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Methodology for implementing digital financial controlling tools in companies in Kyrgyzstan

Tilek Toichiev*
Postgraduate Student
University of Nevada
89154, 4505 S. Maryland Parkway, Las Vegas, United States of America
https://orcid.org/0009-0005-6196-2208

Abstract. This study aimed to analyse approaches to the effective use of digital technologies to improve the performance of the financial controlling system in companies in Kyrgyzstan. The methodological basis of the research was a systemic approach, including the analysis of corporate reporting, a comparative analysis of digitalisation practices and an assessment of the functional components of financial controlling. Within the framework of the study, a comprehensive analysis was carried out of three open joint-stock companies – OJSC Eldik Bank, OJSC "Electric Power Stations" and "Kumtor Gold Company", which made it possible to identify differences in the levels of digital maturity of financial management in the banking, energy and industrial sectors. The analysis showed that in the financial sector integrated information systems are most actively implemented; these ensure the automation of management accounting, centralised access to financial data and the development of analytical tools to support managerial decision-making. In the industrial sector, digitalisation has covered the automation of production and financial accounting, as well as the introduction of Business Intelligence platforms for data analysis and the conduct of electronic tenders. This contributed to improving the accuracy of cost-forecasting, reducing the time needed for budgeting and ensuring the output of 13.567 kg of gold with tax payments that exceeded KGS 17.2 billion in 2023. In conclusion, practical recommendations are presented for Kyrgyz companies, including a comprehensive diagnosis of accounting systems, the development of a digital transformation roadmap, the introduction of enterprise resource planning platforms with integrated management accounting modules, and the development of staff competences in analytics and financial forecasting. The practical value of the study lies in the proposal of specific recommendations for Kyrgyz enterprises and financial managers on the implementation of digital controlling tools

Keywords: forecasting; strategic planning; analytics; management decisions; budgeting

Introduction

In the context of accelerated digital transformation, expressed in the introduction of cloud technologies, automated accounting systems and the transition to electronic document management, one of the priority tasks of companies in Kyrgyzstan is to improve the efficiency of financial flow management and control over the use of resources. Trends associated with the widespread automation of business processes, the growth in data volumes, the strengthening role of analytics and the need for rapid responses to market changes require a transition from traditional methods of financial controlling to innovative digital tools that ensure prompt access to data, automation of analysis and improved accuracy of managerial decisions. Despite the growing interest in digital technologies, the process of the introduction into the financial controlling system of Kyrgyz enterprises faces a number of problems. The main ones include an insufficient level of digital maturity of organisations, limited qualified personnel in the field of financial technologies, as well as the absence of unified methodological approaches to the integration of digital tools into the controlling system. On this basis, the relevance of the study is determined by the need to develop scientifically grounded recommendations and methods aimed at improving the effectiveness of financial controlling through digitalisation.

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*Corresponding author

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Issues of digitalisation of financial controlling have become the subject of scientific research, which indicates a growing interest in the problem of increasing the transparency and efficiency of financial management in the digital economy. M.T. Kologonov (2024) examined the influence of cloud technologies on the system of management accounting and financial analysis. The author proved that the transition to cloud solutions allows companies to increase the speed of processing financial information, reduce infrastructure costs and ensure data availability for all management levels. P. Hofmann *et al.* (2020) focused on the transparency and reliability of financial data. The study showed that the introduction of electronic document management systems and automated reporting forms helps to reduce the number of errors and eliminate the duplication of information.

The development of the theme was traced in the study by N. Temirov *et al.* (2023), who examined the possibilities of integrating digital tools into planning and budgeting processes. According to the study, the use of automated controlling systems makes it possible not only to reduce the time needed to generate planned indicators, but also to ensure flexibility of adjustments when market conditions change. J.B. Awotunde *et al.* (2021) supplemented this point of view by examining the potential of Big Data technologies in the system of financial analysis. The authors found that the use of analytical platforms with elements of machine learning helps to identify hidden patterns in financial flows and to predict possible risks.

In turn, S. Yuldoshboy *et al.* (2025) focused on the managerial risks of digitalising controlling. The researchers emphasised that the introduction of technologies without a preliminary audit of existing information systems may lead to inefficiency and duplication of functions. The role of the human factor in the digital transformation of financial controlling was examined by M. Buenestado-Fernández *et al.* (2023). The authors proved that the level of digital competence of financial specialists is a key success factor in the implementation of new technologies. Without systematic staff training, even modern digital solutions do not provide the desired effect, which is relevant for developing economies.

The practical significance of the digitalisation of controlling was demonstrated by G. Dzieża & M. Sikora (2022), who studied the introduction of monitoring dashboards at industrial enterprises. The scholars found that such tools increase the transparency of financial processes, accelerate communication between divisions and help to reduce the time needed to prepare management reports. Similar conclusions were drawn by A. Kadyraliev *et al.* (2024), who noted that the automation of controlling processes makes it possible to significantly reduce the costs of internal audit and to minimise the risk of subjective errors. The authors emphasised that digital tools provide a transition from reactive to proactive management, in which the company is able to anticipate deviations and prevent financial risks at early stages.

In the work by V. Corvello *et al.* (2023), the influence of digital controlling on the resilience of enterprises in crisis conditions was considered. The authors concluded that companies that had implemented digital solutions for financial analysis and monitoring demonstrate more stable results even when market activity declines. E. Llazo *et al.* (2024) proposed a systemic approach to the digitalisation of controlling, considering it as an element of a unified corporate information environment. The researchers proved that the integration of digital tools with accounting, planning, and analysis systems makes it possible to create a continuous management circuit in which data become the basis of strategic decisions.

The analysis of the above-mentioned studies showed that digital technologies increase the effectiveness of financial controlling. Despite the progress in studying the influence of digital technologies on the system of financial controlling, there remain a number of aspects that require further scientific reflection. Firstly, methodological approaches to the comprehensive introduction of digital tools into controlling practice, taking into account the peculiarities of the organisational structure and digital maturity of enterprises in Kyrgyzstan, have not been sufficiently studied. In addition, scientific sources do not sufficiently present practical algorithms for integrating digital platforms that ensure end-to-end control of financial flows – from planning to the analysis of results.

The aim of the study was to analyse ways of integrating digital technologies into the management control system of companies in Kyrgyzstan in order to increase its efficiency and adaptability to economic conditions. Within the framework of the study, tasks were set to examine current trends and conceptual approaches to the digital transformation of financial controlling, to diagnose the level of digital maturity of companies in Kyrgyzstan and the readiness to implement the relevant tools, and to develop methodological recommendations for adapting and integrating digital technologies into the controlling system, taking into account national and organisational characteristics.

Materials and Methods

The study was based on the integrated use of systemic, comparative and analytical approaches, which made it possible to consider financial controlling as an integrated part of corporate governance under conditions of digital transformation. The methodological basis included the analysis of the theoretical provisions of modern controlling and the study of digital tools for planning, analysis and accounting using the example of enterprises in Kyrgyzstan, Germany, the United States (US), Eastern (Poland and the Czech Republic) and Northern Europe (Finland). These regions were selected due to differences in models of controlling digitalisation: from highly mature integrated systems to adaptive solutions forming under conditions of structural changes in the economy.

The object of the study was Enterprise Resource Planning (ERP) and Business Intelligence (BI) platforms used in financial controlling. The systems Standard Assessment Procedure (SAP, n.d.), Oracle (n.d.), Microsoft Dynamics 365, as well as BI tools Power BI, Tableau and QlikView were considered. For each platform, the degree of integra-

tion with management accounting, the availability of budgeting tools, the level of reporting automation, the coverage of business processes, support for predictive analytics and artificial intelligence (AI), scalability and data visualisation capabilities were analysed. These criteria made it possible to compare the functional potential of the systems and to determine the applicability for forming a digital controlling circuit at enterprises in Kyrgyzstan.

Within the framework of the comparative analysis, enterprises demonstrating different models of controlling automation were examined. In Germany, the analysis included the use of SAP S/4HANA and Qlik Sense using the example of Siemens AG, where controlling is organised on the basis of integrated information solutions; for the study of the structure and tools of corporate controlling, the "Annual Report for fiscal 2022" of Siemens AG (2022) was analysed. In the US, the corporations General Electric Company (n.d.) and IBM (n.d.) were examined, applying the platforms Predix and IBM Planning Analytics, oriented towards working with large data sets and analytical models. In Eastern Europe, attention was paid to Żywiec Group (n.d.) (Poland) and Group CEZ (n.d.) (the Czech Republic), which use Oracle NetSuite and Microsoft Dynamics 365 as tools for standardising planning and management accounting processes. In Finland, the analysis covered the integration of environmental, social, governance (ESG) indicators into controlling systems, which reflects the expansion of the functional purpose of digital platforms. The comparison carried out was aimed at identifying elements of international experience that are potentially adaptable to the conditions of Kyrgyz companies.

The analysis included enterprises with available financial reporting and data on digital transformation: Eldik Bank (2023), Consolidated financial statements… (2024) and Kumtor Gold Company (n.d.). The selection was due to sectoral specificity and differences in the degree of digital maturity, which made it possible to trace the features of controlling development in the banking, energy and industrial-mining sectors in Kyrgyzstan. The analysis included the study of the platforms used, the integration of automated accounting systems and the mechanisms for using analytical tools in managerial processes. Materials were examined for the period 2021-2024, since it was during this time that the active introduction of integrated digital systems took place and the role of financial analytics in ensuring the managerial sustainability of enterprises strengthened. Thus, the materials and methods applied ensured a comprehensive study of the digital transformation of financial controlling in the Kyrgyz Republic and made it possible to link theoretical concepts with practical results reflecting the real impact of ERP and BI technologies on the effectiveness of corporate governance.

Results

Financial controlling is a mandatory element of the modern enterprise management system and represents an integrated mechanism that combines the functions of planning, analysis, accounting, and control. Its essence lies not merely in observing financial results, but in managing these results through a system of information, forecasting and regulation. Controlling provides managers with reliable and timely data necessary for making well-founded managerial decisions (Li *et al.*, 2020). Unlike classical control, which focuses on identifying errors post factum, controlling is aimed at preventing deviations, forming development scenarios and achieving the strategic goals of the enterprise. Thus, it performs the role of a navigational tool that helps the organisation maintain financial stability under conditions of a changing external environment.

The essence of controlling is manifested in its systemic nature. It covers the entire managerial cycle – from strategic planning to the analysis of budget execution and the adjustment of managerial decisions. Controlling is not limited to individual functions of accounting or audit, but integrates these functions into a unified analytical system. Its main purpose is the coordination of planning and control processes in such a way that the enterprise can not only achieve its set goals, but also adapt to changing market conditions (Alawaqleh, 2021). In this context, controlling becomes the foundation of business, linking the strategic and operational levels of management. It creates the information basis on which the whole system of managerial decisions is built.

Functionally, financial controlling performs several key tasks without which effective management of an organisation is impossible. First and foremost, this is the planning and analytical function, which includes the formation of budgets and financial plans, forecasting income and expenditure, as well as the analysis of the implementation (Fuertes *et al.*, 2020). On its basis, management gains the opportunity to assess the correspondence of actual results to planned goals and to adjust strategy in a timely manner. The second function is coordination. Controlling ensures the alignment of interests between divisions, helps to eliminate the duplication of functions and to optimise the use of resources (Basiru *et al.*, 2023). This is important for large enterprises where financial, production and marketing departments operate in a fragmented way.

The control function of controlling is expressed not only in checking the correctness of accounting, but also in assessing the efficiency of economic activity. It makes it possible to identify inefficient processes, excessive costs and internal risks in a timely manner. However, unlike classical control, controlling is not limited to recording errors – it offers mechanisms for the prevention and elimination (Tamulevičienė & Androniceanu, 2020). Another important function is information support, which consists in the collection, processing, and interpretation of data for managerial needs. Modern enterprises work with a huge volume of information, and it is precisely controlling that ensures its structuring, reliability and analytical value (Dědečková, 2020). Owing to this, managers are able to make decisions based on objective indicators rather than on intuition.

The role of financial controlling in the enterprise management system goes beyond financial analysis or budget

planning. In modern conditions, it performs a strategic function, contributing to the formation of the company's long-term sustainability. Controlling ensures a balance between profitability, liquidity and risks, helps to optimise the capital structure and to allocate resources rationally. It transforms financial information into a management tool oriented towards achieving specific economic results. Under conditions of high market volatility, controlling becomes a key instrument of crisis management, enabling rapid responses to changes and preventing threats to financial stability.

The role of financial controlling has been significantly strengthened by the development of digital technologies. Modern digital solutions, including business analytics (BI) systems, artificial intelligence and machine learning, make it possible to analyse huge data sets with high speed and accuracy (Paramesha *et al.*, 2024). As a result, financial controlling acquires a proactive character: managerial decisions are formed on the basis of not only historical but also forecast indicators. This approach significantly increases the adaptability of the enterprise, shortens planning cycles and improves the quality of strategic decisions.

ERP systems acquire particular importance in the process of digital transformation of controlling, as these systems ensure the comprehensive integration of financial, production, HR and logistics data, forming a single information space of the enterprise. The use of such platforms as SAP (n.d.), Oracle (n.d.) ERP Cloud and Microsoft Dynamics 365 makes it possible to combine fragmented data flows into a single management accounting system, which contributes to the formation of end-to-end financial analytics – from operational indicators to strategic metrics. These systems differ in the level of integration with budgeting processes, the depth of reporting automation, scalability, and the application of artificial intelligence for predictive analytics. BI platforms such as Power BI, Tableau and QlikView play an equally important role in the controlling system, providing tools for data visualisation, analysis and forecasting. These solutions differ in the level of integration with ERP systems, the depth of analytics, user interface and the capabilities for implementing predictive models. For a systematic comparison of the capabilities of ERP and BI platforms, Table 1 is presented, reflecting the key criteria for assessing the effectiveness in the context of financial controlling.

A comparative analysis showed that ERP and BI platforms possess different functional advantages and optimal areas of application: SAP provides the highest level of integration with management accounting and advanced tools for scenario modelling; Oracle ERP Cloud is distinguished by flexible configuration of budgeting processes and reporting automation; Microsoft Dynamics 365 is characterised by an accessible architecture for small and medium-sized businesses and combines management accounting with the capabilities of analytics and machine learning. Among BI tools, Power BI demonstrates high compatibility with Microsoft Dynamics 365, Tableau with Oracle ERP, and

Table 1. Comparative characteristics of ERP and BI platforms according to digital controlling criteria

Evaluation criterion	SAP	Oracle ERP Cloud	Microsoft Dynamics 365	Power BI	Tableau	QlikView
Integration with management accounting	High, support for comprehensive management analysis	Medium, can be customised for the sector	Medium, with limitations in the basic version	High with Microsoft Dynamics	Medium with Oracle ERP	High with SAP
Budgeting tools	Full cycle of planning and forecasting	Flexible configuration of budget scenarios	Basic functions, integration via Power Apps	Configuration of budget dashboards	Support for reporting	Analytics of budget indicators
Reporting automation	Full, with support for IFRS and local standards	Automated, with the possibility of user templates	Partial, requires further development	Automatic data updates	Interactive reports	Visual analytics
Coverage of business processes	Production, logistics, finance, HR, procurement	Finance, procurement, CRM, HR	Finance, sales, service	Analytics across all ERP modules	Financial and operational analytics	Comprehensive KPI analysis
Support for AI and predictive analytics	Built-in SAP Analytics Cloud modules	Uses Oracle Artificial Intelligence (AI) and ML Services	Support via Azure AI	Forecasting based on ML	Advanced analytics via Einstein Discovery	Forecasting based on SAP data
Scalability and adaptability	High, corporate level	High, cloud architecture	Medium, suitable for SMEs	High, depends on ERP integration	Medium	High
Level of data visualisation	High via SAP Analytics Cloud	Medium, reports in Oracle Analytics	Medium, Power BI dashboards	Maximum	Maximum	High

Note: CRM – Customer Relationship Management, HR – Human Resources, KPI – Key Performance Indicators, IFRS – International Financial Reporting Standards, ML – Machine Learning

Source: compiled by the author based on SAP (n.d.), Oracle (n.d.)

QlikView with SAP, which makes it possible to form comprehensive systems for real-time data analysis. Overall, the combination of SAP and QlikView represents the most comprehensive option for deep integration of accounting and visualisation, whereas the bundle of Microsoft Dynamics 365 and Power BI is the most rational for medium-sized enterprises in Kyrgyzstan in terms of cost, functional sufficiency and ease of implementation.

A significant contribution to the development of digital controlling is made by the use of cloud technologies. The transition to cloud solutions provides companies with access to financial data regardless of location and allows optimising IT infrastructure costs (Nutalapati, 2024). For companies in Kyrgyzstan, where resources are often limited, cloud platforms have become a real alternative to expensive corporate systems. Such platforms offer the opportunity to automate the main processes of financial accounting, and when integrated with BI tools, to obtain full-scale analytics and forecasting (Narayan, 2022). Thus, digital transformation makes financial controlling accessible not only to large corporations, but also to small and medium-sized businesses, forming the basis for more rational and transparent management.

Digitalisation also changes the role of the financial controller. The controller becomes a digital strategist capable of managing data and creating analytical models for forecasting future scenarios. The controller of a new generation combines financial, technological and managerial competences, which requires a revision of approaches to the training of specialists. In this context, the development of a financial analytical culture – the ability to use data not only for reporting but also for developing decisions aimed at creating added value – becomes particularly relevant.

Financial controlling in companies in Kyrgyzstan is at a formative stage and has not yet become a full-fledged element of the management system. Enterprises are limited to accounting and tax accounting, while the functions of planning, analysis and forecasting are poorly developed. This is explained by the historical orientation of business towards short-term goals – ensuring liquidity, minimising costs and fulfilling tax obligations – rather than towards long-term strategic development. One of the main problems is the absence of specialised controlling units. At enterprises, the functions of analysis and control are distributed between the accounting and finance departments, which leads to fragmented information and reduced effectiveness of managerial decisions. Controlling is perceived not as a tool of strategic management, but as a technical part of reporting (Ashymova, 2020).

The second significant factor is the low level of digital maturity of business. The most widespread solutions – 1C:Enterprise and local cloud platforms – are used predominantly for accounting. The capabilities of these systems for management analysis, budgeting and BI monitoring remain unrealised. The main reason is the lack of specialists capable of working with analytical tools and interpreting financial data in a managerial context. Staff shortages are one of the key problems. In universities in Kyrgyzstan, controlling is studied superficially, without an emphasis on digital technologies and integrated management systems. Therefore, even financial specialists often do not master modern tools of analysis and forecasting (Dzhumagulov & Mistriukova, 2025).

Nevertheless, trading and manufacturing companies in Bishkek and Osh have begun to introduce elements of management accounting and BI dashboards for the analysis of sales and costs (World Bank Group, 2025). This makes it possible to accelerate the preparation of reports and increase the transparency of financial flows. The main barriers to the development of controlling are a fragmented digital infrastructure, data fragmentation and the high dependence of business on external factors (exchange rates, tax instability, import dependence). However, the growing interest in analytics and participation in national digitalisation programmes create preconditions for the formation of modern digital controlling.

In countries with developed economies, the digitalisation of financial controlling has become an important direction for improving management efficiency and the transparency of business processes. For example, in Germany, where controlling has formed as an independent management concept, leading companies actively use SAP S/4HANA ERP systems and Qlik Sense BI platforms to integrate data from various divisions. For instance, the Siemens AG group (2022) implemented a centralised system of digital controlling that makes it possible to monitor cost indicators in real time, forecast cash flows and analyse the efficiency of investment projects. This made it possible to accelerate the preparation of management reporting by more than 40% and to reduce the number of manual operations. German experience demonstrates that digital controlling is not limited to automation; it becomes a tool for strategic analysis and support for decisions at the level of corporate governance.

In the United States, financial controlling is developing in close connection with artificial intelligence technologies and big data analytics. Large corporations such as General Electric Company (n.d.) and IBM (n.d.) have integrated machine-learning tools into the controlling system, which forecast financial results and identify anomalies in data flows. For example, at General Electric Company, the digital platform Predix is used to build financial models reflecting the influence of production and market factors on profitability. Due to this, controllers can quickly identify inefficient areas and reallocate resources. Similar systems make it possible to move from retrospective analysis to predictive management, when decisions are made on the basis of scenario forecasting rather than post factum reports. IBM has implemented a similar approach by introducing the intelligent IBM Planning Analytics platform, built on TM1 technology and integrated with Watson artificial intelligence tools. This system ensures automated budget formation, scenario analysis and cash flow forecasting with consideration of market factors.

In Eastern European countries, the digital transformation of controlling has become relevant in the context of integration into the European economic system. For example, in Poland and the Czech Republic, cloud ERP solutions such as Oracle NetSuite and Microsoft Dynamics 365 are being actively implemented, allowing small and medium-sized enterprises to build transparent management processes at moderate costs. The Polish company Żywiec Group (n.d.) (a subsidiary of Heineken) has implemented a comprehensive controlling system that combines planning, budgeting and analysis functions in a single digital space. This made it possible to increase the accuracy of financial forecasts by 25% and to accelerate the process of report consolidation within the international group. A similar approach was implemented by the Czech energy company Group CEZ (n.d.), one of the largest in Central Europe. As part of digital transformation, the Microsoft Dynamics 365 system was integrated with the BI tools Power BI and Qlik Sense, which ensured the automation of financial flow monitoring, management of investment programmes and cost forecasting for power plant modernisation projects.

The Scandinavian experience is noteworthy, where controlling is closely linked to the concept of sustainable development (ESG). Finnish companies integrate digital controlling dashboards not only for the analysis of financial indicators, but also for monitoring environmental and social indicators. Nokia (n.d.) uses Tableau and Power BI tools to combine financial and non-financial data, which makes it possible to monitor not only profitability but also energy efficiency, CO_2 emissions and social metrics. This approach reflects a modern trend: controlling becomes a tool of comprehensive corporate governance, where digitalisation strengthens not only the economic but also the social responsibility of business.

In Kyrgyzstan, the digitalisation of financial controlling is developing unevenly; however, a number of companies already demonstrate successful examples of the implementation of modern tools. With properly organised processes, even under conditions of limited resources, it is possible to create effective systems of management analytics and control. The financial sector of Kyrgyzstan demonstrates the most advanced level of digital controlling. Eldik Bank (n.d.) is one of the most illustrative examples of digital transformation in the financial sector of Kyrgyzstan. The bank has implemented a digitalisation strategy aimed at improving the efficiency of internal processes, expanding client services and strengthening its market position. One area of development has been the creation of the mobile application "Eldik", which has become the central element of the bank's digital ecosystem. To support technological initiatives, in 2024, Eldik Bank established the subsidiary company ElTech, responsible for the development and implementation of digital products (Akhmatova, 2024). The creation of this structure made it possible to optimise the bank's internal processes related to financial accounting, analytics and the integration of management data. In the same year, in cooperation with the mobile operator MEGA, the Ishker24 platform was launched (version 1.0 – July 2024), aimed at supporting entrepreneurs (RSK Bank & MEGA…, 2024). The service provides functionality for online payments, accounting of financial operations and interaction with state digital services. The implementation of these initiatives became an important step towards the digitalisation of financial controlling, ensuring increased transparency, greater data-processing speed and the automation of management reporting.

Moreover, Eldik Bank (2023) implements programmes in the field of sustainable finance and digital financial inclusion, which is reflected in its strategic documents and sustainability reports. In particular, the bank participates in state projects to support entrepreneurship and to expand access to financial services in the regions. The publication of the "Sustainability report 2023" according to GRI and IFRS standards testifies to the introduction of a systematic approach to data collection, analysis and presentation, which is directly related to the principles of financial controlling. The bank also became the first in Central Asia to connect to the Chinese Cross-border Interbank Payment System (CIPS), providing cross-border settlements in yuan (The CIPS system…, 2025). This strengthened the bank's digital infrastructure and made it possible to integrate international financial flows into a single management system. The acquisition of the telecommunications operator Beeline Kyrgyzstan (Sky Mobile) also demonstrates the striving to create a comprehensive digital ecosystem that combines finance, communications, and analytics (Eldik Bank acquired…, 2025). Table 2 presents the elements of the company's digital controlling tools.

Eldik Bank can be considered one of the leading examples of digitalisation of the financial sector of Kyrgyzstan,

Table 2. Elements of financial controlling of Eldik Bank

Controlling component/digital tool	What has already been implemented at Eldik Bank	Shortcomings / areas for development
ERP/management accounting	No indirect data were found on an ERP system with full management accounting modules. The main digital products are the mobile application, digital platforms and GovFintech services	Integration of management accounting, budgeting and cost analysis modules is required
BI/real-time analytics	Through the mobile application and the Ishker24 platform, digital services and analytics of client operations are provided. Subscription to ESG metrics and the sustainability report form part of external analytics	Lack of data on BI dashboards for internal controlling
Infrastructure and digital ecosystem	The creation of ElTech, the acquisition of Beeline and connection to CIPS all indicate the creation of a digital ecosystem and the expansion of payment channels and cross-border operations	Deeper integration between banking and telecom data is required

Continued Table 2

Controlling component/digital tool	What has already been implemented at Eldik Bank	Shortcomings / areas for development
Performance evaluation, metrics	Historical profit, growth in capitalisation, positions in rankings, fulfilment of sustainable development, and external reporting are available.	There are no open data on the impact of digital tools on the effectiveness indicators of management control.

Source: compiled by the author based on Eldik Bank (n.d., 2023), I. Akhmatova (2024), RSK Bank & MEGA launched version 1.0 of the Ishker24 microfinance system to transition to the new tax regime (2024), The CIPS system has been launched: Eldik Bank has opened direct payments in yuan for businesses in Kyrgyzstan (2025), Eldik Bank acquired the operator Beeline Kyrgyzstan (2025)

where elements of digital controlling are beginning to be formed within the framework of a broader digital development strategy. Despite significant progress in automation, analytics and service integration, the bank's system still lacks a transparent methodology of internal financial controlling at the level of management accounting and forecasting. The further development of these areas will allow Eldik Bank to move from the digitalisation of services to a full-fledged system of digital controlling, providing strategic management based on data.

OJSC Electric Power Plants (n.d.) is an electricity producer in Kyrgyzstan, managing hydroelectric and thermal power plants throughout the country. The company is actively working on the modernisation of its infrastructure and the introduction of digital technologies to improve management efficiency. As part of the development of the financial controlling system, digital tools were introduced to integrate accounting and management accounting, which made it possible to reduce the time needed to prepare management reporting from 10-12 to 3-5 working days, and the discrepancies between planned and actual indicators on average from 8-10% to 2-3%. The introduction of digital cost-control modules ensured regular monitoring of budget execution by centres of financial responsibility, as a result of which the proportion of uncontrolled overspending decreased by approximately 15-20%, and the accuracy of planning operating expenses increased by 10-12% (Consolidated financial statements…, 2024). Owing to this, the enterprise achieved more rational allocation of resources, reduced equipment downtime and increased the overall efficiency of production processes.

Regular publication of annual reports on the company's official website makes it possible to track financial results, the implementation of digital solutions and the impact on business processes. Despite significant progress, the company faces the need to integrate the Automated Electricity Metering System (AEMS) with other accounting and management systems, to develop analytical tools for the real-time analysis of financial data and to create a unified digital ecosystem that combines all aspects of activity. Table 3 presents the elements of the company's digital controlling tools.

Thus, OJSC "Electric Power Stations" demonstrates active work on the introduction of digital tools in the field of financial controlling. The implementation of the Automated System of Electricity Metering, the development of digital channels of interaction with customers and the publication of financial information indicate the company's striving to increase the efficiency and transparency of its financial processes. However, for the full-scale digitalisation of financial controlling, further development of analytical tools, integration of data from various sources and staff training for the effective use of new technologies are required.

Table 3. Elements of financial controlling of the Open Joint-Stock Company (OJSC) "Electric Power Stations"

Controlling component/digital tool	What has already been implemented at OJSC "Electric Power Stations"	Shortcomings/areas for development
ERP/management accounting	The processes of accounting and management accounting have been partially automated; digital data processing is used for costs, revenue, and responsibility centres.	There is no unified ERP platform, and integration of fragmented accounting systems into a single financial controlling framework is required.
BI/real-time analytics	Digital monitoring of key financial and production indicators is carried out, and internal analytical reports are generated in electronic form.	Full-function BI dashboards for online KPI analysis and financial forecasting have not been implemented.
Infrastructure and digital ecosystem	Corporate information systems and internal digital platforms are used for the exchange of financial and production data.	Insufficient integration of IT systems between divisions, and the absence of a unified digital architecture for financial management.
Performance evaluation, metrics	Annual financial results are published and a basic analysis of budget execution is carried out.	No internal KPI system of digital controlling has been formed, and regular evaluation of the economic effect of digitalisation is not applied.

Source: compiled by the author based on OJSC Electric Power Plants (n.d.), Consolidated financial statements… (2024)

Kumtor Gold Company (n.d.) is a large mining enterprise in Kyrgyzstan and one of the most transparent in terms of publishing financial and operational information. The company introduces digital technologies with the aim of improving management efficiency, optimising costs and

strengthening financial controlling. One of the key areas of digital transformation within the enterprise has been the implementation of automated systems of production and financial accounting, which integrate data on extraction, ore processing, fuel costs, equipment depreciation and wages. The company, with revenue of more than USD 989 million and a staff of about 3,436 employees, has managed to significantly improve the accuracy of calculating production cost and ensure more reliable financial reporting (Kumtor Gold Company, 2024). The use of integrated monitoring and analytical systems facilitated control over budget execution and cash flow forecasting, which became an important element of the transition to managerial controlling.

In 2023, Kumtor Gold Company (n.d.) announced the launch of projects on the digitalisation of document management, the introduction of BI platforms for the analysis of production and financial data, and the automation of procurement. This made it possible for the management to monitor key performance indicators in real time, control the implementation of plans and make more well-grounded decisions. In addition, due to the introduction of remote equipment monitoring systems and automatic data collection from production sites, the company gained the opportunity to integrate these data with financial statements, which strengthened managerial controlling through the comparison of operational and financial metrics. Table 4 presents the elements of the company's digital controlling tools.

Thus, Kumtor Gold Company demonstrates one of the most advanced examples of the implementation of digital tools of financial controlling in Kyrgyzstan. The company is consistently integrating automation into accounting, analysis and planning processes, ensuring a high level of transparency and efficiency. Further development of digital solutions should be aimed at deepening analytics, unifying data from different divisions and introducing intelligent forecasting tools to improve business manageability.

Table 4. Elements of financial controlling of OJSC "Kumtor Gold Company"

Controlling component/ digital tool	What has already been implemented at OJSC "Kumtor Gold Company"	Shortcomings / areas for development
ERP/management accounting	A system of cost accounting and production indicators has been implemented, integrated with accounting and tax reporting; regular publication of audited financial statements is carried out.	Full integration of ERP with extraction and supply systems is required for end-to-end analysis of all stages of the production cycle.
BI/analytics and forecasting	BI platforms are used for the analysis of production and financial indicators; data are aggregated for KPI monitoring and report preparation for management.	Predictive analytics needs to be introduced for forecasting gold prices, planning extraction and financial scenarios.
Automation of document management and procurement	Electronic tenders, digital signatures and internal electronic document flow have been introduced, which accelerated the approval of expenditure and increased the transparency of financial processes.	The system should be expanded to all subsidiary units and include real-time monitoring of contract execution.
Infrastructure and data collection	Systems of remote equipment monitoring and production data collection have been introduced, integrated with financial statements.	Centralisation of data in a single cloud storage and the integration with the BI system for automatic analytics are required.
Performance evaluation, metrics	Data on extraction (13.567 kg of gold in 2023), tax payments (KGS 17.2 billion) and staff numbers (about 3,000 employees) are published.	Expansion of the KPI system is required, including indicators of reporting speed, forecast accuracy and cost savings after digitalisation.

Source: compiled by the author based on Kumtor Gold Company (n.d.; 2024)

The analysis of three companies showed that the introduction of digital tools of financial controlling in Kyrgyzstan is developing unevenly, but demonstrates a stable positive dynamic. The financial sector (using the example of Eldik Bank) is already using digital technologies: BI systems, online platforms, automation of internal control and analytics. This made it possible to increase the transparency of operations, improve risk management and accelerate the preparation of reports. In the energy sector (using the example of Electric Power Stations), digitalisation has a more infrastructural nature – the main attention is paid to the automation of accounting, monitoring of technical processes and increasing data accuracy, which creates the basis for the implementation of full-scale controlling based on ERP solutions. In the industrial sector, represented by Kumtor Gold Company, digital technologies are already integrated into production and financial processes: cost accounting is automated, monitoring systems, electronic document management and BI analytics have been introduced, which ensures a high level of manageability and transparency.

Based on the analysis of digital tools of financial controlling, as well as the study of the experience of countries – including examples of system implementation in Germany, the US, Poland, the Czech Republic, Finland, and Kyrgyz companies – practical recommendations were formulated for Kyrgyz enterprises striving to implement digital financial controlling and increase management efficiency through the integration of analytical and managerial technologies. Firstly, enterprises are recommended to carry out a comprehensive diagnosis of the existing system of financial and managerial accounting in order to identify inefficient links – duplication of operations, low speed of report preparation, dependence on manual data entry, and lack of integration between divisions. Based on the results of the analysis, it is advisable to develop a digital transformation

roadmap providing for the transition from fragmented software solutions to a unified ERP platform that ensures the consolidation of data on procurement, production, sales and financial flows. Such integration makes it possible to increase the accuracy of reporting, reduce operating costs and ensure the completeness of managerial information.

The next stage of development is the introduction of BI tools designed for the visualisation of key indicators and real-time analytics. BI technologies make it possible to automate the processes of cost analysis, evaluation of cost efficiency, revenue forecasting and modelling of financial development scenarios. For enterprises operating under conditions of high market volatility, this tool becomes an integral element of modern controlling, ensuring increased adaptability and accuracy of managerial decisions.

Digitalisation of document management and the transition to electronic forms of approval and authorisation of financial operations are also of importance. The use of electronic signatures and automated document management systems contributes to the reduction of administrative costs, increased transparency and a reduction in the time required for financial data processing. At the same time, the introduction of cloud technologies ensures flexibility and scalability of infrastructure, as well as access to data in real time, which is relevant for companies with a geographically distributed structure.

In the context of the integration of operational and financial information, it is advisable to introduce systems for monitoring production indicators linked with financial analysis tools. Such systems, implemented, for example, at Kumtor Gold Company, make it possible to form end-to-end analytics by comparing the dynamics of production processes with financial results, which increases the accuracy of assessing resource-use efficiency and allows timely adjustment of cost-management strategies. An integral element of modern controlling is the development of a system of key performance indicators integrated into digital control panels. Such a system ensures continuous monitoring of financial, production and organisational metrics, creating conditions for increasing transparency and forming an objective system of staff motivation.

An important direction of development is the improvement of staff qualifications involved in financial analysis and managerial accounting processes. Effective use of digital tools requires not only technical skills, but also analytical thinking, the ability to interpret data and apply these data in decision-making processes. In this regard, it is advisable to introduce corporate training programmes and the formation of digital competences at all levels of management. Ensuring information security and data protection is also necessary, since the growth of digital information volumes increases the risks of unauthorised access and leakage of confidential data. Companies must establish internal regulations on data management, introduce backup systems and control access to information.

Thus, the development of digital financial controlling in Kyrgyz enterprises should be carried out gradually and systematically, covering technological, organisational and personnel aspects. Comprehensive digitalisation of financial processes will enable companies to increase the transparency of managerial decisions, reduce costs, improve forecasting and ensure sustainability in the conditions of the digital transformation of the economy.

Discussion

Financial controlling plays a key role in the management of a modern enterprise, acting as a tool for integrating planning, analysis and control. Its distinctive feature lies not only in recording deviations, but also in its ability to prevent risks, model development scenarios and support strategic decision-making. Companies that perceive controlling as a tool for navigation and resource management are able to respond more flexibly to the dynamics of the external environment, ensuring the stability and integrity of financial processes. This underlines the importance of controlling not only as a means of reporting, but also as a managerial mechanism linking strategic and operational levels. C. Bagwe (2024), in the research, considered controlling as a tool for identifying errors and inaccuracies in financial reporting. Such an approach emphasised the retrospective function of control, limiting its role to corrective action after problems arise. In the conducted research, financial controlling was considered more broadly: it performs the function of a navigational tool that makes it possible to forecast the development of processes and manage resources, and not only correct mistakes. The common feature is the recognition of the importance of controlling in working with financial flows, while the difference lies in the orientation – from reactive control to strategic management.

Functionally, controlling integrates planning, coordination, control, and information support. In organisations where a comprehensive controlling system has been implemented, it ensures synchronisation of the work of divisions, optimisation of resource use and the creation of a transparent management system. An important aspect is the integration of financial information with production and operational flows, which allows managers to see the full picture of the company's activities and make decisions based on objective data. In the study by C. Kuntadi & L. Puspasari (2023), it was established that the use of digital tools in the processes of budget planning and cost management contributes to increasing the transparency of financial flows and accelerating decision-making, however the author limited himself to examining exclusively financial functions, without addressing the aspect of integration with managerial and strategic controlling. The present study showed that controlling is able not only to form budgets, but also to coordinate the work of different divisions, combining production, logistics and financial processes. The similarity lies in recognising the importance of planning, whereas the difference is expressed in the expansion of functions to integration and interdepartmental coordination, which ensures a more holistic view of the company's activities.

The digitalisation of financial controlling radically changes the management approach, enabling a shift from retrospective analysis to predictive analytics. Modern platforms allow managers to obtain key indicators promptly, automate data processing and speed up reporting preparation. Access to integrated information in real time enables controllers to work not only with historical results, but also with forecasts and development scenarios, which increases business adaptability and the quality of managerial decisions. The influence of digital technologies was studied by Z. Jaradat *et al.* (2025), who recorded the advantage of BI and ERP systems in accelerating information processing, but noted the limited nature of the application for predictive analytics. Current practices show that digital platforms make it possible not only to speed up data collection, but also to build scenario models, assess risks and forecast key indicators in real time. Thus, digital tools expand the functional capabilities of controlling, creating conditions for managerial decision-making based on the analysis of possible future situations, which was not observed in the author's research.

The use of ERP platforms ensures the integration of various business functions into a single information environment. Due to the integration of management accounting, planning and resource analysis, companies can build end-to-end processes covering production, sales, logistics, and finance. Practice shows that without such integration, ERP systems are often limited to accounting, whereas full-scale controlling requires coordinated work of all divisions and a single data source. J.L. Martins & C. Santos (2021) studied ERP systems and noted the limited use, mainly for accounting, with minimal integration with planning and budgeting. Based on the statements of F. Oberdorf *et al.* (2023), under modern conditions the implementation of ERP is considered the main element for building end-to-end controlling, which integrates financial, production and logistics processes into a single information space. This makes it possible to analyse indicators at all levels of management, assess resource efficiency and plan the budget more accurately. The conducted research also describes the expansion of ERP functionality and the active use of data for strategic planning.

BI platforms provide opportunities for visualisation and interactive analysis of managerial information. These platforms make it possible to create dashboards for monitoring key performance indicators, automate the generation of reports and the assessment of deviations from plans. The implementation of such tools ensures more rapid identification of problem areas, increases process transparency and makes it possible to forecast financial and operational results, which significantly expands the functionality of controlling. The use of BI tools was studied by S. Bussa (2023), who noted that data visualisation was used mainly for external reporting and marketing, without deep integration into managerial processes. However, the current work showed that BI tools are being integrated into everyday controlling, making it possible to monitor key indicators in real time, forecast financial and operational results and assess the performance of divisions. Such an approach makes management more flexible and transparent, expanding analytical opportunities beyond financial indicators.

An analysis of the practices of large companies shows that digital controlling can be integrated with operational and production processes, ensuring a comprehensive system of managerial reporting and decision-making support. The introduction of digital tools makes it possible to speed up information processing, increase the accuracy of forecasts and build scenario models, which makes the controlling system more proactive and strategically oriented. In addition, companies are gradually integrating controlling with non-financial indicators, which allows resources to be managed comprehensively and the efficiency of not only financial but also operational processes to be taken into account. B.I. Adekunle *et al.* (2023) examined the experience of introducing digital controlling in large organisations and recorded increased transparency, although the use of predictive analytics remained limited. The current study also showed that the integration of analytical tools with financial and operational data makes it possible to build scenario models, forecast risks and manage resources more effectively. Thus, digital controlling becomes not only a reporting tool, but also a mechanism for strategic analysis and planning.

In national companies, digital controlling is developing gradually and demonstrates uneven integration of ERP and BI systems. Barriers remain in the form of limited resources, a low level of digital maturity, and a lack of specialists capable of working with analytical tools. However, companies that have begun introducing elements of digitalisation show improved process manageability, transparency of financial flows and more rapid decision-making. This indicates the importance of a comprehensive approach that includes organisational changes, staff training and the formation of a digital infrastructure capable of ensuring the full functioning of managerial controlling. P. Belch (2024) analysed enterprises and identified a low level of digital maturity and a shortage of specialists as the main constraints on the introduction of modern controlling tools. Current observations show that even partial digitalisation makes it possible to increase the transparency of financial flows, accelerate decision-making and improve process manageability. At the same time, not only technologies, but also the development of staff competences, training in the use of analytical tools and the creation of an integrated digital infrastructure become critically important.

Thus, the analysis demonstrated that the role of financial controlling is expanding from retrospective analysis to strategic and predictive management, digitalisation is becoming the main factor of efficiency, and the integration of processes and staff development determine the success of implementation. A systemic approach to controlling, combining ERP, BI and operational data, ensures more accurate planning, increased transparency and more rapid managerial decision-making, which differs significantly from the limited application of tools.

Conclusions

The conducted study made it possible to identify trends associated with the integration of ERP and BI systems into management processes, the growth of the role of predictive analytics and the automation of reporting, as well as patterns expressed in the gradual transition from traditional financial control to comprehensive digital systems that ensure transparency, adaptability and the strategic orientation of managerial decisions in Kyrgyz enterprises. The analysis showed that financial controlling represents not merely a tool for recording the facts of economic activity, but an integrated management mechanism, ensuring the strategic stability and adaptability of the organisation.

The research results confirmed that digitalisation has become a key factor in the evolution of financial controlling. The introduction of ERP platforms such as SAP, Oracle, or Microsoft Dynamics ensures comprehensive integration of financial, production and logistics data, creating a single system of management accounting. At the same time, BI tools (Power BI, Tableau, QlikView) contribute to the transformation of reporting into dynamic analytical panels, allowing managers to assess key performance indicators promptly and model development scenarios.

International experience demonstrates that the effectiveness of digital controlling is achieved through technological integration and strategic data management. In Germany, companies using SAP S/4HANA and Qlik Sense ensure transparency and acceleration of reporting by more than 40%; in the USA, corporations such as General Electric Company and IBM use artificial intelligence and machine learning for predictive analysis and the identification of financial risks; in Eastern Europe, the implementation of Oracle NetSuite and Microsoft Dynamics 365 has made it possible to increase the accuracy of financial planning and the accessibility of analytics for small and medium-sized businesses; in Northern Europe, where controlling is integrated with ESG indicators, companies including Nokia use Power BI and Tableau to combine financial and environmental metrics within a single management system.

The study of Kyrgyz enterprises revealed a heterogeneous level of digital maturity, but at the same time a stable trend towards the expansion of digital practices. Eldik Bank demonstrates successful integration of digital services, online platforms and ESG reporting, which makes it possible to consider it as an example of forming a comprehensive digital management ecosystem. In the energy sector, represented by OJSC "Electric Stations", digitalisation is infrastructural in nature and aimed at improving the accuracy of accounting (to 98-99%) and the transparency of flows, which creates prerequisites for the introduction of end-to-end ERP solutions. The most advanced example is OJSC "Kumtor Gold Company", where the automation of production and financial processes, the introduction of BI panels and digital document management ensure a high level of transparency and controllability.

The analysis of the experience of the mentioned enterprises makes it possible to conclude that the digital transformation of financial controlling contributes not only to improving the accuracy of reporting and the efficiency of planning, but also to changing managerial culture. Further research should reasonably be directed towards the quantitative assessment of the impact of digital controlling on the effectiveness of managerial decisions in various sectors of the Kyrgyz economy.

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Методика впровадження цифрових інструментів фінансового контролінгу у компаніях Киргизстану

Тілек Тойчієв
Аспірант
Університет Невади
89154, 4505 Південний Меріленд Парквей, м. Лас-Вегас, Сполучені Штати Америки
https://orcid.org/0009-0005-6196-2208

Анотація. Це дослідження мало на меті проаналізувати підходи до ефективного використання цифрових технологій для підвищення результативності системи фінансового контролінгу в компаніях Киргизстану. Методологічною основою дослідження виступив системний підхід, що включає аналіз корпоративної звітності, порівняльний аналіз практик цифровізації та оцінку функціональних компонентів фінансового контролінгу. В рамках дослідження було проведено всебічний аналіз трьох відкритих акціонерних товариств – ВАТ «Елдік Банк», ВАТ «Електричні станції» та «Кумтор Голд Компані», що дозволило виявити відмінності у рівнях цифрової зрілості фінансового управління у секторах банківської, енергетичної та промислової галузей. Аналіз показав, що у фінансовому секторі найбільш активно впроваджено інтегровані інформаційні системи, які забезпечують автоматизацію управлінського обліку, централізований доступ до фінансових даних та розвиток аналітичних інструментів для підтримки ухвалення управлінських рішень. У промисловому секторі цифровізація охопила автоматизацію виробничого та фінансового обліку, а також впровадження платформ Business Intelligence для аналізу даних та проведення електронних тендерів. Це сприяло покращенню точності прогнозування собівартості, скорочення термінів бюджетування та забезпечення випуску 13,567 кг золота при податкових відрахуваннях, які становили понад 17,2 млрд сомів у 2023 році. Насамкінець представлені практичні рекомендації для киргизстанських компаній, що включають проведення комплексної діагностики облікових систем, розробку дорожньої карти цифрової трансформації, впровадження платформ для планування ресурсів підприємства з інтегрованими модулями управлінського обліку, а також розвиток кадрових компетенцій у галузі аналітики та фінансового прогнозування. Практична цінність дослідження полягає у пропозиції конкретних рекомендацій для киргизстанських підприємств та фінансових менеджерів щодо впровадження цифрових інструментів контролінгу

Ключові слова: прогнозування; стратегічне планування; аналітика; управлінські рішення; бюджетування