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Research Article

A Survey on Enterprise Resource Planning in the Cloud Era Based on Current Trends and Future Directions

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Abstract

Enterprise Resource Planning or ERP systems occupy a rather central place among the key technologies that manage modern business and improve production processes. Enterprise Resource Planning (ERP) systems are the subject of this investigation, with an emphasis on the rising popularity of cloud-based ERP solutions and the difficulties associated with their implementation. The incorporation of cutting-edge technology like blockchain, IoT, and AI is a major step forward since it improves data analytics, SCM, and real-time insights. However, the transition to cloud ERP comes with challenges such as limited customisation, data security risks, compliance with regulatory requirements, and dependency on reliable network infrastructure. The work highlights the benefits of cloud ERP—lower upfront and operating costs, improved scalability, rapid updates, and better accessibility—while addressing the drawbacks like subscription expenses, integration complexities, and potential loss of control and IT knowledge. With growing adoption and future projections indicating substantial market growth, the evolution of cloud ERP presents opportunities and hurdles that organisations must navigate for effective implementation and sustainable use.

Keywords: *Enterprise Resource Planning (ERP), Artificial Intelligence (AI), Machine Learning, Predictive Analytics, ERP Models, Future Trends in ERP Development.*

Introduction

ERP solutions are only one example of how the IT industry is advancing because of constant innovation. The ERP system was defined by Botta-Genoulaz and Millet as an integrated software package that satisfies the demands of all departments within an organisation. It compromises a series of functional modules, such as Production, Human Resources, Sales, Finance, and so on[1] [2]. The ERP archive dates back a long time, maybe even 1970 when it was started with the intention of integrating company activities. With service providers providing business-wide applications with a broad variety of functionalities, the ERP software industry has grown tremendously over the previous decade[3][4][5].

The ERP price structure, application methodologies, and vertical market modifications will alter company patterns in the coming decade. Various models of cloud applications save data [6]. SaaS, for instance, is trying to attract businesses. The ERP pricing model of usage-based payment is often used by businesses that want to replace high capital costs with monthly subscriptions[7].

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ERP systems hosted in the cloud have revolutionised the whole system lifecycle, from proposal to implementation, use, maintenance, evolution, and retirement. Since the advent of cloud computing technology in the year 2000, ERP systems and database servers have begun to migrate to the cloud. There has been a lot of study on cloud ERP [8], but not nearly as much on ERP post-implementation difficulties or the development and upgrades of cloud-based ERP systems[9]. However, users using cloud ERP systems no longer have a voice in choices about upgrades, fixes, and updates, in contrast to those using on-premise ERP systems. Instead, ERP suppliers choose when to trigger and carry out these tasks. Businesses that have moved to an ERP system on the cloud see automated system updates on predetermined dates[10], independent of user preferences, and often with no extra expense or need for in-house trained staff. Since the vendor is the only party responsible for making choices on ERP system upgrades, the customer does not have control over updates in a cloud ERP system. Client organisations may see the automated upgrades as coercive as the systems are upgraded without their permission[11].

The papers that follow are structured as follows: Section II outlines the latest developments in ERP systems, Section III describes ERP in the cloud,

Section IV explains the pros and cons of cloud-based ERP, Section V lays out the road map for ERP development in the future, Section VI reviews the literature, and Section VII discusses the results and future endeavours.

Current Trends in ERP Systems

ERP systems have undergone substantial evolution in response to an evolving needs of organisations in a digital age [12]. Key trends shaping the ERP landscape include the widespread adoption of cloud-based ERP solutions, particularly SaaS models, which provide scalability, cost-efficiency, and ease of deployment. Emerging technologies like AI), IoT and blockchain are being integrated into ERP platforms, enabling advanced data analytics, predictive insights, and enhanced supply chain management. Additionally, businesses are focusing on customisable and industry-specific ERP solutions to address unique operational requirements [13]. The shift towards mobile and remote access capabilities has also gained momentum, driven by the increasing need for real-time collaboration and remote work support. The following Trends in ERP Systems:

Cloud-Based ERP: Cloud solutions offer scalability, lower costs, and remote access, making ERP more flexible and accessible for businesses of all sizes.

AI and Machine Learning: AI and ML enhance ERP systems with predictive analytics, automation, and smarter decision-making, improving efficiency and data-driven insights.

Mobile ERP: Mobile access to ERP systems increases productivity by enabling employees to manage tasks and access real-time data from anywhere.

ERP for SMEs: ERP systems are becoming more affordable and easier to implement, making them accessible to small and medium-sized enterprises with streamlined, cost-effective solutions.

IoT Integration: IoT integration allows real-time tracking and monitoring of assets and supply chains, improving efficiency, asset management, and predictive maintenance in industries like manufacturing.

Barriers to Adoption of SaaS-Based ERP

Solutions Customization: SaaS solutions in general do not allow customisations. This limitation becomes particularly critical when they take an organisation's business processes into consideration. There would be very few organisations whose business processes would exactly fit the available SaaS solutions. It's not always possible to adjust the business processes for the sake of implementing new software, and hence, it's very important for an ERP solution to be customisable for them to be adopted, whether on-premises or Cloud.

Security and Privacy: Having a SaaS based application inherently comes with a third party being involved in storing and managing the organisational data in a location which cannot be controlled by the Organization itself. With the third party, typically the cloud hosting provider, the cloud solution providers, etc., there is always a risk of non-compliance with security standards of the organisation or sub-par data security procedures being used, risking data breaches can cause reliability issues in SaaS solutions.

Cost: Cost is another significant factor when choosing an ERP solution. With SaaS solutions, the more modern cost models come into play, such as monthly subscription costs, ingress, egress costs, etc. As compared to the Perpetual license and yearly maintenance costs of the on-premises software. Which can be seen as a shift from Capital expenditures (Capex) to Operational Expenditures (Opex). With On-premises ERPs, the initial Capex is larger and then the ongoing Opex is much lower. On the other hand, with the cloud ERP, both Capex and Opex remain similar. This poses a new kind of challenge for the IT executives when trying to get a buy-in from the Organizational Leadership who still might not be accustomed to the increased Opex costs of ERPs.

Regulatory Compliance: Regulatory compliance is another major area of concern while implementing the Cloud based ERP. There is often a requirement for organisations to adhere to specific local data protection laws like HIPAA, GDPR, etc. and extremely strict data storage location requirements for storing data in specific geographic regions. The systems are also required to support audits for regulatory reviews and need to have strict access control. There is are need for the Cloud provider to comply with the local laws around data retention or purging. Finally, there is always the challenge of adhering to specific compliance standards like SOX, PCI, etc., depending on the industry.

Network Limitations and Availability: When implementing a Cloud ERP system, having a high-performance network infrastructure becomes extremely critical. There are usually concerns around having reliable connectivity for the users, latency, downtimes that could impact the day-to-day operations. Depending upon the Internet service providers to access their own cloud ERP systems means that the Organizations now must have more robust SLAs that guarantee a consistent uptime.

Integration Challenges: Every ERP system needs to be integrated with a third-party system whether that is for getting the order in using EDI, importing currency exchange rates, or calling a transport management system for scheduling deliveries. Integrations are inevitable and are an essential part of any ERP implementation. With Cloud ERPs this becomes more challenging due to limitations of available APIs that the cloud provider exposes for handling integrations. At the same time, not all third-party systems might be compatible with the APIs. For example, some third-party systems might require that the SOAP connector be used, while the Cloud ERP might only offer REST endpoints. All these factors play a significant role while

a decision is being made on adopting a Cloud based ERP.

Integration with Emerging Technologies (AI, IoT, Blockchain)

In recent years[14], supply chain management has undergone a digital transformation driven by the rise of advanced technologies. Key trends include the adoption of AI, blockchain, the IoT, and cloud computing, all of which are revolutionising supply chain operations. These technologies enable supply chains to become more agile, efficient, and data-driven.

Artificial Intelligence (AI): Artificial Intelligence (AI) is at the forefront of supply chain innovation, enabling predictive analytics, machine learning, and automation to streamline operations. Algorithms driven by AI can refine demand forecasts, optimise inventory levels, and use real-time and historical data to anticipate any interruptions.

Internet of Things (IoT): The IoT makes it possible to track and monitor assets across the supply chain in real-time. Sensors that are affixed to goods, automobiles, or storage facilities gather and communicate information about their position, state, and surroundings, providing businesses with more operational visibility and control.

Blockchain: Blockchain is revolutionising supply chain transparency and security. The permanent record of transactions made possible by this decentralised ledger technology allows all parties involved to monitor the flow of products and verify their validity.

Focus on Scalability and Flexibility

ERP solutions' scalability and flexibility are becoming more important as retail firms develop and change [15]. To better meet the evolving demands and intricacies of retail organisations, further research should investigate ways to make the suggested ERP system more scalable and flexible. In order to accommodate varying business contexts and scalability needs, this may include using cloud-based deployment methods, adaptable customisation options, or modular architectures.

ERP scalability is the capacity of an ERP system to manage more transactions, users, data, or workloads without declining performance, functionality, or dependability. Businesses that are planning to grow or that see demand surges at certain times of the year will find this to be crucial. For ERP scalability, it's best to go with a system that works with what you already have and can connect to other apps and platforms.

ERP flexibility refers to an ERP system's ability to adjust to changing business processes, workflows, rules, or regulations[16]. This type of system can help you quickly and effectively respond to market changes, customer preferences, industry standards, or legal compliance. To achieve ERP flexibility, choose an ERP system that is configurable and customisable, allowing you to modify or add functionalities.

Enterprise Resource Planning in the Cloud Era

The use of cloud computing to host ERP systems is a new and rapidly growing trend in the industry. "Cloud ERP" describes ERP solutions that are often offered as a service over the Internet. In this model, the business moves the ERP system's use by the organisation's local infrastructure to the provider's web-based processing platform[17]. An alternative to buying a licence is to lease the ERP system on a subscription basis; the supplier will then take care of system maintenance, updates, and data protection. Cloud ERP, or enterprise resource planning, has become more popular in recent years. This is because smaller businesses are able to make use of these systems due to their cheap input costs, simplicity of setup, and lack of requirement for in-house IT infrastructure.

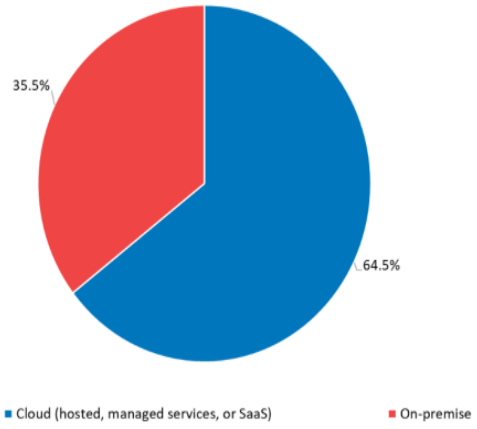
The Essence of Cloud ERP Systems

The creation, development, deployment, scaling, updating, maintenance, and payment of different technologies (such as ERP systems) are being reshaped by cloud computing, which is now one of the most significant developments in the IT sector. “Cloud computing has many advantages, including being accessible on-demand, ubiquitous, and allowing users to quickly provision and release shared pools of reconfigurable computing resources (including networks, servers, storage, applications, and services) with little management effort or interaction from service providers[18][19]” the NIST defines broadly[20][21]. Cloud computing ERP solutions, in contrast to on-premise approaches, are offered as a subscription service that utilises the infrastructure of the IT provider [22]. In accordance with the aforementioned definitions, the receiver is free to utilise the system remotely, regardless of his location or the kind of equipment he operates. Common names for cloud ERP systems include SaaS and ERP as a service, although no one definition has emerged from the academic literature. Many people have different concepts about what Cloud ERP is and how it works. Some say it's just hosted ERP on a cloud provider. Others say it's a web-based architecture that includes all the solutions for managing simple and standard business processes. Still, others say it's just ERP software hosted on the cloud instead of in an organisation's data centre. Table I summarises the main distinctions between Cloud ERP and conventional ERP (on-premise approach).

Table 1 Comparison of ERP system (on-premises) and Cloud ERP system

Aspect	Traditional ERP (on-premises)	Cloud ERP
Costs	Greater potential for return on investment; higher upfront expenses (licences), often yearly maintenance expenditures	No ongoing expenses, low and predictable start-up costs (e.g., monthly)
Customisation	High opportunities for customisation	Low opportunities for customisation
Deployment	Usually, in a local Data Center	Usually, on a provider's server
Ability to reduce IT staff	Small	Large
Updates	Difficult (performed manually by IT staff)	Easy (performed automatically by provider)
Internet access	Not necessary	necessary
Control over the system	High	Limited
Technical infrastructure	Infrastructure (such as servers, backup gear, air conditioners, UPS, etc.) must be invested in.	No infrastructural requirements: the supplier supplies all required hardware.
Typical customers	Large corporations endowed with substantial funds and a vast network of IT	Medium and small businesses with minimal resources
Mobility	Access is possible but requires additional investment	Access is possible from anywhere
Data security	Responsibility for the enterprise	Responsibility of the provider
Implementation time	Long	Shorter

ERP software that is hosted in the cloud offers many advantages to businesses, including cost-effectiveness, availability, scalability, adaptability, and flexibility[23]. Businesses today may likely benefit from new and improved IT solutions that combine the power of cloud computing with an ERP system.



Popularity of basic ERP system implementation models (Cloud ERP and on-premise ERP)[24]

The following are only a few of the many advantages and disadvantages of SaaS-based cloud ERP systems; nevertheless, the dynamic nature of the cloud should mitigate the impact of the concerns raised. Cloud ERP solutions should, therefore, become more popular among many kinds of businesses, according to research from a variety of consulting and analytical firms. The cloud-based ERP market was valued at $40.49B in 2022 and $43.91B in 2023, according to the Business Research Company. This represents a CAGR of 8.5%. Forecasts indicate that by 2027, the cloud-based ERP market would have grown to $65.89 billion, a CAGR of 10.7 percent. According to Blue Weave Consulting, the worldwide cloud ERP industry is expected to increase significantly, reaching $64.7 billion in 2022. From 2023 to 2029, the worldwide cloud ERP market is expected to expand at a strong 15.37% CAGR to reach USD 174.73 billion. In 2023, Panorama Consulting Group found that more over half (64.5%) of the 183 businesses polled chose cloud software over on-premises software. On-premise ERP is still used by just over 35% of the businesses studied (Figure 1).

Benefits And Challenges of Cloud-Based Erp

Cloud-based ERP systems offer benefits like cost-effectiveness, scalability, and enhanced accessibility, enabling businesses to collaborate and adapt quickly to changing needs. However, they also face challenges like data security concerns, limited customisation options, and regulatory compliance issues. Integration complexities and reliance on network availability further impact adoption, requiring careful planning and robust vendor-client agreements.

Benefits of ERP[25]

Lower Costs

Lower Upfront Costs: As enterprises purchase services, they do not invest in building and maintaining computing infrastructure.

Lower Operating Costs: CSPs perform the operational and maintenance, which means decreased costs for enterprises.

Cost Transparency: On-demand or per use models make sure that an enterprise, being provided with a particular service, pays only for a certain period the service is being used.

Efficiency and Agility

Rapid Implementation: Multiple ERP solutions are available off the shelf to solve business needs and contribute to the ERP deployment.

Scalability: Such resources can be more flexibly adjusted and changed to meet the enterprise's needs either at the current or future time.

Focus on Core Competencies: Specifically, enterprises can free up resources for more value

creating strategic activities by outsourcing information technology to CSPs.

Advanced Features

Access to Advanced Technology: Cloud ERP permits the application of special technologies and tools.
Rapid Updates and Upgrades: CSPs make provisions for rapid and efficient update of the software.
Improved Accessibility and Mobility: Open structures allow for high levels of use and can accommodate users from a distance.

Integration and Reliability

Easier Integration: Cloud ERP can be integrated with other cloud tools that help the organisation.
Improved Availability and Disaster Recovery: CSPs also enable well-developed backup and reflectance measures to improve system functionality.

Challenges of ERP[25]

Costs and Contracts

Subscription Expenses: While implementing cloud ERP, there are extra costs due to periodic fees for the same services as well that are for the long run.
Hidden Costs: There are often transition costs, monitoring costs, and coordination costs in contracts.

Security and Compliance

Security Risks: With the use of the cloud, the level of sensitivity of data that may be hacked also rises.
Compliance Risks: The regulations and the data residency laws, in particular, can be quite complicated.

Organisation of Performance and Technical Issues

Performance Risks: This mode of operation is problematic in that network failures and latency hinder cloud ERP.
Functionality Limitations: Cloud ERP solution requires time to reach the optimal efficacy level that is seen in traditional ERP.

Customisation and Integration

Customisation Limitations: It has less flexibility in comparison to conventional ERP systems.
Integration Challenges: Recurrent costs make integration more computational and it is not easy to have a standard for interoperability.

Future Directions in ERP Development

The future of ERP development is centred around leveraging emerging technologies such as AI, ML, and blockchain to improve automation, analytics, and security[26]. The adoption of hybrid cloud models is expected to grow, combining the flexibility of cloud ERP with the control of on-premise systems. Personalised user experiences through advanced customisation and integration of IoT for real-time data insights will drive innovation. Additionally, ERP systems are likely to prioritise sustainability and compliance, aligning with global environmental and regulatory trends.

Incorporation of Advanced Analytics and Machine Learning

AI-Enabled New Directions in ERP Systems

Today, there is a tendency to integrate new AI technologies such as ML, NLP and cognitive computing into modern ERP systems.

Proactive Decision Support

Real-time data is processed in intelligent ERP systems to apply machine learning and creditable analytics to the assessed data in an organisation. This may also include proactive support which helps organisations make decisions on time while avoiding various risks and take advantage of various opportunities.

Complex Analysis and Forecasting Prowess

Modern ERP systems integrate with machine learning to use past data for the analysis of particular patterns and call to predict future results in additions to improving operating efficiency. Business organisations, with the aid of predictive analytics tools, can prognosticate the trends in markets, demand, stocks or supplies and important resources.

Automation of Routine Tasks

Most of the routine tasks such as data input,eonction verification, document analysis and classification can be handled by ERP systems assisted by Artificial Intelligence through what is commonly known as Robotic Process Automation (RPA). This automation enhances precision, limits the participation of people, and accelerates the occurrence of processes.

Real Time Surveillance and Notifications

The most recent advanced ERP systems, with reinforcement learning, receive data regarding the business' performance and KPI. Users are also able to receive notification on concerns or non-concerns that require attention in real-time.

Greater Focus on Customization and Industry-Specific Solutions

Businesses are starting to see the advantages of industry-specific or vertical-specific ERP solutions as

these systems develop. Instead of taking a blanket approach, these specialised ERP systems are tailor-made to meet the specific demands of certain industries. The following are some ways in which this trend is influencing ERP:

Industry-specific Functionality: Vertical ERP packages provide relative industries 'best of breed' functionality that may not be found within a general business ERP package. This leads to improvement in the organisation's productivity and overall performance, as well as increased compliance with rules and regulations within the industry.

Customization and Flexibility: Enterprises can adapt the specialised ERPs to align with their exact processes and goals on the market. Such flexibility enables an organisation to respond and draw necessary changes quickly to its movement and existence based on the dynamic industry environment.

Competitive Advantage: A working system that is obtained through the selection of a specific and unique ERP solution provides firms with a competitive edge over the firms' competitors by improving operations and product differentiation. Such systems typically include prior templates of certain industry benchmark solutions and modules in place to facilitate its solution.

Advantages of Industry-Specific ERP Systems

Tailored Functionality: It is well known that ERP systems can be industry-specific. This allows them to operate more effectively with the complex character of a certain industry using available features which are intended to solve the tasks for that industry.

Increased Efficiency: ERP systems assist a company ehance organisational performance since it does not involve features which are not needed in the business operation but only include functions that are imperative to the operations of a business given the industry. They can achieve this by creating fitted implementations that add over and above workflow improvement and increased productivity.

Compliance and Regulations: Various fields have their own regulations and compliance requirements and guidelines. Certain ERP software includes these industry verticals' requirements integrated so businesses can follow certain industry rules and regulations without requiring a lot of modifications.

Enhanced Reporting and Analytics: Whether it is a large or medium-scale industry report or business performance analysis, data analysis is critical in the operation of the business. Industry-specific ERP also often comes with out-of-the-box reports and analytics specific to the indicators significant in the industry. This provides knowledgeable information analysis to companies for business decisions, planning and management.

Scalability and Flexibility: ERP systems are scalable. And because they are 'scalable,' they are intended to be expanded in their functionality to meet your company's needs. It offers generic solutions that can meet the dynamism that characterises your industry as time evolves.

Role of Hybrid ERP Models

This type of system combines the benefits of both on-premise and cloud ERP systems to meet the requirements of the company. A hybrid model ERP system allows businesses to generate real-time reports and monitor data simultaneously[27]. It supports integration with third-party platforms to perform diverse functions like CRM, accounting and sales management[28]. A hybrid model ERP system allows businesses to generate real-time reports and monitor data simultaneously. It supports integration with third-party platforms to perform diverse functions like CRM, accounting and sales management.

Infrastructure Scalability and Performance Management: Provides flexibility in hosting ERP solutions externally (via IT providers) or internally (on-premises), allowing better control over performance, security, and accessibility.

License Scalability: Integrates well with the concept of scale since businesses do not have to acquire licenses; they may not need them at present but instead acquire them when they expand. Using the contingency model, Sohrabess defines it as a combination of cost efficiency and flexibility.

Fast and flexible Support and Customization Management: Enables degree of support and flexibility in customisations to address various business environments.

Upgrade Control: Enables it to be programmed by the enterprise management to facilitate the update of system at one's own convenient time.

Cost Optimization: Mitigates the problem of high initial investment with relatively lower and more certain maintenance costs as well as modularity of payment.

Enhanced Customization: It helps in gaining better control over changes in ERP software for various customizeds and integration that is crucial in every organisation.

Bridge Between Cloud and On-Premises Solutions: Acts as a middle ground, leveraging the benefits of both cloud and on-premises ERP while mitigating their individual limitations.

Literature Review

A literature review will compile previous research based on the main concept for the next study. The goal of literary research is to determine the boundaries of advanced knowledge and the literature interspace. Here Below discussed some existing related work on cloud-based ERP systems in different sector:

Ratchatawetchakul et al. (2024), This research aims to 1) apply an enterprise resource planning (ERP) system with cloud computing, 2) implement automated workflow processes (RPA) using UiPath tools within

the ERP production cycle, and 3) assess the efficiency of automated workflow processes (RPA) within the ERP production cycle on cloud computing platforms. The results from applying automated workflow processes (RPA with UiPath) within the production cycle of the enterprise resource planning system (ERP with Odoo) hosted on cloud servers (Cloud with Microsoft Azure) indicate that manual processes in the production formula system take 1.05 times longer than automated processes, manual processes in the purchasing system take 1.29 times longer, manual processes in the goods receipt system take 1.22 times longer, and manual processes in the production operations take 1.15 times longer than their automated counterparts[29].

Ying Hong et al. (2023), study discusses the two approaches to customise Enterprise Resource Planning system in microservice SaaS architecture - intrusive and non-intrusive approaches, and the advantages and the disadvantages of each approach. In this paper, it shows that non-intrusive approach is more sounding approach in implementation for enterprise system[30]. Shang, Jiang and Zhang (2023) aim to select the most suitable SaaS ERP service provider for enterprises and empirically analyse the influencing factors of SaaS ERP service provider selection through the two dimensions of the enterprise's factors and SaaS ERP service provider factors. Aiming at the characteristics of multi-objective attributes and uncertainty, the fuzzy ELECTR-IV method is applied to establish the SaaS ERP service provider selection model of SME based on the "enterprise-service provider" matching perspective, and the case verification is carried out to guide the SaaS ERP service provider selection of SMEs[31].

Dissanayake and Thelijjagoda (2022) seeks to achieve as CSFs sufficient end-user training, BPM, and support from upper management. The results confirm that a successful ERP adoption depends on three factors: support from upper management, effective business process management, and sufficient training for end users. Statistics show that end user training is the most critical of the three recognised CSFs for a successful post-go-live deployment. On the other hand, getting the backing of upper management and effective business process management are both crucial for an ERP installation project to succeed. In addition to adding to the current body of knowledge, this research has the potential to guide organisations, benefit ERP clients, consultants, and service providers[32].

Tongsuksai, Mathrani and Weerasinghe (2022) article uses a case study from the retail sector to identify the CSFs and risk factors that impact the adoption of cloud ERP by SMEs in New Zealand. Data for this all-inclusive cloudERP adoption picture came from five in-depth interviews with cloudERP decision-makers. Effective administration of cloud ERP software, a well-thought-out company strategy, and adopters with the necessary education and training are all highlighted by the results. Adoption of cloud ERP is risky due to internal opposition and a lack of awareness and understanding. To help businesses effectively use cloud ERP systems, the results provide useful information for decision-making teams[33].

Arora, Gera and Saxena (2021) addressing the issues during Cloud Based ERP implementation for an organisation, e.g. data security and data privacy along with the ways to address them. Healthcare and hospital organisations have unique problems when implementing cloud-based ERP systems, and this article details those obstacles. It goes on to detail the difficulties encountered before, during, and after a SaaS installation, as well as solutions to these problems[34]. Tongsuksai and Mathrani (2020), includes an extensive literature analysis of recent studies on cloud ERP system integration with emerging technologies in an Industry 4.0 setting. The primary advantages of combining cloud ERP systems with IoT-based technologies as a component of the Industry 4.0 revolution were determined by this study's evaluation of sixteen pertinent papers. [35].

To organise and present the findings from these various studies on cloud-based ERP systems, They created Table II, which includes the key columns for each research paper. The columns include the Author(s), Year, Study Focus, Key Findings, and Technology/Method Used. This will help compare and analyse these studies effectively.

Table 2 Summary of the related work on Enterprise Resource Planning in the Cloud Era

Author(s) & Year	Study Focus	Key Findings	Technology/ Method Used	Challenges	Future Work
Ratchata wetchakul et al. (2024)	Application of ERP with cloud computing and automated workflow (RPA)	Automated processes in ERP (Odoo on Azure) are faster than manual processes: production formula (1.05x), purchasing (1.29x), goods receipt (1.22x), production (1.15x).	ERP with Odoo, RPA with UiPath, Cloud with Azure	Integration complexity with existing systems, initial implementation cost, and training requirements.	Expanding the study to other ERP systems and industries to generalise findings.
Ying Hong et al. (2023)	Customizing ERP in microservice SaaS architecture	Non-intrusive customisation is preferred for implementing enterprise systems due to lower disruption and higher flexibility.	Microservice SaaS architecture	Challenges with scalability and integration of microservices.	Explore hybrid models combining intrusive and non-intrusive approaches for complex enterprise needs.
Shang et al. (2023)	Selection of SaaS ERP service	Fuzzy ELECTRE-IV method applied to assess "enterprise-	Fuzzy ELECTRE-IV,	Dealing with incomplete or	Applying the model to larger datasets and

	provider and influencing factors	service provider" fit for SMEs. Highlights multi-objective attributes and uncertainty factors in provider selection.	Case Study	uncertain data in decision-making.	different industries for validation and improvement.
Dissanayake & Thelijjagoda (2022)	Critical success factors (CSFs) for ERP implementation success	Top Management Support, BPM, and end-user training are CSFs. End-user training is most critical for post-go-live success, while BPM and management support also contribute.	Empirical analysis, Statistical verification	Resistance to change, ensuring consistent support from top management.	Investigating more detailed training programs and long-term impacts of BPM on ERP performance.
Tongsuksai et al. (2022)	CSFs and risk factors affecting cloud ERP adoption in SMEs	Effective management, business plan, vision, and sufficient training are CSFs; lack of awareness, knowledge, and in-house resistance are risks for cloud ERP adoption.	In-depth interviews, Case study in retail industry	Limited knowledge of cloud ERP benefits among SMEs, resistance to adopting new systems.	Conducting larger-scale studies in various industries to validate and expand on CSF and risk factor findings.
Arora, Gera and Saxena (2021)	Challenges in cloud-based ERP implementation (data security, privacy)	Data security and privacy risks in cloud-based ERP; challenges specific to healthcare sector; solutions outlined for implementation issues.	SaaS ERP, Data security and privacy analysis	Ensuring data compliance with regulations, protecting against cyber threats.	Research on advanced security protocols and data encryption techniques for cloud ERP.
Tongsuksai and Mathrani (2020)	Literature review on cloud ERP integration with Industry 4.0 technologies	Evaluated benefits of integrating cloud ERP with IoT technologies, contributing to the industry 4.0 ecosystem and enhanced operational efficiency.	Literature review, IoT integration	Integrating ERP with various IoT devices and standardising protocols for seamless communication.	Developing real-world case studies to better understand integration challenges and effective solutions.

Conclusion and Future Work

ERP systems are in the process of experiencing changes in order to provide value added to present day organizations. Finally, with advantages like scalability, improved accessibility, and cost savings, the shift towards cloud-based ERP systems is a major step forward in how companies handle their operations. Improving data-driven decision-making and streamlining processes are the promises of developing technology integration with cloud ERP systems, including AI, IoT, and blockchain. However, businesses must consider challenges such as data security, regulatory compliance, integration difficulties, and potential long-term costs associated with subscription models. To fully leverage the advantages of cloud ERP, companies should adopt a well-planned approach that includes thorough risk assessments, robust security measures, and strategic training to mitigate the downsides. As cloud ERP systems continue to mature and evolve, organizations that can navigate these challenges effectively will be better positioned to benefit from the transformative potential these platforms offer.

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