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Optimization of IoT in the Enterprise Resource Planning System

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Abstract: ***The Internet of Things has become an innovative Approach in technology, with prospective advantages for businesses and growing rapidly. Implementing Enterprise Resource Planning (ERP) systems in organizations can give them a competitive advantage in highly competitive markets. Internet of Things (IoT) is one of the technologies that ERP is compatible with IoT. IoT identifies, controls, and transfers data to databases and individual users via a special Internet protocol. ERP is used to retrieve and organize the data after it has been collected via IoT and saved on the cloud. In this article, we examine the difficulties, unresolved problems, functions, and design of the IoT-based ERP. In order to highlight the IoT's distinctive qualities and go over its implications for ERP, we examine and evaluate the most recent articles on the subject.***

Keywords: Enterprise Resource Planning, Cloud ERP, Artificial Intelligence, Big Data, Business Intelligence System.

I. INTRODUCTION

In the modern world, information technology is a necessary tool for managing and operating all operations, from supply chain management to production scheduling. Therefore, enterprise resource planning (ERP) is the general term used to refer to an integrated software-based management system that includes side functions like cost accounting, purchasing, distribution, customer relations, cash flows, warehouse management, human resources, material management, electronic banking, and quality control in addition to basic business functions like production, finance, and marketing [1]. ERP is a vital tool for optimizing business operations and streamlining procedures in a variety of industries. The ERP landscape is changing today due to the Internet of Things (IoT) and massive data influxes, opening up new opportunities for workflow automation and operational excellence [2]. A computer's ability to recognize, manage, and send data to other people and associated databases is made possible by each system component in the Internet of Things having an IP address. ERP is able to manage, control, and process data thanks to the collected data that is stored in the cloud. All things considered, there are many benefits to integrating ERP with IoT, the most significant being improved management, automation, product traceability, and lower ERP implementation costs. By minimizing human intervention and fostering automation through the use of sensors, IoT establishes a connection between the product and the customer [3]. Nonetheless, there are numerous obstacles to IoT integration into ERP, the most significant of which is the lack of confidence in IoT as a relatively new technological development. Companies that heavily invest in ERP are very cautious about the accuracy and dependability of the data coming from an IoT system, and data security is one of their top concerns. ERP systems have been around for nearly thirty years, and they are now so well-oiled that

a single record may be worth several million dollars. In large-scale ERP implementations, saving money is inadvisable unless it involves millions of dollars, as new technology is inherently risky [4].

II. Effect of the IoT on ERP Systems

The software environment of enterprise resource planning (ERP) systems is multilayered and intricate. To store various amounts of data from the system, an ERP software consists of a database layer and database design. In business, applications like marketing, finance, and production are modeled as applications and can be automated through IoT in the ERP system. Ultimately, user interfaces at the end-user layer provide access to the system for end users [5]. The majority of IoT related technologies have an impact on new ERP systems at various stages of data collection, analysis, and mining. For instance, because they automatically gather data from the source, big data and cloud computing technologies greatly enhance the capabilities of ERP software.

In a comparable manner, IoT devices facilitate data integration between ERP systems and data. Furthermore, obtaining business intelligence and drawing conclusions from ERP systems are made possible by artificial intelligence and autonomous robots [6]. The newest developments in the IoT technologies are cloud-based ERP automation. The hardware and software systems that guarantee the services for utilizing apps over the Internet may be defined as cloud based IoT. IoT can now operate on multiple platforms thanks to cloud computing, which also increases their functionality. By utilizing Software as A Service (SAAS) architecture, cloud systems transform IoT into ERP services. Numerous significant factors are taken into consideration when choosing the SAAS architecture [7]. IoT-based ERP systems are readily available due to their powerful hardware. Web-based systems are very flexible, compatible, and easy to use. They are also readily available. Analyzing acquired data, some conclusions have been drawn at the IoT level. One approach to this goal is inference using artificial intelligence. The goal of artificial intelligence with IoT is to create computer programs that resemble human capacities like learning, reasoning, and natural language interaction. Distributed processing, among other IoT based artificial intelligence strategies, dramatically improves ERP systems because most ERP system decisions require multiple decision makers to make independent decisions. Software that makes distributed, autonomous decisions about a system is known as an IoT-based automation system. Several practical uses of IoT-based systems help bridge the transition from classical systems to Industry 4.0 facilities [8]. The new manufacturing paradigm for the current era of technology is the intelligent robot. Robots must perform certain tasks, like acceleration and flow, because they must process and analyze large amounts of raw data from various sources, including force, image, and sound sensors. This volume of raw data necessitates the use of cloud systems and big data applications by intelligent robots. In order to create an environmentally friendly production setting that involves recovering, reusing, recycling, and reorganizing processes, robots are essential [9]. The idea of IoT based smart facilities, which integrate planning, self-governing decision-making processes, and automated production, is the factory of the future. Because of this, the main goal of the smart factory model is to enable and guarantee the availability of all pertinent data for real-time archiving, which will be made possible by the integration of all value chain components.

III. Feature Trends of IoT on ERP Systems

The majority of businesses are currently actively pursuing digital transformation. ERP will remain a crucial tool for businesses as technology advances in remarkable and unanticipated ways. ERP's future developments in Iot. IoT based ERP is the successful fusion of technologies such as 3D printing and rapid prototyping that are quickly gaining traction among people and are widely utilized in everyday activities. IoT based production allows parts to be produced quickly in accordance with specifications and does not require extra time or money for design changes. By removing design boundaries, complex geometries and challenging-to-make parts can be produced in layer production. The Fourth Industrial Revolution concept will place a high priority on IoT based automated production due to its advantages and added value in the ERP systems. The industry needs machinery that can produce the required components more precisely and flexibly than ever before in order to implement IoT [10]. Production will result in less mold construction, additive manufacturing processes, and prototype

construction. Therefore, the goal is to use faster and larger 3D printers to increase productivity while lowering costs. Organizing the data stack that comes with 3D printing presents the largest difficulty for producers. The need for the IoT based ERP system becomes apparent as more production increases the volume of data at every stage of the production process. To benefit from this trend, manufacturers will need to carefully assess their current ERP capabilities. Prior ERP systems had greater limitations in terms of analytics and reporting, but they may have been better at gathering and organizing data. Making decisions based on data is now a top concern for all manufacturers. Consequently, in order to satisfy the demands of manufacturers, ERP solutions are expanding their analytical capabilities. Users of contemporary ERP solutions can visualize data, run ad hoc reports, and integrate analytical tools into already-existing applications.

IV. IoT BASED CLOUD ERP SYSTEMS

The term "cloud ERP" refers to an enterprise resource planning solution in which all applications, programs, and data are accessed online and stored on virtual servers rather than actual computers. IoT based Cloud-ERP has emerged as a new trend in the ERP market. Organizations are considering moving IT services to the cloud on a daily basis in this new internet-oriented world because things are changing so quickly. Many manufacturing sectors are rapidly adopting it as an industry standard [11]. Many businesses are concerned about how the competitive landscape is changing in light of IoT based Cloud ERP's numerous benefits.

Benefits of IoT based Cloud ERP are as follows: (a) eliminating unnecessary expenses, (b) overcoming remote access barriers, (c) increasing productivity, (d) having a flexible and agile solution, (e) provides new business opportunities for organizations (f) the reduction of computing costs, (g) making data more secure,

Manufacturer productivity is increased and transparency is increased with Industry 4.0 and the Internet of Things (IoT). It could also increase the accuracy and availability of data, which would have a big effect on the manufacturing industry. An operational machine component and the ERP system are directly connected by means of the internet-connected sensors [12]. Industry 4.0 utilization facilitates integration and communication amongst all system. Emerging technologies are essential for a "smart" ERP that helps get around the present constraints on real-time data capture and sharing, such as IoT deployment at the endpoints. IoT is required because of its disruptive nature, affordability, and potential. The Internet of Things (IoT) is an inventive coalition of multiple supplementary technologies brought together to close the gap between the digital and physical worlds [13]. These days, ERP based cloud computing, social networking, GPS telematics, and (big) data analytics augment the Internet of Things platform. Self-awareness, individuality, control, interconnectivity, flexibility, transformability, synergy, self-decisiveness, and strategic behavior are some of the key attributes of the Internet of Things [14]. The Internet of Things is said to be a catalyst for the automation and digitalization that will bring in the ERP system. Smart goods, smart machinery, and intelligent services like quality-controlled manufacturing, logistics, and maintenance are made possible by IoT-based ERP. IoT based ERP to take industrial production to a new level, but its idealistic vision can only materialize if industry can function as a cohesive unit by becoming increasingly digital, self-assisted, and information-led.

Additionally, for notable performance gains, the IoT platform facilitates the integration of supply chain operations with outside partners like suppliers and customers [15]. While IoT applications can help with real-time asset tracking, material flow tracking, better transport handling, and accurate risk management in the early stages of ERP system, the ultimate goal is to create a self-sufficient supply chain platform through complete automation with little to no human intervention. Industrial IoT is not just for big, resource-hungry companies and their supply chains . It is a widely used technology that is readily available for a variety of ERP systems [16].

Integrating data with ERP systems, obtaining real-time sourcing progress data, giving visibility into parts and raw materials, producing real-time quality/maintenance data, tracking inventories, sharing information, and placing joint orders,

facilitating improved reverse logistics, and capturing product data while it's being used to maximize revenue opportunities and create operational efficiencies.

V. CONCLUSION

ERP is at the heart of the technological transformation of enterprises. IoT based ERP promises to open up a wide range of new research and implementation opportunities for businesses, including examining and integrating new technologies into traditional production environments, redefining roles and skill sets, and educating the workforce about emerging technologies.The future of enterprise resource planning will be significantly impacted by this new development. It is evident that implementing IoT based ERP eliminates certain concerns. Although there is still much to learn about the Internet of Things, the idea is already widely accepted in the digital era. The Internet of Things has already become highly democratized and is beginning to spread for ERP systems. Artificial intelligence and IoT are technologies that seem to be at their beginnings in the ERP platforms. These two fields are flourishing at the moment and will keep transforming in the years to come. Deep learning and artificial intelligence will both advance in sophistication and efficiency and become indispensable for utilizing the ever-growing amounts of data that are being gathered.

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