



# Accounting Information Systems Implementation: A Literature Review

Viron Zaçe\* and Ingrid Shuli

## ABSTRACT

The rapid evolution of information technology has profoundly influenced everyday life, reshaping not only social interactions, but also the way businesses operate and how decisions are made in accounting. Accounting information is increasingly required to be as fast, accurate, and straightforward as possible. Achieving these objectives necessitates the automation of transaction recording in the initial phases, the acceleration of data processing within accounting systems, and the provision of financial and nonfinancial reports in real time, whether for managerial decision-making or for the preparation of financial statements. Even smaller economic entities commonly employ at least one basic accounting information system to record their daily transactions. However, as economic entities grow in complexity, the demand for accounting information systems that are capable of processing larger volumes of data with greater accuracy is becoming increasingly pressing. Consequently, there is a growing need to transition from traditional accounting systems to more advanced Accounting Information Systems solutions or, in the case of entities still relying on manual accounting tools, such as Excel, to adopt an appropriate accounting information system. The objective of this study is to examine the definitions of AIS, the processes involved in their implementation, and their impact on organizations, with particular attention to their influence on financial and non-financial reporting, as well as on key performance indicators. This is achieved through a critical analysis of the contributions of various authors who have examined the field of Accounting Information Systems.

Keywords: Accounting, Accounting Information Systems (AIS), financial reports, non-financial reports.

Submitted: August 27, 2025 Published: October 10, 2025

do 10 24018/eibmr 2025 10 5 2803

Accounting Department, University of Tirana, Tirana, Albania.

\*Corresponding Author: e-mail: viron.zace@unitir.edu.al

## 1. Introduction

As discussed by Richardson et al. (2023), an Accounting Information System is a system that records, processes, analyses, reports, and communicates business transaction results to generate financial and non-financial reports that help in decision-making. The definition of AIS has evolved over time and now increasingly refers to computerized accounting information systems, which focus on computers and various software in recording, processing, and reporting data. Given the highly dynamic and technologydriven business environment, the implementation of an AIS helps companies record, securely store, and report their financial data to third parties as accurately and quickly as possible. Accurate and timely reporting aids in successful decision-making. Reporting refers to both accounting reports and various managerial reports that

serve the company in its daily activities. One of the main points of this study is the impact of AIS implementation on the financial and non-financial reporting of a company. According to the conceptual framework, financial statements generated both manually and through an AIS must meet several qualitative characteristics to make the information in financial statements valuable to users. These qualitative characteristics include the following.

- Understandability
- Relevance
- Reliability
- Comparability

Most companies consider information a strategic asset and use it to develop a competitive advantage to manage their business better than their competitors. Information is a strategic asset if the company (1) knows what kind of information it needs, (2) develops systems to collect, store, and process that information, and (3) uses that information for decision-making. An AIS comprises several modules built to handle various aspects of financial management and reporting within a company. These modules vary from one company to another and include administration, procurement, sales, inventory, cash, banking, human resources, accounting, cost centers, production, long-term asset management, and reports. The implementation of an AIS requires time and money; therefore, it is considered a strategic investment that must be carefully studied. Successful implementation requires an appropriate combination of people, equipment, training, and management support. The purpose of implementing an AIS is to improve business processes, financial and nonfinancial reporting, and companies' financial indicators in the long term.

#### 2. Research Methodology

This study adopts a scoping review approach in order to synthetize the existing body of literature on Accounting Information Systemts (AIS) implementation. While working for this article, we analyzed two important databases (Web of Science and Scopus) where various publications on AIS were published. These databases were choosen because of their extensive coverage of peer-reviewed journals in the fields of accounting, management, and information systems. To capture the breadth of relevant studies, the following keywords were used:

- 1. "Accounting Information Systems" or "AIS
- 2. "implementation" or "adoption" or "design" or "enhance"
- 3. "financial reporting" or "non-financial reporting" or "performance"
- 4. "Albania" or "globally" or "international"

These terms were combined to ensure that both global and local perspectives on AIS were included. Searches were limited to titles, abstracts, and keywords. The search covers publications from 1973 to 2025, beginning with Marshall's seminal article on AIS decision-making models (Marshall, 1973), up to the most recent contributions on blockchain, cloud computing, and artificial intelligence in AIS. Articles were included if they met at least one of the following conditions:

- 1. Focused explicitly on AIS definitions, designs, adoption, or implementation.
- 2. Examined the impact of AIS on financial reporting, non-financial reporting, or company performance.
- 3. Studied factors influencing AIS efficiency, quality, or selection.
- 4. Were published in peer-reviewed journals indexed in WoS or Scopus.
- 5. Included research relevant to Albania or comparative international contexts.

The following were excluded: conference abstracts without full text, studies unrelated to AIS, duplicate records, and non-peer reviewed sources.

The initial search retriewed over 45 records. After removing duplicates and applying inclusion/exclusion criteria, a final sample of 23 core articles was selected for detailed analysis. The articles that we chose included the following topics:

- 1. AIS impact on a company (in terms of financial reporting and financials indicators)
- 2. AIS design
- 3. The importance of AIS implementation on SME
- 4. Factors that influence the efficiency and quality of an AIS
- 5. Factors that influence on selection of an AIS

The first database we considered was Web of Science, which is one of the largest databases in the world for publications, articles, and editorials. This database covers more than 32,000 journals from 80 countries in the world, compared with the Scopus database, which covers more than 42,000 journals.

In the WoS database, we selected research conducted by Monteiro and Cepeda (2021) that focuses on all articles published in this database regarding the field of AIS. It is important to note that WoS includes highly reputable journals with high academic impacts. This study uses WoS data and compares them with the results of previous studies based on the Scopus database. This study also considered the work done by Ezenwoke et al. (2019). This approach enables a broader analysis of scientific research on AIS.

According to this bibliometric analysis of Monteiro and Cepeda, which was conducted on approximately 144 articles on AIS in the Web of Science database, it has been discovered that the majority of articles in this field have been published in the last 10 years. The highest interest in the field of AIS by the authors has been shown from the year 2020 onwards. The trends in research on AIS include the following areas.

- 1. AIS impact on a company(in terms of financial reporting and financial indicators)
- 2. AIS design
- 3. The importance of AIS implementation on SME and public sector
- 4. Factors that influence the efficiency and quality of an AIS

## 3. LITERATURE REVIEW

# 3.1. Definitions of AIS

During the literature review, we identified two definitions of AIS: the first defines AIS as a system that records, processes, analyses, and reports financial and nonfinancial information, while the other definition refers to AIS as computerized systems, thus including information technology and computers. Most authors define AIS along with the computer component. The first classic definition, also articulated by Romney et al. (1997), states that AIS processes data and transactions to provide users with the information they need to plan, control, and manage their business.

Considering that computers are very present in business life, this has also changed the definition of AIS. In most of the reviewed literature, AIS definitions consider that we are dealing with systems that include the IT part, that is, the computer part. Therefore, in our article, when we refer to AIS (Accounting Information Systems), we are referring to computerized accounting information systems. The second definition by Simkin et al. (2014) highlights that AIS lies in the middle of two disciplines: accounting and information systems. As a result, the study of AIS is usually viewed as a study of computerized accounting systems. Therefore, AIS is defined as a combination of data and processing procedures that creates the necessary information for users. Processing procedure: computerized processing. Throughout our work, we rely on the second definition of Accounting Information Systems, considering that we are dealing with Computerized Systems.

## 3.2. Components of AIS

Based on the articles reviewed from the Web of Science database, the majority of authors share the same opinion regarding the components of AIS. According to several studies (Ivungu, 2019; Romney & Steinbart, 2017), an AIS consists of six components.

- 1. People
- 2. Procedures and instructions
- 3. Data
- 4. Software used to process data
- 5. IT infrastructure (computers, devices, network)
- 6. Internal control

Before implementing an AIS, it is essential to ensure the integration of all the above components.

# 3.3. AIS and ERP Systems

In addition to Accounting Information Systems (AIS), the broader field of information systems also encompasses Enterprise Resource Planning (ERP) systems. ERPs can be considered comprehensive and large-scale accounting information systems that integrate multiple functional modules within a centralized database, thereby supporting a wide range of organizational processes. Despite differences in AIS, ERPs can be a good field to study the various problems that arise during the selection of the right ERP package for a company or to study different issues that arise during the implementation phase. ERPs are software packages that have been spreading in our country in recent years due to foreign companies with branches in Albania, as well as the increasing complexity of local companies and the need for a more configurable, faster, and more productive system. However, in many cases, the implementation of ERPs in Albania has been difficult for various reasons. Depending on their needs, businesses must choose an AIS that suits them. However, several factors must be considered when selecting AIS. According to Perri and Manoku (2021), some factors influencing the selection of an ERP package are as follows:

- 1. Compatibility with accounting standards
- 2. Credibility and consistency of the system
- 3. Decision by top management
- 4. Decision by head quarters
- 5. User simplicity
- 6. ERP flexibility to adapt to the company

- 7. Multiple functions offered by the system
- 8. The good name of ERP vendor
- 9. Affordable costs of the implementation and support

## 3.4. Challenges in AIS Implementation

After the selection of an AIS, the next phase is implementation, which is challenging. As shown by Rosati and Lynn (2023), the challenges of adapting and successfully implementing an AIS project are not different from those in other business areas. Implementation involves the transition from manual accounting to AIS, as well as the transition from one current AIS to another. Managers must consider several factors when facing the implementation of a new AIS project, such as the processes to be applied, the people involved, the selected AIS, and the equipment to be purchased. AIS implementation requires the involvement of managers at all levels within the organization, including accountants and external consultants. For example, some researchers have analyzed the link between the personal characteristics of top-level managers and the implementation of a new AIS. As Hiebl (2014) states, younger and shorter-tenured CFOs and top managers with business-related backgrounds are associated with more innovative and sophisticated management accounting and control systems. When implementing an AIS, companies should compose a proper squad of IT professionals, accountants, managers, and consultants. Apart from people, they should have a proper plan with specific tasks and deadlines to ensure the transition to a new AIS. In his study Nelson (2007) claims that errors related to processes and people were the main contributors to IT system implementation failures at 45% and 43%, respectively. The remaining part is 8% because of the product and 4% because of technological errors. This indicates the importance of processes and people in information system projects.

# 3.5. Factors Influencing Implementation Success

The implementation of the AIS depends on several factors. Most of the analyzed authors referred to the DeLone and McLean models when discussing the factors influencing AIS implementation. In accordance with this study, DeLone and McLean (1992), the authors constructed a model to evaluate the factors affecting AIS implementation. Over the years, this model has been used as a theoretical basis by other authors to develop their work, and the original authors have improved their initial work through publications in the following years, in line with various changes in the business and IT markets. They identified six factors influencing AIS implementation: system quality, information quality, use, user satisfaction, personal impact, and organizational impact. One of the authors who later revised this model was Lutfi (2023), who studied the impact of system quality, service quality, information quality, internal control quality in AIS usage, and user satisfaction. System quality refers to how effectively and appropriately system functions meet client requirements. Service quality refers to how efficiently AIS support meets clients' needs. Information quality refers to

the "product" produced by the AIS, that is, the reports/information generated. Internal control quality refers to the mechanisms of an economic unit to protect and assess the accuracy and reliability of accounting information. Based on a study conducted in Albania by Zoto (2014), data quality is very important for the success of an AIS, where AIS refers to a computer-based system that processes financial data and supports decision-making processes within the organization.

# 3.6. Impact of AIS on Reporting and Performance

Other authors in these papers have not only focused on the structure of an AIS or the factors influencing its implementation. Many emphasize the importance of AIS in a company and the improvements it brings. In a study conducted by Monteiro et al. (2021), it is analyzed the effect of internal control and AIS on the quality of financial reporting. After analyzing the data collected through questionnaires and reviewing the literature in this research, it was concluded that the quality of financial reporting is directly influenced by the quality of internal controls and the quality of the implemented AIS. (H 3: The quality of AIS (implementation) has a positive impact on the quality of financial reporting). There are some goals when a company implements an AIS, such as generating on-time financial and non-financial reports, speeding up business processes, enhancing staff communication, and improving interactions with third parties. According to Idris et al. (2017), the implementation of an AIS is successful if it generates accurate and timely information that can meet the requirements of the economic unit to facilitate business operations and enhance user satisfaction.

The implementation (investment) of an AIS system creates value for the companies. Creating value means that the company may increase its revenues, margins, or other performance indicators, such as ROA and ROE. Many authors have studied the impact of implementing an AIS system on performance indicators. According to a study by BinSaeed et al. (2023), there is a positive link between "digital orientation" and the financial performance of organizations. The results of this study confirm that AIS systems act as mediators between en "digital orientation" and financial performance. Attention has also been given to the impact of AIS systems on specific performance indicators such as ROA, ROE, and sales turnover. Kobelsky et al. (2008) found a positive link between annual investments in AIS systems and future accounting profits (measured by ROA and sales turnover), suggesting that investing in AIS systems creates value. Richardson et al. (2021) illustrated how an AIS creates value if implemented properly. As shown in Table I, the elements of income statements change after good AIS implementation.

#### 4. RESULTS AND DISCUSSION

The review of the existing literature highlights several key findings regarding the implementation of Accounting Information Systems (AIS) and their impact on organizations, both internationally and within the Albanian context.

### 4.1. Results

The first finding relates to the evolving definition of AIS. Earlier studies emphasized AIS primarily as systems for recording and reporting financial transactions (Romney et al., 1997), while more recent literature (Simkin, et al., 2014) integrates the technological dimension, framing AIS as computerized systems that combine accounting processes with information technology. This evolution reflects the increasing role of digital transformation in shaping accounting practices.

Second, the bibliometric evidence from Monteiro and Cepeda (2021) and Ezenwoke et al. (2019) shows a growing academic interest in AIS research, particularly after 2020. The main themes emerging form these studies include the impact of AIS on company performance, system design, challenges of implementation in SMEs and public entities, and the factors that determine the efficiency and quality of an AIS.

Third, the literature consistently identifies critical factors influencing AIS implementation. Building on the DeLone and McLean (1992) model, recent studies (Lutfi, 2023) emphasize system quality, service quality, information quality, user satisfaction, and internal control mechanisms as fundamental elements for successful AIS adaoption. Evidence also shows that people and processes remain decisive, with failures often attributed to

TABLE I: THE POTENTIAL EFFECT OF AIS ON AN INCOME STATEMENT

Income statement	Effect of AIS on income statement
Revenues	Customer relationship management (CRM) techniques could attract new customers, or better service existing customers to generate additional sales revenue.
Less: Cost of goods sold	Supply chain management (SCM) software allows firms to carry the right inventory and have it in the right place at the right time. This, in turn, will lower obsolescence as well as logistics and procurement costs.
Gross margin	The gross margin will change as the result of changes in revenues or cost of goods sold due to the effects of AIS.
Less: Selling, General, and Administrative Expenses (SG&A)	An efficient enterprise system can significantly lower the cost of support processes included in sales, general, and administrative expenses.
Less: Interest expense	SCM software allows the firm to carry less inventory. Less inventory on hand leaves fewer assets to finance, potentially reducing the amount of debt and the related interest to service the debt.
Net income	All combined, a well-designed and well-functioning AIS with investments in enterprise systems, SCM, and/or CRM may be expected to improve net income.

organizational resistance, lack of training, or managerial shortcomings (Nelson, 2007).

Finally, the impact of AIS on organizational performance is strongly supported. Several studies (Monteiro et al., 2021; BinSaeed et al., 2023; Kobelsky et al., 2008) demonstrate that well-implemented AIS improve both quantitative indicators (revenues, margins, ROA, ROE, cost reductions) and qualitative outcomes (quality of reporting, internal communication, and decision-making). The reviewed literature confirms that AIS act as strategic investments that create long-term value for companies.

## 4.2. Discussion

These results underline the strategic importance of AIS implementation in enhancing organizational performance. For Albanian companies, the transition from manual or fragmented accounting practices to integrated AIS solutions represents not only a technological adjustment but also an organizational change process. The literature suggests that while advanced ERP systems are increasingly adopted by larger firms and multinational subsidiaries, local SMEs often face barriers such as high costs, limited IT infrastructure, and lack of expertise (Perri & Manoku, 2021). This indicates that contextual factors play a critical role in determining the success of AIS implementation in

Moreover, the findings highlight that the benefits of AIS are not limited to financial outcomes but extend to non-financial dimensions, such as timely decision-making, better internal control, and improved relationships with external stakeholders. This multidimensional impact is particularly relevant in the Albanian environment, where transparency, compliance with international standards, and the integration of new technologies (cloud computing, AI, blockchain) are becoming increasingly important.

Overall, the reviewed literature demonstrates that while AIS implementation is complex and requires significant investments in people, processes, and technology, its positive impact on both efficiency and effectiveness makes it indispensable for modern organizations. For Albania, this suggests a strong need to encourage both academic research and practical initiatives that facilitate the adoption of AIS across different sectors, especially among SMEs and public institutions.

# 5. Limitations

This study is subject to several limitations that should be acknowledged. First, as a literature review, the analysis relies exclusively on secondary data rather than empirical evidence. While this approach enables the synthesis of prior findings, it restricts the depth of insights that could be gained from field-based research, such as surveys or interviews with Albanian companies. Second, the scope of the review is constrained by the availability and accessibility of published sources, particularly in the Albanian context, where academic research on Accounting Information Systems (AIS) remains relatively scarce. Some potentially relevant local studies may not have been included due to language barriers or limited indexing in major international databases. Third, the rapid development of digital technologies, such as artificial intelligence, blockchain, and cloud computing, may have caused that certain finding may quickly become outdated, reducing the long-term applicability of the review. Finally, as the synthesis of literature is interpretative in nature, there is a risk of subjective bias in the selection and evaluation of sources. These limitations suggest that the conclusions drawn should be interpreted with caution and viewed as a foundation for future empirical research.

#### 6. FUTURE RESEARCH DIRECTIONS

Development in the IT field affects Accounting Information Systems, as one of its essential components is IT Infrastructure (computers, devices, and networks). However, recent developments have brought about significant changes in the design and access of AISs. Concepts such as blockchains, artificial intelligence (AI), and cloud computing have been introduced. According to Giang and Tam (2023), incorporating blockchain in accounting will help businesses optimize the security and transparency of accounting information. It will also have a significant impact on current Accounting Information Systems. Another major change in everyday business is the introduction of Artificial Intelligence. Today, we see AI in every business process, from making orders, recording invoices, customer care, summarizing information, etc. As emphasized by Hall (2019), AI can be implemented in an AIS to solve suspicious and complex situations in seconds, automate daily tasks, improve processes, and optimize reports. Another emerging trend in the AIS field, which was perhaps introduced earlier, is cloud computing. This issue was introduced years before AI and blockchain, which is why it has experienced a broader expansion in the field of AIS. The majority of accounting information systems and even many ERPs are moving towards cloud solutions for increased data security, better system performance, high speed, and lower maintenance costs. As demonstrated by Mell and Grance (2011), cloud computing is a new technology for users to access an on-demand network of computing resources over the Internet, including networks, servers, virtual storage spaces, applications, and services.

#### 7. Conclusion

This study has examined the field of Accounting Information Systems (AIS) through a structured literature review, considering both international and Albanian perspectives. The findings confirm that AIS play a vital role in modern organizations by integrating accounting processes with information technology to enhance the quality, timeliness, and reliability of financial and nonfinancial reporting. The evolution of AIS definitions, from traditional transaction processing systems to complex, technology-driven solutions, reflects the broader digital transformation of business environments.

The review indicates that the successful implementation of an AIS depends on multiple interrelated factors, including organizational size and complexity, industry characteristics, cost-benefit considerations, vendor reputation, user training, internal controls, and the capacity of the system to integrate with other technologies. Evidence from the literature demonstrates that effective AIS implementation generates value both quantitatively, by improving revenues, margins, and performance indicators such as ROA and ROE, and qualitatively, by strengthening reporting processes, internal communication, decisionmaking, and stakeholder relations. In contrast, weak implementation strategies caused by insufficient planning, inadequate training, or lack of managerial commitment, pose significant risks of inefficiency or failure.

The Albanian context reflects many of these global trends, though challenges remain, particularly for SMEs and public institutions that face resource limitations, insufficient IT infrastructure, and restricted access to expertise. Nevertheless, the local literature suggests a growing awareness of AIS as a strategic investment and a critical driver of transparency, accountability, and competitiveness in the Albanian economy.

Finally, the rapid advancement of digital technologies, including cloud computing, blockchain, artificial intelligence, and business intelligence tools, is reshaping the future of AIS worldwide. These innovations provide new opportunities for efficiency, integration, and data-driven decision-making, but they also require organizations to continuously adapt their systems and processes. In this respect, AIS should not be seen as static solutions, but as dynamic infrastructures that must evolve alongside technological and organizational change.

#### CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest.

# REFERENCES

- BinSaeed, A., Yousay, A., Grigorescu, A., Radu, A., & Nassani, A. A. (2023). Digital revolution and digitalization process to promote SIK as a vector of financial performance. Systems, 11(8), 339. https:// doi.org/10.3390/systems11080339
- DeLone, W., & McLean, E. (1992). Information systems success: The quest for the dependent variable. Information Systems Research, 3(1), 60–95. https://doi.org/10.128
- Ezenwoke, O., Ezenwoke, A., Eluyela, D., & Olusanmi, O. (2019). A bibliometric study of accounting information systems research from 1975-2017. Asian Journal of Scientific Research, 12(2), 167-168. https://doi.org/10.3923/ajsr.2019.167
- Giang, N., & Tam, H. (2023). Impacts of blockchain on accounting in the business. SAGE Open, 13(4), 21582440231222419. https://doi.
- Hall, J. A. (2019). Accounting Information Systems. 10th ed. Cengage Learning.
- Hiebl, M. (2014). Upper echelons theory in management accounting and control research. Journal of Management Control, 24(3), 223-240. https://doi.org/10.1007/s00187-013-0183-1.
- Idris, M., Mohamad, R., & Lutfi, A. (2017). AIS usage factors and impacts among Jordanian SMEs: The moderating effect of environment uncertainty. Journal of Advanced Research in Business and Management Studies, 6(1), 24-38.
- Ivungu, J. A. (2019). Effect of accounting information system on financial performance of firms: A literature review. IOSR Journal of Business and Management, 21(1), 39-49.
- Kobelsky, K., Richardson, V., Smith, R., & Zmud, R. (2008). Determinants and consequences of firm information technology budgets. The Accounting Review, 83(4), 957-995. https://doi.org/10.2308/
- Lutfi, A. (2023). Factors affecting the success of SIK from the lens of DeLone and McLean IS model. International Journal of Information

- Management Data Insights, 3(2), 100202. https://doi.org/10.1016/j.
- Marshall, R. (1973). Determining an optimal accounting information system for an unidentified user. Journal of Accounting Research, 10(2), 286–307. https://doi.org/10.2307/2490181.
- Mell, P., & Grance, T. (2011). The NIST Definition of Cloud Computing (Special Publication 800-145). National Institute of Standards and Technology, U.S. Department of Commerce. https://doi.
- Monteiro, A., & Cepeda, C. (2021). Accounting information systems: Scientific production and trends in research. Systems, 9(3), 67. https://doi.org/10.3390/systems903006
- Monteiro, A., Vale, J., Silva, A., & Pereira, C. (2021). Impact of the internal control and accounting systems on the financial information usefulness: The role of the financial information quality. Academy of Strategic Management Journal, 20(1), 1-12.
- Nelson, R. (2007). IT project management: Infamous failures, classic mistakes, and best practices. MIS Quarterly Executive, 6(2), 67-78.
- Perri, R., & Manoku, E. (2021). Factors of success in implementation of enterprise resource planning systems. WSEAS Transactions on Business and Economics, 18(102), 1002–1013. https://doi. org/10.37394/23207.2021.18.102.
- Richardson, V. J., Chang, C. J., & Smith, R. E. (2021). Accounting Information Systems. 3rd ed. McGraw Hill.
- Richardson, V. J., Chang, C. J., & Smith, R. E. (2023). Accounting Information Systems, 4th ed. McGraw Hill.
- Romney, M. B., Steinbart, P. J., & Cushing, B. E. (1997). Accounting Information Systems. 7th ed. Prentice Hall.
- Romney, M. B., & Steinbart, P. J. (2017). Accounting Information Systems. 14th ed. Pearson.
- Rosati, P., & Lynn, T. (2023). AIS: Challenges to technology implementation. In E. Strauss, & M. Quinn (Eds.), *Routledge Handbook of* Accounting Information Systems (2nd ed., pp. 329–348). Routledge.
- Simkin, M. G., Rose, J. M., & Norman, C. S. (2014). Core Concepts of Accounting Information Systems. 13th ed. Wiley.
- Zoto, E. (2014). Data quality and accounting information systems: Actual performance in Albania. Perspectives of Innovations, Economics & Business, 14(1), 34-41. https://doi.org/10.15208/ pieb.2014.04.