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Higher Ed ERP Systems - The Evolution

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ABSTRACT

This research offers a comprehensive review of Enterprise Resource Planning (ERP) literature in both journals and conferences, specifically concentrating on Higher Education Institutions (HEIs). This research aims to delineate and evaluate the pertinent intellectual landscape of ERP systems in higher education, with the objective of updating the current status of research, formulating research questions, and subsequently enhancing the knowledge base. The overview encompasses the period from 2009 to till date, organized by issues addressed in contemporary writing. The study aims to achieve three objectives. Initially, to investigate the types of inquiries that emerge inside the ERP area. This paper will serve as a valuable resource for future research. Finally, it will furnish a comprehensive bibliography of the articles for the specified period.

Introduction

The realm of Information Technology (IT) is advancing due to pervasive innovation, with ERP systems being a notable example. Botta-Genoulaz and Millet characterized ERP systems as integrated software packages consisting of a series of functional modules (such as Production, Human Resources, Sales, Finance, etc.) that unify various departmental operations inside businesses into a single system, addressing the requirements of all departments [1-3].

The implementation of an ERP system resulted in enhanced performance and provided significant advantages, including increased productivity, improved access to accurate and timely information, streamlined workflows, reduced dependence on paper, facilitated knowledge sharing, stringent control, and the automation of all processes through the integration and coordination of information across all departments [4-9].

This study aims to present a comprehensive assessment of ERP literature published in journals and conferences from 2009 to 2017. This article seeks to present a comprehensive overview of the current state of ERP systems, specifically within the higher education sector, and to pinpoint avenues for additional study in this area [10-17]. The paper aims to achieve three objectives. Initially, to investigate the kind of questions that emerge inside the area. This paper will serve as a valuable resource for future research.

This research will ultimately furnish a comprehensive bibliography of the papers for the specified period. The structure of this document is as follows: In the subsequent part, we delineate the methods employed for article retrieval, followed by an evaluation of the selected articles. The final section concludes the work and suggests potential directions for further research.

2. Review of Literature

The literature review for the present study is categorized into three sections: the idea of ERP systems, the advantages of ERP systems, and the use of ERP systems in higher education, all of which are detailed in the subsequent section.

2.1 Definition of Enterprise Resource Planning (ERP) Systems

The term ERP, an abbreviation for "Enterprise Resource Planning," was coined by the Gartner Group in the early 1990s and denotes computer and software systems that amalgamate and integrate all associated processes of the enterprise, facilitating users in the management of all functions within the organization [18-31].

Researchers have referred to ERP systems as enterprise systems (ES), enterprise resource management, and business systems, respectively. Klaus and Rosemann envisioned the ERP System as an all-encompassing packaged software solution of Information Systems (IS) intended to connect all business operations and provide a holistic view of the enterprise from a unified IT and information architecture. Davenport 8 has characterized ERP as an information strategy that integrates all data inside a company, establishing a complete information architecture that encompasses all organizational units and activities. Marnewick and Labuschagne elucidated that an ERP system transcends just product or software, further conceptualizing ERP into four components. The initial component is the software component (Finance, Human Resources, Supply Chain Management, Supplier Relationship Management, Customer Relationship Management, Business Intelligence), which is visible to users and seen as the ERP product. The second component is process flow, which pertains to the information flow across modules inside the ERP system. The third aspect is customer mindset, which delineates the impact of the ERP system on users, teams, and the organization. The fourth component is change management, which addresses the adaptability of ERP system installation inside the firm, including user attitudes, project modifications, business process alterations, and system adjustments.

Similarly, ERP systems as business management systems consisting of a full suite of software designed to integrate and manage all organizational operations. This collection encompasses applications for human resources, finance and accounting, sales and distribution, project management, material management, supply chain management (SCM), quality management, among others. The structure and functional elements of the ERP system.

The authors define an ERP system as a "business management system consisting of a suite of integrated software applications that employ a common database to oversee the real-time flow of integrated information and manage all processes across the organization's functional domains."

1.1 Benefits of ERP Systems

The benefits of ERP systems are well acknowledged, prompting larger companies with significant data volumes to adopt these systems. The fundamental principle of an ERP system is the integration of data through a unified database. ERP systems are software modules that utilize a centralized database to enable the exchange of information across them. They include functions for sales and marketing, product development and design, field service, production, inventory management, distribution, process management, procurement, quality assurance, manufacturing, human resources, finance and accounting, and information services. Input the data for 26, 27, and 11 a single time. ERP systems constitute the most comprehensive corporate information systems, providing a solid

informational foundation for operational processing and decision-making, dependent on successful deployment. Hwa Chung and Snyder (29) claimed that ERP is a methodology rather than only software, unifying the activities of all corporate divisions via the integration of various software applications [32-49].

1.1 Enterprise Resource Planning (ERP) in Tertiary Education

The ERP system has been expanding in the higher education sector inside universities over the past decade, with certain systems gaining prominence. Pollock and Cornford, as well as Rabaa'i and Bandara, asserted that the use of ERP systems in higher education has evolved since the late 1990s. ERP systems for universities as IT solutions engineered to automate and integrate recruiting, academic and administrative services, financial aid, admissions, and student data. Universities are transitioning from current administrative IT systems to ERP solutions to enhance their operations and render them controllable and clear, eventually compelling institutions to confront novel concepts and practices associated with ERP systems

Additional motivations for the implementation of ERP systems in universities include governmental pressure for enhanced efficiency, the acceleration of organizational change and effectiveness, the facilitation of user access to information and performance enhancement through superior managerial tools, the improvement of business performance via enhanced services for faculty, staff, and students, the provision of systems that allow users to access critical information such as academic records and student data, the replacement of legacy systems, the enhancement of the IT environment, the provision of improved information for planning and management, the increase of customer satisfaction, and the optimized utilization of ERP systems to support the adoption of advanced applications. Lope, Othman 50 claimed that there is a paucity of research on ERP deployment in higher education institutions, indicating that this sector requires further investigation.

The technique utilized for the compilation of a literature review on ERP systems, specifically in higher education, encompassed all publications and conferences without constraints, covering the period from 2009 to 2017. To adhere to the primary focus of our study, which is an overview of ERP systems in higher education, we employed combinations of keywords shown in Table III. The selection criterion requires that both keywords be included in the article title; hence, an effort has been made to compile all relevant publications from both journals and conferences. Initially, we utilized Google Scholar as the primary search engine to extract a corpus of pertinent literature through the application of term clusters. Subsequently, the identical search methodology is reiterated for academic databases like Emerald, ProQuest Computing, and Science, Utilize Direct, JSTOR, IEEE Explore, Springer Link, and ACM Digital Library to broaden our research resources.

This section aims to analyze the retrieved papers in relation to established knowledge, topics, and contemporary concerns within the ERP area in higher education. A total of 34 publications were picked within the defined range, meeting our search criteria; among them, 20 articles were published in journals, while 14 were presented at conferences. Some articles may be absent from the pool; however, the comprehensive list of journals, along with the corresponding number of articles published in each journal, is provided in Table IV, while conference articles are detailed in Table V. Analyzing the distribution of published research papers reveals that 19 distinct journals published articles from 2009 to 2016. The majority

of the articles were published or presented in 2009 and till date, totaling 14 (7 each), which is 41 percent of the collection.:

4.2.1 Essential Success Factors (ESFs)

The predominant focus of the discussion is to Critical Success Factors (CSFs). Authors employed several techniques to identify critical success factors in higher education. Olugbara and Kalema identified and analyzed 37 ERP success criteria that affect the effective utilization of ERP systems, particularly in higher education institutions. The authors employed a multifaceted approach to discover, validate, and rank.

Classify the critical success factors of ERP in the context of higher education. Initially, critical success factors (CSFs) were selected from the literature; subsequently, expert judgment elicitation was employed to validate the relevance of these CSFs within the higher education context, followed by ranking by principal component analysis. Finally, cross-impact analysis was employed to categorize ERP elements into four classifications: Critical, Active, Reactive, and Inert. They asserted that the results of this study will enhance the efficacy of ERP installation and its application in higher education and other institutions.

In a comparable scenario, alALdayel, Aldayel executed a case study at King Saud University in Saudi Arabia that adopted the MADAR system. The objective was to obtain a comprehensive understanding of the critical success factors of ERP installation in higher education from both technical and user perspectives. The research indicated that, from a technical standpoint, the primary critical success factors in ERP adoption are project management and system selection. Additional aspects pertaining to the technical perspective include departmental involvement, business process reengineering and support, makeup of the ERP team, integration of the ERP system, selection of the supplier and its support, as well as the scope of implementation and consultative participation. The study indicates that, from the user's perspective, training is the most critical aspect, whereas system usefulness and user interaction are seen less significant. AlQashami and Heba conducted a comprehensive assessment of 50 ERP research publications published between 2002 and 2015 to identify the essential crucial elements for ERP adoption in the same region. They recognized and delineated 13 critical success factors pertaining to the installation of ERP systems that are significantly relevant to the higher education industry globally and within Saudi Arabia [50-60].

Lechtchinskaia and Uffen did a meta-analysis to identify critical success factors for the selection and implementation of Integrated Information Systems (IIS) and their relevance to the higher education sector. A total of 22 critical success factors were derived from 21 chosen published articles via a qualitative content analysis methodology. Consequently, categories such as Effective Project Management, Project Team, Integration, Change Management, Organizational Culture, Vendor Profile, and Customization were established. The findings indicate that "change management and organizational culture," namely internal and external communication, stakeholder engagement, and business process reengineering, were the most often referenced elements.

Bologa and Muntean and Bologa assessed research on ERP adoption in industry and compared them to practices in universities in Romania. The researchers recognized the essential success variables and examined the distinctions, notably with the situation of universities. The distinctions include communication structure, management engagement, organizational culture, implementation team competencies, and inter-departmental

communication, emphasizing the significance of these aspects inside institutions. They determined that extra emphasis must be devoted to human variables and organizational aspects, as they markedly differ from those in corporate settings inside the academic context.

The applicability of ERP deployment in higher education institutions and developed a framework for its implementation. This research examined a single institution as a case and recorded all the issues encountered during the implementation of the I-campus system, which consists of three modules: the primary module (Student Finance and Administration), the human resources module, and the finance module. Consequently, they emphasized the critical success factors essential for I-CAMPUS implementation, which include: commitment from top management and comprehension of information systems, effective change management, appropriate strategies for varying scales of information systems, a clearly defined environment, high-quality analysts and designers, suitable methodologies for diverse applications, acceptable time constraints, system integration, effective handling of data issues, project commitment, manageable project size, and quality assurance throughout the system development life cycle. They assert that information management must be conducted properly and efficiently to guarantee success at the institution. In the same region, Lope and Othman (50) provide a framework for ERP Campus deployment following a field study of 50 private higher education institutions. They emphasized four phases of the framework: project initiation, project implementation, realization, and operation and maintenance including critical success factors, deliverables, and responsibilities, and determining its appropriateness for the Malaysian context with its distinctive characteristics.

Aljohani and Peng examine determinants by interviewing decision-makers, IT personnel, and managers involved in the replacement decision process. They identified elements that affect the replacement of the ERP system. The causes include trend pressure, inadequate interdepartmental integration, and public hostility; it is further argued that these aspects require investigation for more explanation. Finally, Karande and Jain (34) provided a research examining the essential success elements pertinent to higher education in India. They identified critical success elements from prior research and categorized them into groups: strategic considerations, tactical factors, and operational aspects, to assist higher education in the effective implementation of ERP systems.

4.2.2 Change Management

In their examination of change management, Al-Shamlan and Al-Mudimigh (2011) utilized MADAR as a case study to analyze change management techniques and processes for effective ERP installation, finally assessing its influence on personnel. The data was gathered by the distribution of questionnaires to 40 workers to assess the effects of change management. The research indicates that effective methods should encompass three stages: pre-implementation, implementation, and assessment. Change management activities, including preparation and analysis, should be executed during the pre-implementation phase; training and communication activities should occur in the implementation phase; and monitoring of employee performance should take place in the assessment phase. They emphasized that commitment from senior management, effective communication, and training are essential procedures for change management in ERP deployment.

Noaman and Ahmed similarly demonstrate the successful implementation of ERP curriculum in higher education. This study emphasizes the functionalities of ERP in higher education, including the factors that hinder its implementation, a comparison of ERP in higher education with business models, a technical overview of ERP in this sector, and a

case study of the ERP framework at King Abdul Aziz University in Saudi Arabia. The authors demonstrated that ERP systems in higher education include a distinct set of features compared to those in business. An ERP system for higher education must be customized to accommodate the organizational structure, including policies and strategies, business process architecture, data flow, and academic functions.

Waring and Skoumpopoulou did this study to examine the impact of ERP deployment on university culture via a relational ontology. Data for this study was gathered through document analysis, interviews, and participant observations. Big City University used an ERP solution, Strategic Information Technology Services (SITS), with minimal stakeholder engagement, lacking customisation and alterations to business processes. The university implemented the system based on the values and assumptions of the developers and consultants. The authors examined the evolution of culture inside Big City following the interaction between ERP technology and the organization. The research included a comprehensive analysis of the information systems and organizational culture preceding SITS deployment, as well as the ensuing cultural transformations from the perspectives of integration, differentiation, and fragmentation post-implementation.

4.2.3 Evaluation of the ERP System

In this subject, Abugabah and Sanzogni 68 conducted a critical evaluation of prior research on ERP systems in higher education, specifically emphasizing Australian higher education. The authors proposed that research should pivot towards the user perspective, rather than concentrating on technical and organizational aspects, and shift from success and implementation to user-related concerns that provide value and results of ERP systems.

In the context of Australian higher education, Rabaa'i and Bandara performed a descriptive research at Queensland University of Technology (QUT). Interviews highlighted several aspects, including ERP adoption, ERP selection, customisation processes, ERP system integration, the consultant's role, and ERP system evaluation. The report emphasized several challenges associated with ERP implementation in higher education and presented pertinent real-life examples for institutions to emulate. The authors ultimately determined that further study may assess ERP stakeholders within the higher education framework.

In a comparable research, Rabaa'i (2009) conducted a literature review to identify essential vital success elements for the successful adoption of ERP systems. The objective of the study is to comprehend the phenomena of ERP deployments and the assessment of ERP in higher education within the Australian area. The study analyzes essential success variables associated with the successful adoption of ERP systems in a university setting and discusses their significance. The study identified 12 essential success factors for ERP implementation: top management commitment and support, change management, project management, business process reengineering and system customization, training, ERP team composition, vision and planning, consultant selection and relationship, communication plan, and ERP system selection.

Integration of ERP systems and subsequent evaluation of implementation. The author elaborated on its significance in the successful adoption of ERP systems. In conclusion, he proposed that all aspects be examined among various implementation stakeholders, including senior executives, end users, project team members, technical users, and consultants.

Additionally, Khare (2014) presented a summary through a descriptive analysis of ERP in higher education institutions. The study examined the advantages of ERP in higher education and its function inside educational institutions. The research proposed redirecting focus from technical success and failure causes to aspects such as users, tasks, and systems, and how these features might be assessed to enhance the advantages of ERP systems. Finally, Bhamangol et al. (2011) provided a comprehensive literature analysis on ERP systems in higher education. This research emphasizes the advantages of ERP in higher education, provides a checklist of characteristics to verify before to deployment, and underscores the necessity for modification post-acquisition. Subsequently, two groups were proposed, one from the company and the other from the vendor, which was deemed essential for ERP deployment.

4.2.4 Implementation of ERP

In the context of ERP deployment, de Castro Silva and de Oliveira (79) conducted a research to examine the problems that emerged during the scope defining phase of planning for the acquisition of an ERP system at the Federal Rural University of Rio de Janeiro (UFRRJ), Brazil. The study emphasized the advantages and challenges of deployment, as well as the system's impact on the institution's operations, while delineating the potential for acquiring an ERP system for UFRRJ. The authors outlined key considerations for project acquisition, including cost reduction, work reduction, elimination of inconsistencies, removal of interfaces between isolated systems, enhancement of integrated management, and global optimization of the company's processes.

In a similar vein, Abdellatif presented a research concentrating on ERP adoption, emphasizing post-implementation challenges in developing nations, including Bahrain and Egypt. The authors elucidated that the failure rates of ERP systems result from insufficient IT infrastructure, a deficiency in IT/ERP expertise, and legislative laws that are incompatible with ERP standards. The subsequent investigation examines the instance of Pan-American University in Mexico, focusing on how ERP installation resolved the institution's administrative challenges. Ultimately, it was determined that ERP systems continue to provide significant challenges and risks for institutions in poor nations.

Likewise, Luić and Kalpić did this study to elucidate the risks associated with integrating an ERP system into the academic setting. They emphasized the significance of ERP and the requirements of the academic community, as well as the relevance of an Integrated Information System in Higher Education. They offered several capabilities in higher education, including grant and money administration, financial management, budgeting and planning, and Human Capital administration (HCM). They determined that the Integrated Business Information System (IBIS) is a complicated procedure, making the implementation of ERP in higher education a risk that should be conducted at the state level.

4.2.5 Evaluation of ERP

The assessment of ERP systems in higher education remains a contentious issue. To address this deficiency, numerous scholars, including Nizamani and Khoumbati, have made attempts. They devised a technique to assess ERP systems in Pakistan's higher education sector. The model includes system quality, information quality, service quality, user satisfaction, individual impact, and organizational impact from the IS success model, alongside critical success factors such as top management support, business process reengineering, education and training, and organizational culture as independent variables,

with ERP system success as the dependent variable. Subsequently, in their later study, they evaluated and validated their model by gathering samples from seven institutions in Pakistan. All assumptions are substantiated, and based on the results, an alternative model with fewer instruments has been presented, pending validation.

Althonayan and Papazafeiropoulou (2013) similarly assessed the influence of ERP systems on stakeholder performance in higher education. To achieve this objective, three models were integrated: the Task Technology Fit Model, Delone and McLean's Information Systems Success Model, and the End User Computing Satisfaction Model, to extract components for the theoretical framework. Impact-related parameters were sourced from Delone and McLean, regarded as one half of the measure, while quality-related elements were obtained from TTF and EUCS, constituting the other half of the measure. The data was gathered using a structured questionnaire from 60 users of the MADAR system at King Saud University. This study concluded that system quality—flexibility, compatibility, accuracy of data, currency, simplicity of use, and timeliness—and service quality—tangibility, dependability, responsiveness, and assurance—affect stakeholder performance [61-64].

Recently, Soliman and Karia did a research on ERP system success in higher education in Egypt. The suggested model, grounded on the IS success model and Diffusion of Innovation (DOI) theory, elucidates the effective deployment of ERP systems and their prospective influence on competitive advantage in higher education institutions (HEIs). The model examined the correlation between the variables from the IS success model, DOI theory, and critical success factors like as top management support, business process re-engineering, and training are utilized to assess competitive advantage through ERP implementation.

4.2.6 Additional Data

Literature indicates that research on ERP systems extends beyond the aforementioned concerns within the realm of higher education. Researchers elucidated several topics, including the effect of ERP systems 72, 73, the utilization of ERP systems 80, and ERP replacement 76.

In a similar vein concerning user performance within higher education, Abugabah and Sanzogni conducted a study to assess the influence of ERP systems on user performance in higher education institutions, aiming to elucidate the ERP phenomenon in these settings and further analyze its implications in complex environments. A synthesized model is built including features from the D & M IS Success model, the Technology Acceptance Model (TAM), and task-technology fit. The results reveal that ERP systems significantly affect user performance in higher education. The results further emphasize that the System Quality, Information Quality, and task-technology fit of the ERP are the most critical aspects influencing user performance in the ERP system. Although the research parameters account for a significant fraction of the diversity in user performance, some volatility remains unexplained.

Conclusion

This report aims to present an overview of recent trends in ERP systems within the higher education sector. This study aims to present a comprehensive assessment of ERP literature published in journals and conferences from 2009 to 2017. This article seeks to present a comprehensive overview of the current state of ERP systems, specifically within the higher education sector, and to pinpoint avenues for additional study in this area. The study aims to achieve three objectives. Initially, to investigate the types of inquiries that emerge inside the

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