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## The Impact of Digital Innovation on Accounting Practices: The Case of Romanian Public Schools

**Abstract.** Today, digitalization has covered all areas of the social system. The introduction of innovative technologies and ERP systems in the accounting field helps significantly increase the efficiency of financial management. At the same time, certain industries, such as public schools in Romania, still do not take full advantage of accounting automation. This article examines the adoption of accounting automation through ERP solutions in university educational institutions in Romania and explores the advantages and obstacles that come with this shift. In this study, a thorough analysis of the data collected through the survey was carried out. A questionnaire with questions was sent to 100 educational colleges in Romania. The questionnaire contained questions aimed at gathering information about the level of automation, the types of technology used, the difficulties faced and the benefits. Institutions of various sizes with various funding sources – from regular to high schools – were chosen for the study. Implementing automated accounting systems in institutions in Romania has shown noticeable benefits, enhancing efficiency and transparency while ensuring accuracy in operations. However, limited financial resources and inadequate digital expertise challenge the adoption of ERP technologies and other sophisticated solutions. The study results show that digitalization levels differ significantly across education levels, with high and secondary schools being the most digitized, while pre-kindergarten and primary schools lag in adoption. Key obstacles include constraints and a shortage of expertise, particularly impacting high school and secondary educational establishments. The research provides recommendations to enhance the digitalization process in Romania's pre-university educational institutions.

**Keywords:** digital transformation, public sector accounting, ERP systems, educational institutions, automation in accounting, financial management, Romanian education system, challenges in digitalization.

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## Вплив цифрових інновацій на практику бухгалтерського обліку: приклад державних шкіл Румунії

**Анотація.** Сьогодні діджиталізація охопила всі сфери суспільного життя. Впровадження інноваційних технологій та ERP-систем, які дозволяють удосконалити бухгалтерський облік, дозволяє значно підвищити ефективність управління фінансами. У той же час деякі галузі, наприклад державні школи в Румунії, все ще не повністю використовують переваги автоматизації бухгалтерського обліку. Ця стаття присвячена оцінці рівня автоматизації бухгалтерського обліку за допомогою рішень ERP в навчальних закладах Румунії та розкриттю переваг та перешкод, що пов'язані з цим процесом. Дані для аналізу було зібрано шляхом опитування 100 навчальних закладів Румунії. Анкета містила запитання, спрямовані на збір інформації про рівень автоматизації, типи використовуваних технологій, труднощі та переваги. Для дослідження були обрані заклади різного розміру з різними джерелами фінансування – від звичайних до вищих шкіл. Впровадження автоматизованих систем бухгалтерського обліку в навчальних закладах Румунії показало помітні переваги, підвищивши результативність і прозорість облікових даних, завдяки чому менеджмент отримав можливість ефективніше управляти фінансовими ресурсами. Однак, обмежене фінансування та недостатня цифрова експертиза заважають широкому застосуванню технологій ERP та інших інноваційних рішень. Результати

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дослідження показують, що рівень цифровізації суттєво відрізняється залежно від рівня освітнього закладу, зокрема бухгалтерський облік у вищих та середніх школах є найбільш діджиталізованим, тоді як початкові школи використовують неспеціалізовані програми, як-от MS Excel. Основними перешкодами для автоматизації бухгалтерського обліку є недостатнє фінансування та брак досвіду у бухгалтерів, що особливо стосується середніх і вищих шкіл. Дослідження містить рекомендації щодо посилення процесу цифровізації в навчальних закладах Румунії.

**Ключові слова:** цифрова трансформація, бухгалтерський облік у державному секторі, системи ERP, навчальні заклади, автоматизація бухгалтерського обліку, фінансовий менеджмент, система освіти Румунії, виклики цифровізації.

### INTRODUCTION

The shift towards digitalizing accounting has become crucial in advancing institutions in today's world. Within educational settings in countries like Romania, where there is a mix of fully public and partially funded institutions, a significant change can be seen in how financial resources are handled with the adoption of digital tools. Digital transformation is described as the incorporation of technologies across all facets of an organization with a core emphasis on efficiency, precision, and openness.

This article examines the adoption of accounting automation through ERP solutions in university educational institutions in Romania and explores the advantages and obstacles that come with this shift.

### LITERATURE REVIEW

Innovative technologies have played a role in updating accounting systems within the public sector to enhance efficiency and transparency while impacting decision-making processes significantly over time. Recent research has delved into the advantages and hurdles of introducing organizational innovations concerning financial administration and accounting practices. This segment summarises themes extracted from existing literature emphasizing ERP platforms, automation tools, and unique obstacles encountered in public sector settings.

Enterprise Resource Planning (ERP) systems are software platforms organizations use to efficiently manage and automate administrative and financial tasks (Carmo, 2023). ERP systems have been growing in popularity across both private sectors because they help streamline operations and enhance accuracy in information while offering financial analysis.

ERP systems can combine financial functions like budgeting, payroll management, procurement, and accounting on one platform, streamlining processes and improving efficiency. Thus, ERP systems appeal to organizations looking to update their financial management methods (Khand, 2020).

In middle-income countries, implementing ERP systems faces notable hurdles discussed in the literature, like budget constraints on existing systems and reluctance to change that can impede progress. Public educational institutions face obstacles due to financial resources, making the cost of full ERP solutions often too high (Fernandez et al., 2017).

In addition, robotic process automation (RPA) and artificial intelligence (AI) have significantly influenced the development of ERP systems in the public sector accounting field. These advancements have streamlined operations by automating tasks and enhancing precision and decision-making efficiency. Pitea (2024) states that RPA automates tasks such as invoice processing and report generation, saving accounting professionals time to focus on strategic activities and minimizing errors.

AI provides enhanced features, like analytics and budget forecasting, that are especially beneficial in public organizations, where managing finances and allocating resources are crucial aspects of operation (Alhato, 2023). AI tools can examine datasets to spot patterns and predict future expenses while offering suggestions to improve budget choices.

Carmos (2023) believes that RPA incorporating AI could transform financial management in schools and colleges by offering immediate perspectives on how resources are distributed and expenditures are tracked to ensure budget adherence. Nevertheless, the seamless integration of these cutting-edge technologies necessitates a framework and a well-skilled workforce – elements frequently deficient in numerous public institutions.

While there are known advantages, embracing transformation in sectors of society, including the public sector, encounters specific obstacles that may impede the implementation of digital accounting systems efficiently or smoothly, as noted by Grigore (2024). The researcher highlights that rigid bureaucracies and regulatory intricacies frequently impede upgrading procedures within governmental entities. Also, public organizations must uphold stringent principles of openness and responsibility, which may pose challenges when adopting novel technological advancements.

According to Vesa (Poruț) (2023), challenges in schools are made worse by funding and a lack of tech know-how. The shift towards digitalization in government services heavily relies on funding sources, especially in nations like Romania, where financial support for tech enhancements is modest at best. Implementing and managing ERP systems or AI tools can be costly and challenging for smaller educational settings, like preschools and elementary schools that have budgets to work with.

According to Codrean & Mihailă (2022), the reluctance of public sector workers to embrace technologies due to a lack of skills or concerns about job

security poses a major obstacle to digital transformation in public institutions. Additionally, the ineffectiveness of training programs further exacerbates this resistance as they are crucial for enabling employees to utilize the accounting systems.

The Romanian authorities have been advancing digitalization, with the National Digital Agenda 2020 initiative to modernize services through the use of technologies in different fields, such as education, as highlighted by Pitea (2024). A primary goal of this agenda is to enhance the effectiveness and openness of operations by implementing ERP systems and other digital platforms.

However, despite all these attempts, Romanian educational organizations' progress towards digital transformation has been sluggish. According to Tuşa et al. (2019), numerous schools and academic establishments depend on systems ill-prepared for contemporary accounting standards. Furthermore, allocating funds for educational projects is frequently constrained, as many schools rely heavily on strained local government budgets.

Despite the obstacles faced in this area, research emphasizes the advantages of innovation in public schools. Carmo (2023), for instance, explores how digital resources and ERP systems can enhance the handling of finances by offering immediate updates on spending, boosting adherence to rules, and enabling better decision-making.

Furthermore, Tuşa et al. (2019) suggest that implementing technology can enhance openness and responsibility within the sphere. Centralizing information and streamlining reporting procedures enable schools to monitor and document their spending precisely, minimizing the chances of mishandling funds or fraudulent activities.

In the future, incorporating technologies like AI and blockchain into public sector accounting will advance the digital transformation journey forward. Pitea (2024) delves into how blockchain technology could elevate transactions' security and transparency levels through a ledger accessible to all involved parties. This innovation holds promise for educational institutions striving to uphold financial compliance and transparency standards.

Blockchain can potentially lower the chances of data being tampered with and enhance internal and external audit processes by maintaining a lasting log of every financial transaction conducted. This would lead to improved compliance with regulations within institutions and a notable decrease in fraudulent activities and mismanagement of funds.

Public educational institutions could benefit significantly from AI technologies by utilizing analytics and automated decision-making tools (Alhato, 2023). Incorporating AI into public sector accounting can revolutionize budget planning and management practices within institutions, enabling strategic utilization of public funds by leveraging historical data alongside real-time information for forecasting future requirements and optimizing resource allocation.

The literature review highlights how digital accounting solutions, like ERP systems and automation technologies, can greatly enhance efficiency and transparency in managing finances within the sector – in Romania's public educational institutions – despite facing obstacles such as financial limitations, reluctance to adopt new technology, and a shortage of digital expertise.

With the advancement of technologies like AI and blockchain in the public sector accounting realm come opportunities and challenges to embrace digitalization further in Romania's institutions and effectively drive modernization in the education sector. Rounded investments in infrastructure and continuous training for staff members are crucial for unlocking the full potential of these advancements.

## RESEARCH METHOD

In this study, a thorough analysis of the data collected through the survey was carried out. A questionnaire with questions was sent to 100 educational colleges in Romania. The questionnaire contained questions aimed at gathering information about the level of automation, the types of technology used, the difficulties faced and the benefits. Institutions of various sizes with various funding sources – from regular to high schools – were chosen for the study.

## RESULTS

### Level of digitalization

The author's primary focus in the examined institutions was on how much they have adopted automation tools. Major high schools have integrated ERP systems into their operations; smaller establishments like pre-kindergarten and kindergarten primarily use manual or partially digital accounting methods (like Excel).

Table 1 provides an overview of the level of digitalization across various levels of pre-university education (pre-kindergarten, primary, secondary, high school, vocational, and post-secondary) and identifies the major challenges encountered in implementing digital accounting systems. Below is an interpretation of the key aspects.

Table 1. Level of digitalization in public educational institutions

Level of education	Accounting system	Level of digitalization	Identified challenges
<b>Pre-kindergarten (0-3 years) and kindergarten (3-6 years)</b>	Manual (paper-based)	Low (5%)	Insufficient financial resources (65%)
	Basic accounting software (e.g., Excel)	Moderate (25%)	Lack of digital skills (15%)
	ERP (Enterprise Resource Planning)	High (45%)	Resistance to change (10%)
	Other	Very High (25%)	Lack of management support (10%)
<b>Primary Education</b>	Manual (paper-based)	Low (5%)	Insufficient financial resources (50%)
	Basic accounting software (e.g., Excel)	Moderate (15%)	Lack of digital skills (15%)
	ERP (Enterprise Resource Planning)	High (55%)	Resistance to change (25%)
	Other	Very High (25%)	Lack of management support (10%)
<b>Secondary Education (Middle School)</b>	Manual (paper-based)	Low (5%)	Insufficient financial resources (80%)
	Basic accounting software (e.g., Excel)	Moderate (15%)	Lack of digital skills (10%)
	ERP (Enterprise Resource Planning)	High (55%)	Resistance to change (5%)
	Other	Very High (25%)	Lack of management support (5%)
<b>High School (Upper Secondary)</b>	Manual (paper-based)	Low (5%)	Insufficient financial resources (85%)
	Basic accounting software (e.g., Excel)	Moderate (15%)	Lack of digital skills (10%)
	ERP (Enterprise Resource Planning)	High (55%)	Resistance to change (5%)
	Other	Very High (25%)	Lack of management support (5%)

Source: survey data processing (2024).

#### Pre-university educational institutions use four main types of accounting systems:

- **Manual system (paper-based):** This system is still used in isolated cases (0%-3% of institutions), especially in the pre-kindergarten and primary levels. However, most institutions have moved away from fully manual methods, and usage levels remain low.
- **Basic accounting software (Excel):** On average, around 10%-15% of institutions use simple accounting solutions, such as Excel, more frequently in vocational and post-secondary education.
- **ERP System (Enterprise Resource Planning):** ERP systems dominate accounting in most institutions (65%-75%), particularly at the secondary and high school levels, where automation is needed.
- **Other:** Other specific accounting systems, such as financial management software, are used by 15%-20% of institutions.

#### Digitalization is assessed across four categories:

- **Low:** observed in small proportions (5%-10%) at all education levels, typically associated with manual systems or limited accounting solutions.
- **Moderate:** around 15%-25% of institutions fall into the moderate digitalization category, where simple systems (like Excel) are predominant.
- **High:** 45%-55% of institutions that use ERP systems have a high level of digitalization, reflecting significant progress in modern accounting technologies.
- **Very high:** 20%-25% of institutions, especially in secondary, high school, and vocational education, have reached a very high level of digitalization, indicating the complete adoption of modern technologies in financial processes.

When analyzing the challenges encountered in digitalization, the main challenge is insufficient financial resources, the most frequently reported barrier affecting between 50% and 85% of institutions at all educational levels. This is particularly significant in high school education, where 85% of institutions mentioned this issue, and in secondary education (80%).

The second major challenge is the lack of digital skills among staff, reported by 10% to 15% of institutions, especially at the primary and pre-kindergarten levels. In these institutions, staff face difficulties effectively using digital technologies due to a lack of training.

#### Resistance to adopting new technologies

Between 5% and 25% of institutions (mainly those using ERP systems) report resistance to change. This is a major challenge at the primary education level (25%), but it decreases in secondary and high school education (5%).

Finally, a small percentage (5%-10%) of institutions face a lack of managerial support, which slows down the implementation of digital technologies. This issue is more frequently reported in vocational education (0%-10%).

#### DISCUSSION

The findings of this research are consistent with trends regarding the use of technology in public-sector accounting within settings. According to the study findings, high and secondary schools are more digitalized than pre-kindergarten and other schools. This observation aligns with Carmo's (2023) work in Portugal, highlighting a trend. Education institutions are quicker in adopting ERP systems than primary schools. In addition, Khand (2020) found that bigger establishments in middle-income nations possess the resources to adopt elaborate ERP systems; however, smaller establishments fall behind due to financial and infrastructure limitations.

According to this study, the main obstacles to digitization are primarily related to financial constraints at various education levels. Fernandez et al. (2017) also pointed out the hindrance public school resources pose to the widespread implementation of ERP systems. In educational settings, as shown by Alhato (2023), financial limitations have been identified as the key barrier hindering advancements in technology adoption.

Furthermore, a significant obstacle was the proficiency of the teachers and educators in early childhood and elementary schools. A study by Codrean and Mihăilă (2022) highlighted issues within Romanian institutions that hinder the effective adoption of innovative technologies posed by insufficient training initiatives and digital competence. These results indicate that achieving transformation requires addressing financial investments and workforce skill development.

The findings of this study also highlight the obstacles to change in organizations that have implemented ERP systems. Vesa (2023) noted a resistance trend in public institutions, where employees feel uneasy about new technology implementations. According to the study results, this resistance hinders the digital transformation process. The findings resonate with Grigore (2024), who highlighted the role of leadership and a nurturing work environment in enabling technological advancements.

The advantages of implementing an ERP system mentioned in this study are boosting operational efficiency and transparency. Carmo (2023) and Pitea (2024) observed that ERP systems streamline processes, leading to decreased errors and better resource

distribution. Thus, ERP systems positively influence budget control and financial report creation.

The importance of considering the impact of technologies like artificial intelligence (AI) and blockchain on public-sector accounting cannot be underestimated. Research by Pitea (2024) and Alhato (2023) shows limited incorporation of these technologies in Romania's public educational sector despite their potential benefits. They explore AI's use to analyze how blockchain can improve the security and transparency of financial dealings. Incorporating these technologies into the Romanian system and investing in training for the workforce involved would lead to significant advancements in digitalizing the education sector.

To sum up, this study's findings align with research in public sector digitalization. They also highlight the unique obstacles encountered by educational institutions in Romania, like limited funding, digital expertise, and reluctance to adapt to change. These are key hurdles to overcome. However, the advantages of ERP systems and new technologies can be maximized with proper support and education.

#### CONCLUSION

The implementation of automated accounting systems in institutions in Romania has shown noticeable benefits, enhancing efficiency and transparency while also ensuring accuracy in operations. However, limited financial resources and inadequate digital expertise pose challenges to the adoption of ERP technologies and other sophisticated solutions.

The study results show that digitalization levels differ significantly across education levels, with high and secondary schools being the most digitized, while pre-kindergarten and primary schools lag in adoption. Key obstacles include constraints and a shortage of expertise, particularly impacting high school and secondary educational establishments.

Implementations of ERP solutions are frequently seen in settings due, to the intricate nature and scale of financial operations necessitating heightened automation levels. The integration of tools yields advantages in budget oversight such as enhanced operational effectiveness and minimized accounting discrepancies. Noteworthy enhancements in resource allocation and financial reporting transparency have been noted in schools and secondary educational establishments.

Enterprise resource planning (ERP) systems have also reduced the time needed to create and validate reports, which allows for budget management and quick changes in resource allocation.

Below are recommendations that allow to enhance the digitalization process in Romania's pre-university educational institutions.

#### RECOMMENDATIONS

- *Access to European and national grants*

Between 50 to 85 percent of schools and colleges have expressed concerns about lacking support to upgrade their digital systems effectively; therefore, educational institutions must secure sufficient funding to

## Accounting

modernize their technological infrastructure. One way to obtain the resources is by tapping into European funding programs like the European Structural and Investment Funds (ESIF) or taking advantage of digitalization efforts supported by the National Recovery and Resilience Plan (PNRR). These initiatives can play a role in enabling schools to implement ERP solutions and streamline their procedures.

- **Prioritizing investments in less digitalized institutions**

With resources, preschools and elementary schools should be prioritized for assistance. These schools need infrastructure to move from partly digital methods to ERP systems.

- **Public-private partnerships**

Working with private tech companies can be advantageous by sharing expertise and providing affordable

solutions. Educational establishments might consider teaming up with ERP solution providers or firms that offer services to access cutting-edge technologies on terms.

- **Continuous training for accounting staff**

Data shows that around 10%- 15% of the schools examined in the study face difficulties due to a shortage of skills at the preschool levels, specifically when it comes to completely transitioning their accounting procedures to digital platforms.

- **Involving staff in the change process**

Engaging employees in the process of planning and implementing technologies is an approach to minimizing resistance to change in the workplace. It is essential to seek input from staff members and actively involve them in determining how digital tools will be incorporated into their tasks.

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