International Journal of Financial Management and Economics

P-ISSN: 2617-9210
E-ISSN: 2617-9229
IJFME 2024; 7(2): 644-647
www.theeconomicsjournal.com
Received: 09-07-2024
Accepted: 15-08-2024

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A study on ERP based approach to industrial 4.0

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DOI: https://doi.org/10.33545/26179210.2024.v7.i2.431

Abstract
A new paradigm for automating technological systems is known as the Fourth Industrial Revolution (I4.0). Its foundation is the combination of newly relevant information and communication technologies (big data, cloud computing, etc.) with the technologies that form the foundation of intelligent production. analytics, artificial intelligence, and the basis of distributed control. Opportunities for manufacturing systems have never been greater, especially when it comes to supply chains, resource levels, and planning and management. The Fourth Industrial Revolution is seen as an opportunity to increase manufacturing productivity and efficiency as well as the beginning of the era of automation and computer connections. To forecast, control, and reduce costs over time, networked sensors and software are connected with physical equipment and devices using real-time data and information. This study outlines the fundamental concepts of the Fourth Industrial Revolution and provides an explanation of each technology based on data from the most recent research. This study also seeks to understand how the Fourth Industrial Revolution impacts the ERP approach, how each technology may be linked to an ERP system, and whether or not the current ERP systems are equipped to manage the Fourth Industrial Revolution.

Keywords: Fourth industrial revolution, industry 4.0, automation, smart manufacturing, ERP systems

1. Introduction
Effective information management and use are critical to modern businesses' success since the business environment is becoming more complicated and globalized in most industries. Information systems that can combine data from management to production (entire Product Lifecycle Management) and be accurately and continuously accessible are necessary for managing all business operations. To manage their company processes and integrate all the various operations to enhance internal communication and collaboration with partners, suppliers, and customers, many companies employ IT-provided solutions, such as ERP (Enterprise Resources Planning) systems. Among the many ways that ERP systems help firms are by improving departmental information sharing and optimizing workflow, improving order management, standardizing various company procedures, improving supply chain management, supplying precise accounting data for inventory management, and integrating data, procedures, and technology in real-time across internal and external value chains.

Whereas the first generation of industrial production started with steam and water-powered machines; the second generation started with electricity-powered mass production; and the third industrial revolution used computers and electronics to automate production. The Fourth Industrial Revolution, also known as the fourth generation, is currently in its early phases of automation and computer connectivity through the use of Internet of Things devices. It will eventually replace human labor with robots and machines, starting with suppliers, distributors, and production facilities.

2. Review of Literature
2.1 Ruwan Wickramarachchi (September 2022) [1]
This study examines the different ways that Fourth Industrial Revolution improves ERP systems' functionality. It is clear that the idea of Fourth Industrial Revolution has given rise to numerous cutting-edge technologies in a variety of industries in recent years, and the actual use of these technologies is also growing quickly in a wide range of businesses.

Furthermore, using Fourth Industrial Revolution-related technology has significantly improved an organization's performance, which has resulted in long-term, consistent profitability ERP systems will be able to integrate Fourth Industrial Revolution technologies like RFID and the Internet of Things to collect real-time data at the work floor level. As a result, ERP systems are helping to generate projections and analytics with more accuracy.

2.2 Muhamet Gërvalla (October 2019) [2]

This study outlines the key concepts of the Fourth Industrial Revolution and provides an explanation of each technology using data from the most recent research. This study also attempts to understand how the Fourth Industrial Revolution impacts the ERP approach, how each technology may be linked to an ERP system, and whether or not the current ERP systems are equipped to deal with the Fourth Industrial Revolution. According to the findings, there are many challenges to solve before the Fourth Industrial Revolution can be successfully integrated with the current ERP systems, especially when it comes to data security and communication between machines and ERPs.

2.3 Martin Polívka (September 2023) [3]

The impact of the "Fourth Industrial Revolution" concept on the enter ERP system selection process is the topic of this article. First, a survey of the literature is given on the subject of choosing an ERP system, with a focus on the part that new technologies play in this process. Second, the meaning of "Fourth Industrial Revolution" is explored and contextualized in relation to ERP system architecture. Subsequently, the article's major body presents the survey results among Czech medium-sized and large industrial enterprises. The corporation asked its decision-makers to participate in the ERP system selection process.

2.4 Marija Savković (October 2022) [4]

In this study, the literature on the integration of ERP 4.0 and LEAN ERP systems is thoroughly reviewed. According to the report, it is important to integrate ERP systems with the Fourth Industrial Revolution methods and the LEAN philosophy. The work intends to highlight the importance and applicability of ERP systems in partnership with LEAN and the Fourth Industrial Revolution by compiling a survey of the literature addressing these themes in one place.

2.5 Onyeka Franca Asuzu (February 2024) [5]

In this work, we develop the architecture for a future ERP system, with the idea of a digital control twin serving as its foundation. In this document, "architecture" refers to the manner in which the various ERP programs interact with the computer's operation control system. Due to the architecture's design, numerous EPR-Applications can be combined into a single system. These days, ERP applications consist of discrete modules such as JIT-Call-Offs, Material Requirement Planning, Warehouse Management, Transportation Control, or Master Production Scheduling and Manufacturing Execution. As a result, there is a decrease in the consistency and accuracy of data, as well as a delay in response times and adjustments.

2.6 Andrzej Bytniewski (March 2020) [6]

Identifying and discussing the aspects of the freshly developed ERP 4.0 system is the chapter's main objective. Additionally, it examines and classifies the key contributions to the management literature on ERP 4.0 in an attempt to offer a unique definition, point out any gaps in the research, and recommend future lines of inquiry. Developing guidelines for the structural and technological development of ERP-class systems is the chapter's main contribution, with an emphasis on the technological solutions of the ERP 4.0 system, such as cognitive technologies, big data, the Internet of Things, cloud computing, and fog computing. Additionally, the authors attempt to outline the unique features of the ERP system as well as potential avenues for further study.

2.7 Patryk Morawiec (March 2023) [7]

The role of the ERP system in agile companies and the impact of elements of the Fourth Industrial Revolution on business agility are examined in this article using the TOE (technology, organization, environment) paradigm. The research methods used in this article were based on a comprehensive literature review of the sources identified in the Scopus and Web of Science databases. Both academic and practical examples from the literature were examined. An explanation of the significance of organizational agility in the workplace, a list of Fourth Industrial Revolution technologies that have been connected to the TOE factors, and an examination of how Fourth Industrial Revolution indicators could aid in achieving technological organizational agility are the study's outputs.

2.8 Md. Al-Amin (February 2023) [8]

This research article uses a state-of-the-art review strategy to examine and gather the latest information about the potential integration of Fourth Industrial Revolution technologies into the future development of ERP. It is found that a number of software applications, such as Computer Integrated Manufacturing (CIM), Manufacturing Resource Planning (MRPII), and Material Requirement Planning (MRP), contributed to the creation of the modern ERP. Future ERP systems may incorporate disruptive technologies from the Fourth Industrial Revolution, such as the internet of things, big data, blockchain technology, artificial intelligence, business intelligence, and omnichannel strategy. The project team, IT infrastructure, communication, qualified staff, training and education, monitoring and assessment, and top management support have all been recognized as important crucial success factors for ERP.

2.9 Majstorovic Vidosav (August 2020) [9]

A new paradigm for automating technological systems is known as the Fourth Industrial Revolution (I4.0). In addition to newly applied information and communication technologies (AI, big data analytics, and cloud computing), it is based on the convergence of technologies that make up intelligent manufacturing and distributed control. From supply chains to resource levels, manufacturing systems can now take advantage of previously unheard-of planning and management options. The implementation of I4.0 characteristics, such as cloud computing (CC), big data analytics (BDA), the internet of things (IoT), and artificial intelligence (AI), is therefore at the forefront of research and development on enterprise resource planning (ERP), as this study illustrates.

2.10 Marek Szelągowski (September 2022) [10]
This paper seeks to address the following query: Will postmodern ERP and iBPMS integrate freely and flexibly in the future, or are we moving toward process-based ERP systems, The authors reviewed narrative literature and examined the content of 88 ERP systems available in Poland.
Consequently, eleven ERP systems with BPMS-specific features were found. Additionally, five expert interviews were conducted to establish the foundations of the ERP conversion to process-based ERP systems. This made it possible to create two techniques for this conversion: integrating ERP systems with iBPMS as an external subsystem that takes over the implementation of specific business processes using the ERP system's data and metadata.

3. Research Objective
- To study ERP software related to the manufacturing industry.
- This involves analyzing the types of ERP software commonly used in manufacturing, their features, capabilities, and specific applications within the industry.
- Investigate why ERP systems are crucial for operational efficiency, how they streamline processes, and their role in integrating various business functions.
- Employee awareness and opinion on the ERP system.
- Assess how well employees understand the ERP system, their training, and their views on how it impacts their daily tasks.
- Study the positive outcomes of ERP implementation, including improvements in productivity, data management, and decision-making processes.
- To measure the satisfaction level of employees on benefits of the ERP system.
- Collect feedback to evaluate if employees find the ERP system beneficial and if it meets their expectations in terms of efficiency and usability.

4. Data Analysis
4.1 Chi-Square Analysis
Majority of the respondents are satisfied. Chi-square analysis of management calculates return on investment (ROI) and profit improvement.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	89.902[a]	16	.000
Likelihood Ratio	78.861	16	.000
N of Valid Cases	50		

4.2 Hypotheses
- Null Hypothesis (Ho): There is no relationship between management’s calculation of ROI and profit improvement.
- Alternative Hypothesis (H1): There is a relationship between management’s calculation of ROI and profit improvement.

The null hypothesis (Ho) is rejected and the alternative hypothesis (H1) is accepted since the P-value of.000 is smaller than the significance level of.05. This indicates that there is evidence of a statistically significant correlation between management's calculation of return on investment and the observation of profit growth.

5. Suggestions
One of the most crucial components of an ERP system's effective adoption has been identified as the dedication of top management. In order to create a successful system, the top management must supply enough funding and resources. Because implementing an ERP package is a complicated and expensive process, depending on the size and structure of a business, it is crucial to select the right vendor, have enough scalability features, have proper hardware, and have a user-friendly product. A successful ERP deployment depends heavily on project management-related elements such as a clear aim and target, Clear and effective communication, data conversion, implementation plan, modification requests, other department interaction, realistic expectations, and good project management. The success of the system is fully dependent on how the employees utilize it. The management should provide special training to employees about ERP systems. As the customization is problematic in ERP implementation, the management should manage those problems in future. As the ERP system required extensive training requirements and took resources from daily operations, the management should appoint the trained persons to do the tasks.

6. Conclusion
ERP systems improve visibility into the organization's operations and establish a disciplined manner of working. Small and medium-sized enterprises are the foundation of the economies of developing nations, and they now face international competition. Enterprise resource planning has been found to have many powerful advantages. With its assistance, numerous problems that formerly plagued businesses have been fixed. ERP systems are now the main business approach used by the majority of large companies. ERP systems are also being adopted by small and medium-sized businesses. Instead of viewing ERP as only an IT solution, they must take a proactive stance and view it as a business solution. There are still a number of problems to be fixed, despite the fact that the ERP industry is expanding and that ERP providers have turned their attention to the Small and Medium Industries sector. It is necessary to make small and medium-sized businesses "ERP aware." It has the ability to provide data in a granular manner and integrate cost, profit, and revenue information from sales. As a result, it becomes essential that they find ways to react to the changing markets.

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