# POSSIBILITIES OF ANALYSING THE ECONOMIC AND FINANCIAL PERFORMANCE OF ECONOMIC ENTITIES THROUGH THE IMPLEMENTATION OF ACCOUNTING INFORMATION SYSTEMS

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**Abstract**
The accelerated evolution of digitisation and information technologies in recent years, together with growing competition in the business environment, have led to a profound transformation of the activities carried out within economic entities. The fundamental purpose of this study is to investigate in depth the influence that accounting information systems, especially ERP systems, have on the organisational performance of economic entities. This influence is analysed from the perspective of reducing operational costs, optimising the decision-making process and improving the efficiency of decision-making by management. The central objective of this research is to investigate how ERP information systems influence organisational performance, as well as to assess the perception of employees within economic entities on the use of these IT solutions in their daily professional activity.

**Keywords:** accounting information systems, economic and financial performance, ERP, economic entity, decision-making process, efficiency

**JEL Classification**: M41

## 1. Introduction

Performance is one of the most commonly used terms in everyday life to reflect progress. If we refer strictly to the measurement of results achieved by an individual, a member of the entity, this will be called individual performance. However, when referring to the

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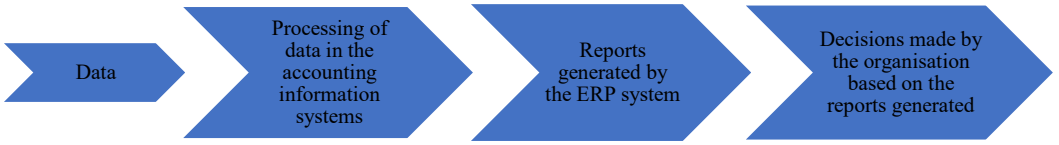
concept of economic performance at the organisational level, performance management is one of the responsibilities of the entity's management, and this is exercised through the implementation of measures and actions aimed at increasing performance.
With this study, we seek to demonstrate that the use of modern accounting information systems has a positive impact on economic entities, for the purpose of achieving above-average results, namely high and very high performance. We have addressed this topic because we believe that a large number of domestic economic entities do not pay sufficient attention to this segment, refusing to invest the necessary resources to implement modern IT solutions that would simplify work processes and, implicitly, increase performance.
The rapid evolution of digitalisation and IT technologies in recent years, together with increased competition in the business environment, have led to a profound transformation of the activities carried out within economic entities. In this context, traditional processes based on manual labour and excessive use of paper for information transmission have been replaced by efficient digital solutions. ERP-type information systems, implemented by an increasing number of economic entities, contribute to the rigorous monitoring and planning of daily activities, providing managers with a clear, complete and accurate picture of the organisational situation.
These IT systems facilitate optimised resource management, minimising waste and reducing the risks associated with their inefficient use. As a result, ERP systems have become basic tools for carrying out the current activities of economic entities, supporting the flow of information and contributing to the decision-making process.
The need to implement these systems stems mainly from the increasing volume of data and documents that must be processed within a limited time frame, in correlation with the entity's development objectives. An additional reason for adopting these solutions is the *"possibility of meeting the organisation's objectives in real time"* [1], given that the information generated through these systems is complete, accurate and delivered promptly.
The modular structure of ERP systems, together with their ability to integrate data into a single database, significantly streamlines the process of data sharing between the entity's different departments. Thus, they provide *"an accurate and complete picture of the entity's situation"* [1]. Each module is designed to include functionalities specific to the needs of each department, thus contributing to ensuring transparency and consistency of data at the organisational level.
The main role of these systems is to *"share and transfer data and information"* [2], both within the entity and in its external relations. In addition, ERP systems support the process of optimising and automating business operations and provide a solid basis for strategic decision-making by management.

## 2. Literature review

In recent decades, technological progress has led to the accelerated and refined development of information systems, contributing significantly to the optimisation of how entities operate. These systems aim not only to streamline internal activities but also to increase competitiveness in relation to other entities in the same sector. In this context, this study aims to investigate in depth the influence of integrated ERP-type information systems, both on the overall performance of the entity and on how they influence the work of accounting professionals.

Numerous specialist studies have outlined various perspectives on the definition of accounting information systems and highlighted the significant impact that the implementation of ERP solutions can have on organisational performance.
Accounting information systems are often described as platforms for collecting, storing and processing financial and accounting data, information that is subsequently used by decision-makers within organisations. *Onete & Dina* emphasise that these systems play a fundamental role in business administration and management, decisively influencing the economic development of entities, which makes them an indispensable element of long-term success.
According to *Bagranoff et al*., accounting information systems are defined as a *"collection of data and procedures"* [4], designed to provide relevant and accurate information to interested users. An important advantage of ERP systems is their ability to centralise information in a single database, thus enabling the storage and sharing of basic data between different departments and organisational functions.
Through these integration mechanisms, the entity's management, as well as external parties, can access the information necessary for planning, control and decision-making processes in a timely manner. Thus, ERP systems serve to bring together a *multitude of business processes and activities,* and the accounting information they generate provides managerial support in making the most effective strategic decisions. From *Alnajjar's* perspective, accounting data processed through ERP is a *"crucial ingredient"* [5] in organisational decision-making, whether managerial or financial. That is why the processing of this information requires a high degree of rigour, thus ensuring transparency and clarity in the reports generated, as illustrated in Figure 1.




**1 .** Data flow and ERP systems
Source: authors' processing

Any modern entity needs to invest in complex IT solutions, such as ERP systems, in order to strengthen its operational efficiency, reduce waste of resources and unnecessary consumption of electricity, and increase overall labour productivity. These integrated IT systems contribute significantly to the optimisation of internal processes by automating workflows and improving decision-making capabilities.
In a comprehensive study, *Ahmad and Al-Shbiel* highlighted that the literature supports the effectiveness of ERP systems in increasing organisational performance, which can only be achieved if entities are willing to accept and manage the environmental changes that may arise as a result of implementing these technologies [6]. In this regard, *Esmeray* emphasises that ERP systems play an essential role in supporting decision-making and internal control processes, becoming an indispensable tool for effective governance [7].
In terms of organisational performance, *Gruian* defines it as an entity's ability to access, allocate and use resources in an optimal way so as to obtain a level of remuneration

sufficient to cover the risk assumed and to maintain interest in the context of long-term sustainable development.
However, although organisational performance can be assessed using a variety of indicators, the literature does not provide clear guidance on selecting the most appropriate IT system to ensure performance improvement.
*Sousa et al.* also used a series of qualitative indicators – including productivity, customer satisfaction and the degree to which their needs are met – to comprehensively assess organisational performance [8]. On the other hand, financial performance is measured using specific indicators calculated on the basis of data generated and managed using ERP systems.

## 3. Research methodology

In order to achieve the established research objective, a mixed methodological approach was used, combining quantitative and qualitative methods, as well as theoretical analysis of the specialised literature.
The research methods used were summarised as follows:
Theoretical research, focused on exploring relevant concepts in the literature, with the aim of outlining a solid conceptual framework for the in-depth analysis of the topic under investigation;
Quantitative research, structured around two components:
Bibliometric analysis, designed to highlight the benefits of implementing ERP systems in improving organisational performance, by selecting and examining scientific papers indexed in established databases, such as Web of Science and Scopus;
Analysis of financial data from the financial statements of selected entities that have implemented ERP systems, comparing their performance before and after implementation (over a period of three years) by calculating relevant financial indicators in order to highlight the impact of ERP systems on organisational performance.

## 4. Proposals for innovative solutions regarding the integration of modern information technology components into financial-accounting information systems

The concept of performance has been defined in the explanatory dictionary of the Romanian language as "an outstanding result achieved in a particular field of activity". *Niculescu and Lavalette* define performance as "a state of competitiveness of an economic entity, achieved through a level of productivity and efficiency that ensures its sustainable presence on the market" [9]. *Albu, C. N. and Albu, N.* define performance as the ability of an entity "to progress through constant efforts" [10], which can also be defined by three other concepts: effectiveness, efficiency and value.

*Gruian* defines the performance of an entity as "the ability to access resources, allocate them and use them optimally in order to obtain sufficient remuneration to cover the risk assumed and justify the interest, on the path to sustainable future development" [11].

However, it is considered that each area within the entity contains specific values that can be monitored, such as: in the marketing department, entity statistics are tracked; in the sales department, new opportunities and potential customers are monitored; and managers

analyse financial values. Values are quantified through performance indicators. Performance indicators are defined in M.P.F. Order No. 285/2009 as the unit of measurement that examines and indicates the performance strategy, providing clear and accurate information about the entity's situation.

*Higgins and Hack* (2004) identified three categories of performance indicators [12]:

- financial and non-financial indicators;
- reactive indicators (based on past results) and proactive indicators (based on future estimates);
- internal and external indicators for the purpose of analysing the internal and external performance of the entity.

The main characteristics of a performance indicator that *Bradford* (2015) identified in his work are [13]:

- they are based on corporate standards and valid data,
- they are easy to understand by stakeholders (what they represent, how they are measured and how the indicators are calculated),
- they are relevant to the entity,
- it leads to positive actions.

There are five reasons why performance measurement is necessary, as shown in Figure 2:

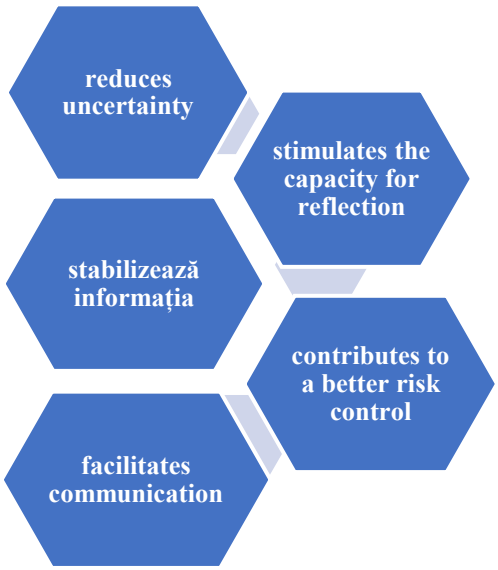



**Figure 2.** Reasons for measuring performance by an organisation

(Source: adapted from information in M.P.F. Order No. 285/2009)

*Ormenișan* considers that performance indicators are necessary for control, self-assessment and consistent improvement so that possible errors that the entity may face can be identified [14]. The entity's management has the role of detecting deviations from the desired performance, but also of planning and achieving the objectives set for the entity. For the

short-, medium- and long-term development of the entity, performance measurement systems must comply with a minimum set of 15 principles, as presented in Figure 3.


**Figure 3.** The 15 principles that must be followed for organisational performance measurement systems

Source: author's processing

According to *Kanji and Moura [15]*, performance measurement can fulfil the following roles:

- verifying the entity's progress at a given time in order to meet the set objectives;
- presenting managers with information relevant to ensuring the entity's success and identifying areas or aspects that require further improvement;
- enabling the development of effective and efficient strategies necessary for the entity's development.

Performance measurement has three meanings according to *Neely et al*. [16], which are presented in Figure 4:

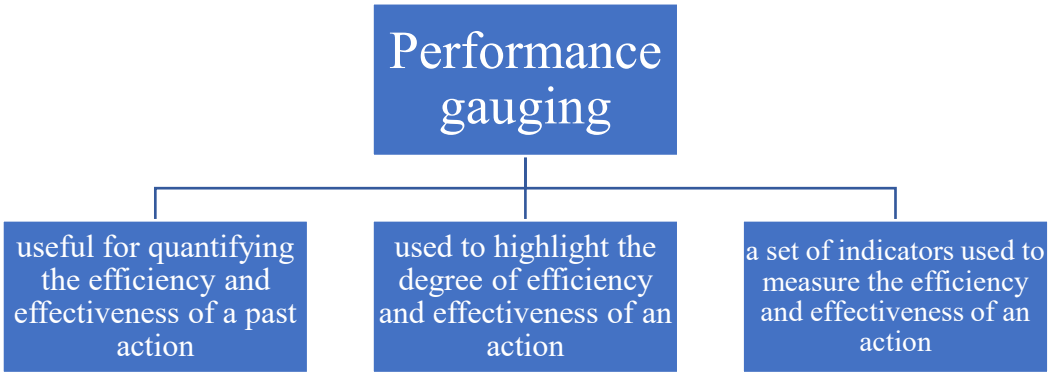



**Figure 4.** The three meanings of performance measurement

Source: authors' processing

In other words, *Lohman* characterises the concept of performance measurement through five criteria presented in Figure 5, such that the combination of the five elements will lead to beneficial results for the entity [17].

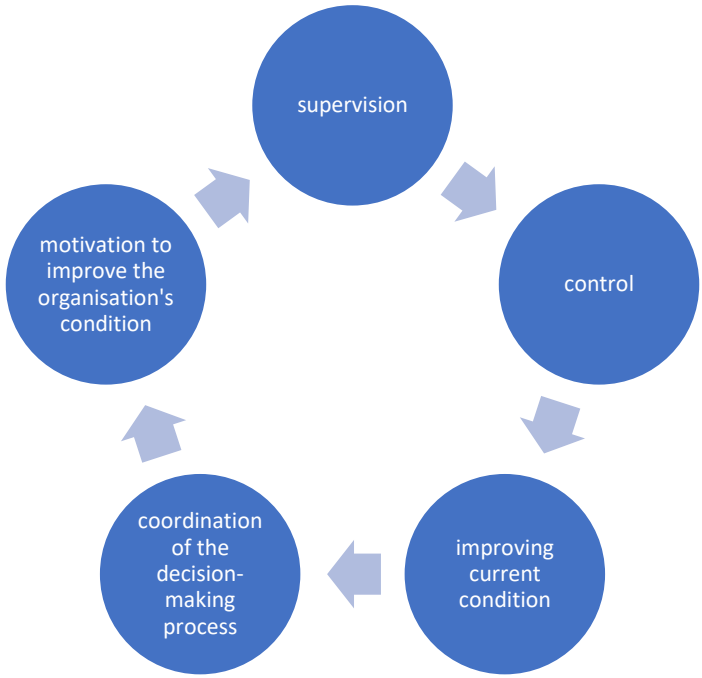



**Figure 5.** Characterisation of the concept of performance measurement

Source: authors' processing

In order to analyse the performance of an entity, the following aspects should be identified according to *Bratian* [18]:

- correlating the entity's performance indicators: the entity's strategies, objectives and budget;
- identifying the categories of indicators that are critical for an entity in order to identify its situation - indicators that reflect the entity's vision, mission, values and objectives;
- identifying financial and non-financial indicators that reflect the entity's situation as accurately as possible;
- aligning organisational levels.

Thus, in order to measure performance indicators, it is necessary to centralise all data/information within the entity using ERP-type information systems. ERP systems are designed to integrate information from within and outside the entity and to provide real-time processed information to employees and business partners. ERP systems are information systems that enable entities to identify, collect, integrate and structure all business processes in different departments of an entity, providing data to employees in the shortest possible time.

*Saeed et al*. state that ERP systems allow entities to automate a number of functions related to technology, services and human resources [19]. The main functionality of ERP systems is that they allow the creation of a permanent data backup, coordinating the flow of information in the database.

Entities in the economic environment decide to implement IT systems because they expect to generate financial benefits in the shortest possible time and maximise them using their own management techniques.

The implementation of ERP systems promotes operational efficiency and the transformation of all processes within an entity, offering numerous benefits. In the study conducted by *Balic et al.*, the quality offered by ERP systems was analysed from the perspective of three dimensions [20]:

- ERP information quality - understood as the way in which data meets the needs and requirements of users;
- ERP system quality – reflected in the system's capacity and the quality of information processing to meet technical requirements;
- ERP service quality - relating to customers' normative expectations and the perceived performance of the services provided by ERP systems.

Thus, the three dimensions have an impact on financial and non-financial performance indicators.

Financial performance indicators can be classified into two categories:

- rates of return – on investments, sales, inventory turnover;
- cost-related indicators savings.

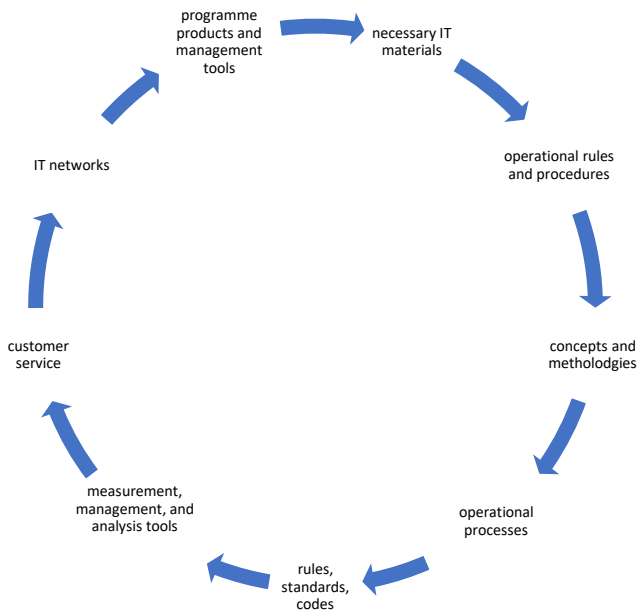
The results show that the implementation of ERP systems influences these indicators in the long term and that the impact of ERP system implementation is rarely visible in the short term. Non-financial indicators come from improvements in processes, workflow and access to information as a result of data processing using ERP systems.

## 5. Analysis of factors affecting organisational performance and the positive impact of implementing accounting information systems

The role of ERP systems is to integrate all information into a database from all departments of an entity, while facilitating the elimination of boundaries between departments and functional delimitations.

Given the upward trend in the modernisation of equipment and programmes used by entities as a result of technological progress, many of them decide to invest in the implementation of ERP systems. The main goal is to increase efficiency and flexibility, reduce maintenance costs, minimise risks, and integrate and process data in a single database shared by all departments of an entity. However, in the process of implementing these ERP systems, the risks to which the entity may be exposed in the process of transferring data from the database of the previous application to the database of the new application should be taken into account. Thus, ERP systems have the role of determining changes in the entity's strategy and vision. It should be noted that ERP systems have the role of eliminating problems that arise in resource management and clarifying the issues presented in Figure 6:

**Figure 6.** Problems arising in the management of an entity's resources




Source: authors' processing

Once this system has been implemented, it brings about changes both in the way activities are carried out and in the organisation. According to *Gargeya and Brady*, an ERP system is a system that allows the entity to have greater visibility of the information stored in the database and “to have better control over operations” [21].

Authors *Gargeya and Brady* have identified the main tangible and intangible benefits of the ERP system, which are presented in Table 1.

**Table 1**. Benefits of implementing ERP systems

| Tangible benefits | Intangible benefits |
|---|---|
| • Reduction in material storage;<br>• Reduction in personnel (i.e. reduction in salary and other salary-related expenses);<br>• Improved productivity;<br>• Improved management process;<br>• Improved financial cycle;<br>• Reducing utility costs;<br>• Improving cash management;<br>• Increasing revenue/profit;<br>• Reducing time spent on equipment maintenance. | • Information visibility;<br>• New/improved processes;<br>• Integration and standardisation of information;<br>• Flexibility;<br>• Increased business performance. |

Source: Gargeya and Brady, 2005

At the same time, it has been observed that entities that have implemented ERP systems can more easily achieve the following objectives:

- Integration of numerical data useful for the presentation of financial information;
- Centralised data control, eliminating data falsification;
- Integration of business processes;
- Standardisation of business operations;
- Accurate data analysis;
- Evaluation of programmes or decision-making processes.

In addition, ERP systems also bring about cultural and professional changes, as the technology stimulates employee creativity by organising the volume of information into a network, with all information collected from departments being stored in a single database.

The role of employees changes as a result of the implementation of this system, as they spend more time analysing different data and less time processing documents. However, professional evaluation criteria will also change, with more emphasis on skills and less on performance.

Other benefits of implementing ERP systems identified on the Wikiejemplos.com website are: automation of processes carried out within the entity in order to constantly improve the efficiency of daily operations, a higher degree of control and traceability that allows close monitoring of all processes within the entity, improvement of the decision-making process

as a result of the quality of information processed with ERP systems and the stability of information because all information is stored in a single database.

*Soja* (2016) [22] identified the main success factors in ERP implementation, divided into two sections, presented in Table 2:

**Table 2.** Success factors in ERP system implementation

| **Working environment** | **Methodological** |
|---|---|
| • Description of the entity's activity;<br>• High productivity;<br>• Entity's willingnessto change. | • Use of the embedded approach to implementation. |

Source: authors' processing

*According to Yang and Su* (2009), the main benefits of ERP systems that offer improvements in an entity's performance have been identified, as presented in Table 2.3[23]:

**Table 3.** Main benefits of ERP systems and their impact on performance from different perspectives

| **ERP benefits** | **Performance** |
|---|---|
| Operational benefits<br>• Operational: automation of the functional process;<br>• IT infrastructure: reduction of equipment maintenance costs.<br>Tactical benefits<br>• Managerial: efficient planning of data, production, inventory and physical resources.<br>Strategic benefits<br>• Strategic: possibility and support offered by systems for the development of the entity;<br>• Organisational: development of the learning process within the entity and increased employee morale. | • Outlook on the internal business process<br>- Improving of inventory management;<br>- Improving business process;<br>- Improving information support.<br>• Perspective on the external business process<br>- Improving the business process with the external environment;<br>- Improving customer relations<br>• Customer service perspective<br>- Improving customer satisfaction;<br>- Improving flexibility.<br>• Cost management |

Source: Yang and Su, 2009

In order to quantify the main benefits of implementing ERP systems, *a bibliometric analysis* was performed on the main articles rated by Web of Science that deal with this topic. The sample of articles was selected on 20 November 2022 based on the following keywords:

ERP, performance and benefits, resulting in a sample of 573 articles. The main Web of Science categories in which the articles were published are: Management, Neuroscience, Business, Computer Science Information Systems, Environmental Studies.

The journals that published articles on the benefits of ERP systems on organisational performance are presented in Figure 7:

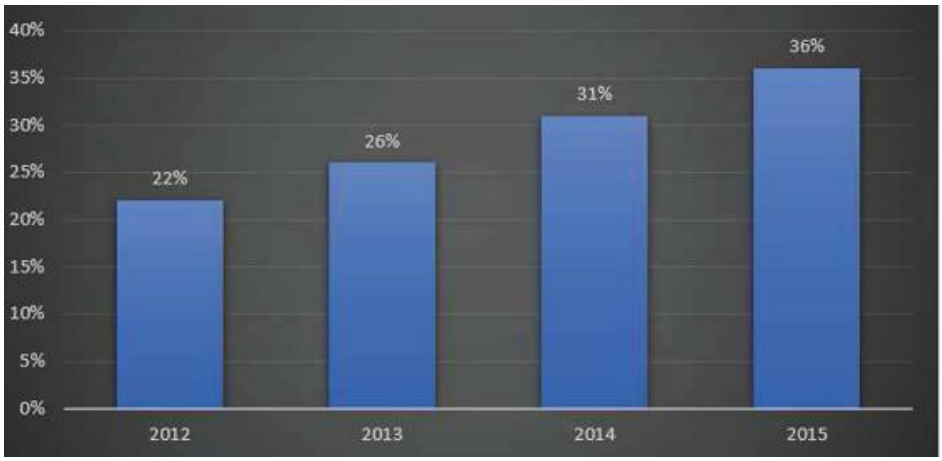

**Figure 7**. Journals that presented the benefits of ERP systems on the performance of entities and the years of publication of these journals


Source: Web Of Science Platform, 2022

The reason why the number of articles published on the topic of ERP systems has gradually increased since 2012 is due to the rapid growth in the rate of ERP system implementation among entities.

The evolution of ERP system implementation rates is shown in Figure 8.

**Figure 8.** Evolution of the implementation rate of ERP systems




Source: authors' processing

For the bibliometric analysis, the VOSviewer programme was used to obtain the following representation of ERP benefits, based on the articles selected in the sample (Figure 9).

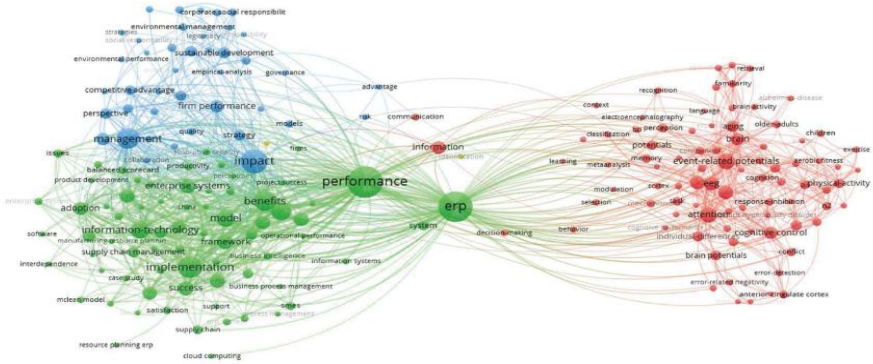


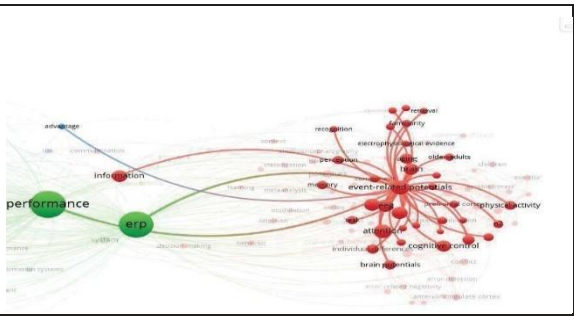
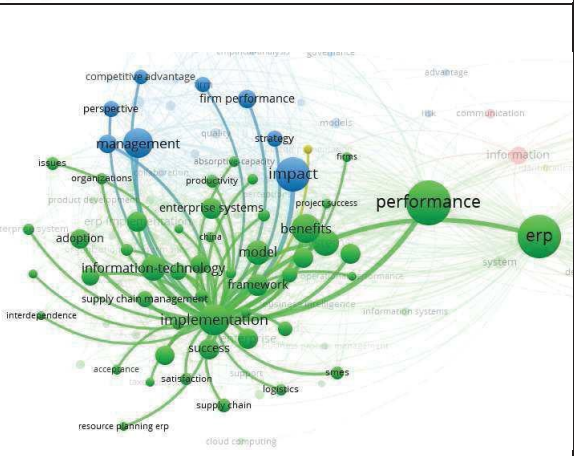
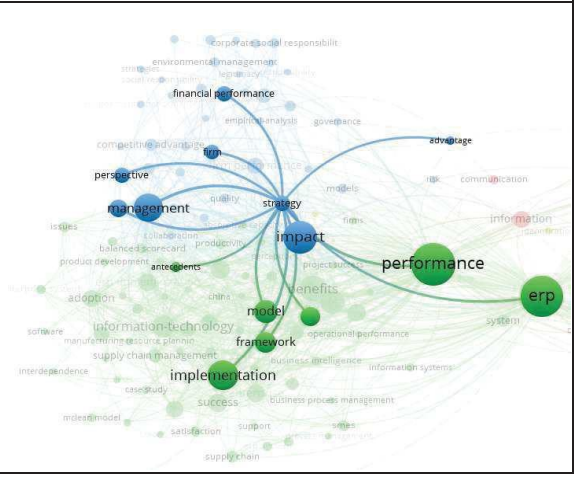

**Figure 9.** Bibliometric analysis of the main benefits offered by ERP systems for improving performance (Co-occurrence & Keywords option)

Source: authors' processing

Each node represents a keyword identified in the articles selected for this sample, and the connection between nodes is determined by the degree or frequency of occurrence of that word in the articles. Each colour aims to illustrate the theme of each pair of clusters, which can be used to identify the main keywords that underpin the definition of the benefits offered by ERP systems.

Following the analysis, the following four clusters were identified based on the keywords identified in the 573 articles, presented in Table 4:

**Table 4.** Analysis of the 4 pairs of clusters that define the benefits offered by ERP systems

| | |
|---|---|
| Articles in the medical field (red area), containing words such as: attention, cognitive control, memory activity, brain activity, recognition and others. |  |
| Articles in the field of ERP system implementation (green area, with implications in the blue area), containing words such as: information technology, conceptual framework, success, meeting requirements, operational performance, business intelligence, productivity. |  |
| Articles analysing the benefits of ERP system implementation (blue area), containing words such as: impact, strategy, management, perspective, financial performance, advantages, sustainable development. |  |

| | |
|---|---|
| Articles analysing the post-implementation effects of ERP systems (yellow area) |  |

Source: authors' processing

Based on the information presented in Table 4, it can be stated that the largest proportion of articles focus on the benefits of implementing ERP systems, as many entities are interested in the main functions of ERP systems and the possibility they offer to streamline their activities.

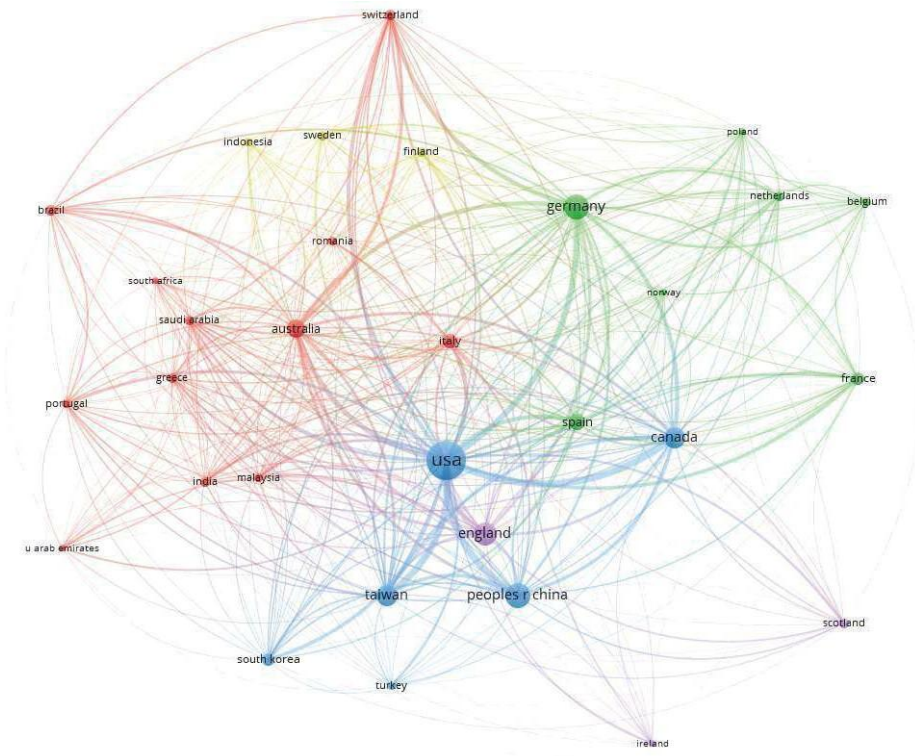



**Figure 10.** Bibliometric analysis of the main countries where articles were written about the benefits offered by ERP systems for improving performance

Source: authors' processing

According to Figure 10, most articles were written in the USA, Canada, China, Germany, Taiwan and Australia, as these are the most developed countries in terms of technology.
Based on the specialised literature, internal and external factors that could disrupt the entity's performance were identified, these being represented by:

- Internal factors: organisational culture, communication within the entity, quality of decisions made by its management.
- External factors: restrictions imposed by the state, sudden legislative changes, market fluctuations.

The first internal factor is the entity's culture, defined as a complex model of beliefs and aspirations shared by its members, including employee behaviour, rituals and ceremonies. If misunderstandings arise between members or employees of the entity, the flow of information will be disrupted and could affect its entire activity. Communication is another important factor for performance, as a correct and continuous flow of information between managers and team members, with the aim of defining expectations and sharing information about the entity's mission, values and objectives, is essential. The third internal factor is the quality of the decisions taken by the entity's management. The more rigorously data is processed using IT systems, the more accurate and clearer the data used by managers in the decision-making process will be, adding value to the entity's activities. This is also due to the fact that all data is centralised and stored, after processing, in a single database, which makes data analysis much easier for managers.
Analysing the first two external factors relating to state restrictions and legislative changes can have a major impact on the performance of both employees and the entity. The areas most vulnerable to legislative changes that can influence the entity's performance are shown in Figure 11:


**Figure 11.** Areas vulnerable to legislative changes

Source: authors' processing

Legislative changes can negatively influence the entire activity of the entity, generating possible decentralisations of the model or information flow within it. Laws are regulations that serve to constrain, guide or protect entities, with the aim of resolving various conflicts that may arise at the organisational level.
These legislative changes are also influenced by market fluctuations (changing consumer preferences, natural events, etc.). However, the purpose of ERP systems is to provide or report information as accurately and transparently as possible.

The main features of these systems are shown in Figure 12.

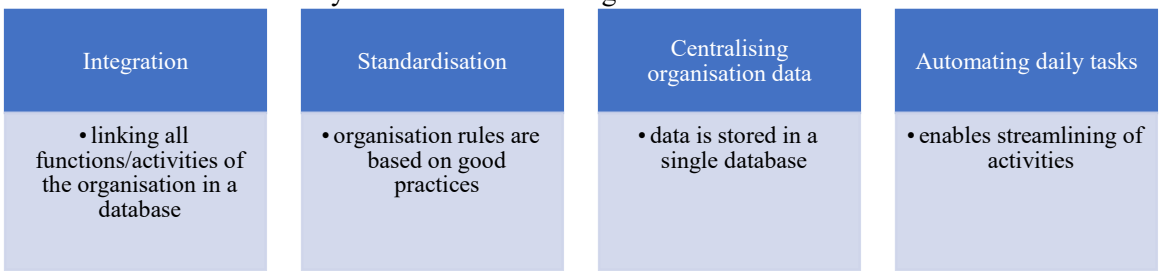



**Figure 12.** Characteristics of ERP systems

Source: author's processing

As can be seen in Figure 12, the main key features of ERP systems found in the literature are:

- Integration;
- Standardisation;
- Data centralisation;
- Automation of daily tasks.

## 6. Study of performance indicators and the influence accounting information systems have on them

The concept of an entity's performance has been defined from various perspectives. The main definition of performance refers to profit maximisation, but also to the entity's ability to cope with competition. Performance can also be viewed in terms of productivity or the objectives set by the entity. Performance analysis is based on two key aspects: performance indicators and the performance measurement system. Performance indicators reflect the degree of efficiency and effectiveness of actions or activities carried out by an entity in a given period, but may also vary depending on its size.
The main categories of performance indicators that can be influenced by the implementation of ERP systems are:

- Accuracy of the invoicing process and information flow;
- Fixed assets;
- Operating expenses;
- Net profit;
- Break-even point;

- Earnings before interest, taxes, depreciation and amortisation – EBITDA;
- Asset turnover ratio, asset turnover period;
- Current/intermediate liquidity;
- Solvency ratios;
- Rates of return: on total assets – ROA, on equity – ROE, on resources consumed – RRC.

The reason why these indicators are directly influenced by the implementation of an ERP system is that the acquisition and integration of these systems involves a significant financial effort, which affects both the liabilities and assets in the balance sheet and the expenses (equipment maintenance, training programmes) in the profit and loss account.
The entity's performance can only be accurately assessed after the successful implementation of an ERP system, as shown in Table 5.

**Table 5.** Effects of ERP system implementation

| | | | |
|---|---|---|---|
| **ERP systems environment** | • Correct selection of the ERP system according to the entity's requirements and field of activity;<br>• System analysis and testing;<br>• Technological infrastructure;<br>• System quality;<br>• Support provided by the supplier;<br>• Presence of consultants to provide information when uncertainties or problems arise in using the ERP system; | **Results of the ERP system implementation project** | Resulting business processes:<br>• Operational efficiency;<br>• Operational effectiveness;<br>• Operational flexibility; |
| **Adoption of ERP systems within the entity** | • Presence of training programmes;<br>• System development/customisation by the user;<br>• Ongoing support of the management team;<br>• Clear and well-defined objectives;<br>• Re-engineering of certain processes. | | |

Source: authors' processing

In order to quantify how performance is influenced by the implementation of ERP systems in entities, a *bibliometric analysis* was carried out on the main articles indexed in Web of Science that deal with this subject. The sample of articles was selected on 20 November

2022, based on the following keywords: ERP, performance and implementation, thus obtaining a sample of 1006 articles.

The main Web of Science categories in which these articles were published are: Management, Computer Science Information Systems, Business, Operations Research Management Science and Information Science Library. The selected articles appeared in journals between 1997 and 2023.

Using the VOSviewer application, Figure 13 was constructed, illustrating the main keywords found in articles associated with ERP systems, thus obtaining nine clusters, highlighted as follows:

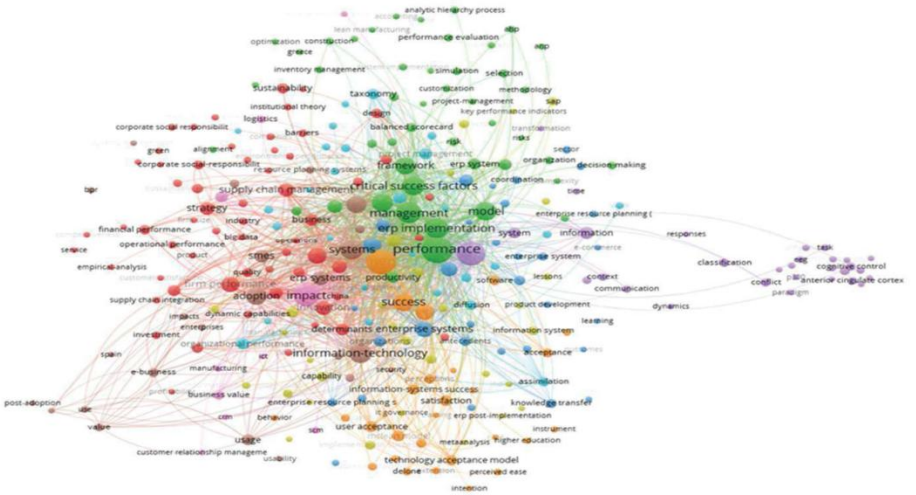



**Figure 13.** Bibliometric analysis of how the implementation performance of an ERP solution is influenced - Co-occurrence & Keywords option

Source: authors' processing

According to Figure 13, the nine clusters identified refer to the following aspects:

- The first group refers to new technologies - Big Data, Business Intelligence, Industry 4.0, but also to strategy and sustainable development;
- The second group refers to analysis, data processing, and the benefits offered by the implementation of ERP systems (improved decision-making, ERP system maintenance, productivity, organisation, performance, simulation, security of processed data);
- The third group includes data on the flexibility and support offered by ERP systems, as well as the development of these systems;
- The fourth group details the processing environment, performance indicators, success and risk factors in the implementation of ERP systems;
- The fifth group defines human perception and behaviour in the use of these systems;
- The sixth group defines the factors that influence the entity's performance, resource management, culture and the problems it may face;

- The seventh group presents the satisfaction of ERP system users' requirements regarding the activity carried out in entities;
- The eighth group presents the post-implementation effects of ERP systems, the quality of management decisions, and how data is saved on the server - Cloud;
- The ninth group defines logistics, CRM and supply chain management issues.

Analysing the countries of origin of the authors who have written about this concept, we find that the most recent articles were written in countries such as Indonesia, Russia, the United Arab Emirates and India, followed by articles written by authors from France, Romania, Turkey, Spain, Portugal, Germany and Sweden (2016–2018). The oldest articles come from countries such as the USA, Taiwan, and the Netherlands (before 2012) (Figure 14).

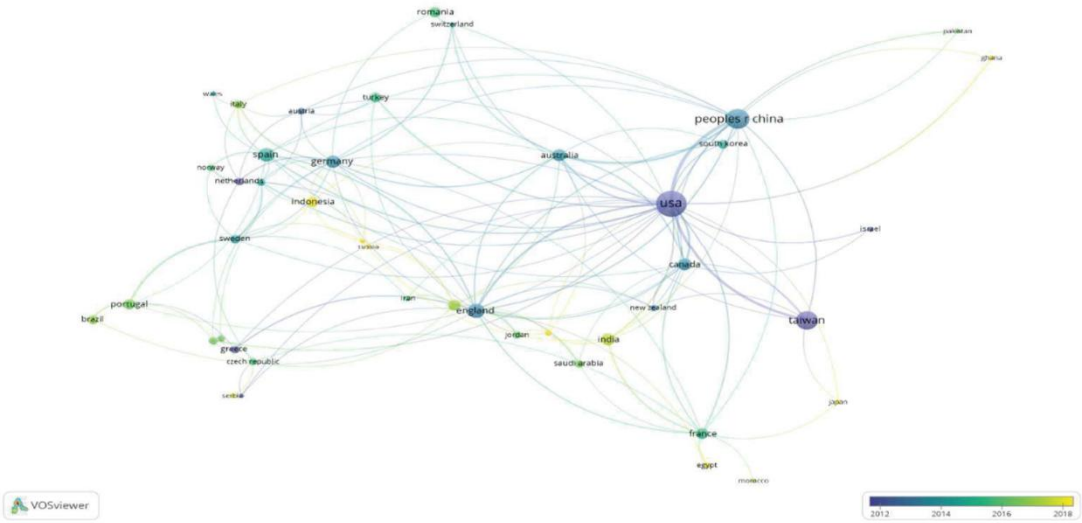



**Figure 14.** Bibliometric analysis of how the implementation performance of an ERP solution is influenced – Co-authorship & Countries option

Source: authors' processing

ERP systems can bring financial benefits following their implementation. Firstly, by reducing resource consumption, which results in lower resource procurement costs, and secondly, through sustainable development, which makes it easier to obtain financial benefits from the bank as a result of the implementation of the sustainable development project. In this context, several financial performance indicators affected by the implementation of ERP systems will be analysed, with a few key aspects defining these indicators being presented first in Table 6.

**Table 6.** Financial indicators used in the research study

| Indicators | Formula | Brief description |
|---|---|---|
| Current liquidity ratio | Current assets/Short-term liabilities | Liquidity indicators reflect the organisation's ability to pay short-term obligations as they fall due, based on current assets represented by inventories, receivables and investments |
| Intermediate liquidity ratio | Current assets + Inventories / Short-term liabilities | |
| Cash liquidity ratio | Cash and cash equivalents + Short-term liabilities / Current liabilities | |
| Overall solvency ratio | Total Assets / Total Liabilities | Solvency indicators provide information about the organisation's ability to cover its total liabilities |
| Equity solvency ratio | Equity / Equity + Bank loans | |
| Return on assets (ROA) | Operating profit / Operating assets x 100 | Profitability indicators show whether the organisation is using all its resources to generate profit.<br>Return rates provide information about the state of the organisation, reflecting the relationship between turnover and profit.<br>Asset turnover highlights the intensity of the organisation's asset utilisation, thus showing how much capital was invested to achieve the annual turnover. The turnover period shows the number of days required to recover the assets. |
| Return on equity (ROE) | Net profit / Equity x 100 | |
| Return on sales (ROS) | Profit / Turnover x 100 | |
| Return on Resources Consumed (RRC) | Operating profit / Operating expenses x 100 | |
| Asset turnover ratio | Turnover / Average current assets, where average current assets = (opening balance + closing balance) / 2 | |
| Asset turnover period | Average current assets / Turnover x T, where T = 365 days | |

Source: authors' processing

The research study began with an analysis of creditworthiness indicators (liquidity and solvency indicators) and will continue with an analysis of profitability rates over a period of three consecutive years. The situation of the entities will be analysed before, during and after the implementation of the ERP systems.

Creditworthiness refers to the liquidity and solvency of the entity over a certain period of time. Liquidity can be understood as the entity's ability “to pay its short-term debts on the basis of short-term assets (current assets/current assets)”:

- Solvency can be understood as the entity's ability “to pay its total debts on the basis of its total assets”.

- The first ratio analysed in the proposed case study is the current liquidity ratio, which expresses the entity's ability "to cover short-term liabilities with current assets".

Analysing the current liquidity ratio (Table 7) for the selected entities over a period of 3 years, significant changes in the entities' situation were observed: approximately 18.18% of the selected entities encountered difficulties in honouring their debts (marked in red), while 81.82% of entities achieved a current liquidity ratio above 1.5, providing assurance that those entities have the ability to discharge their short-term obligations (marked in green).

**Table 7.** Current liquidity ratio calculated over a period of 3 years

| No. | Organisation | Year of ERP system implementation | Type of ERP system implemented | Situation before implementation | Situation in the year of implementation | Situation after implementation |
|---|---|---|---|---|---|---|
| 1 | Johnson & Johnson | 2004 | SAP ERP | 1,710 | 1,962 | 2,485 |
| 2 | Curtiss Wright | 2015 | Oracle ERP | 2,747 | 3,365 | 3,313 |
| 3 | SIFCO Industries | 2015 | MS DAX | 2,762 | 2,158 | 1,144 |
| 4 | Robert Bosch Power Tools GmbH | 2016 | SAP ERP | 1,691 | 1,673 | 1,723 |
| 5 | Avant | 2016 | Oracle Netsuite ERP | 1,330 | 1,294 | 1,753 |
| 6 | Tikkurila Sverige AB | 2016 | MS DAX | 1,834 | 1,707 | 1,398 |
| 7 | HP Inc. | 2017 | SAP ERP | 0,982 | 0,996 | 0,851 |
| 8 | Siemens Gamesa Renewable Energy S.A | 2017 | SAP ERP | 1,279 | N/A | N/A |
| 9 | Central Garden & Pet Company | 2005 | SAP ERP | 2,704 | 3,059 | 3,062 |
| 10 | Cooper Standard Automotive Inc | 2008 | SAP ERP | 1,460 | 1,381 | 1,826 |
| 11 | Sopharma | 2017 | MS DAX | 1,409 | 1,289 | 1,224 |
| 12 | Toyota | 2018 | SAP ERP | 1,030 | 1,485 | 1,696 |
| 13 | Engie | 2018 | SAP ERP | 1,061 | 1,071 | 1,045 |
| 14 | Titan Shops, a Division of CSU Fullerton Auxiliary Services Corporation | 2018 | Oracle Netsuite ERP | 1,717 | 1,776 | 1,758 |
| 15 | Chatham Financial | 2018 | Microsoft Dynamics GP | 0,948 | 0,505 | 0,422 |
| 16 | Tyson Foods, Inc | 2019 | SAP ERP | 1,131 | 1,300 | 1,862 |
| 17 | Hewlett Packard Enterprise | 2019 | SAP ERP | 1,004 | 0,790 | 0,884 |
| 18 | Accenture | 2019 | SAP ERP | 1,338 | 1,397 | 1,402 |
| 19 | Colgate-Palmolive | 2020 | SAP ERP | 1,035 | 0,985 | N/A |
| 20 | Gartner | 2010 | MS DAX | 0,621 | 0,766 | 0,766 |
| 21 | Valora | 2020 | SAP ERP | 1,028 | 1,027 | N/A |
| 22 | Landbay | 2020 | Oracle Netsuite ERP | 4,585 | 5,621 | N/A |

Source: adapted from Barna et al., 2021

The current liquidity ratio is influenced by elements that make up current assets and liabilities such as: inventories, trade receivables, short-term investments, cash and bank accounts, and short-term liabilities.

*ABC Training Consulting* believes that in order to become "liquid" and turn into cash, inventories must go through a process consisting of the following phases: sales, receivables, collections. The outcome of this process may depend on a number of quantitative and qualitative factors, such as: the degree of moral and physical wear and tear of inventories, the possibilities for capitalising on inventories, and the time taken to collect trade receivables.

The intermediate liquidity ratio in Table 8 indicates that more than 45% of the selected entities (marked in green) have a maximum capacity to cover payments that have reached maturity, while the other entities have problems in honouring payments when due. The optimal level of this ratio is between 0.8 and 1.

**Table 8.** Intermediate liquidity ratio calculated over a period of 3 years

| No. | Organisation | Year of ERP system implementation | Type of ERP system implemented | Situation before implementation | Situation in the year of implementation | Situation after implementation |
|---|---|---|---|---|---|---|
| 1 | Johnson & Johnson | 2004 | SAP ERP | 1,443 | 1,693 | 2,171 |
| 2 | Curtiss Wright | 2015 | Oracle ERP | 2,067 | 2,693 | 2,332 |
| 3 | SIFCO Industries | 2015 | MS DAX | 1,774 | 1,315 | 0,583 |
| 4 | Robert Bosch Power Tools GmbH | 2016 | SAP ERP | 1,151 | 1,180 | 1,213 |
| 5 | Avant | 2016 | Oracle Netsuite ERP | 1,330 | 1,294 | 1,753 |
| 6 | Tikkurila Sverige AB | 2016 | MS DAX | 1,074 | 1,034 | 0,817 |
| 7 | HP Inc. | 2017 | SAP ERP | 0,744 | 0,738 | 0,610 |
| 8 | Siemens Gamesa Renewable Energy S. | 2017 | SAP ERP | 0,964 | N/A | N/A |
| 9 | Central Garden & Pet Company | 2005 | SAP ERP | 2,612 | 2,904 | 2,893 |
| 10 | Cooper Standard Automotive Inc | 2008 | SAP ERP | 1,166 | 1,122 | 1,610 |
| 11 | Sopharma | 2017 | MS DAX | 0,862 | 0,740 | 0,679 |
| 12 | Toyota | 2018 | SAP ERP | 0,892 | 1,263 | 1,440 |
| 13 | Engie | 2018 | SAP ERP | 0,986 | 0,999 | 0,983 |
| 14 | Titan Shops, a Division of CSU Fullerton Auxiliary Services Corporation | 2018 | Oracle Netsuite ERP | 0,484 | 0,373 | 0,458 |
| 15 | Chatham Financial | 2018 | Microsoft Dynamics GP | 0,948 | 0,505 | 0,422 |
| 16 | Tyson Foods, Inc | 2019 | SAP ERP | 0,432 | 0,555 | 0,883 |
| 17 | Hewlett Packard Enterprise | 2019 | SAP ERP | 0,862 | 0,666 | 0,741 |
| 18 | Accenture | 2019 | SAP ERP | 1,338 | 1,397 | 1,402 |
| 19 | Colgate-Palmolive | 2020 | SAP ERP | 0,688 | 0,605 | N/A |
| 20 | Gartner | 2010 | MS DAX | 0,621 | 0,766 | 0,766 |
| 21 | Valora | 2020 | SAP ERP | 0,687 | 0,753 | N/A |
| 22 | Landbay | 2020 | Oracle Netsuite ERP | 4,585 | 5,621 | N/A |

Source: adapted from Barna et al., 2021

Analysing the overall solvency ratio (Table 8), it can be stated that most entities are solvent, exceeding the minimum threshold of 1.4, and are marked in green.

**Table 9.** Overall solvency ratio calculated over a period of 3 years

| No. | Organisation | Year of ERP system implementation | Type of ERP system implemented | Situation prior to implementation | Situation in the year of implementation | Situation after implementation |
|---|---|---|---|---|---|---|
| 1 | Johnson & Johnson | 2004 | SAP ERP | 2,2559 | 2,4794 | 2,8791 |
| 2 | Curtiss Wright | 2015 | Oracle ERP | 1,7696 | 1,8678 | 2,0978 |
| 3 | SIFCO Industries | 2015 | MS DAX | 3,3164 | 1,8738 | 1,8614 |
| 4 | Robert Bosch Power Tools GmbH | 2016 | SAP ERP | 1,8035 | 1,7880 | 1,8473 |
| 5 | Avant | 2016 | Oracle Netsuite ERP | 2,0167 | 2,0390 | 29,6978 |
| 6 | Tikkurila Sverige AB | 2016 | MS DAX | 2,0456 | 2,0342 | 1,7232 |
| 7 | HP Inc. | 2017 | SAP ERP | 0,8818 | 0,9062 | 0,9819 |
| 8 | Siemens Gamesa Renewable Energy S.A | 2017 | SAP ERP | 1,4274 | N/A | N/A |
| 9 | Central Garden & Pet Company | 2005 | SAP ERP | 1,9863 | 2,0746 | 1,9019 |
| 10 | Cooper Standard Automotive Inc | 2008 | SAP ERP | 1,1418 | 1,0109 | 0,8500 |
| 11 | Sopharma | 2017 | MS DAX | 2,3349 | 2,0534 | 2,0129 |
| 12 | Toyota | 2018 | SAP ERP | 1,5949 | 2,0035 | 1,9491 |
| 13 | Engie | 2018 | SAP ERP | 1,3951 | 1,3631 | 1,3124 |
| 14 | Titan Shops, a Division of CSU Fullerton Auxiliary Services Corporation | 2018 | Oracle Netsuite ERP | 2,0765 | 2,2360 | 2,1690 |
| 15 | Chatham Financial | 2018 | Microsoft Dynamics GP | 2,3903 | 2,2770 | 2,1680 |
| 16 | Tyson Foods, Inc | 2019 | SAP ERP | 1,7860 | 1,7539 | 1,8147 |
| 17 | Hewlett Packard Enterprise | 2019 | SAP ERP | 1,6217 | 1,4949 | 1,4245 |
| 18 | Accenture | 2019 | SAP ERP | 1,7814 | 1,9910 | 1,8938 |
| 19 | Colgate-Palmolive | 2020 | SAP ERP | 1,0385 | 1,0743 | N/A |
| 20 | Gartner | 2010 | MS DAX | 1,1020 | 1,1703 | 1,1517 |
| 21 | Valora | 2020 | SAP ERP | 1,3544 | 1,3890 | N/A |
| 22 | Landbay | 2020 | Oracle Netsuite ERP | 8,3467 | 5,8881 | N/A |

Source: adapted from Barna et al., 2021

The optimal value of this indicator presented in Table 9 is above 1.4, in which case the entity can continue its activity without becoming insolvent. Analysing the solvency ratio, it can be seen that the entire sample of entities had no problems continuing their activity during the three years (Table 10).

**Table 10.** Equity solvency ratio calculated over a period of 3 years

| No. | Organisation | Year of ERP system implementation | Type of ERP system implemented | Situation prior to implementation | Situation in the year of implementation | Situation after implementation |
|---|---|---|---|---|---|---|
| 1 | Johnson & Johnson | 2004 | SAP ERP | 1 | 1 | 1 |
| 2 | Curtiss Wright | 2015 | Oracle ERP | 1 | 1 | 1 |
| 3 | SIFCO Industries | 2015 | MS DAX | 1 | 1 | 1 |
| 4 | Robert Bosch Power Tools GmbH | 2016 | SAP ERP | 1 | 1 | 1 |
| 5 | Avant | 2016 | Oracle Netsuite ERP | 1 | 1 | 1 |
| 6 | Tikkurila Sverige AB | 2016 | MS DAX | 1 | 1 | 1 |
| 7 | HP Inc. | 2017 | SAP ERP | 1 | 1 | 1 |
| 8 | Siemens Gamesa Renewable Energy S.A | 2017 | SAP ERP | 0,8061 | N/A | N/A |
| 9 | Central Garden & Pet Company | 2005 | SAP ERP | 1 | 1 | 1 |
| 10 | Cooper Standard Automotive Inc | 2008 | SAP ERP | 1 | 1 | 1 |
| 11 | Sopharma | 2017 | MS DAX | 0,9499 | 0,9087 | 0,9252 |
| 12 | Toyota | 2018 | SAP ERP | 0,9721 | 1 | 1 |
| 13 | Engie | 2018 | SAP ERP | 0,6273 | 0,6077 | 0,5590 |
| 14 | Titan Shops, a Division of CSU Fullerton Auxiliary Services Corporation | 2018 | Oracle Netsuite ERP | 1 | 1 | 0,7299 |
| 15 | Chatham Financial | 2018 | Microsoft Dynamics GP | 1 | 1 | 1 |
| 16 | Tyson Foods, Inc | 2019 | SAP ERP | 1 | 1 | 1 |
| 17 | Hewlett Packard Enterprise | 2019 | SAP ERP | 1 | 1 | 1 |
| 18 | Accenture | 2019 | SAP ERP | 1 | 1 | 1 |
| 19 | Colgate-Palmolive | 2020 | SAP ERP | 0,6822 | 0,8102 | N/A |
| 20 | Gartner | 2010 | MS DAX | 1 | 1 | 1 |
| 21 | Valora | 2020 | SAP ERP | 1 | 1 | N/A |
| 22 | Landbay | 2020 | Oracle Netsuite ERP | 1 | 1 | N/A |

Source: adapted from Barna et al., 2021

## 7. Conclusions

Information systems offer a multitude of benefits to both employees and entities, contributing significantly to the automation of redundant activities and the streamlining of internal processes. These systems are designed to support the achievement of the entity's strategic objectives by reducing operational costs and improving the management of repetitive and bureaucratic tasks.

The coherent integration of data within databases managed by an ERP system facilitates the decision-making process, allowing for the efficient allocation of resources and significantly reducing waste. By centralising information, ERP systems contribute to better interdepartmental coordination and a unified view of the entity's organisational performance.

One of the fundamental objectives of ERP systems is to stimulate employee productivity by providing them with modern work tools, while managers benefit from increased control over the decision-making process. IT platforms provide managers with quick and easy

access to essential information about the entity, thus contributing to more efficient and better-informed decision-making. Consequently, the implementation of ERP systems allows for the development of a clear and up-to-date perspective on the internal situation of the entity, increasing its ability to react and adapt to market dynamics. In this context, training programmes become essential to facilitate employee acceptance and use of the system, especially given that the implementation process is complex and can generate resistance to change. Following the implementation of these systems, the work of accounting professionals has undergone significant changes, with redundant tasks being replaced by value-added activities such as consulting and data analysis.

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