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# COMPREHENSIVE REVIEW OF ENTERPRISE RESOURCE PLANNING (ERP) SYSTEMS AND PERFORMANCE MANAGEMENT INTEGRATION IN HEALTHCARE

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**Abstract:**
This review paper investigates the relationship between Enterprise Resource Planning (ERP) systems and performance management in healthcare, aiming to clarify how ERP implementation affects both operational and strategic outcomes. Applying the PRISMA framework, the study analyzed 74 research papers, providing a detailed content analysis of ERP benefits, challenges, and implementation factors alongside a quantitative review of research themes and geographic focus. Findings indicate that ERP systems can streamline healthcare operations and enhance strategic management, yet a significant gap remains, indicating that limited studies address how ERP systems specifically affect performance management frameworks. This review is particularly relevant for healthcare administrators, policymakers, and system integrators, offering insights to optimize operational efficiency, allocate resources, and align ERP adoption with strategic goals. While considerable research examines ERP's operational advantages, few studies connect these to actual performance outcomes, highlighting a need for further investigation. This review focuses on ERP systems within healthcare, recommending that future research extend to other systems to support broader healthcare improvements. The practical implications of integrating ERP with performance management frameworks extend to improving patient-centered care and driving efficient service delivery. Addressing identified gaps may strengthen ERP adoption and performance strategies, fostering a more effective healthcare environment. Moreover, integrating ERP with performance management frameworks has social implications, as it could enhance patient-centered and efficient service delivery. The originality of this study lies in its comprehensive exploration of ERP-performance relationships, providing a meaningful foundation for future research initiatives.

***Key words:*** Enterprise Resource Planning, ERP, Performance Management, Healthcare

## INTRODUCTION

In today's highly competitive landscape, organizations are compelled to excel in their performance to sustain their market presence. As such, the concept of Performance Management (PM) is utilized in various industries. According to [1], PM is about improvement of processes with the ultimate aim of synchronizing improvement to create value for and from customers with the result of economic value creation to stakeholders and owners. However, [2] defined PM as the translation of plans or strategies into results through guided execution. Therefore, PM acts as an all-encompassing value creation framework supporting decision-making and planning, which organizations deploy through diverse strategies to reach their goals [3]. This framework merges operational and financial data, encompassing numerous approaches like strategy mapping, balanced scorecards, costing, budgeting, forecasting, and planning for resource capacity requirements [4]. As per [5], these approaches enhance other fundamental systems such as Customer Relationship Management (CRM), Supply Chain Management (SCM), Enterprise Risk Management (ERM), and Human Capital Management (HCM), enriching the organizational ecosystem with robust, data-driven insights.

Consequently, PM plays various roles in organizations. As clarified by [6], PM is commonly perceived in organizations as a system that primarily focuses on managing human resources and personnel matters for individual employees. However [7], explained that the core of PM consists of methodologies, metrics, processes, software tools, and systems that manage the performance of an organization, which aims to create value for customers, stakeholders, and employees. Furthermore, within any organization, two primary PM business processes are identified: the front office system; centered on customer satisfaction, and the back-office system; concentrated on administrative processes [8].

According to [8] Enterprise Resource Planning (ERP) system is among the prevalent systems employed in the back office.

Subsequently [9], identified ERP systems as the backbone of the PM framework for value creation. Serving as an essential element in the PM framework, ERP is an enterprise-wide information system that is designed to coordinate resources, information and activities needed to complete business processes such as order fulfilment or billing [10]. This system provides a single integrated software that aims to handle multiple corporate functions including finance, human resources, manufacturing, materials management, and sales and distribution, which are ERP systems programs [11].

Therefore, ERP provides various benefits to organizations, which streamline and enhance operational efficiency across various departments [12]. For example, it was found by [13] that ERP systems automate routine tasks which reduce the needed time for manual intervention, in return minimizing errors. Moreover, literature shows that ERP systems could lead to various benefits. For example [14], emphasized the potential of ERP systems result in reduced costs in operational and administrative processes by introducing optimized process control. In return, this could result in improved reporting and planning capabilities, enabling businesses to generate customized reports with ease and supporting more effective analysis and comparison across departments. Furthermore [15], found that the shared database in ERP systems ensures the advantage of an integrated data sharing methodology across the organization, which enhances collaboration and eliminates informational silos between departments. In addition, [15] also establish that ERP systems are scalable and can easily expand to incorporate new ventures and departments as a firm grows, making it a smart long-term investment. Similarly [16], explained that the ERP system plays an important role in supporting firms in maintaining regulatory compliance through technologies that manage and monitor complying to laws and regulations, reducing compliance risks. Likewise [17], highlighted that ERP systems enhance customer service by providing improved access to customer data, which in turn enhances customer relationship management initiatives.

Furthermore, effective ERP systems are crucial for facilitating efficient and strategic management decisions across various sectors, including healthcare [18]. The healthcare industry is strongly dependent on its customers and the various informational aspects, such as customer data, pharmacies and other service providing processes [19]. Therefore [20], underlines that decision makers within the healthcare industry are seeking ways to improve service quality, especially with the increased demand for services by patients. Furthermore, increased demand has led to increased competition among healthcare providers, leading healthcare organizations to adapt their strategies in recent years with the aim of enhancing the effectiveness and productivity of healthcare service provision [21]. This transformation has emphasized the crucial need for improving healthcare's performance management, especially the back-end operational efficiencies in accomplishing these goals and the aim of creating value for customers [22].

As a result, the need to improve ERP systems has clearly emerged as not only advantageous but also crucial for back-end operational efficiencies [23]. A recent study by [24] on the impact of ERP systems on organizational efficiency underscores the critical need for enhanced ERP systems within the healthcare sector. This need is particularly evident considering insights shared by the CEO of Epic, the leading Electronic Health Records (EHR) company in the U.S. The study identifies a significant challenge: over half of the patients using emergency department software arrive without accessible historical medical data. This lack of information compromises patient safety, delays treatment, and escalates costs. Additionally, the prevalent manual data management methods, often reliant on outdated communication like telephone, highlight the necessity for an ERP system that facilitates seamless electronic data sharing. By optimizing data exchanges, such as improving access to X-ray and laboratory results and enhancing supply chain management, an integrated ERP system benefits healthcare providers by creating informed decision-making regarding their healthcare.

Similarly, insights from a case study by [27] on SOTI, an enterprise mobility management solution, underscore the critical need for enhanced ERP systems to support the digital maturity of the healthcare sector. The findings reveal considerable potential for automation, with 99% of respondents agreeing that automation could enhance at least one manual process within their organizations. Furthermore, an overwhelming 93% prioritize the integration of new technologies, recognizing their critical importance. Security emerges as a paramount concern, with 97% of respondents anxious about safeguarding patient data. Additionally, IT professionals report an average loss of 3.4 hours per employee each week due to system or technical challenges, highlighting the inefficiencies of current systems. These insights underscore the urgent need for robust enterprise resource management solutions to address these issues.

Based on the above, previous studies has shown some shortcomings in the healthcare industry's ERP system deployment that might affect performance management practices. This gap underscores the need for further investigation into the specific ways that ERP system improvements can impact industry-wide performance and efficiency. The aim of this systematic literature review is to examine the existing research on ERP systems and their integration into healthcare. Additionally, it investigates the impact of ERP systems on performance management and the interplay between these elements. This study comprehensively reviews the literature to highlight opportunities, challenges, and emerging trends, providing a detailed overview of key areas for future research. This study provides a comprehensive approach for selecting and analyzing articles, as well as performing

an in-depth content analysis and quantitative analysis. It serves as a valuable guide for future research efforts. In conclusion, the study highlights these discoveries and suggests areas for further research to enhance the understanding and application of ERP systems in healthcare, particularly in light of the changing requirements of healthcare performance management.

## METHODOLOGY

The research methodology implemented in this study is based on a structured approach for gathering and analyzing literature specifically relevant to the integration of ERP systems for enhanced organizational performance management in healthcare. It involves four main stages, described as follows.

## LITERATURE RETRIEVAL

The first step in this research involves the selection of search terms and keywords to compile relevant literature on the integration of ERP systems in healthcare for enhanced organizational performance management. The Scopus database was utilized using the following keywords search string: ((“Performance Management” OR “Enterprise Resource Planning”) AND “Healthcare”). The choice of Scopus, over other databases, was based on its comprehensive coverage of multidisciplinary research and its robust indexing of peer-reviewed journals, particularly in the fields of healthcare and management. While Web of Science also offers extensive resources, Scopus was prioritized due to its wider citation network and advanced analytics tools, aligning with the research’s aim to capture a broad and detailed view of ERP integration in healthcare. The term "healthcare" was chosen over "hospital" and "health". While "hospital" corresponds to a specific care facility and "health" broadly refers to well-being, per [25], "healthcare" includes the entire system of providing health services, such as clinics and health initiatives, fitting the research’s focus on health service delivery systems, as defined by [26].

In healthcare, a wide range of information systems are employed to support different functions, including the Hospital Information System (HIS), Laboratory Information System (LIS), Radiology Information System (RIS), Pharmacy Information System (PIS), Picture Archiving and Communication System (PACS), Customer Relationship Management (CRM), Supply Chain Management System (SCMS), Revenue Cycle Management (RCM), Decision Support System (DSS), and Electronic Health Records (EHR). Each of these systems plays a vital role in enhancing the efficiency and effectiveness of healthcare service delivery [27]. However, ERP systems stand out by serving as a central framework that consolidates and streamlines processes and data flows across these disparate systems [28]. Due to its ability to unify operations and improve overall organizational performance, this study specifically focuses on the role of ERP in the healthcare context.

In addition, the selection of the keyword "Performance Management" for the systematic review is in line with the research’s specific focus on examining the influence of ERP systems on the organizational performance within the healthcare sector. The keyword ensures that the systematic review outcomes is targeted towards the pivotal aspects of performance that ERP systems are designed to optimize in healthcare settings.

Moreover, the systematic review adheres to selective filtering criteria, requiring that publications be in English, of types limited to peer-reviewed journal articles and conference papers, and specifically within the subject areas of Business, Management and Accounting, Engineering, Decision Sciences, and Multidisciplinary studies. In addition, given the importance of a substantial body of literature for an exhaustive review, the date range of 2005 to 2024 has been chosen. The date range of 2005 to 2024 was chosen as 2005 marks the period when ERP systems saw significant adoption in healthcare, coinciding with a growing focus on integrating these systems with performance management frameworks to address operational and strategic challenges. This range captures the evolution of ERP systems over nearly two decades, highlighting their development and impact. This period captures the significant developments in performance management and ERP system integration within healthcare practices, providing a rich historical perspective on the transformative impact in the field. Hence, this process resulted in the accumulation of a comprehensive collection of 224 papers, spanning the period of 2005 to 2024, providing a broad overview of the research topic.

## LITERATURE SCREENING

In this study, the PRISMA statement is adopted for the literature screening process, ensuring a structured and evident approach to systematic reviews and meta-analyses (Figure 1).

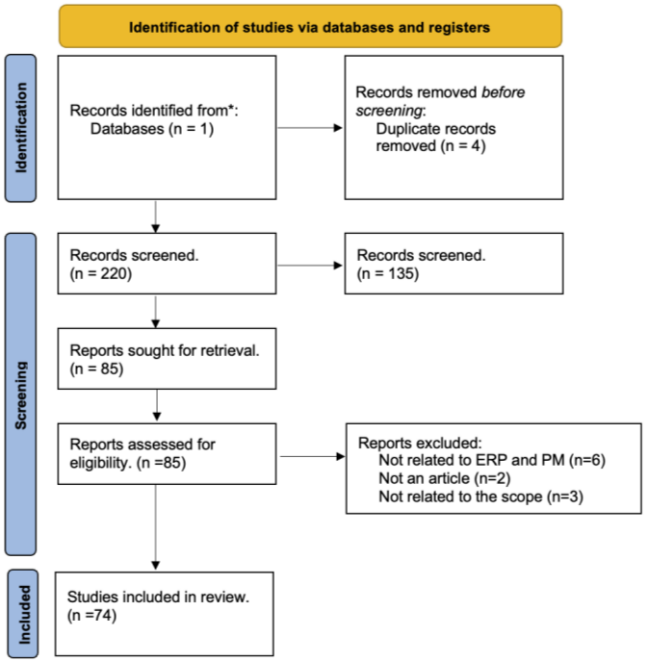


***Fig. 1 Literature screening approach***

The PRISMA framework offers a methodical structure for identifying, selecting, and evaluating relevant literature, hence enhancing the dependability and replicability of the review process [29]. Initially, a total of 224 papers were retrieved, focusing on the integration of ERP systems in healthcare for improved organizational performance management. Post the removal of 4 duplicates, the dataset was narrowed down to 220 papers. Following the screening process, a total of 135 records were removed due to their lack of relevance to the topic of this study. After that, 85 reports were sought out for further retrieval. Out of the 85 reports assessed, 11 were excluded for the following reasons: (6 were not related to ERP or PM, 2 are not an article and 3 were not related to the scope of the review). Finally, 74 studies were included in the systematic review. This selection offers an extensive overview of the field's development over the selected years.

The chronological distribution of the 74 papers, in relation to the topic of ERP systems in healthcare, is illustrated in Figure 2.

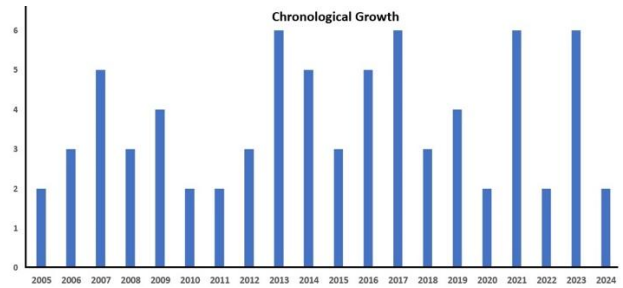


***Fig. 2 Distribution of the 74 publications in relation to ERP Systems and Organizational Performance Management in Healthcare (2005-2024)***

The graph illustrates the number of research in academic articles and conference proceedings on ERP Systems for Enhanced Organizational Performance Management in healthcare, spanning from 2005 to 2024. While the number of publications is evidently increasing with a consistent rate, the frequency of publication fluctuates, suggesting that research attention on ERP systems during this time period is shifting. The data does not show a single peak or a steady upward trend, but instead reveals a pattern of alternating peaks as well as low points, indicating periodic interest and examination of the effectiveness of ERP systems in healthcare operations. The varying number of publications indicates the continuous and irregular involvement of academia and industry research in the field of ERP system integrations with the goal to enhance healthcare performance management.

**CONTENT ANALYSIS**

In this phase, the study conducts a detailed review of the wide array of research publications found, systematically categorizing the data to identify recurrent themes and patterns within the field of ERP systems and performance management enhancement in healthcare. The content analysis is centered on understanding the integration of ERP systems and performance management in healthcare. By segmenting research articles into specific themes and sub-themes, the analysis aims to provide a clear understanding of the current status and perspectives of ERP system and performance management practices in healthcare. In addition, the content analysis aims to explore the research done in relation to integration of both ERP and PM in Healthcare.

**QUANTITATIVE ANALYSIS**

This study conducted a quantitative analysis to examine the role of ERP systems in enhancing healthcare performance management. Using data from the Scopus database, the research quantitatively mapped citation patterns, co-occurrences of key terms, and collaborative trends via VOSviewer, producing four essential visualization maps. These maps quantified central themes, relationships, and areas of focus within the field, with terms like "ERP", "management", and "healthcare" underscoring the primary topics. The study further quantified frequently occurring keywords, publication sources, and geographic contributions to capture the global scope of ERP research in healthcare. Additionally, it classified document types and research methodologies, emphasizing the quantitative role of descriptive case studies, modeling, and data mining tools in assessing ERP integration's impact on healthcare efficiency and service quality.

The rest of the paper will discuss findings from both the content and quantitative analyses, offering insights into current research trends and areas requiring further exploration.

**CONTENT ANALYSIS**

Analysis of ERP systems and performance management has become a subject of considerable interest, pointing out some new perspectives and challenges for healthcare management practices. ERP solutions have been investigated across different healthcare sectors, offering transformational opportunities in healthcare operational efficiency, organizational management, and patient care. This section provides comprehensive content analysis of the current ERP practices in the healthcare sector, current performance management drivers and investigate possible integration of both ERP and performance management in healthcare sector.

**Status of ERP Systems in the Healthcare Sector**

This section presents a comprehensive analysis of the research studies related to ERP systems and its practices in the healthcare sector. The studies are organized into four main subthemes as detailed below.

**Benefits and challenges of ERP system implementation in healthcare**

The implementation of ERP systems in the healthcare sector has resulted in a variety of benefits, alongside a range of challenges. This subtheme explores a collection of research papers that explore those benefits and

challenges associated with ERP implementation in the healthcare settings, as shown in Table 1.

The findings from the studies highlight the benefits and challenges associated with implementing ERP systems in healthcare. On the benefits side, ERP systems optimize operations and facilitate customized treatments, ultimately improving patient care. They have proven effective in reducing congestion in emergency departments by enabling improved decision-making through real-time data analytics, thereby enhancing patient satisfaction.

Concepts like the Smart Pharmacy illustrate how ERP systems enhance operational efficiency, ensure regulatory compliance, and promote safety.

***Table 1***

***Benefits and challenges of ERP system implementation in healthcare***

| Authors | Focus |
|---|---|
| [30] | Analyzes the implementation of ERP system at Médikal Center's to achieve its digital transformation. The study shows that ERP implementation and automation lead to improved patient care and efficiency, streamlining operations, enhancing efficiency and improve patient care and personalize treatments. |
| [31] | Assesses reducing Emergency Department congestion through a home healthcare system using ERP system that provide real-time information transmission, enhancing decision-making processes, managing, and analyzing data, reducing emergency department crowding and improving patient satisfaction |
| [32] | Explores using ERP systems in emergency care for heart symptom patients, emphasizing their role in improving healthcare processes through technology.<br>It introduced a framework for planning and managing healthcare systems and identified gaps in cost, service, and quality with ERP implementation. |
| [33] | Explores the integration of ERP into the Smart Pharmacy concept, highlighting its significant impact on healthcare by improving efficiency, regulatory compliance, and safety. It demonstrates how advanced ERP systems can enhance healthcare operations and safety. |
| [34] | Proposes a framework for integrating ERP and Electronic Data Interchange (EDI) in the healthcare industry, aiming to improve efficiency, reduce costs, and enhance communication. The framework tackles challenges like cost and flexibility, focusing on maintenance, speed, and adaptability in system implementation. |
| [35] | Examines ERP systems" impact on healthcare and insurance sectors, revealing significant data discrepancies affecting claims settlements. Challenges include poor integration, lack of adaptability, and tracking issues. |
| [36] | Evaluates the standard SAP ERP All-in-One solution in healthcare, focusing on centralizing information, maintaining data integrity, and managing drug warehouses and billing. It identifies issues like healthcare billing incompatibility, patient data handling challenges, and complexities in material classification |
| [37] | Evaluates a teaching hospital's IT maturity for implementing Hospital Information Systems, identifying high-risk issues like vendor dependency and IT skills shortage. It recommends internal helpdesk, network restructuring, and enhanced IT support infrastructure. Challenges include inadequate infrastructure, insufficient planning, vague role definitions, and limited IT staff competence. |
| [38] | Examines the integration of Electronic Health Records (EHR) and ERP systems in healthcare, revealing that EHR improves coordination and care-delivery flexibility, while ERP facilitates real-time information flow, reducing silos. Challenges like communication, integration, patient records management, and data processing limit successful technology adoption. |
| [39] | Explores the use of ERP systems in healthcare, highlighting their potential to improve financial management, efficiency, safety, and quality of care, while also highlighting the need for future research on practical challenges and success stories in healthcare organizations considering evolving regulations and technological advancements. |
| [40] | Explores the benefits of ERP implementation including improved operations, reduced costs, financial management, enhanced IT infrastructure, and a central database. However, challenges include complexity, high costs, maintenance, vendor dependency, and potential service interruptions. ERP systems are costly and difficult to implement, causing resource and financial losses |
| [41] | Identifies non-complete integration with ERP systems based on six case studies. Highlighting challenges due to human-related issues, legal constraints, and diverse needs of hospital departments. However, successful ERP implementation result into improved resource use, data standardization, and better information share. |
| [42] | Highlights that ERP systems aid healthcare organizations in managing large amounts of information, controlling supply costs, addressing patient census failures, medical payments, and staff shortages, enhancing management and administration. |
| [43] | Investigates the benefits achieved and the criticalities encountered during the implementation of an ERP system in a public healthcare context in Italy, with a focus on process integration and operational efficiency improvements. |
| [44] | Examines how digital transformation, including technologies like IoT, Electronic Health Records (EHR), and AI, has been integrated into healthcare to improve patient care, enhance operational efficiency, and address cybersecurity challenges. |
| [45] | Evaluates the causes of failure in public sector ERP projects and compares them with private sector implementations to identify common and sector-specific factors affecting ERP success. |
| [46] | Evaluates the effectiveness of stand-alone systems versus enterprise resource planning (ERP) systems in the materials management department, examining how these systems support procurement, inventory control, and supply chain processes within organizations. |
| [47] | Synthesizes existing literature to explore how healthcare information systems (HIS) contribute to the improvement of healthcare delivery, patient care, and organizational efficiency, while also identifying the challenges associated with their implementation. |

These systems also provide improved cost management, effectiveness, security, and healthcare quality, all supported by robust IT frameworks and centralized databases.

However, ERP implementation faces significant challenges. Discrepancies in data can disrupt essential processes such as claims settlements, emphasizing the need for better system integration and adaptability. High-risk factors, such as vendor dependency and limited IT expertise, can delay successful implementation. Additional hurdles include challenges in billing, patient data administration, and material classification, as well as the complexities of customizing ERP software to meet hospital-specific requirements and government regulations. Furthermore, the high costs of ERP systems, potential service interruptions, and the ongoing need for maintenance present substantial barriers to their effective deployment and sustained operation in the healthcare sector.

These findings provide valuable insights into ERP systems implementation benefits and challenges in healthcare. The benefits identified through the analysis are summarized in Figure 3, with improved efficiency being the most frequently mentioned benefit across six publications.

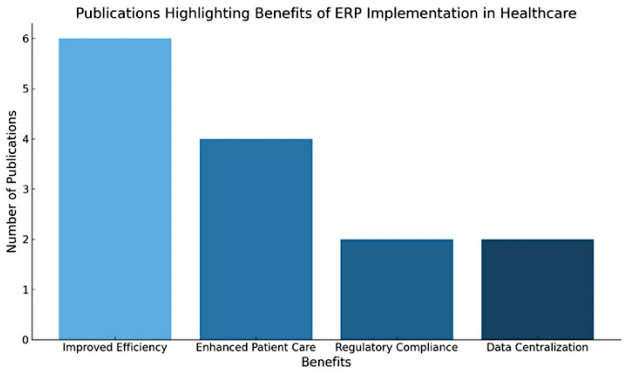


***Fig. 3 Benefits of ERP Implementation in Healthcare***

This suggests that ERP systems are primarily valued for streamlining operations and enhancing organizational workflows. Enhanced patient care, cited in four publications, emphasizes the role of ERP systems in improving decision-making and personalized treatments. Although mentioned less frequently, regulatory compliance and data centralization, each cited in two publications, remain important benefits, ensuring adherence to healthcare regulations and maintaining accurate patient data. This distribution reflects ERP"s comprehensive impact on both operational and clinical aspects of healthcare.

Moreover, the challenges are presented in Figure 4, showing that integration issues are the most frequently cited, mentioned in 3 publications, indicating that healthcare organizations struggle to integrate ERP systems with existing infrastructure and processes.

High costs, vendor dependency, and complex implementation, each cited in 2 publications, also pose significant barriers. High costs remain a challenge for many healthcare institutions, especially smaller ones, while vendor dependency highlights concern over long-term reliance on external providers.

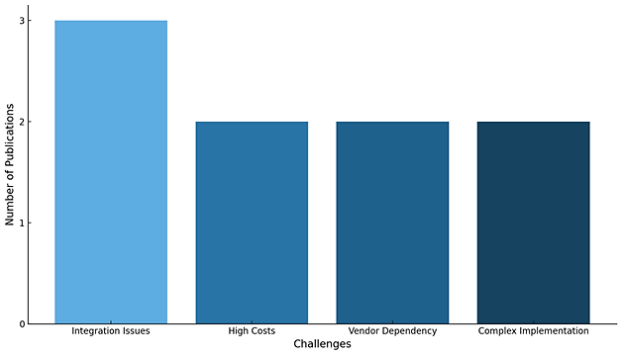


***Fig. 4 Challenges of ERP Implementation in Healthcare***

Complex implementation underscores the technical and organizational difficulties that often accompany ERP system deployment, requiring substantial restructuring of workflows and processes. These challenges underscore the multifaceted nature of ERP adoption in healthcare.

The research highlights a focus on the immediate effects of ERP systems, neglecting potential long-term benefits and challenges, and identifies a gap in standardized evaluation due to the absence of uniform metrics for assessing ERP implementation performance. This lack of benchmarks hinders healthcare organizations from making informed decisions and generalizing findings. Future studies should adopt longitudinal analyses to systematically monitor and evaluate the long-term impacts and sustainability of ERP implementations, developing predictive models to anticipate future benefits and challenges, considering technological advancements and regulatory changes. Scalability should also be addressed by evaluating ERP systems" ability to adapt to the growing and diverse needs of healthcare organizations. The integration of ERP systems with emerging technologies, such as artificial intelligence, big data, and telemedicine, offers a promising research direction to assess their combined impact on healthcare efficiency and outcomes. Furthermore, a standardized evaluation framework incorporating Key Performance Indicators (KPIs) is essential to enable objective measurement, comparative studies, and strategic planning. Cross-sectional research could further contribute to this standardization, equipping healthcare institutions with the tools to navigate ERP adoption confidently and effectively, ultimately aligning ERP solutions with their operational goals.

**ERP System Technological Advancement**

This subtheme examines a collection of research papers that demonstrate various applications of technologies in ERP systems tailored for healthcare settings. The results of these analyses are presented in Table 2.

Advancements in ERP systems are transforming healthcare by integrating technologies such as RFID,

telemedicine, and artificial intelligence, enhancing patient care, decision-making, and process efficiency through advanced data management and analysis.

***Table 2***
***ERP system technological advancement***

| Authors | Focus |
|---|---|
| [48] | Develops an fb-kNN algorithm integrated into ERP systems for disease pattern analysis and correlation in Healthcare 4.0, aiming for improved health monitoring and early intervention. ERP systems support in enhancing clinical decision-making and patient care. |
| [49] | Proposes a healthcare ERP system implementation model utilizing Service-Oriented Architecture (SOA) and Software as a Service (SaaS) concepts, addressing adoption challenges, and enhancing efficiency, emphasizing the growing significance of cloud-based ERP systems in public healthcare, and suggesting research areas. |
| [50] | Explores the use of process mining techniques in healthcare, specifically in managing sepsis cases, by analyzing event logs from a hospital's ERP system, emphasizing its significance in improving understanding and efficiency in critical areas like sepsis management. |
| [51] | Discusses the integration of RFID, telemedicine, and AI with ERP systems to improve healthcare productivity, highlighting potential benefits like cost reduction, improved patient care, and better decision-making, while highlighting research gaps in AI and machine learning. |
| [52] | Presents Total Healthcare Enterprise Resource Planning (THERP) as a comprehensive healthcare ERP system improving patient care and information access, with a focus on a six-phase implementation and principal refinement. |
| [53] | Develops a clinical recommender system using data mining and ERP principles, aiming to elevate nursing care effectiveness with further research needed on predictive accuracy. |
| [54] | Critiqued the prevalent automation in healthcare ERP systems and advocated for a human-centered systems (HCS) approach to reconcile technology's social impact and system engineering. |
| [55] | Explores solutions for addressing architecture risks and supporting digital transformation through the actions of Architecture Boards, focusing on the implementation of an Adaptive Integrated Enterprise Architecture (EA) framework within a global healthcare enterprise. |

Cloud-based ERP systems further amplify accessibility and efficiency, enabling healthcare providers to deliver innovative solutions to complex challenges and improve patient management. However, alongside these benefits, challenges persist, including data privacy concerns, integration difficulties, and the need for frameworks that incorporate new technologies without compromising care quality. These challenges call for cautious implementation, particularly in sensitive areas like patient data management and telemedicine. Future research should focus on aligning advanced technologies with ERP systems while assessing their long-term impacts to maximize benefits and mitigate risks. Additionally, a significant gap exists in understanding how end-users perceive and adopt these technologies, emphasizing the importance of studying human-technology interactions within ERP systems. Addressing this gap will improve design, training, and implementation strategies, ensuring user-friendly, effective solutions tailored to healthcare professionals" needs.

**Factors Influencing ERP Adoption In Healthcare Setting**

This section provides a structured analysis of the primary factors influencing ERP adoption in the healthcare sector, with insights organized by key categories as shown in Table 3. Each factor, whether technological, organizational, performance-related, or centered on change management, highlights unique enablers and challenges in the adoption process.

The critical analysis of the findings across the subcategories of the papers outlined in Table 3 reveals several key considerations for ERP implementation in healthcare. Technological factors emphasize that the adoption of ERP systems is heavily influenced by an organization"s technological readiness, budgetary constraints, and the specific functionalities of the ERP system. Research, including [56], highlights the importance of aligning corporate strategy with technology use while addressing weaknesses in time management, and [59] underscores the growing issue of cybersecurity due to the sensitive nature of healthcare data.

These studies stress the need to prioritize system performance, data privacy, and overall security for successful ERP implementation. Organizational, managerial, and strategic factors demonstrate that the effectiveness of ERP systems relies not only on technological capabilities but also on strong leadership, adequate training, and alignment with healthcare objectives. The ability of managers to anticipate future needs and strategically plan plays a critical role in successful ERP adoption. Performance and quality factors focus on the performance metrics of ERP systems and their impact on hospital management and service quality. The varying responses from staff and patients and the need for thorough risk analysis indicate a more nuanced approach is required to evaluate ERP systems" effectiveness in improving healthcare efficiency. Finally, change management, culture, and user satisfaction factors highlight the interplay between technical and user-centric considerations. The technical excellence of an ERP system must be complemented by a supportive organizational culture and management practices that prioritize user satisfaction to ensure successful implementation and adoption.

***Table 3***

***Factors influencing ERP adoption in healthcare setting***

| Factors | Authors | Focus |
|---|---|---|
| Technological Factors | [56] | Explores the factors influencing healthcare technology adoption, specifically ERP systems. Key issues include business strategy, cost, vendor experience, ERP capabilities, time management challenges, user resistance, and system complexity. |
| | [57] | Presented a Technology-Organization-Environment (TOE) theory-based framework, highlighting technological, organizational, and environmental contexts influencers of ERP adoption |
| | [58] | Identifies technological factors influencing the adoption of Cloud-based ERP systems in the healthcare sector including cost reduction, system speed, performance, and data privacy. |
| | [59] | Explores cybersecurity in an ERP system, specifically Odoo 11, used in healthcare for patient data storage. It reviews security audit orchestration frameworks, identifies gaps for comprehensive audits, and introduces a static analysis phase for enhanced security. |
| | [60] | Explores the adoption of ERP systems in the healthcare sector, identifying various motivations such as technological, managerial-operational, managerial-strategic, clinical-operational, clinical-strategic, and financial. |
| | [61] | Explores the use of ERP software and cloud computing in medical offices to improve patient care, safety, efficiency, and cost reduction. It emphasizes advancements in computer science and information technology, highlighting the potential for improved reliability and efficiency. |
| | [62] | Explores security risks in cloud-based ERP systems, particularly in healthcare, revealing a gap in current security solutions and suggesting further research to develop robust measures, considering the evolving nature of cyber threats and increasing reliance on cloud technologies. |
| | [63] | Identified nine key factors including acquisition costs, monthly payments, market reputation, support, training, deployment experience, feature set, ease of use, efficiency, reliability, and maintenance influencing ERP software selection in Brazilian healthcare, critical for long-term success and user trust. |
| Organizational, Managerial and Strategic factors | [60] | Explores the adoption of ERP systems in the healthcare sector, identifying various motivations such as technological, managerial-operational, managerial-strategic, clinical-operational, clinical-strategic, and financial. |
| | [64] | Investigates the correlation between training, supportive leadership, and ease of use in implementing ERP systems in Jordanian healthcare SMEs. Results show a significant relationship between these factors and ERP implementation success, with user satisfaction playing a critical role |
| | [65] | Examines the use of ERP systems in a Spanish public hospital, focusing on technical and organizational aspects. The Foundation (FHM) deemed an integrated management system necessary, emphasizing user satisfaction and adaptability to organizational culture. |
| | [66] | Discusses the implementation and integration of SAP R/3 ERP software in healthcare, highlighting challenges and complexities. It suggests organizational change, integration with non-ERP systems, and addressing implementation challenges. It also suggests using Enterprise Application Integration (EAI) technologies for cost reduction and improved operations. |
| | [67] | Examines IT project management in NHS hospital pathology departments using causal loop modelling and qualitative research. Key success factors include project team competency, inter-departmental cooperation, top management support, government influence, resource allocation, vendor support, and end-user involvement. |
| | [68] | Examines the success of ERP implementation at Fortis Hospital in Bangalore, India, highlighting five key factors: top management commitment, user involvement, business process reengineering, project management, and ERP teamwork. |
| | [69] | Explores the use of ERP systems in a Spanish public hospital, highlighting their role in integrating functions like Human Resources, Financial and Cost Management, and Patient Care Management, emphasizing the need for diverse operations. |
| | [58] | Identifies Organizational and Environmental factors influencing the adoption of Cloud-based ERP systems in the healthcare sector. Organizational factors include size, resource availability, and readiness. Environmental factors include government regulations, competition, and accreditation agencies. |
| | [70] | Evaluates the impact of professional characteristics (such as IT experience and age) and organizational support (including training and support services) on healthcare personnel's attitudes towards adopting and using ERP systems in a Spanish public hospital. |
| | [71] | Assesses the critical factors influencing the success of ERP implementations, focusing on strategies to overcome common challenges and improve alignment between ERP systems and business processes. |
| | [72] | Evaluates the effectiveness of ERP systems in healthcare organizations, focusing on their impact on operational efficiency and patient care. Identifies challenges and critical success factors in ERP implementation,<br>including user competency and alignment with organizational goals. |

***Table 3 cont.***

| | | |
|---|---|---|
| Performance and Quality Factors | [73] | Investigates the use of SAP ERP systems in hospital management to improve operational efficiency, supply chain management, and service quality. Results reveal varied responses from employees and patients, with some preferring traditional methods and others satisfied with SAP ERP systems. |
| | [18] | Explores the impact of ERP systems on service quality improvement in Lahore, Pakistan, involving 279 medical professionals from five organizations. Results show positive feedback on ERP"s effectiveness in managing attributes and system quality. |
| | [74] | Discusses the role-oriented approach to integrating medical resources in healthcare organizations, emphasizing the significance of roles like Reception, In-Door Patient, and Intensive Care Unit in achieving core competencies and facilitating collaboration. It also underscores the need for more comprehensive integration strategies in medical ERP systems. |
| | [75] | Identifies three main competencies in emergency care for heart patients: process-oriented, logistics-oriented, and personal/management competencies. It highlights the need for better definition and modeling of care processes to improve decision-making. |
| | [76] | Explores the implementation of ERP systems in business-to-business markets in Spanish healthcare revealed that over half of ERP buyers were dissatisfied, emphasizing the need for alignment between ERP sellers and buyers, flexibility, adaptability, and marketing strategies. |
| | [77] | Presents a real options-based decision-making framework for evaluating ERP system investments, particularly in a hospital information system, using multiple binomial trees and aligning business and IT strategies with financial strategies. |
| Change Management, culture, and User Satisfaction Factors | [65] | Examines the use of ERP systems in a Spanish public hospital, focusing on technical and organizational aspects. The Foundation (FHM) deemed an integrated management system necessary, emphasizing user satisfaction and adaptability to organizational culture. |
| | [78] | Examines the critical success factors for Integrated EMR and ERP system implementation in healthcare, emphasizing the importance of clear business case, strong physician support, internal project champion, careful planning, strong project management skills, and willingness to change workflow. |

Technological factors are crucial enablers of efficiency in ERP adoption, though challenges like cybersecurity concerns and user resistance are common obstacles. Similarly, organizational and managerial elements underscore the importance of leadership and training but are often complicated by resource constraints and system complexities. Performance and quality considerations focus on how ERP impacts healthcare service quality and operational efficiency, although mismatches between healthcare organizations and ERP vendors can create dissatisfaction. Change management and user satisfaction factors, on the other hand, highlight the need for adaptability and support systems that foster user engagement and satisfaction. Figure 5 visually synthesizes these findings, providing a structured overview of the factors" impacts, both positive and negative, on ERP adoption in healthcare settings.

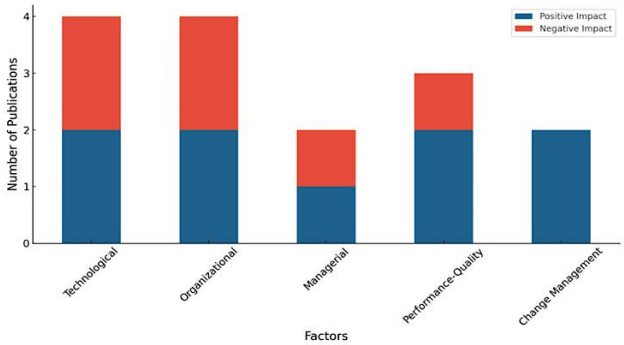


***Fig. 5 Impact of Factors Influencing ERP Adoption in Healthcare***

The insights gathered in this section indicate that adopting ERP systems in healthcare is a multifaceted process that demands an integrated approach addressing both technological and cultural dimensions. Moving forward, further research should develop multidimensional assessment criteria to measure ERP's impact on clinical, operational, and financial outcomes. Additionally, it is essential for future ERP implementations to account for the evolving challenges and trends in healthcare, ensuring systems are adaptable, secure, and aligned with long-term organizational goals.

**ERP Application in Different Healthcare Departments**

This subtheme delves into the utilization and deployment of ERP systems within various departments of the healthcare sector. The aim of this analysis is to understand the current practice in developing cross department ERP system in healthcare setting as shown in Table 4.

This section illustrates the application of ERP systems in healthcare setting, showcasing its capacity to improve departmental operations within the sector. The analysis encompasses a range of ERP applications, including managing warehouse operations in public hospitals, integrating with electronic health records (EHRs), redesigning user interfaces for dental clinics, managing pharmacy supply, facilitating nursing education, and integrating radiological activities. However, although various studies have documented the specific advantages of ERP applications in specific department in healthcare setting, there is still a significant lack of research in integration across different department. This brings to attention the silo nature of these implementations,

pointing out that the services provided by different healthcare departments using ERP systems are often limited to their own needs rather than the overall healthcare setting.

***Table 4***
***ERP application in different department in healthcare***

| Authors | Focus |
|---|---|
| [79] | Explores the creation of an ERP system for warehouse management at an Indonesian public hospital, aiming to integrate data management and enhance operational efficiency and patient care. |
| [80] | Examines the integration of AI and NLP into EHR systems, addressing usability, data handling, and ethical issues, while proposing a collaboration-enhanced approach for interactive healthcare tools that support decision-making and patient care. |
| [81] | Explores redesigning the ERP system UI in dental clinics using design thinking to meet clinical staff needs, with user interviews shaping personas and driving iterations to improve usability and satisfaction in healthcare services. |
| [82] | Examines supply chain optimization using ERP in a Portuguese hospital's pharmacy by analyzing selection methods for medications, identifying stock management inefficiencies, and employing historical data to forecast demand, suggesting enhancements through advanced algorithms and AI integration. |
| [83] | Evaluates the 3S-BIS ERP system's influence on nursing education, highlighting its enhancement of management skills and entrepreneurial competency among students through a randomized trial comparing groups with and without the intervention. |
| [84] | Proposes an ERP and PACS integrated model to improve radiology services in healthcare. It details workflow optimization from patient admission to image processing and discusses using SAP for Healthcare to enhance operational efficiency and patient care. |
| [85] | Analyzes how ERP systems are used and implemented in healthcare, revealing a focus on materials management over a fully integrated approach. It suggests ERPs are still evolving within healthcare, with a significant need for research on information management and usability. |
| [71] | Evaluates the implementation of ERP systems in hospitals with divided functional areas, assessing the achievement of technological goals and the integration between clinical and administrative sectors. |

Subsequently, the analysis provides a more in-depth exploration of the field, revealing 23 distinct departments within the healthcare sector, as represented in Figure 6. It is significant to recognize that certain papers encompassed multiple departments within the scope of the study. This highlights the interconnected nature of the health care system and the significance of multiple perspectives in research.

Figure 6 highlights the focus of academic research on the Information Technology (IT) department, with 20 papers emphasizing its critical role in implementing and integrating ERP systems in healthcare.

The Management department follows with 9 instances, reflecting research into organizational arrangements and leadership in advancing technology. Similarly, the Administrative department, with 10 occurrences, underscores its importance in enhancing healthcare performance. Operations and Supply Chain departments, noted in 6 instances, reveal a focus on logistical and operational integration for improved performance. Quality and Patient Service, along with studies spanning multiple departments, each appear 4 times, demonstrating a holistic approach to assessing healthcare services and patient care. Moderate research interest is evident in Health Information Management (HIM), HR, and Finance, each with 3 instances, focusing on information, human resources, and financial management. Legal and Compliance, as well as Pharmaceutical departments, are each noted twice, highlighting regulatory, ethical, and pharmaceutical advancements. Lastly, clinical departments such as Cardiology, Emergency, and Radiology, each appearing once, indicate limited research in specialized fields compared to the broader focus on administrative and operational aspects.

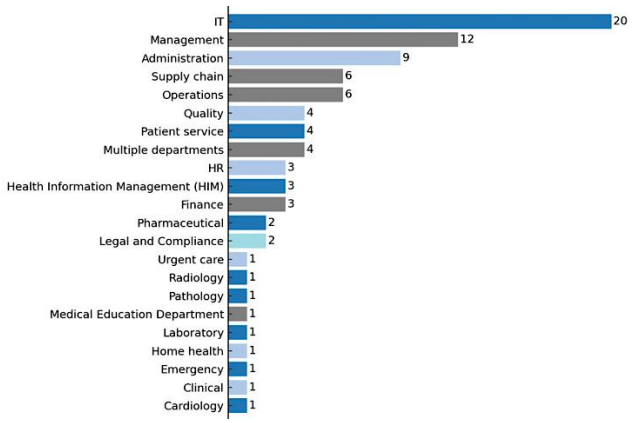


***Fig. 6 Occurrences of healthcare departments***

Future research should consider a critical and multidisciplinary approach when integrating ERP systems in healthcare. This approach would support the emergence of a diverse range of potential advantages and disadvantages. Further exploration of the interconnectivity of healthcare services, with a focus on overcoming obstacles related to data silos and interoperability. Furthermore, it is necessary to conduct a comprehensive examination of the ongoing long-term impacts of ERP systems on the provision of healthcare services, patient outcome, and information management. This may encompass an examination of the ethical implications associated with the sharing of data, the identification of potential biases in the design of systems, and the establishment of transparency as a means for building trust among all parties involved in the healthcare system.

**Performance Management in the Healthcare Sector**

This section offers a detailed examination of various research studies on performance management in the

healthcare sector. The studies are categorized into two key subthemes, each focusing on different aspects of performance management within this field, as outlined below.

**Performance Measures**

This subtheme delves into the diverse range of performance measures utilized within healthcare settings to evaluate and enhance various aspect of healthcare performance as shown in Table 5.

The studies underscore the critical role of advanced technologies in enhancing performance measurement within healthcare environments, highlighting approaches such as multidimensional management dashboards, lean supply chain management, and knowledge-centric frameworks for enterprise system adoption. Despite these advancements, significant challenges remain, including fragmented information systems, inadequate management structures, and a disproportionate emphasis on economic indicators that fail to capture the multifaceted nature of healthcare operations. Moreover, while technological innovations have contributed to operational efficiency and system design, there is insufficient focus on their direct impact on clinical outcomes and patient care.

***Table 5***

***Performance measures***

| Authors | Focus |
|---|---|
| [86] | Examines technological improvements in performance measurement at a public university hospital, addressing system fragmentation and management issues, with a call for further research into technology's impact on organizational goals and management roles. |
| [87] | Focuses on enhancing lean supply chain management in healthcare, emphasizing the importance of supplier selection criteria to boost system value. A study shows a significant trend in researching technology's role and implementation within supply chain networks. |
| [88] | Proposes a framework to evaluate the impact of enterprise system adoption on business processes, focusing on employee knowledge and performance metrics, with future steps including refining and linking it to training methodologies. |
| [89] | Proposes a mobile collaborative healthcare implementation success framework using DeLone and McLean's IS success model. It uses a quantitative approach to identify the impact of information quality, service quality, system quality, and mobile collaborative healthcare implementation-related variables on Indonesian healthcare institutions' performance. |

This observation underscores the necessity of developing integrated performance evaluation systems that align organizational objectives with the quality of healthcare services, thereby bridging the gap between operational efficiency and patient-centered outcomes. Furthermore, the identification and analysis of critical success factors associated with technology adoption and utilization in healthcare can provide valuable insights into the intricate relationship between technological and human factors. Such an approach is essential to ensure that advancements in performance measurement effectively contribute to enhanced patient care and satisfaction.

**Performance Improvement**

For this subtheme, the research delves into an array of scholarly papers that focus on performance improvement practice within healthcare settings as shown in Table 6.

***Table 6***

***Performance improvement***

| Authors | Focus |
|---|---|
| [90] | Proposes a framework employing Critical Success Factors and Key Performance Indicators to evaluate and enhance the effectiveness of healthcare simulation programs, focusing on project management outcomes. Findings indicate customer responsiveness is key to simulation project success |
| [91] | Examines Critical Success Factors for implementing Value Stream Mapping in various sectors including healthcare, aiming to enhance performance by realigning production systems with lean principles. The analysis reveals an increasing focus on Lean methodologies within healthcare to improve organizational performance. |
| [92] | Develops a framework to align business and IT operationally to enhance performance and diagnosing alignment issues. Future work will refine assessment methods and conduct case studies across industries to validate the framework's components and their interrelations. |
| [93] | Highlights the need for robust performance management to predict and enhance future outcomes, introducing a „control tower" method that merges lean principles with connected performance, offering substantial benefits in complex service delivery despite the challenge of finding participants for empirical validation studies. |
| [94] | Assesses the relationship between Human Resource Management (HRM) practices and organizational performance in public healthcare, examining how strategic HRM is perceived and implemented across different managerial roles. |

The research papers in this section collectively explore various performance measurement and improvement strategies within healthcare, emphasizing frameworks such as Critical Success Factors (CSFs), Key Performance Indicators (KPIs), and lean methodologies like Value Stream Mapping (VSM). These approaches highlight the dynamic nature of healthcare efficiency and management, with operational alignment frameworks focusing on integrating business and IT elements to enhance overall performance. However, the studies reveal a tendency to prioritize operational and administrative efficiency, sometimes at the expense of patient-centered outcomes and care quality. While operational improvements are vital, the ultimate goal of healthcare, which is delivering high quality patient outcomes, must remain central to any performance

measurement system. Future research should aim to link operational enhancements to clinical benefits through robust validation procedures and alignment of performance indicators with patient satisfaction and health outcomes. Additionally, further investigation is needed to ensure the responsible application of performance management tools, avoiding unintended compromises in patient care. The successful and ethical integration of these strategies into healthcare practices and policies will require interdisciplinary collaboration.

**Integration of ERP And Performance Management in Healthcare**

This section presents an analysis of research studies that explore the intersection of ERP and performance management in healthcare. Each of the study discuss how ERP systems can contribute to enhancing the performance management practices in the healthcare sector, as detailed in Table 7.

***Table 7***
***Integration of both ERP and performance management in healthcare***

| Authors | Focus |
|---|---|
| [95] | Investigates the mediating role of ERP implementation between knowledge management and perceived organizational performance in healthcare, showing that ERP significantly impacts performance and mediates KM's effect. |
| [96] | Highlights the crucial role of strategic alignment and performance measurement in healthcare IT governance, advocating for IT investments that contribute to clinical, operational, and strategic improvements |
| [97] | Demonstrates the application of process mining with a real hospital dataset and an ERP package to optimize time cost and resource utilization, using Heuristics Miner and ProM tools with MRI tests as a focus. |
| [98] | Investigates the effects of goal awareness and IT self-efficacy on job satisfaction among healthcare ERP system users, affirming the positive influence of these factors on satisfaction and decision-making. |
| [99] | Reports that ERP systems in Saudi private hospitals streamline operations and offer strategic benefits, with success hinging on management support, effective project management, and user training, leading to performance enhancements like improved financial and operational metrics. |
| [100] | Identifies five key factors, excluding data fit, that significantly affect the success of IHIS adoption in healthcare, with business process fit being particularly influential on system quality. |
| [101] | Explores the benefits and barriers of adopting Enterprise Application Integration (EAI) in healthcare organizations, focusing on how it can enhance data sharing and integration of clinical and business processes while addressing implementation challenges. |
| [102] | Analyzes the use of process mining techniques to evaluate the performance and identify bottlenecks in electronic billing processes within hospital services, exploring how these insights can be applied to enhance process efficiency and reduce delays. |

The studies underscore the critical role of ERP systems in enhancing healthcare performance management by optimizing operations, improving organizational performance, and aligning strategic objectives with IT governance. Effective implementation hinges on Knowledge Management, where strategic alignment ensures IT investments yield desired outcomes in clinical and operational domains. Process mining facilitates resource optimization, while user-centric features like goal awareness and IT self-efficacy boost job satisfaction and decision-making. Successful ERP integration requires robust leadership, efficient project management, and targeted user training to harmonize new systems with existing healthcare procedures, collectively driving improvements in healthcare services and confirming the essential role of ERP systems in promoting efficiency and effectiveness. However, existing studies often provide limited insights, highlighting the need for longitudinal analysis to understand the long-term impacts and sustainable integration of ERP systems in healthcare. Comprehensive research is needed to explore the benefits, challenges, and connections between performance measures and ERP systems over time. Future studies should prioritize systematic investigation of ERP's long-term effects on performance indicators and undertake comparative analyses to elucidate the complex relationships between ERP adoption and diverse healthcare outcomes.

To sum-up the findings in this section, Figure 7 provides a comprehensive visualization and categorization of the diverse themes found in the field of ERP integration for enhanced performance management.

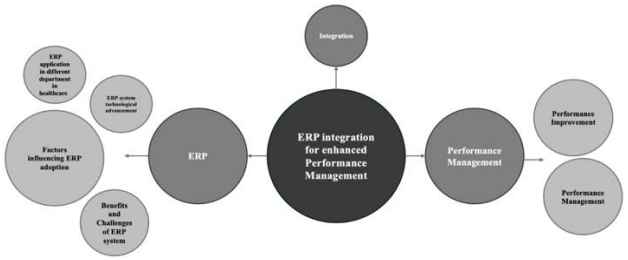


***Fig. 7 Summary of identified themes in ERP integration for enhanced performance management***

Similar to the previous bubble diagram, Figure 7 incorporates a two-tier structure. The first tier focuses on the main themes that were identified during the exploration of current research in the field of ERP integration for enhanced performance. The relative sizes of the circles indicate the frequency of these themes, reflecting the number of publications associated with each theme. In addition, within each thematic group, there is a secondary layer that defines individual themes.

Overall, this section provides a critical analysis of the role and impact of ERP systems integration on performance management within the healthcare sector. The analysis encompasses the implementation and technological advancements of ERP systems, the factors influencing their adoption, their application across different healthcare departments, and the integration of ERP with

performance management practices. In addition, it assesses the performance management papers through assessing performance improvement and performance measures. Lastly, assessing the relationship between both of them was conducted.

## QUANTITATIVE ANALYSIS

This section presents a comprehensive quantitative analysis of ERP systems in healthcare, focusing on their role in enhancing performance management. By examining a substantial collection of articles from the Scopus database, the research provides an in-depth exploration of the current state of innovation and integration in this evolving field. Utilizing VOSviewer, the study generates three distinct visualization maps to analyze the relationships between ERP systems and performance management in healthcare. These maps, populated with circles representing elements such as publications, researchers, or specific terms, illustrate the prominence and activity levels within the field, as indicated by circle size and font. Larger circles and fonts signify higher activity, while smaller ones denote lower activity. The maps also depict interconnections among terms, with closer distances indicating stronger relationships and longer distances suggesting weaker links. This visual and methodological approach offers valuable insights into the dynamics and interrelationships of ERP systems integration, providing a detailed perspective on their application in improving healthcare performance management.

### Co-Occurrence Map Based on Text Data and Keywords

The relevant and frequently occurring terms were identified by analyzing the text data of the 74 selected publications. Text data analysis involves the extraction of pertinent terms from the titles and abstracts of chosen publications, followed by the construction of a network using VOSviewer to establishes co-occurrence connections among these terms. This analysis facilitates an understanding of emerging developments and the identification of significant terms within the field. The study yielded a total of 1832 terms, of which 35 terms meet the threshold set by the VOSviewer based on relevance and occurrence, which are illustrated in Figure 8. Terms that have a high relevance value indicate that the text data covers more specialized themes, whereas terms with a low relevance score are more generic in nature [103] (Van Eck and Waltman 2018). It is essential to note that a thesaurus was generated and subsequently uploaded to VOSviewer by the software in order to standardize keywords and remove duplicate terms [104]. As such, Figure 8 presents a network diagram illustrating the interconnections among various words in the healthcare field, focusing on the development and administration of ERP systems.

The central terms "system," "ERP," "hospital," "management," and "patient" are the most extensively examined in the evaluated literature.

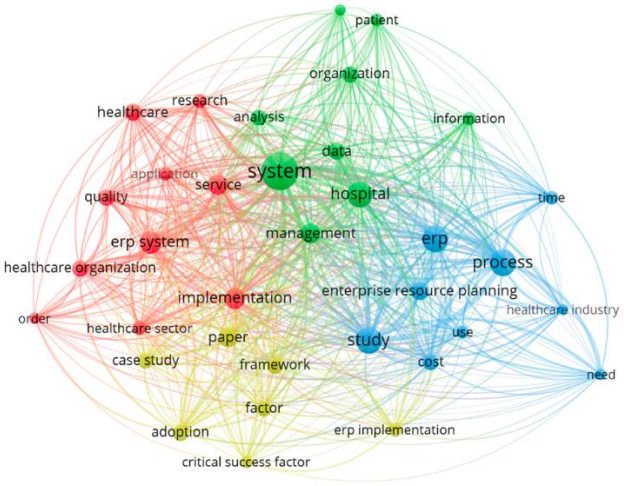


***Fig. 8 Co-occurrence map – text data***

The mapping demonstrates a strong correlation between the pragmatic elements of ERP systems, such as implementation and service, and the organizational environments in which they function, such as hospitals and healthcare organizations. The mapping emphasizes the utilization of ERP systems to enhance healthcare services and operational effectiveness. The inclusion of terms like "quality," "process," and "management" underscores the focus on enhancing healthcare delivery and administrative operations through technology. The mapping also encompasses the pragmatic aspects of adopting ERP systems, including the necessary resources and motivations behind these endeavors.

Furthermore, the network visualization indicates the significance of "Enterprise Resource Planning" (ERP) as a key focus in healthcare research, as shown in Figure 9. ERP is closely linked to crucial operational and managerial elements in healthcare systems, including implementation, hospital management, system integration, and process optimization.

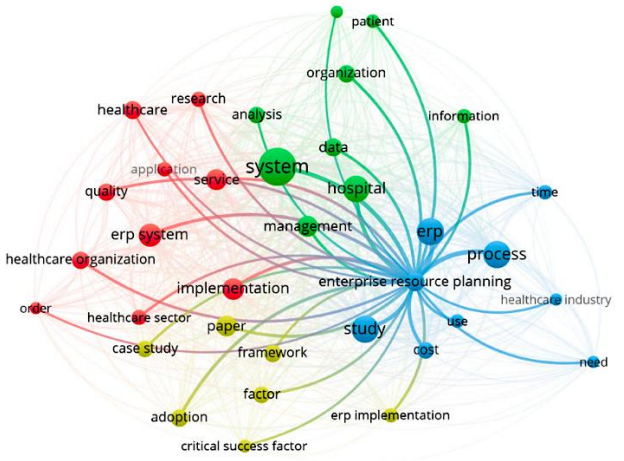


***Fig. 9 Terms directly connected with "Enterprise resource planning"***

Furthermore, it indicates that ERP plays a crucial role in enhancing efficiency and facilitating modernization inside healthcare organizations. The research primarily focuses on the actual application of the technology in hospitals, the enhancements it can bring to management, and its

compatibility with wider industry processes. Furthermore, economic factors, such as costs and organizational needs, also play a considerable role, indicating a strong focus on the financial consequences and rationale of ERP systems in the healthcare industry. The aforementioned statement highlights the diverse functions of ERP in enhancing healthcare services and optimizing the operational effectiveness of healthcare organizations.

As such, Table 8 presents a comprehensive analysis of the major terms that are commonly encountered within the context of the study.

***Table 8***

***Top 10 keywords by occurrences of a text data***

| Rank | Term | Occurrences | Relevance score |
|---|---|---|---|
| 1 | System | 139 | 0.7582 |
| 2 | Process | 70 | 1.4691 |
| 3 | ERP System | 47 | 0.6479 |
| 4 | Healthcare | 29 | 0.8522 |
| 5 | Adoption | 27 | 0.424 |
| 6 | Healthcare Organization | 27 | 1.0041 |
| 7 | Quality | 26 | 0.7928 |
| 8 | ERP Implementation | 18 | 1.9904 |
| 9 | Time | 17 | 1.5409 |
| 10 | Use | 15 | 0.2828 |

The term "System," with the highest occurrences (139 times) and has a relevance score of 0.7582, implies a fundamental element inside the topic, showing a focus on understanding or improving systems. "Process" with relevance score of 1.4691 indicates that the procedural aspects are being thoroughly assessed or addressed. In addition, The inclusion of the terms "ERP System" and "Healthcare", with relevance scores of 0.6479 and 0.8522 respectively, highlights the specific areas of attention, potentially associated with the utilization of technological systems in the healthcare sector. The terms "Adoption" and "Healthcare Organization" exhibit equal frequency but possess varying levels of significance, with relevance scores of 0.424 and 1.0041 respectively. This suggests that these terms reflect different degrees of focus on the adoption of practices or systems and the involvement of organizations in the healthcare sector.

Moreover, by evaluating the bibliographic data of the 74 selected papers, the analyze was conducted to identify the frequently occurring keywords. A grand total of 609 keywords were identified, from which 17 were chosen, with a minimum requirement of 5 occurrences for each term. The network generated is illustrated in Figure 10.

This analysis includes a comprehensive examination of all keywords, including both author keywords and index keywords. Author keywords are specific keywords chosen and provided by the authors of the articles themselves, while index keywords are keywords that have been assigned by indexers or databases to classify and categorize the articles for the purpose of information retrieval and indexing. Figure 11 show the most common keywords identifies such as "healthcare," "enterprise resource planning (ERP)," and "information systems".

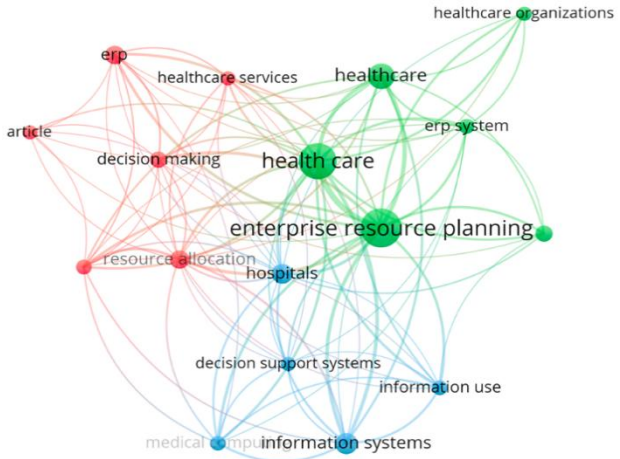


***Fig. 10 Co-occurrence map of all keywords***

Additionally, a thorough examination of the key terms associated linked to ERP systems in the healthcare sector is generated, as shown in Table 9. The term "Enterprise Resource Planning" leads with the highest occurrences and total link strength, indicating its central role in the study.

***Table 9***

***Top 10 keywords by occurrences of all keywords***

| Rank | Term | Occurrences | Total Link Strength |
|---|---|---|---|
| 1 | Enterprise Resource Planning | 38 | 114 |
| 2 | Health Care | 33 | 103 |
| 3 | Healthcare | 17 | 48 |
| 4 | Information Systems | 12 | 44 |
| 5 | Hospitals | 10 | 36 |
| 6 | ERP | 9 | 25 |
| 7 | Resource Allocation | 9 | 40 |
| 8 | Decision Making | 7 | 22 |
| 9 | Enterprise Resource Planning (ERP) | 7 | 16 |
| 10 | Enterprise Resource Planning Systems | 6 | 32 |

"Health Care" follows, with a strong link strength, underscoring its importance and close association with ERP. The presence of "Healthcare" as a separate term, despite a lower occurrence, still carries substantial weight, suggesting varied contexts or nuances in usage. "Information Systems" and "Hospitals" are also crucial, pointing to the settings and systems where ERP is applied. The term "ERP" alone, along with its variations, emphasizes the focus on these systems. "Resource Allocation" and "Decision Making" are less frequent but have significant link strength, implying their importance in the effective management of healthcare resources and strategic processes within ERP frameworks. "Information Use," "Medical Computing," and "Decision Support Systems" suggest a technical focus on the use of information and computing in healthcare decision-making. The term "Article" with the lowest link strength might refer to the source of data, such as scholarly articles or publications. These terms collectively highlight the integration of ERP systems in healthcare, focusing on the

management of resources, information systems, and the decision-making processes that are vital to healthcare delivery.

**Data Analysis on Article Sources**

To assess the distribution of the 74 publications, a catalog of publication sources was organized, highlighting the frequency of publication contributions. A visual depiction of the leading sources is provided in Figure 11, which displays a bar graph detailing the top 10 sources. The bar chart provides a comprehensive overview of the publication landscape, confirming the diverse nature of the study field under consideration.

The publication venues examined in this research, including the Journal of Enterprise Information Management and Enterprise Information Systems, underscore the field's reliance on computer science expertise and its focus on integrating management and business processes with technological solutions. The inclusion of sources such as Communications in Computer and Information Science and various conference proceedings highlights the interplay between technical innovation and practical application. Contributions from diverse outlets, such as the Indian Journal of Public Health Research and Development, further demonstrate the multidisciplinary relevance of this research, particularly its applications within the healthcare sector. The range of sources represented, as illustrated in the bar chart, emphasizes the collaborative integration of knowledge from various academic disciplines, underscoring the critical role of interdisciplinary approaches in addressing the complex dimensions of this field. This comprehensive integration of insights and expertise facilitates the advancement and deliberate implementation of systems in enterprise and healthcare contexts.

**Top Countries In ERP And Performance Management Research In Healthcare**

To assess the top countries that published within the 74 publications, a comprehensive analysis was conducted to identify the distribution of contributions across different nations. This analysis aimed to highlight the global engagement in the field of ERP systems and their application in healthcare, as shown in Figure 12.

The findings reveal that the United States is the leading contributor to healthcare technology research, with 34 publications, reflecting its substantial investment in this domain. Germany ranks second with 22 publications, demonstrating a strong commitment to advancing innovative solutions for healthcare management. India, China, and the United Kingdom follow with contributions of 10, 8, and 7 publications, respectively, indicating their increasing engagement in integrating ERP systems into healthcare frameworks. This distribution highlights the varying levels of research activity across countries, suggesting that regions with higher publication outputs benefit from well-established research infrastructures and collaborative networks in healthcare technology. The analysis underscores the potential for international collaboration to further advance ERP system integration by fostering knowledge exchange, strengthening research quality, and enhancing healthcare delivery and performance management on a global scale.

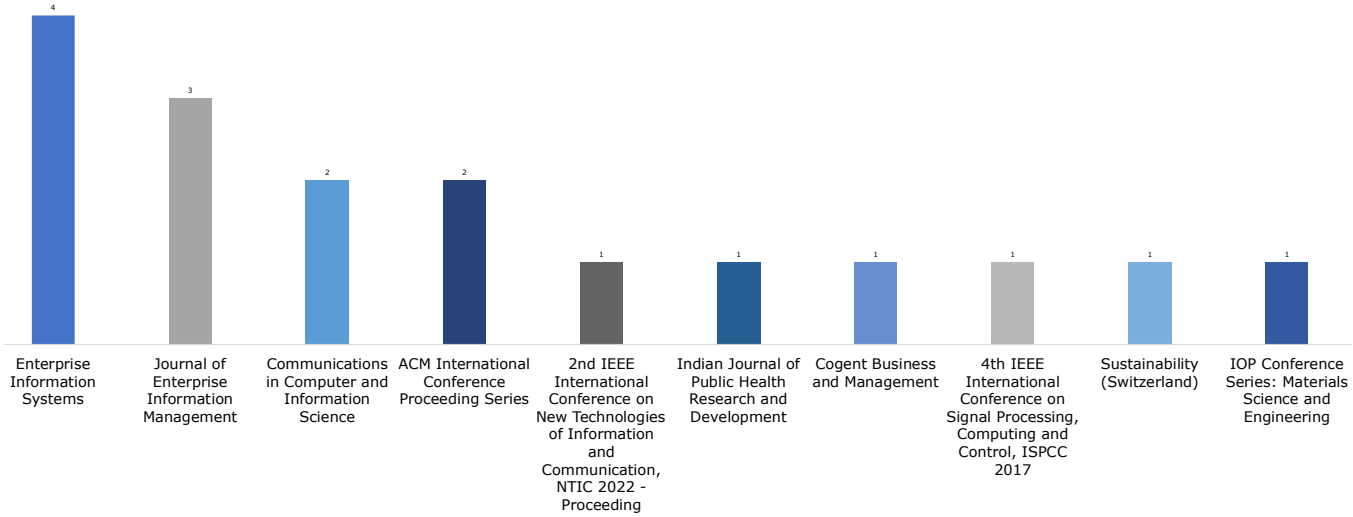


***Fig. 11 Bar graph of the top 10 sources by number of publications***

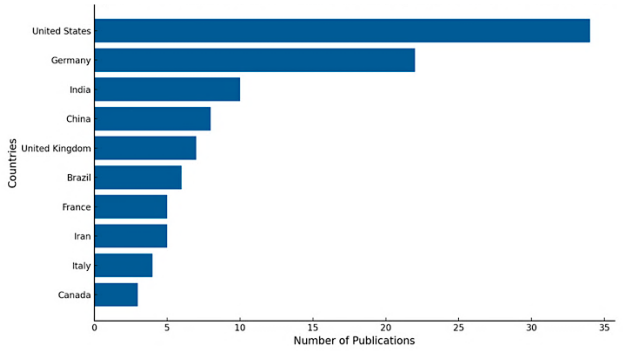


***Fig. 12 Top Countries In ERP And Performance Management Research In Healthcare***

**Data Analysis on Fields, and Research Types**

In this section, the 74 papers focused on distinct sectors within the healthcare industry, spanning both private and public domains. In specific cases, the study expands its focus to include the healthcare industry as a whole, investigating the essential components of the process without making any distinctions between sectors. As illustrated in Figure 13, a significant proportion of the papers pertain to the healthcare sector in its entirety, examining diverse processes within the industry, with a total of 54 instances.

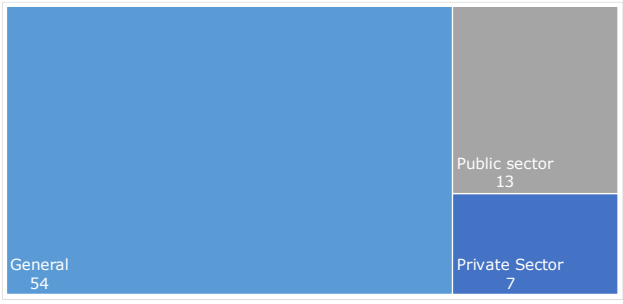


***Fig. 13 Occurrences of healthcare sector type***

The public sector has a notable number of papers, with a total of 13 occurrences. Nevertheless, the quantity of papers examined within the private sector is evidenced by 7 papers in the publications.

The following stage of analysis covers the types of research conducted in the context of ERP integration and its potential for performance enhancement offering valuable insights into the nature and focus of the scholarly work conducted in this field, which is demonstrated in Figure 14.

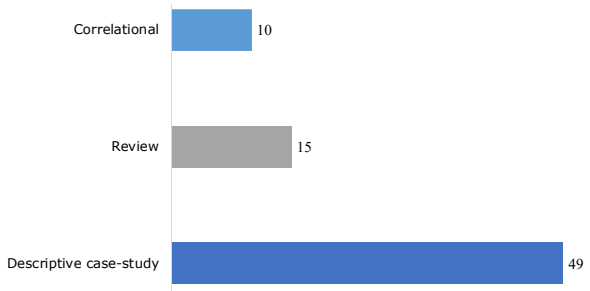


***Fig. 14 Occurrences of research type***

The most common sort of research is the descriptive case study, with 49 occurrences. Descriptive case studies are a type of research that entails conducting a thorough investigation of a specific topic. These studies seek to provide a comprehensive, detailed explanation of the subject or situation in its real-world context. Descriptive case studies are useful for acquiring a thorough understanding of a specific event, investigating the underlying challenges, and developing hypotheses that are tested quantitatively [105]. This method has been employed in the field of ERP integration in healthcare to assess the present state of technology advancements in the sector and identify opportunities for performance improvement in various fields and sectors. Conversely, the second form of research identified is review research, with 15 occurrences. This category includes systematic and literature reviews that aggregate and analyze relevant literature. Review research uses multiple sources to draw conclusions, identify patterns, and identify research gaps, unlike empirical studies. Systematic reviews are structured and transparent to minimize bias, while literature reviews are narrative or thematic. Both help synthesize current knowledge, guide future research, and shape policy and practice [106]. In this instance, a number of discoveries from reviews in ERP integration for enhanced performance in healthcare provide possibilities for significant advancement that could improve the quality of healthcare procedures and services. Finally, the last research type found is the correlational study, with 10 occurrences. Correlational studies explore and measure the relationships between variables, assessing their strength and direction. These studies serve as a foundation for initial research, pinpointing potentially related variables for deeper examination via experimental approaches [107]. The analysis found that correlation was utilized to uncover factors contributing to the successful integration of ERP systems in healthcare organizations and to examine how such integration influences performance management enhancements.

Moving forward, the analysis was carried out to examine the tools utilized in the identified case studies, which are summarized in Figure 15.

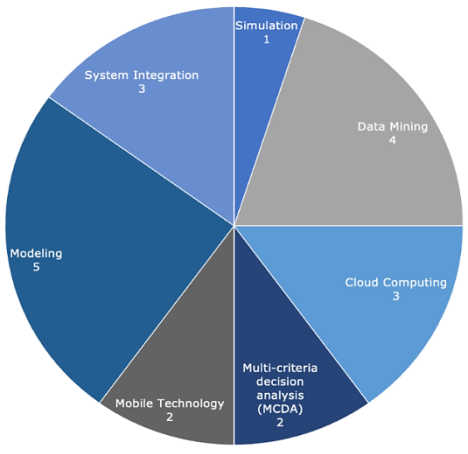


***Fig. 15 Occurrences of tools and methods in various descriptive case studies***

The analysis highlights the use of various tools in descriptive case studies on ERP system integration in healthcare. Modeling tools were the most prevalent, used in five studies to replicate real-life scenarios and identify areas for improvement. Data mining, employed in four cases, processed large datasets to uncover findings that enhance healthcare practices and decision-making. System Integration and Cloud Computing, featured in three studies each, facilitated seamless information flow and leveraged internet-based resources to improve operations. Mobile Technology and Multi-Criteria Decision Analysis (MCDA), each used in two studies, demonstrated their roles in enhancing patient interaction and supporting complex decision-making. Simulation, utilized in one study, provided predictive insights into potential changes within healthcare environments. Collectively, these tools play a pivotal role in advancing ERP system integration and improving performance in the healthcare sector.

**CONCLUSIONS AND FUTURE RESEARCH**

This review examines the integration of ERP systems and Performance Management in healthcare, offering a comprehensive analysis of the current state of research and future outlook. This study conducts an in-depth examination of 74 research papers, consolidating existing knowledge and practices while also identifying areas that need further investigation and suggesting potential future research in this field. The first step of this review was to conduct a comprehensive examination of the utilization of ERP implementation and performance management research through a comprehensive content analysis of the literature in the field.

The content analysis has provided significant finding that highlight many aspects of ERP implementation and current research in performance management practices in healthcare. The adoption of an ERP system in the healthcare sector presents numerous benefits and challenges for healthcare organizations in different fields and conditions. However, the implementation of ERP is also influenced by several factors that can have either a positive or negative effect on the successful deployment of the ERP system. Furthermore, the progress of technologies can also help to the improvement of the performance and operation of the ERP system. The study also includes examining the implementation of ERP systems in various departments within the healthcare industry to gain insight into the existing approach to establishing cross-department ERP systems. From a performance management perspective, the content analysis categorizes the papers into two main categories: those that focus on performance metrics and those that focus on performance improvement strategies within healthcare organizations.

The comprehensive quantitative analysis of ERP systems and performance management in healthcare conducted in this section yielded several key findings. The research highlights a significant and exponential growth in publications from 2005 to 2024, reflecting a heightened interest in the field. It emphasizes ERP systems" crucial role in enhancing operational efficiency and strategic management within healthcare organizations. Notably, descriptive case studies predominate in the literature, utilizing tools such as modeling and data mining, which indicates a trend toward qualitative exploration and practical applications of ERP systems to improve healthcare services. Additionally, various visual representations, including bar graphs and occurrence charts, were developed to illustrate the distribution of publication sources, document types, healthcare sectors, and research methodologies. These charts provide a comprehensive overview of the current research landscape, enhancing the understanding of ERP integration's impact on performance management in healthcare settings.

The study uncovers an important gap in the existing body of knowledge regarding the direct correlation between ERP systems and performance management approaches in the healthcare sector. While many publications discuss the benefits of ERP systems in healthcare organizations, they frequently rarely directly focus on performance management measures. There is little emphasis on the connection between ERP systems and performance management systems. This lack provides a chance for more investigation to specifically clarify how ERP systems contribute to and merge with the performance management framework in healthcare organizations, consequently providing a more specific understanding of the interaction between these two critical aspects.

Based on the finding from this review paper, several future research directions can be suggested for ERP and performance management integration in healthcare industry:

- Conduct longitudinal studies to evaluate the long-term impacts of ERP systems on healthcare services, patient outcomes, and information management.
- Establish a standardized evaluation framework with KPIs to track ERP progress beyond deployment and identify areas for improvement.
- Integrate ERP systems with emerging technologies like AI, big data, and telemedicine to enhance efficiency, scalability, and patient outcomes.
- Develop cross-sectional research to standardize ERP evaluations across institutions and guide better adoption strategies.
- Examine human-technology interactions to design user-friendly ERP systems that align with organizational culture and improve acceptance.
- Bridge operational efficiency and patient outcomes with integrated performance systems that align goals with healthcare quality.
- Address data silos and interoperability to improve ERP-supported collaboration across departments and institutions.
- Identify critical success factors by analyzing the interplay of technological and human elements in ERP implementation.

- Align ERP systems with organizational strategies to support patient outcomes, streamline processes, and optimize resources.

This review acknowledges certain methodological considerations. The study primarily relied on English-language publications indexed in the Scopus database, selected for its comprehensive coverage of multidisciplinary research and robust indexing of peer-reviewed journals in healthcare and management. While this choice may have excluded studies from other databases or in languages other than English, it aligns with the research aim of providing a focused and in-depth analysis using a widely respected resource. No territorial restrictions were applied, ensuring the inclusion of global research contributions. Although the PRISMA framework was employed to ensure a structured and transparent review, minor selection biases inherent to systematic reviews remain a possibility. Future research could benefit from integrating additional databases and exploring multilingual sources to further enrich the scope and applicability of findings.

The findings have practical implications for practitioners and policymakers alike. For practitioners, the study emphasizes the importance of a comprehensive approach to ERP implementation in healthcare, one that balances technological integration with organizational change management to maximize ERP benefits. For policymakers, these insights provide a basis for establishing standardized guidelines that could improve operational efficiency and strategic management in healthcare settings. Future research would benefit from longitudinal studies that examine the long-term impact of ERP systems on healthcare performance, along with predictive models that incorporate emerging technologies such as artificial intelligence and big data to better meet the dynamic needs of the healthcare sector.

This review highlights the potential of ERP and performance management systems in the healthcare industry, noting their promise for enhancing service quality, patient experience, and support for healthcare professionals. Continued research into ERP-PM integration, alongside the development of detailed frameworks and analytic capabilities, will pave the way for a more technologically advanced, inclusive, and efficient healthcare ecosystem.

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