2	52.1	168	-4.65
EBITDA profit margin	14.7	9.3	10.6	-27.89
Net margin	8.1	2.2	4.7	-41.98
Earnings Per Share	2.19	0.64	0.65	-70.32
Operating profit before changes in working capital	324.8	183.3	604	85.98
Changes in working capital	-324.8	-31.2	28	108.62
Financial expenses	-62.3	-78	-32	48.63
Tax payments	-18.8	-44	-32	-70.21

Source: compiled by the authors based on annual reports of Kernel (2018; 2024)

An analysis of the financial performance of Kernel Agro Holding for the period from 2017 to 2024 has demonstrated the significant impact of digitalisation on its economic performance. In 2017, the company demonstrated stable results: its revenues grew by 65.1%, and EBITDA increased by 19.36% in 2024 compared to 2017. However, in 2018, despite the increase in revenues to USD 2.403 million, EBITDA decreased to USD 222.5 million, which corresponded to only 9.3% of the margin. The main reason for this was an increase in operating expenses, in particular, financial expenses by 25% and tax payments by 2.3 times. The use of Big Data, automated processes and analytical platforms has significantly optimised operations, reduced costs and improved management efficiency.

Compared to 2018, in 2024, Kernel generated 49% more revenue and 71% more EBITDA. Accordingly, the EBITDA margin grew by 1.1 percentage points, while net profit increased 3.2 times. The positive dynamics of EBITDA margin and net margin since 2018 reflected increased asset utilisation and improved cost management, which

resulted from the success of strategic planning and modernisation of key business processes. This improved the efficiency of the cash flow management of the company. At the same time, financial costs were reduced due to improved transparency and accuracy of financial transactions. Overall, digital innovations have helped the company improve its competitiveness and financial stability in the market.

Strategies and innovative approaches to the digitalisation of accounting

Automation of accounting operations has become one of the main areas of accounting development. Data entry, reporting, and processing of financial documents have been greatly simplified using specialised software for cost accounting, account management, and automatic import of transactions from banking systems (Holovchak *et al.*, 2024). Automation and digital innovations have fundamentally changed accounting processes, reducing the time required to complete accounting tasks and increasing the accuracy of financial reporting by minimising errors. Accountants

can now concentrate on strategic aspects of financial management, such as decision-making and data analysis. At the same time, automated systems optimised operations, and standardised processes and provided greater transparency of financial data, which meets the modern requirements of the global business environment. Processing large amounts of data in real-time has become one of the key benefits of automation. This allows businesses to synchronise financial information with banking systems, making it easier to monitor payments and financial flows. These changes have affected both the technical elements of accounting and the overall structure of accounting departments, creating new opportunities for effective financial management.

Cloud computing has become an important element of accounting transformation, helping to automate processes, increase the efficiency of accounting operations and speed up reporting. Companies were able to access financial data from anywhere and at any time using cloud platforms such as M.E.Doc and SAP Business One, which were widely used in Ukraine. This was especially important for branched structures or remote access organisations (Artemieva & Chernai, 2020). Cloud solutions reduce IT infrastructure costs and provide flexibility in resource management. Companies could use these platforms on a pay-per-use model, which made them more profitable. In addition, cloud-based systems offer automatic software updates, giving users access to the latest features at no additional cost.

AI in accounting created new opportunities for automating repetitive operations, such as transaction processing, report generation, and account management. It provided high accuracy and efficiency in performing routine tasks, which far exceeded human capabilities. For instance, AI tools can be used for round-the-clock support of workflows by automating functions that previously required a significant amount of manual work, such as call centre support (Ponurina & Artyukh, 2021). Data analytics combined with AI-enabled accountants to extract useful information from large amounts of data, helping to identify trends and anomalies in the company's financial performance. This contributed to more accurate forecasting of financial performance, more efficient budgeting, and optimised strategic management. Integrating AI into accounting expanded business opportunities by automating complex processes, reducing the risk of errors, and increasing the speed and transparency of financial transactions.

AI in accounting has contributed to the automation of routine processes, such as transaction processing through robotic process automation. For example, AI systems could automatically check that financial transactions comply with regulations, identifying anomalies such as duplicate payments or inconsistencies in invoices. AI-powered data analytics enabled the integration of an application programming interface to process large amounts of transactions and generate automated reports on expenses and income.

Call centres use digital assistants and chatbots to analyse calls using natural language processing, automatically answer standard questions and direct complex requests

to the appropriate specialists. Anomalies in financial data were detected using data mining. This could include clustering transactions to identify atypical expenses, fraudulent transactions, or significant deviations from the budget.

Machine learning-based forecasting algorithms were used to create accurate cash flow forecasts, analyse costs, and assess financial stability. AI-assisted risk management included automatic budget control and integration of ERP systems to identify risks of cost overruns or failure to meet financial obligations. In addition, intelligent auditing helped to analyse compliance and provided document recognition through optical character recognition, which significantly increased the transparency of accounting processes. AI was also able to find patterns in accounting data, such as seasonal trends in income or expenses, by analysing big data. These patterns became the basis for making informed decisions in strategic planning. The integration of the Internet of Things has enabled the tracking of financial transactions in real-time, providing a high level of control.

Blockchain technology is also used in accounting. It ensured transparency and immutability of records, which made it particularly useful for financial reporting and auditing. Blockchain can be used to create distributed ledgers that can be accessed by all parties to a transaction, which increases the level of trust between the parties. The use of blockchain could significantly reduce the risks of fraud and errors in financial reporting. However, the introduction of this technology required significant investment in staff training and adaptation of existing systems.

Blockchain is used in such areas of accounting as international settlements, tax planning, settlements with counterparties, financial reporting, payment of taxes and fees, and recording of business activities in real-time. In addition, this technology provided quick access to state registers and the necessary information, which significantly improved the efficiency of accounting processes. The introduction of the blockchain helped automate accounting operations, improve communication between business process participants, multi-level data protection and increase the accuracy of financial information. For example, blockchain has reduced the risks of cyberattacks, fraud and intentional misuse of data, and has built trust between the parties through transparency and reliability of information. The transparency of financial transactions was greatly enhanced by blockchain technology, which stored data in decentralised records. Accounting and auditing became faster and more efficient as a result. For example, blockchain allowed for the creation of smart contracts that were executed automatically when certain requirements were met; this reduced manual work and increased accuracy (Mohamed & Ibrahim, 2023).

Along with the many benefits of using blockchain, there were challenges, such as the need for significant investment to adapt existing systems, staff training, and the need to ensure compatibility with traditional accounting platforms. Nevertheless, blockchain technology has great potential to improve accounting by providing process automation, data accuracy and speed of information processing.

Innovative financing methods, such as blockchain technologies and FinTech solutions, have become increasingly common. FinTech solutions included the use of digital platforms and applications for financial management, online lending, automated investment platforms (robo-advisors), and apps for budgeting and monitoring expenses. Blockchain financing methods included the use of distributed ledgers to ensure transparency of financial transactions, reduce fraud risks, and optimise accounting and settlement processes. For example, due to their speed and efficiency, blockchain-based money transfer services became increasingly popular as the technology provided security and transparency of financial transactions in accounting, automating the verification and confirmation of transactions, and reducing the risk of fraud and errors. Blockchain technology ensured transparency and security of transactions, which was an important factor in the business environment.

Electronic document management was actively introduced in accounting due to its ability to optimise document processing. It reduced the time required to search for, approve and sign documents, eliminated the risk of losing paper copies and improved control over transactions. The use of electronic document management ensured the legal significance of documents thanks to the Law of Ukraine No. 851-IV "On Electronic Documents and Electronic Document Management" (2003). The introduction of this technology allowed businesses to minimise the cost of paperwork and physical storage while increasing the transparency of accounting processes. However, a full transition to electronic document management requires investment in staff training and adaptation of accounting systems to new work formats (Gonçalves *et al.*, 2022).

Multi-level authentication and data encryption ensured the integrity and protection of information, which was critical in the financial sector. Cloud platforms also allowed for the integration of different accounting processes in one digital space, which improved collaboration between company departments. For small and medium-sized enterprises, the pay-as-you-go model significantly reduced IT infrastructure costs, making accounting more affordable by allowing them to use cloud-based accounting systems without the need for significant capital expenditures to purchase and maintain server hardware. This allowed the company to focus on the efficient management of financial data, as well as providing access to up-to-date software updates and the ability to scale resources to meet the needs of the enterprise.

Table 2 analyses the impact of new information technologies on accounting information systems. These benefits were particularly important for companies trying to become more competitive in a rapidly changing environment. However, automation and digital innovations also had disadvantages: the need to train staff to interact with new systems, the need to protect data from cyber threats, which required significant investments in cybersecurity, and the need to change corporate culture, as employees could resist change due to fear of losing their jobs or unwillingness to adapt to new circumstances. Thus, automation and digital innovations not only changed approaches to accounting but also contributed to the formation of new standards in accounting practice. Their implementation was a prerequisite for ensuring the efficiency and transparency of financial processes, especially in the context of globalisation and rapid technological development.

Table 2. Comparison of traditional and automated accounting

Aspect	Traditional accounting	Automated accounting
Execution time	Long (requires manual entry)	Fast (automated data entry and processing)
Accuracy	High error risk	High precision
Expenses	High (salaries of accountants)	Lower (less manual labour)
Information access	Restricted (physical access required)	Broad (access through the cloud, data transparency)
Focus of work	Routine tasks	Strategic analysis

Source: compiled by the author based on Z. Minovski *et al.* (2020)

The digitalisation of business processes was also a significant trend. It continued to change the business landscape, enabling companies to automate routine processes and increase productivity. The introduction of new digital technologies, such as AI and data analytics, helped businesses make more informed decisions based on real-world data. For example, the use of data analytics has allowed companies to not only better understand their customers' needs and tailor their products and services, but also to improve accounting efficiency. Big Data tools helped to improve tax risk assessment and planning activities based on the level of tax liabilities, which had a positive impact on business processes and overall business planning. This ensured more accurate forecasting, reduced the risk of

financial errors, and facilitated informed management decisions (Holovchak *et al.*, 2024).

The growing importance of environmental sustainability also influenced accounting, as companies increasingly integrated environmental aspects into their financial statements. For instance, the introduction of innovative solutions such as specialised carbon footprinting (Sphera, Carbon Footprint Manager) and environmental impact monitoring (Ecovadis, Sustainability) software has enabled companies to not only accurately measure and report their environmental impact but also integrate this data into their reporting. These systems automated the calculation of emissions using data on energy consumption, logistics operations and production processes. The data was then

integrated into accounting systems, allowing for environmentally focused reporting, such as sustainability reports or environmental, social and governance reports. These programmes also helped to identify financial risks associated with changes in environmental regulations and to forecast the costs of reducing the carbon footprint. In the accounting context, this allowed for a more accurate assessment of the costs associated with environmental initiatives and their proper recording in the financial statements, ensuring compliance with legal requirements. Such tools also helped to reduce financial risks, increasing the company's attractiveness to conscious consumers who value environmentally friendly products and services. The integration of environmental indicators into the financial statements, such as the "Form of Tax Declaration of Environmental Tax" (Order of the..., 2015), "Form No. 1-Environmental Expenditures (Annual) "Report on environmental protection expenditures"" (Order of the..., 2024), also facilitated management decisions aimed at optimising costs and increasing resource efficiency, which became an additional competitive advantage for the business.

Overall, businesses face many challenges and opportunities to implement innovative solutions. The digitalisation of processes, cooperation with start-ups and the use of AI were creating a new business landscape that allowed companies to gain a competitive edge (Shuplat *et al.*, 2022). Notably, successful innovation requires cultural and technological change. Companies had to be prepared to adapt to changes in financial reporting requirements and frequency of reporting, as well as to the introduction of new technologies for automating accounting processes. In the world of globalisation and rapid technological change, accounting has become not only substantial for ensuring transparency and accuracy of financial information but also a prerequisite for strategic planning and decision-making at all levels of business.

The growth of crowdfunding, venture capital and the digitalisation of business processes has created a new business landscape that has also affected accounting (Kwilinski *et al.*, 2022). Companies needed to adapt their accounting systems to accurately reflect crowdfunding and venture capital financing, addressing the specifics of these sources of investment. This included the correct classification of proceeds in the accounting records. For instance, in the case of crowdfunding, proceeds could be classified as revenue if they were consideration for goods or services provided, or as an advance if the money was received to finance future expenses.

In the case of venture capital, funds were generally accounted for as equity if the investor received an equity interest in the business or as a liability if the investment was provided in the form of a loan. Accounting for the terms of investor agreements involved a detailed analysis of key provisions, such as the amount of investment, the term of the investment, the rate of return, the procedure for paying dividends or interest, and the existence of conditions for converting debt into equity. For this purpose, special

accounts or sub-accounts were created in the accounting systems to record various aspects of the agreements, such as contingent liabilities or guarantees.

In addition, it was necessary to capture all changes in transactions using automated monitoring tools and integration with ERP systems, which helped ensure data accuracy and compliance with financial reporting standards such as International Financial Reporting Standards. The use of accounting platforms such as SAP, Oracle NetSuite, Xero and QuickBooks helped automate these processes, ensuring accuracy and transparency of reporting. The integration of these platforms with M.E.Doc allowed for the automatic exchange of financial transactions and reporting data between the systems, reducing the risk of errors and greatly facilitating the process of submitting tax reports and other mandatory documents.

Integration of accounting with innovative projects implemented in cooperation with start-ups and other partners could be achieved using modern technologies and adaptation of accounting systems to the specifics of such projects. Integration through the application programming interface allowed the accounting platforms described above to connect to the start-ups' digital platforms for automatic data exchange, which ensured accurate and timely reflection of financial transactions. ERP systems could be used to manage joint projects, combining finance, procurement and logistics data to ensure transparency and control. In addition, accounting systems could be set up to record joint project costs and revenues, including the use of separate accounts to reflect each partner's share. It was important to consider the social aspects of such changes, including training employees to work with new technologies, which could increase their motivation and efficiency.

Recommendations for the digitalisation of accounting

The first step to implementing digital innovations is to assess the current state of accounting procedures. This determines which parts of the accounting department need to be automated or improved, as well as gaps in existing processes. Assessing the current state may include analysing delays, data entry errors or high administrative costs that often accompany traditional accounting methods. Identifying problem areas helps to select the appropriate technologies that will automate accounting processes, improve the accuracy and speed of data processing, and reduce costs.

The second important step is to choose the right digital devices and technologies to automate accounting operations. The choice of tools depends on many factors, such as the size of the company, the type of its activities, the available budget and the specifics of its business processes. Small businesses can use simple accounting software such as QuickBooks or Xero, which provide basic accounting automation and easy reporting. Larger businesses with more complex business processes may need more comprehensive solutions, such as ERP systems that integrate accounting with other business operations, such as logistics, production, inventory and supply chain management. One

of the most important aspects of choosing such tools is the system's ability to store and process data in the cloud, which allows for real-time access to financial information and reduces physical infrastructure costs.

Cloud-based solutions such as M.E.Doc automate accounting and reporting processes, which significantly improves the accuracy and efficiency of accounting. In addition, systems based on Microsoft Azure and Google Cloud are actively used to process large amounts of data and identify financial trends, providing powerful analytical capabilities and allowing for the integration of data from various sources in real-time. SAP S/4HANA AI technology is actively used to detect anomalies in financial transactions, which allows timely prevention of fraud and forecasting of possible financial trends (Singh, 2024).

As the introduction of new tools requires significant changes in the working process, staff training becomes an important step in the digitalisation process. Employees should be trained not only in the technical aspects of the new tools but also in how these technologies help the company reduce costs, improve accounting efficiency and provide greater transparency in financial processes. The training should be comprehensive and include both theoretical and practical sessions so that employees can comfortably and quickly learn new responsibilities. An important part of this process is not only knowledge of the functionality of the new systems but also an understanding of how these systems affect the overall business performance.

Online courses and training on the Coursera and Ude-my platforms can be used to effectively train employees. For instance, the course "Introduction to Generative AI in Finance" on Coursera focuses on the use of generative AI to improve financial forecasting and data analysis in the financial sector, in accounting (Perchuk & Yosypenko, 2024; Vailaya, n.d.). The course Artificial Intelligence for Finance, Accounting & Auditing (2020) on the Ude-my platform teaches how to apply AI technologies to automate accounting processes and improve auditing. In addition, mobile applications such as M.E.Doc for smartphones are convenient, allowing users to learn new functions in real-time, providing flexibility and convenience of learning. In-house training at enterprises is also central and may include seminars, webinars and other forms of training that allow for the rapid integration of new technologies into daily work.

Once the staff is trained and the right tools are selected, the next step is to implement digital solutions in accounting. This involves installing the software, configuring it to integrate with other enterprise systems, and testing the user-friendliness of each interface.

Once new systems are implemented, their effectiveness should be regularly evaluated to understand how well the automation goals, such as reduced data processing time, lower administrative costs, and improved financial reporting accuracy, have been achieved. This also includes getting feedback from users to identify issues that need to be addressed. If the system is not working properly, corrective actions are taken to optimise performance.

The final stage of the process is the continuous optimisation and updating of digital tools. Technology is evolving rapidly, and for a company to remain competitive, it is necessary to regularly update the software and adapt the system to new conditions. This may include adding new features, improving data security, or integrating with other platforms. Continuous optimisation allows businesses to maintain a high level of efficiency in accounting processes and ensure their competitiveness in a dynamic market environment.

Discussion

Digital innovations have influenced the development of accounting and have been an important factor in improving the efficiency of business processes. Technological changes, including the automation of accounting operations and the use of modern digital tools, have helped to reduce costs, improve data accuracy and increase the transparency of financial statements. These innovations saved time on routine tasks and improved management functions, which was critical for companies seeking to remain competitive in a rapidly changing market.

Comparison with a study by P.J. Klenow & H. Li (2020) revealed a common focus on the role of innovation in improving productivity, but different approaches. In their study, P.J. Klenow & H. Li analysed economic growth through creative destruction, innovation in leading firms, and new product introduction. They showed that large companies with innovations in existing products were the key drivers of economic growth. In contrast, this study looked at digital innovation, including the automation of business processes and the introduction of digital technologies that reduced costs and improved the accuracy of financial reporting. In addition, P.J. Klenow & H. Li addressed the macroeconomic aspects of innovation, while this study focused on the practical aspects of its implementation.

Scientists N. Rehman & O. Mena (2024) and this study highlighted the importance of digital technologies in modernising accounting and improving business efficiency. In their work, N. Rehman & O. Mena analysed the impact of technologies such as AI and blockchain on creating ethical, inclusive and sustainable accounting practices, as well as their role in improving the social and organisational aspects of business. At the same time, this study focused more on practical aspects, such as the automation of routine tasks, the use of cloud technologies and the implementation of electronic consignment notes, with a focus on economic outcomes, including cost reduction and increased transparency.

B. Odonkor *et al.* (2023) correlated with this study in recognising the importance of automating accounting processes to improve data accuracy, reduce human error and optimise the handling of large amounts of information. The authors of both studies emphasised that modern technologies such as AI and automation have greatly facilitated routine tasks, accelerated the processing of financial data and increased the transparency of accounting processes. An important common conclusion was that the introduction of these technologies helped to reduce the cost of

administrative processes and increase management efficiency. A.A. Vărzaru *et al.* (2022) correlated with this study in recognising the importance of introducing innovative tools to improve financial and management processes, as well as in noting the positive impact of innovation on the performance of enterprises in the face of economic instability. Both approaches emphasised that the latest tools helped businesses adapt to changing economic conditions. However, A.A. Vărzaru *et al.* paid more attention to management tools, such as balanced scorecards, cost life cycle and economic value added, which were aimed at achieving long-term sustainability. In addition, their study considered adaptation to external economic conditions, including crises, which were not covered in this study.

Researchers M.M. Yassin & A.A. Toumeh (2024) studied the impact of business intelligence and automation of accounting processes on accounting, emphasising the importance of adapting professional education to technological change. The authors noted that automation reduced costs, improved decision-making, and increased efficiency by reducing the risk of errors. The study addressed the integration of modern technologies into training programmes to prepare accountants to use innovative tools. This study focused on the implementation of digital platforms in enterprises. The ideas of M.M. Yassin & A.A. Toumeh on training complemented the practical approach of this study, as qualified professionals were key to the successful implementation of innovations.

F. Aslam & A. Tonazzo (2024) considered an interdisciplinary approach to accounting, combining traditional practices with psychology, sociology, and digital technologies. The main emphasis was devoted to the impact of AI and automation on accounting processes, which increased accuracy, data processing speed, and reduced costs. The authors emphasised the importance of preparing accountants for digital transformation by integrating business intelligence into educational programmes. The interdisciplinary approach helped to expand the boundaries of accounting and adapt to modern challenges. The research focused on the practical use of technology to automate accounting processes and improve reporting transparency and operational efficiency.

D. Sheibuta *et al.* (2024) studied the impact of innovation strategies on the development of small and medium-sized enterprises, on their adaptation to market changes and competitiveness. Their findings were consistent with the present study, as both emphasised the importance of innovation for enterprise development. However, the study by D. Sheibuta *et al.* addressed general business development strategies, while the present study focused on technological innovations in accounting, in particular, automation of accounting processes. Both approaches supported the idea that innovation contributed to increased competitiveness, but the focus of this study was on specific tools to optimise accounting and financial processes, which reduced costs and improved financial performance. Yu. Klius *et al.* (2024) examined the impact of innovation strategies

on the development of entrepreneurship and business. The authors analysed how strategic innovations could improve management functions, promote the development of new markets and increase the competitiveness of companies. The authors also addressed the importance of innovation for business growth and adaptation to market changes. A common thread with this study was the focus on innovation to improve the efficiency of enterprises. Both surveys highlighted the importance of technological change in improving company performance.

Scientists J. Abbas *et al.* (2024) and the present study agreed that digital innovation had a significant impact on improving the efficiency of enterprises. Both studies emphasised the importance of using the latest technologies to improve financial performance and increase the competitiveness of companies. The study by J. Abbas *et al.* noted that digital technologies had an impact on the overall strategy of the enterprise and market competition, which correlated with the increase in efficiency resulting from the use of such technologies. This study also confirmed the positive impact of the introduction of digital tools, in particular eTTN and automation of accounting processes, on reducing costs and improving the accuracy of financial reporting. Both studies emphasised the importance of digitalisation for improving business process efficiency and competitiveness, but this study was more focused on the practical aspects of using these technologies in the Ukrainian agricultural sector, while the study by J. Abbas *et al.* addressed more general trends and strategies for enterprises in a global context.

Authors B. Murphy *et al.* (2024) studied the use of AI, in particular machine learning, in accounting to predict financial data, detect fraud, and improve auditing. The authors showed that AI was changing the traditional functions of accountants by automating processes but retaining their role in strategic management and decision-making. Their conclusions were consistent with this study in that technology was not replacing accountants, but changing their functions, focusing on data analysis. However, there were inconsistencies: this study focused on the practical implementation of digital innovations to improve economic efficiency, while B. Murphy *et al.* explored more theoretical aspects and used topic modelling to analyse trends in the accounting field.

R. Hasibuan *et al.* (2024) addressed the creation of affordable software for the financial accounting of small and medium-sized enterprises, which helped automate accounting processes and reduce human errors. The study analysed the accessibility and simplicity of the software, which could be used by both students and entrepreneurs who did not have the necessary knowledge to work with complex accounting systems. This research was consistent with this paper in the context of using technology to automate accounting and reduce errors. Both approaches emphasised the importance of technological solutions to improve the efficiency of financial processes. While R. Hasibuan *et al.* emphasised small enterprises and simplifying accounting processes, the current study analysed larger enterprises

with more complex accounting needs and the use of more comprehensive technological solutions for digitalisation.

This study, as well as A.R. Hasan (2022), investigated the impact of AI on accounting and auditing, in particular, the automation of routine tasks and efficiency. However, A.R. Hasan analysed the concept of AI in the context of the overall digital transformation, including changes in the role of accountants and auditors, who had to adapt to new technologies through education and training. The author also analysed the strategic impact of AI on the profession in the long term, including ethical challenges and the need for an interdisciplinary approach. This study focused mainly on the practical aspects of implementing digital tools to reduce costs and optimise processes.

The conclusions of O.H. Ovharhe & C.J. Akandu (2024) and M.H. Naeem *et al.* (2023) correlated with the study in the common aspect of recognising the importance of innovation for increasing efficiency, reducing costs and optimising processes. The study emphasised that innovation was a key factor in competitiveness, contributing to improved governance, data transparency and information accessibility. O.H. Ovharhe & C.J. Akandu highlighted strategic aspects such as fragmented innovation, while M.H. Naeem *et al.* emphasised technology, including mobile banking and automation. However, the study by M.H. Naeem *et al.* noted both positive and negative impacts of innovation, such as inflationary pressures from mobile banking, while this study assessed digital innovation as exclusively positive. The main difference between the approaches was the level of analysis: M.H. Naeem *et al.* looked at the macroeconomic context using data from 92 countries, while O.H. Ovharhe & C.J. Akandu used panel data for strategic analysis, and this study focused on the corporate level using case studies. All these approaches confirmed the importance of innovation as a driver of efficiency and optimisation of business processes.

The studies by N.R. Sallem *et al.* (2024), and N.S. Zamain & U. Subramanian (2024) followed the present study in identifying the importance of AI in improving efficiency, automating processes, and ensuring transparency and accuracy of accounting. All these studies recognised the role of AI in detecting fraud, supporting strategic decisions, reducing errors, and enhancing analytical capabilities. However, the study by N.R. Sallem *et al.* highlighted bibliometric analysis, identification of publication trends, key authors, and collaboration between countries, while N.S. Zamain & U. Subramanian analysed in detail the impact of AI on the transformation of the professional role of accountants, as well as the risks of implementation, such as ethical issues and high cost. In turn, this study highlighted the practical implementation of digital technologies within companies and their impact on business efficiency. In addition, N.R. Sallem *et al.* considered ethical challenges, data privacy issues, and job loss risks, while N.S. Zamain & U. Subramanian analysed the impact of AI on the professional activities of accountants, which was not covered in the current study. Digital

innovations in accounting reduced costs, increased accuracy and transparency, optimised processes, reduced the risk of errors, and ensured fast decision-making, contributing to sustainable business development.

Conclusions

The study highlighted the critical importance of introducing digital innovations in accounting as a key factor in ensuring the economic growth of enterprises. In the context of modern globalisation and rapid technological change, the use of the latest technologies, such as accounting process automation, AI, cloud technologies and blockchain, has significantly improved the efficiency of financial management, reduced costs, and increased the accuracy and transparency of financial reporting. Digitalisation has not only contributed to the efficiency of accounting but also created new opportunities for optimising all business processes.

The study of the financial performance of Kernel demonstrated the importance of digital tools in achieving significant economic results. The analysis showed that the introduction of innovative technologies, such as automation of accounting processes and precision farming systems, has reduced costs, increased management efficiency and improved EBITDA. However, despite this, in 2018, the company faced a 30.3% decrease in EBITDA compared to 2017. This was due to higher operating expenses and lower margins, which indicates the need for further cost optimisation. However, in 2024, Kernel showed positive dynamics using new technologies, such as eB/L, which significantly reduced document flow costs, increased transparency of financial and logistics processes, and reduced risks associated with the transportation of products. Digital solutions were among other factors that contributed to a 49% increase in revenues compared to 2018, as well as a 71% increase in EBITDA. Net profit reached 168 million USD, reflecting the overall positive impact of the implemented innovations and optimisation of business processes.

In general, the introduction of digital technologies in Kernel's accounting has become an important factor in the company's sustainable development and increased competitiveness in the market. Given the results achieved, it is possible to argue that the digitalisation of accounting directly affected the company's economic performance increasing the efficiency of asset use, reducing costs and improving management processes.

The study confirmed that digitalisation was a prerequisite for achieving sustainable economic growth. The introduction of the latest technologies not only reduces costs but also significantly increases the competitiveness of the enterprise, which is critical in a rapidly changing market. The use of tools such as Big Data, automation of accounting processes and precision farming systems allows businesses to optimise internal processes, and increase the efficiency of accounting and financial reporting, which in turn improves financial results and ensures transparency.

In the context of the overall economic environment, the digitalisation of accounting has given businesses the

flexibility and ability to respond quickly to changes arising from technological innovations, changes in the economic situation and market needs. Given Kernel's experience, it is possible to conclude that the correct implementation of digital technologies not only allowed the company to maintain its stable development but also significantly increased its competitive advantages.

For SMEs, the introduction of digital technologies could be a challenge, requiring additional investment in staff training and adaptation of existing systems. To effectively implement such tools, businesses need to actively work on improving their internal processes and infrastructure. This included not only technical solutions, but also organisational changes aimed at optimising the work of all business units. In the future, given the rapid development of technology, businesses must implement innovations and adapt their business processes to remain competitive.

Recommendations were developed for the digitalisation of accounting, which included an assessment of the

current state of accounting procedures to identify problem areas. The selection of appropriate digital tools, such as cloud-based solutions (M.E.Doc) and ERP systems, helped automate accounting and improve the accuracy of financial data. To implement digital solutions effectively, staff training was required through online courses and workshops. Once the systems have been implemented, it is necessary to evaluate their effectiveness and continuously optimise them.

Further research can conduct a comparative analysis of the impact of digitalisation of accounting on enterprises of different industries and sizes, as well as assess the long-term effects of the introduction of innovative technologies in financial management.

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Conflict of Interest

None.

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Цифрові інновації в бухгалтерському обліку як фактор економічного зростання підприємства

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Анотація. Метою дослідження було проаналізувати вплив цифрових інновацій на бухгалтерський облік та ефективність фінансових процесів підприємств. Методологія включала аналіз фінансових показників компанії Kernel, одного з лідерів агропромислового сектору України. Порівнювались ключові фінансові показники підприємства до і після впровадження цифрових інновацій, таких як автоматизація облікових процесів, використання оптичного розпізнавання символів і впровадження електронних товарно-транспортних накладних. Розглянуто, як сучасні технології автоматизації обліку, машинне навчання, аналітика даних, алгоритми прогнозування, штучний інтелект (ШІ) для виявлення аномалій, хмарні технології та блокчейн змінювали підходи до ведення обліку, знижуючи витрати, підвищуючи точність і прозорість фінансової звітності. Результати дослідження показали, що впровадження цифрових інструментів дозволило Kernel суттєво покращити ключові економічні показники. Доходи зросли з USD 2168,9 млн у 2017 році до USD 3581 млн у 2024 році (+49 % порівняно з 2018 роком). Показник прибутку до сплати відсотків, податків, амортизації та зносу компанії зріс з USD 319,2 млн до USD 381 млн (+71 %), а чистий прибуток у 2024 році склав USD 168 млн. Застосування електронних товарно-транспортних накладних забезпечило ефективне управління логістичними процесами, мінімізувало ризики та покращило управління транспортуванням продукції. Використання діджитал-технологій сприяло підвищенню ефективності операцій, скороченню витрат та покращенню економічної результативності. Встановлено, що автоматизація облікових операцій за допомогою впровадження цифрових платформ, таких як система електронних товарно-транспортних накладних та інтеграція хмарних технологій, дозволила скоротити час на обробку фінансових даних, знизити ймовірність помилок і підвищити точність фінансової звітності. Рекомендації для українських підприємств включали впровадження автоматизації облікових процесів, що охоплювало використання облікових програм, зокрема QuickBooks, а також інтеграцію блокчейн для підвищення безпеки та прозорості фінансових транзакцій. Дослідження підтвердило, що цифрові інновації в бухгалтерії були не лише технологічною необхідністю, але й важливим фактором економічного зростання підприємств, який дозволив знижувати витрати, покращувати управлінські рішення, оптимізувати контроль бюджетів і підвищувати конкурентоспроможність компаній на ринку.

Ключові слова: цифровізація; автоматизація; фінансові технології; ефективність; аналіз даних; конкурентоспроможність