ERPs in Higher Education Institutions: Motivations, Challenges, and Success Factors

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***Abstract*— Enterprise Resource Planning Systems (ERPs) are of vital importance to all institutions, especially those involved in higher education (HEIs). However, the level of their implementation among these institutions has shown poor results. Currently, higher education institutions in Malaysia have yet to explore factors leading to the successful implementation of ERPs. There is a lack of research on ERP systems implemented in HEIs, especially regarding their success factors. As such, a literature review was conducted on ERPs in higher education institutions, discussing the advantages of different systems; their obstacles to implementation; and their success factors in HEIs. This review concluded with two theories by which to define the most critical and impactful factors to these systems' success. It is hoped that this review will help HEIs to understand the factors that might lead to the successful implementation of ERPs. In addition, implementing ERPs successfully in higher education will help develop a global competitive advantage, as well as affect the satisfaction levels of stakeholders in HEIs. Whilst investments in ERP systems by modern organisations are becoming increasingly common – especially amongst higher education institutions - the lack of previous empirical research in this environment has neglected the potential benefits of these systems.**

Keywords— *Enterprise resource planning systems (ERPs), higher education institutions (HEIs), critical success factors (CSFs).*

I. INTRODUCTION

This Corporations are actively turning towards scalable and adaptable ERP technologies to remain abreast of the dynamic and progressive business sector (Shi and Wang, 2018). Organisational data resources are institutionalised through ERP software, which are information system (IS) packages rather than transactional systems that serve specific business processes (Klaus et al., 2000). As a result of the constant flow of information across an organisation, ERP systems are used extensively by businesses across the globe to enhance operational efficiency (Acar et al., 2017; Madapusi and D'Souza, 2012). Since its inception in the late 1990s, ERP software has become increasingly popular among business professionals and information system (IS) researchers (Davenport, 1998).

Global trends have significantly impacted upon the adoption of new technologies in higher education institutions. Governments have demanded that institutions globally enhance their performance and efficacy (Allen and Kern, 2001). However, there are several issues that higher education institutions must confront, including increased pressure from stakeholders such as students and authorities; a decrease in government aid; and the demands of quality and performance criteria by which they might hope to maintain a competitive educational environment (Fisher, 2006). In response to the rising competition in the academic industry and to meet stakeholder expectations, universities are therefore adopting ERP systems into their programmes (Egdair et al., 2015; Ismail et al., 2010; Khalid et al., 2018; Basri et al., 2017). The unique benefit of an ERP system is that it can integrate all organisational data and resources into a centralised system to effectively support all organisational operations (Scholtz et al., 2016).

The implementation of ERP technology in universities enables efficient and cost-effective office administration, personnel management, and procurement, whilst reducing paper usage in administrative correspondence (Maulana, 2018). The primary reason for universities to adopt ERP is to improve their student services and to maintain a competitive edge through improved operational efficiency (Rizkiana et al., 2021). Due to modern developments in technology and globalisation, the nature of higher education (HE) is evolving continuously, with many institutions of various sizes and types struggling to remain competitive by strengthening their technological skills alone. Furthermore, with government directives demanding more efficient and high-quality standards of education, modern academic enterprises are relying increasingly more heavily upon the global advancement of information technology (IT) as a result. Rapid improvements in information technology have therefore changed university administration procedures. In addition, the global educational environment and demands of stakeholders are acting to compel universities to improve

their overall performance (Khalid et al., 2018). The higher education sector has undergone many transformative changes in recent years, including institutional budget cuts; the introduction of newer models of educational instruction; the incorporation of Information and Communication Technology (ICT) infrastructure and applications; and revised governmental regulations. In response to these changes, HEIs have attempted to gain a competitive advantage by influencing their strategic policy orientation (Mathooko & Ogutu, 2015).

The HEI industry is an essential industry looking to keep pace with technological advancements, seeking to reap the benefits of ERP systems in order to expedite and simplify the management of data and internal operations with minimal costs and enhanced institutional performance. HEIs, in contrast to for-profit corporations, exist to serve the public good rather than to make a profit. Higher education institutions spend large sums of money upgrading to these newer systems - yet there may be several issues to the process. As part of the government sector, HEIs often trend towards inactive administrative systems, with personnel opinions usually biased against the idea of change. As a result, ERP implementations often fail before they may be successfully completed. Because of this, HEIs must focus on altering their procedures before deploying new technologies. Planning and deploying ERP systems requires the active involvement of senior executives, who may invigorate the organisation and its employees by engaging in effective communication with the workforce in advance of implementation. Therefore, careful planning is fundamental to the effective deployment of an ERP in higher education.

No institution exists today that can function effectively without utilising the most up-to-date technologies available to them. However, higher education institutions are typically considered exceedingly challenging when it comes to adopting ERP systems, presenting high costs and a slew of relevant risk factors to be considered. Of further concern, even if these systems are implemented fully, they can nevertheless prove ineffectual or unsuccessful over the consistent alternatives of long-term investment returns. Despite the increasing popularity of ERP technology amongst organisational management, the actual implementation of the system has demonstrated a high failure rate, with almost 70% of these implementations falling short of organisational expectations (Mehlinger, 2006; Ramayah et al., 2007; Keong, 2008; Keong et al., 2012; Terminanto and Hidayanto, 2017).

ERP systems are among the most considerable information system projects to be embraced by universities, with significant resources required for their implementation. For example, higher education institutions have collectively spent more than $5 billion on ERP investments over recent years. However, a relatively limited number of studies have been conducted into factors affecting the successful implementation of ERP implementations in higher education institutions (Fadelelmoula, 2018; Khand and Kalhoro, 2020; Rizkiana et al., 2021).

Whilst many prior studies have examined the adoption of ERP systems in the corporate sector, very few have considered the influential factors that lead to successful ERP system integration in higher education institutions (Aldayel et al., 2011; Abugabah and Sanzogni, 2010; Okunoye et al., 2008; Soliman and Karia, 2016; Noaman and Ahmed, 2015). These studies further support the argument that the academic community requires additional research into ERP adoption. Additionally, Malaysia - being one of the top countries for higher education institutions - lacks any body of comprehensive studies into ERP and its success in higher education institutions. For this reason, as well as the fact that HEIs have a higher failure rate amongst academic institutions than in the corporate sector, it is therefore critical to pinpoint what exactly makes these systems work. As such, this research conducted a literature review to identify contributing factors to the successful implementation of ERP technology within higher education organisations. In section 3, the review demonstrates the motivations and benefits behind the implementation of ERPs. Section 4 outlines ERPs challenges. In section 5, this paper explores the success factors. Section 6 discusses the pros and cons of the ERP system's integration within HEIs. And lastly, in section 7, the failure and success factors of ERPs in HEIs are listed, alongside the theories which drive this review's conclusion.

template, modified in MS Word 2007 and saved as a "Word 97-2003 Document" for the PC, provides authors with most of the formatting specifications needed for preparing electronic versions of their papers. All standard paper components have been specified for three reasons: (1) ease of use when formatting individual papers, (2) automatic compliance to electronic requirements that facilitate the concurrent or later production of electronic products, and (3) conformity of style throughout a conference proceedings. Margins, column widths, line spacing, and type styles are built-in; examples of the type styles are provided throughout this document and are identified in italic type, within parentheses, following the example. Some components, such as multi-leveled equations, graphics, and tables are not prescribed, although the various table text styles are provided. The formatter will need to create these components, incorporating the applicable criteria that follow.

II. Materials and Methods

A literature review was conducted to explore ERPs' success factors in higher education institutions. A large number of papers were reviewed to outline the motivations behind the implementation of ERPs, with considerations payed to its benefits and challenges, and to conclude upon their success factors accordingly. This study further explored a variety of articles to define ERP systems' advantages and obstacles in

their implementation to HEIs. Lastly, the review defined their failure and success factors, concluding with theories employed to determine the most significant of these success factors.

III. ERP Adoption Motivations and Benefits

The adoption of ERP systems is justified for a variety of reasons. When a business decides to implement these systems, it is critical that they understand the consequences of their decision. In this section, we explore the most important justifications for the installation of an ERP system.

Through computerisation, the availability of an integrated business computing solution improves a company's capacity to compete in the competitive marketplace; develops their business operations and organisational workflow efficiency; and reduces overhead facility expenditure. Such solutions also improve the efficacy of their decision making by providing accurate and updated information from across the organisation. It has been shown that company performance may expect significant improvements across the following areas (Beheshti, 2006; Luo et al., 2004; Jenab et al., 2019; Cruz-Terres et al., 2021; Putra et al., 2021).

Various studies (Spathis et al., 2005; Nah et al., 2001; Shang et al., 2000; Heredia-Calzado and Durendez, 2019; Abdel-Haq et al., 2018; Sanchez and Yague, 2010; Azevedo et al., 2012) have pronounced upon the essential characteristics of ERP systems and their capacity to improve business organisational operations, such as with the following:

1. The digitisation, synchronisation, and integration of business practices across many organisational locations and functions.
2. The reduction of errors by the sharing of common data and processes throughout the organisation.
3. The improved access to and management of real-time data from any location and at any time, by which effective decision making may be improved and financial costs reduced. In order to demonstrate interactivity, a user-friendly web interface system is provided to develop integrated portals for a wide range of administrative functions.
4. The effective and efficient conducting of innovative business processes, including e-government procedures, e-learning, e-commerce, e-procurement, and e-portfolios.

IV. Challenges Faced in ERP Implementation

Despite the many benefits of an ERP system, implementing one can prove challenging. There is a high failure rate even under perfect conditions for ERP system integration, which therefore necessitates an extensive risk-management plan. Implementation is a time-consuming and costly procedure (Xu et al., 2010; Al shamlan et al., 2011; Samuel et al., 2013; Al Mashari et al., 2003; Ngai et al., 2008; Zhang et al., 2005; Dezdar et al., 2009; Osnes et al., 2018; Abd Elmonem et al., 2016; Venkatraman and Fahd, 2016; Hawking, 2007), with many ERP initiatives costing 178% over budget, taking 2.5x longer to complete, and providing only 30% of the anticipated benefits considered under initial estimates (Zhang et al.).

In addition, a number of obstacles present various difficulties for successful implementation, including major issues within the company such as workers who are reluctant to adapt (Al Mashari et al., 2003; Umble et al., 2003; Xue et al., 2005; Haddara and Moen, 2017; Ahmed et al., 2006; Ghosh, 2012; Escobar-Rodriguez and Bartual-Sopena, 2015). As such, the decision to employ an ERP system might seem a daunting experience for any enterprise. Of the many firms that have used ERP systems throughout the years, many have failed, overspent or faced delays, with 90% of ERP projects failures attributable to time or money constraints (Martin, 1998; Samuel et al., 2013; Al Mashari et al., 2003; Elragal and Kommos, 2012; Shatat, 2015).

In the eyes of managers and implementation consultants, Markus and Tanis defined success as finishing the ERP project's implementation on schedule and under budget. CEOs and managers must therefore be deeply involved in and firmly committed to ERP deployment in order for it to succeed (Gargeya et al., 2005; Tarigan et al., 2020; Chakravorty et al., 2016; Agrifoglio and Metallo, 2010).

Understanding the primary reasons behind the failure of many ERP implementation initiatives could provide formulas for success in future projects. Umble et al. (2003) categorised project failure into ten categories, including a lack of clearly defined strategic goals; bad project management; a reluctance to change; poor team selection for implementation; inadequate education and training that prevents users from operating the system; a lack of adjustable performance indicators, configurable to organisational changes; unresolved multi-site challenges; poor project management; and technological problems (Amid et al., 2012; Zare Ravasan and Mansouri, 2016; Wong et al., 2005).

V. Implementing ERP: Success Factors

In the early 1960s, the concept of critical success factors (CSFs) was first proposed by Ronald Daniel, who stated that information analysis must focus on 'success factors' when used as a new strategy to assist organisations in achieving their goals (qtd. in Rockart et al., 1986). Chief executives should be involved in identifying CSFs, as in so doing they may ensure that these variables are provided the attention they require and are handled well by the organisation (Huang et al., 2011; Law et al., 2007; Silva et al., 2013; Ward, 2006; Ahmed et al., 2020). For example, Rockart et al. (1986) argued that the success of a limited number of areas should be sufficient for a company to achieve effective and competitive performance. 'Things must go right' (Rockart et al., 1986) refers to the few key areas for the business to thrive and the management to achieve their goals. On the subject of CSFs, Pinto and Slevin (1987) argued that there are 'factors that, if addressed, considerably increase project implementation odds'; whilst according to Rabaa'i (2009), there are 'a set of activities that require specific considerations and continuous attention for developing and implementing an ERP system'. In addition, 'factors essential to ensure a successful ERP project' (Holland et al., 1999) have been defined by a variety of papers. Regarding ERP project execution, it is crucial that CSFs are employed, as they provide a clear picture of which areas should be prioritised and where resources and attention

should be focused. Each phase of ERP deployment has its own set of key criteria that must be considered to ensure a successful outcome. A proactive method by which to counteract the high failure rates of ERP deployment can be established by focusing on the essential aspects involved in ERP adoption (Loh et al., 2004; Rockhart, 1978; Huang et al., 2011; Law et al., 2007; Osnes et al., 2018). It is believed that this will improve their ERP system's long-term likelihood of success, as well as reducing its cost and labour demands whilst improving its quality and overall efficiency (Finney, 2007; Ismail et al., 2010). It is therefore of vital importance that a better understanding may be reached regarding the key factors affecting the successful implementation of ERPs in higher education institutions.

VI. ERPs in Higher Education Institutions

Rather than creating their own IT systems, many local governments are reliant upon commercial off-the-shelf ERP systems (COTS) instead. A single database is used to store all of the data needed to accomplish critical administrative tasks, such as budgeting, accounting, procurement, performance, and HR administration. IT resources can then be planned and managed more effectively as a result of this information (Thomas, 2004; Khalid et al., 2018; Basri et al., 2017). ERP systems are finding further implementation in new organisations; and because of their significant representation as a governmental department, HEIs have been influenced by this global trend of utilising cutting-edge technology in everyday life. ERP systems are therefore implemented in HEIs to take the place of legacy information management systems, assisting in all business functions; improving management and administration systems; managing and making operations more visible; and improving overall performance.

HEIs' most significant ICT investment is ERP implementation (Pollock et al.,2004; Zornada et al., 2005; Chaushi et al., 2019). Lockwood (1985) found that since there are so many similarities and differences between HEIs and business organisations, they often face many of the same challenges, such as organising resources, encouraging and supporting employee entrepreneurship, and keeping costs to a reasonable level. HEIs are distinctive because of their multifaceted aims; restricted measurability of results; autonomy and dependence on society; dispersed authority structures; and internal fragmentation. HEIs differ from business models, however, due to their distinct decision-making processes, wherein each executive member can make independent decisions (Pollock et al., 2004; Heiskanen et al., 2000; Rayevnyeva et al., 2018; Knobel, 2021). Owing to their loosely-connected and autonomous administrative and academic components, HEIs are therefore more resistant to change than businesses (Gates, 2004). HEIs also have distinct characteristics that necessitate a specific project management style.

On the other hand, reduced business risks; expanded services for teachers, students, and employees; increased revenue; and decreased costs are all benefits to the implementation of an ERP system at a higher education institution (King et al., 2002; Soliman and Karia, 2016; Abugabah and Sanzogni, 2010; Abugabah et al., 2015; Ullah et al., 2018).

Few HEIs have implemented integral ERP solutions, however, and so more must therefore be done. Their complexity makes ERP deployment at HEIs a risky procedure (Zornada et al., 2005; Ullah et al., 2018), as ERP systems often 'refashion the character of universities and are accompanied by tensions' (Pollock et al., 2004). Implementing these systems in HEIs raises organisational challenges (Beekhuyzen et al., 2001; Yadav and Joseph, 2020). Rather than tailor the ERP system to meet the specific needs of academic institutions, these systems were built for the corporate sector with little thought to how they would work in educational institutions (von Hellens et al., 2005). The institution implemented ERP despite escalating expenditures, which eventually totalled $15 million - $10.8 million more than was initially expected and budgeted for. The cost of Ohio State University's ERP implementation climbed from $53m to $85m; whilst the University of Minnesota's $38 million project ended up costing $60 million (Parth et al., 2003). As such, it is imperative that institutions minimise ERP failure to avoid rampant expenditure such as this.

VII. Result and Discussion

Use The ERP system can be considered a double-edged sword. Whilst it can provide organisations with a diverse array of benefits, its implementation could prove catastrophic to their workflow and budget. Integrating an ERP system within any organisation could allow it to remain updated with cutting-edge technology and development; however, it might not fit the organisation's environment and requirements to do so. It is therefore recommended that a correct understanding and definition of CSFs by an institution be reached before it seeks to implement ERPs, as this would most likely produce a positive impact upon the system's outcomes as a result.

As such, in reviewing the success factors of ERPs in HEIs, we have developed two theories to guide this study, which are as follows:

1. Theory of Resources and Capacities

The Theory of Resources and Capacities guided this study's response to the following queries: What impact does a suitable application have on the knowledgeable management of ERP systems when used by HEIs? What impact does the professionalisation of skills and/or competencies have on the adoption of ERP in HEIs? Does the proper use of professionalisation and knowledge management affect the competitive advantages of HEIs while using ERP? What impact does effective ERP system use have on HEIs' competitive advantages?

2. Organisational Information Processing Theory

OIPT posits the resolving of uncertainty as the central task in organisational design. The theory conceptualises uncertainty as a lack of information regarding the status of any given task, such as its environment. It therefore follows that ERP, as a type of computerised information system, is an appropriate coordination mechanism under many circumstances but is less so under others. Information processing theorists have suggested various sources or types of uncertainty, including the characteristics of the self-contained tasks where sub-units must execute; instability of external environment; interdependency with other sub-units (Tushman and Nadler, 1978); and differentiation among sub-units (Daft and Lengel, 1986).

The below table memorises ERP system failures and success factors in HEIs.

TABLE I. ERPS' CHALLENGES AND SUCCESS FACTORS IN HEIS.

No.	Failure Factors	Success Factors
1	Uncertainty and instability.	Evolving Chief executives in defining critical success factors to gain great attention during system execution.
2	Independence of administrative decisions.	Decision-making centralization.
3	Inflexibility to change.	The success of key areas of the organization
4	Complexity.	Interdependence among organizational sub-units.
5	Distinctive requirements.	Define the areas that increase implementation possibility and require more attention to meet their needs.
6	Huge cost to cope with institution requirements.	

In conclusion, with integration and standardisation being two of the most significant characteristics of ERP, we therefore focused on the two sources of uncertainty most related to them: interdependency and differentiation. Theory suggests that greater interdependency among organisational sub-units is associated with more significant benefits from ERP. On the other hand, differentiation among organisational subunits can lead to some high ERP-related costs.

VIII. CONCLUSION

Many higher education institutions (HEIs) rush to implement ERP systems to computerise their tasks and benefit from this modern technology. Despite the glamorous advantages they present, implementing such a system always leads to failure with the institution bearing its consequences. As such, critical success factors should be defined and considered to minimise the risks inherent to ERP implementation. This review discussed the benefits of ERPs, alongside its challenges and success factors. In addition, it demonstrated ERPs' advantages and disadvantages when employed by HEIs. Furthermore, it concluded upon two theories with which to define the most influential factor for a successful implementation at the most minimal cost: the high interdependency of organisational subunits.

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