

USING EXCEL TO TEACH ACCOUNTING AS AN INTEGRATED SYSTEM IN BULGARIA

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Abstract. This paper introduces a novel approach to teaching accounting as an integrated system by utilizing Excel as an emulative environment that mirrors the real-world flow of accounting information throughout the bookkeeping process. Leveraging Excel's widespread accessibility and computational capabilities, the proposed system enables students to engage with complex accounting scenarios that require understanding the flow and interaction of multiple accounting objects. The system supports accurate calculations, automated financial reporting, and flexible account management, thereby enhancing adaptability to diverse educational settings. A key advantage is its ability to initiate the accounting process with a trial balance containing non-null entries—a feature often unavailable in subscription-based accounting software. Overall, this Excel-based system provides a practical and intuitive platform for conducting examinations and fostering a deeper understanding of accounting principles, bridging the gap between theory and practice in accounting education.

Key words: trial balance, automation, digitalization, integration, theory, practice

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1. Introduction

Accounting education has a long-standing tradition in the Bulgarian educational curriculum. Its significance was recognised even during the socialist period: a 1954 methodological note stipulated that students should be provided with visualizations of accounting documentation, representations of the flow of accounting information, and illustrations of relationships and processes within the system of accounts (Kovachev & Keshisheva, (1954).

In modern times, Bulgarian higher education continues to rely on traditional methods of reporting information. The Bulgarian Higher Education Act (Закон за висшето образование) adds to this challenge: Article 44, paragraph 2, requires that all exams must be "written" (except in special cases). However, this definition is unclear in modern contexts—raising questions about whether exams conducted in Excel qualify as "written". Damyanov (1999) further contends that regulations governing mid-term tests and exam exemption policies should be re-evaluated to eliminate school-like practices from higher education. When designing a course and its assessments, it is essential to distinguish between knowledge and skills acquisition. In this regard, knowledge comprises facts, theories, and concepts acquired through study or experience. On the other hand, skills refer to the ability to apply knowledge effectively in practical situations. Knowledge is primarily theoretical (it can be acquired through education); skills require repeated application (they are practical).

Motivated by the concerns above, the present paper proposes a system that emulates the flow of accounting information within the bookkeeping cycle. This "emulation-like environment" is fully implementable in Excel, a widely accessible tool, familiar to students in Bulgarian schools and universities. Although Excel is well suited to introductory accounting courses, students must be trained to work with accounting software—most of which can export reports to Excel. The proposed approach allows students to tackle complex cases, requiring a deep understanding of the flow and interaction among multiple accounting objects; Excel's built-in computational functions ensure accurate accounting calculations. The system can also automatically generate reports—balance sheet, income statement, and cash-flow statement. Most importantly, it permits the accounting cycle to begin with a trial balance containing non-null entries—a capability rarely available in subscription-based accounting software. Furthermore, the system is highly intuitive, making it ideal for examinations and other forms of testing.

2. Literature review

In the context of accounting education, the incorporation of technology into teaching practices is considered highly significant by the Accounting Education Commission (AEC). This approach is essential for ensuring the relevance of accounting education and for equipping future accountants with the skills necessary to excel in an increasingly technology-driven profession. Recently, almost all universities worldwide have been investing in learning management systems (LMSs). This trend has resulted in a significant surge in e-learning and has emphasized the need to digitize the curriculum. According to Mihret et al. (2017), applying technology in teaching activities facilitates guidance by lecturers and prompts feedback from learners regarding the effectiveness of study materials and teaching methods.

Globally, accounting education is highly valued by students, as it represents a crucial stage in developing the skills required to become competent and successful accountants. Moreover, the accounting field places a strong emphasis on technical skills (Tran, 2022), highlighting the need to acquire practical competencies, such as proficiency in MS Excel. Accounting education institutions must respond to evolving demands by providing programs that align with market expectations—particularly the growing need for specialized computational skills and the capacity to manage big data effectively.

Digitalization in the field of accounting has led to significant changes both in educational process and in practical accounting activities. The integration of intelligent applications in the field of accounting will significantly enhance the efficiency of accountants' work. This advancement enables professionals to serve a broader client base while offering real-time analysis, consulting, and up-to-date information relevant to their clients' operations. In this context, accounting education plays a critical role in preparing graduates to integrate effectively into the labour market concerning the new demands.

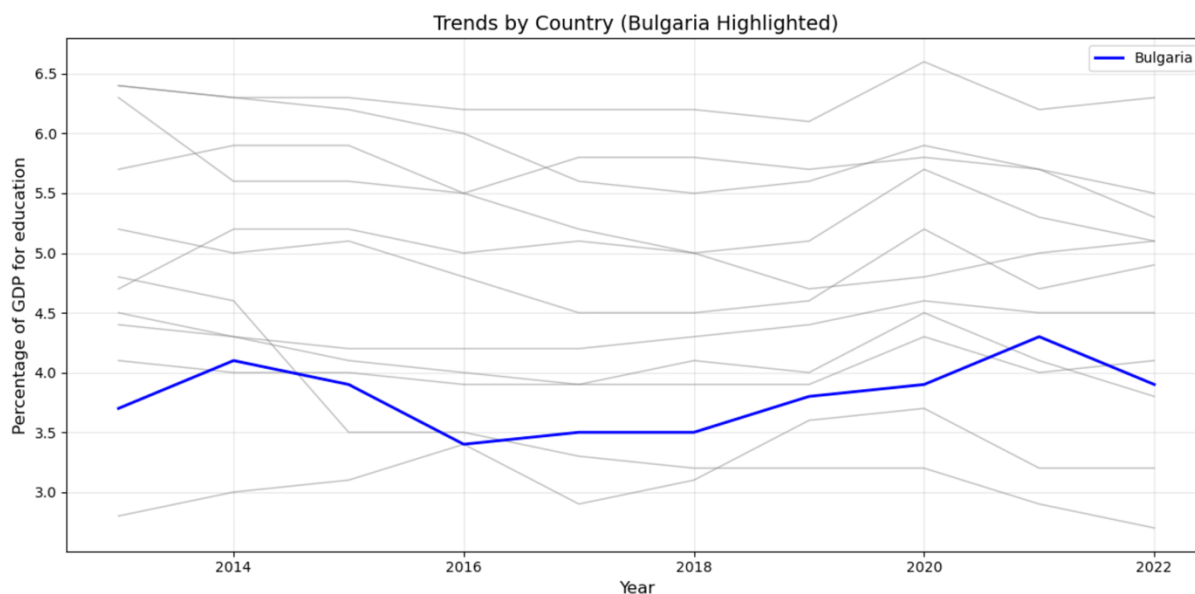


Figure 1. Percentage of GDP for education from 2014 to 2022. Selected EU countries.

Source: Eurostat (https://doi.org/10.2908/GOV_10A_EXP), visualization in Python

According to the OECD (2020), significant global disparities exist between countries regarding digital competencies and digitalization of educational institutions. While developed countries find relatively easily the means to bring and integrate the new technologies in the process, education systems in developing countries often struggle to meet market expectations. A survey conducted by the Central Independent and Public Employees' Trade Union found that 93% of surveyed professors felt stressed and overwhelmed by the demands of virtual teaching (Iordan et al., 2022). This issue is particularly significant in Bulgaria, where investments in education, measured as a percentage of GDP, have historically been among the lowest in the European Union (Figure 1).

In addition to technical accounting knowledge, the industry expects accounting graduates to develop intellectual skills such as analytical thinking, problem-solving abilities, communication skills, and interpersonal competence. All these skills are expected to enable students to cope more efficiently in the ever-changing, dynamic corporate world. However, accounting research still engages in ongoing debates about which skills accounting graduates should possess and how these skills can be delivered to them.

There is also a new impetus for the accounting profession to understand Big Data and business analytics, creating a growing opportunity for accounting educators to integrate these topics into the curriculum (Sledgianowski et al., 2017). An example of this is a recent study by Stancheva and Bogdanova (2021), where the authors present a topical application of big data and machine learning-based algorithms, in a learning environment to classify and analyse traditional accounting information, which accountants often handle in large volumes. Our approach facilitates the analysis of vast volumes of data, leveraging Excel automation to enable students to classify and extract coherent information from reports such as the trial balance. This innovative methodology bridges a significant gap in accounting education in Bulgaria, where traditional case studies often fail to connect tasks to the broader accounting system. By integrating these processes, our approach not only enhances the learning experience but also aligns more closely with real-world accounting practices, equipping students with the tools and skills necessary for modern accounting challenges. Furthermore, a subject such as Data Analytics in Managerial Accounting can integrate analytical thinking and technology skills, introducing a critical thinking framework that provides a sound structure for data analytics inquiries (Janvrin and Weidenmier Watson, 2017).

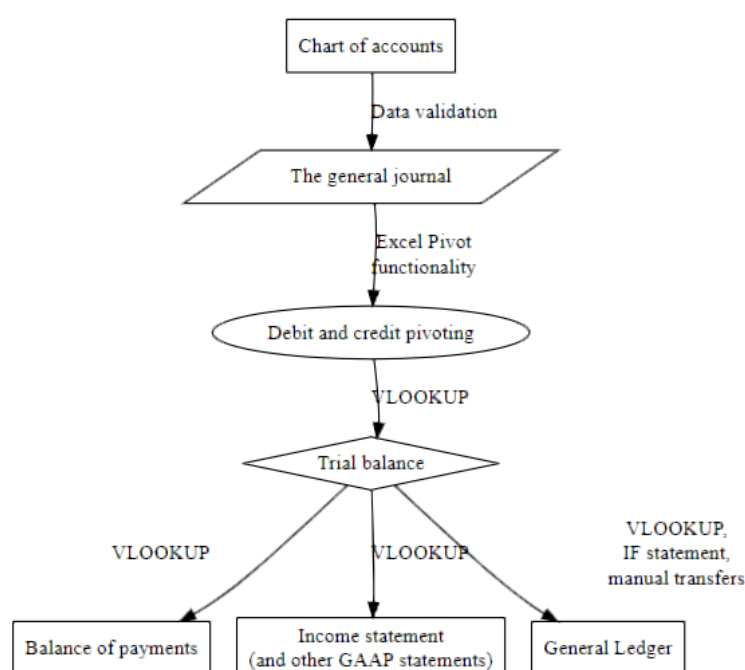


Figure 2. Representation of the flow of information in the Excel simulated accounting system.

Source: Author's calculations in R

Accounting firms and professional associations recommend that Big Data, technology, and information systems be integrated into accounting coursework to provide students with the necessary skills and knowledge to adapt to the data-centric environment (Sledgianowski et al., 2017). This goal can be effectively achieved through the integration of Excel into the accounting curriculum, as proposed in this paper. This is primarily because, for Big Data models to capture meaningful relationships, students must approach the information generated from solving practical cases as part of a unified firm, rather than as isolated tasks granting points—a common approach until now. This shift promotes a deeper understanding of how data interconnects within a holistic accounting system, enhancing both the analytical and problem-solving skills required for real-world applications. Therefore, with the growing body of knowledge in accounting, developing the curriculum for any accounting course can be both exciting and challenging (Handoyo and Anas, 2019).

We recognize the urgency of rethinking and reinventing accounting education to meet the demands of the digital era. An ideal model for 21st-century education combines both skills and knowledge through the use of platform technologies. According to the UNESCO report *The Digital Transformation of Education* (2020), UNESCO's e-Schools Initiative is a global effort aimed at integrating connectivity with inclusive and high-quality teaching and learning. The initiative seeks to improve learning outcomes and enhance employability for learners worldwide. The Digital Education Action Plan (2021–2027) is a renewed European Union (EU) policy initiative that sets out

a common vision of high-quality, inclusive, and accessible digital education in Europe. It aims to support the adaptation of the education and training systems across Member States to the demands of the digital age.

More importantly, accounting education institutions bear the responsibility of creating curricula that align with current labor market demands. Beyond performing fundamental tasks, accountants are now required to possess a diverse skill set, including excellent basic technical ability and knowledge of the general business environment.

3. Set up of the system

Based on the flow diagram presented in Figure 2, an adequately comprehensive system for accounting education can be implemented using Excel-based tools. The diagram illustrates the logical flow of accounting processes, integrating core elements of the accounting cycle—such as the chart of accounts, the general journal, and the preparation of trial balances, the general ledger, and financial statements (e.g., the income statement). This structured flow mirrors the operations of modern accounting software, thereby providing a valuable educational tool for developing both conceptual understanding and practical skills.

The proposed system leverages Excel's widely accessible features, including data validation, pivot tables, and formula-based automation (e.g., VLOOKUP and IF statements). To support implementation and replication, a complete Excel spreadsheet, along with a solved accounting case, is available on GitHub¹. The configuration of the Excel environment is structured as follows:

1. Create a sheet named "Chart of Accounts", listing all accounts required to solve the assigned case. These accounts can either be generalized or follow the national chart of accounts.
2. Create a second sheet named "General Journal" to record transactions.
 - a. Add three columns—Account Name, Debit Amount, and Credit Amount—to capture transaction details.
 - b. Insert a dropdown menu in the "Account Name" column by using Excel's data-validation tool, populated with account names from the "Chart of Accounts" sheet.
3. Generate a pivot table from the data in the "General Journal" sheet.
 - a. The pivot table includes rows for Account Names and columns for Sum of Debit Amounts and Sum of Credit Amounts.
 - b. This pivot table automatically calculates the current turnover (debit and credit totals) for each account.
4. Create a "Trial Balance" sheet that consolidates all financial data:
 - a. Columns include Account Name, Opening Balance (Debit and Credit), Current Turnover (Debit and Credit), and Closing Balance (Debit and Credit).
 - b. To link the current turnover from the pivot table, use the VLOOKUP function, where:

Debit turnover is given by:

$$= IFERROR(VLOOKUP(B_n, Pivot! \$A\$2: \$C\$458, 2, FALSE), 0)$$

Credit Turnover (adjusting the index to 3):

$$= IFERROR(VLOOKUP(B_n, Pivot! \$A\$2: \$C\$458, 3, FALSE), 0)$$

Debit Closing Balance is calculated as:

$$= IF(C_n + E_n > D_n + F_n, C_n + E_n - D_n - F_n, 0)$$

Credit Closing Balance is calculated as:

$$= IF(D_n + F_n > C_n + E_n, D_n + F_n - C_n - E_n, 0),$$

where C_n , D_n represent Opening Balances (credit and debit) and E_n , F_n represent Current Turnovers. B_n is the account name from the "Charts of Accounts" sheet.

5. Create the General Ledger as a separate sheet. Individual T-accounts for each ledger entry can be accessed by double-clicking on the debit or credit totals in the pivot table, providing a detailed breakdown of transactions.

¹ See Rusinov (2025) implementation in GitHub.

The income statement, balance sheet, and cash flow statement can be derived from the trial balance and turnover sheet. These statements aggregate the balances and provide insights into financial performance and position.

This structured approach leverages Excel's built-in features—such as data validation, pivot tables, and formula-based automation—to create a flexible and scalable accounting system suitable for both educational and practical applications. It enhances the learning experience by developing technical proficiency in Excel, a critical tool for accountants. It helps students understand the accounting cycle and the interdependence of its components, and elevates the practical aspects of the financial data creation and collection. This approach reinforces key accounting principles such as debit/credit equality and financial reporting accuracy.

4. Practical case example

In the following section, we present a sample case with two operations for a firm. The trial balance is shown in Table A.1, and the charts of accounts (based on the Bulgarian national classification) is provided in Table A.2.

1. The company sells a machine for 12,500 BGN, with an additional 20% VAT charged on the amount. The total sum has been deposited into the settlement account. The asset has a book value of 20,000 BGN and accumulated depreciation of 13,000 BGN up to this point.
2. In connection with the commencement of the construction of a store, materials worth 20,000 BGN have been invested in a business-like manner.

The solution to this case is presented in the General Journal (Table 1), where students are tasked with systematically and chronologically addressing the economic events within the firm. Although the documentation aspect of the processes is not explicitly discussed, it could be incorporated into the analysis. The account names in the General Journal may be represented either numerically or textually, depending on the accounting system used.

Table 1. General Journal after the completion of the given tasks

General Journal				
Dt	Ct	Name of the account	Debit amount	Credit amount
Dt		Clients	15000	
	Ct	Revenue from the sale of fixed assets		12500
	Ct	VAT sales		2500
Dt		Payment account in BGN	15000	
	Ct	Clients		15000
Dt		Depreciation of machines	13000	
	Ct	Machines		13000
Dt		Revenue from the sale of fixed assets	7000	
	Ct	Machines		7000
Dt		Expenses for materials	20000	
	Ct	Materials		20000
Dt		Expenses for acquiring fixed assets (in-house method)	20000	
	Ct	Expenses for materials		20000

After successfully solving the case in the General Journal, students can compile the pivot table in the Pivot sheet, resulting in the updated Trial Balance. Excel automatically calculates the current turnover. In our case, the results from this procedure are presented in Table 2.

Table 2. Listing of the affected accounts. ΔDt and ΔCt indicate the change in the respective accounts caused by the new information provided by the General Journal (see Table A.1)

№	Name of the account	Operating balance		Current Turnover		ΔDt	ΔCt
		Dt	Ct	Dt	Ct		
1	Materials	200000	0	0	195000	0	195000
2	Machines	0	240000	0	20000	0	20000
3	Payment account in BGN	298200	0	319700	428024	15000	0
4	Clients	120800	0	234240	295000	15000	15000
5	Depreciation of machines	0	130000	13000	15700	13000	0
6	VAT sales	0	0	0	39040	0	2500
7	Revenue from the sale of fixed assets	0	0	7000	12500	7000	12500
8	Expenses for materials	0	0	190000	190000	20000	20000
9	Expenses for acquiring fixed assets (in-house method)	0	0	33980	0	20000	0
Total:		619000	370000	797920	1195264	90000	90000

The total of 90,000 BGN (calculated as the sum of ΔCt and ΔDt) matches precisely the aggregate of all debit and credit entries recorded in the General Journal. Additionally, the resulting changes are reflected in the General Ledger, as detailed in Table 3.

Table 3. The General Ledger. The initial entries are taken directly from the Trial Balance (the transfer is automatic for accounts with non-zero closing balance). The second row (if non-zero) is automatically imported from the Trial Balance sheet if the user indicated a non-zero current balance.

Dt	Materials	Ct	Dt	Machines	Ct	Dt	Payment account in BGN	Ct
200000				240000		298200		
0	175000		0	7000		304700	428024	
	20000			13000		15000		
5000	0		0	260000		189876	0	
✓	✓		✓	✓		✓	✓	

Dt	Depreciation of machines	Ct	Dt	VAT sales	Ct	Dt	Revenue from the sale of fixed assets	Ct
	130000		0	0		7000	12500	
0	15700			36540				
13000				2500				
0	132700		0	39040		0	5500	
✓	✓		✓	✓		✓	✓	

Expenses for materials		Expenses for acquiring fixed assets (in-house method)	
Dt	Ct	Dt	Ct
170000	170000	13980	0
	20000	20000	
20000			
0	0	33980	0
✓	✓	✓	✓

Source: Author's calculation

The General Ledger can be automatically generated from the changes recorded in the General Journal by double-clicking on the pivot row within the Pivot sheet. The resulting data is then manually transferred to the General Ledger. The checkmarks in the last row of each T-account provide an automated verification process, ensuring that the closing balances in the Trial Balance and the T-accounts are consistent, thereby confirming the accuracy of the manual transfers.

Conclusion

The integration of MS Excel into accounting education represents a transformative pedagogical approach that bridges the gap between theoretical knowledge and practical application. By simulating the real flow of accounting transactions within an accessible and computationally robust environment, Excel fosters a deeper understanding of core accounting principles while equipping students with essential digital competencies. The findings of this study underscore the significant role of Excel in enhancing the learning process, improving students' ability to manage complex financial data, and automating fundamental accounting tasks.

This pedagogical approach not only aligns with the increasing digitalization of the accounting profession but also ensures that graduates possess the technical proficiency demanded by the modern job market. The ability to initiate an accounting process with a structured Trial Balance, coupled with automated financial reporting, further enhances students' readiness for real-world accounting challenges.

Moreover, this research is designed to serve as a gateway to a pilot study aimed at refining the proposed methodology. Future research could explore the benefits of integrating Excel-based learning beyond traditional computer laboratories, allowing students to leverage their personal technological devices in accounting coursework. Additionally, examining the integration of Excel in conjunction with emerging data analytics tools may further enrich accounting education and better prepare students for the evolving landscape of financial reporting and business intelligence.

Appendix

Table A.1. Starting Trial Balance for a hypothetical firm (before any transactions are recorded from the student)

№	Name of the account	Operating balance		Current Turnover	
		Dt	Ct	Dt	Ct
1	Materials	200000	0	0	175000
2	Machines	0	0	0	0
...					
4	Payment account in BGN	298200	0	304700	428024
5	Clients	120800	0	219240	280000
...					
18	Depreciation of machines	0	130000	0	15700
...					
20	VAT sales	0	0	0	36540
...					
32	Revenue from the sale of fixed assets	0	0	0	0
32	Expenses for materials	0	0	170000	170000
33	Expenses for acquiring fixed assets (in-house method)	0	0	13980	0
...					
51	Interest settlements	0	0	15000	16800
Total:		1611700	1611700	2105848	2105848

Table A.2. Charts of accounts based on the national classification in Bulgaria

Chart of accounts				
No.	Acc. Name	Code	Acc. Name	Code
1	Materials	302	Staff	4211
2	Production	303	Buildings	202
3	Machines	205	Long-term loans received	152
4	Short-term bank loans received	151	Social security (DOO) settlements	4212
5	Payment account in BGN	503	Social security (DZPO) settlements	4213
6	Clients	411	VAT payable	4531
...				
15	Suppliers	4011	VAT sales	4532
32	Revenue from the sale of fixed assets	705	Depreciation expenses	603
33	Expenses for materials	601	Salaries expenses	604
34	Expenses for acquiring fixed assets (in-house method)	613	Insurance expenses	605
...				
40	Production, type B	303.2	Interest settlements	496
	Expenses for core activity (Production 'A')	611.1		

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