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A Comparative Study of Critical Success Factors (CSFs) among Local Enterprise Resource Planning Software System in Private Educational Institute: A Cross-Sectional Study

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ABSTRACT

Keywords:

Critical Success Factors (CSFs), Local Enterprise Resource Planning Software System, Private Educational Institute, Cross-Sectional Study

Globalization drives information transitions, necessitating Enterprise Resource Planning (ERP) for efficient coordination in higher educational institutes. Deployment is a costly and intricate process that requires specific success factors. Previous research focused on management, overlooking user perspectives. The study uses a quantitative methodology to gather data from 300 employees in private Higher Education Institutions, focusing on user perspectives rather than management. Non-probability convenience sampling was employed to obtain cross-sectional data. The successful implementation of an ERP system requires top management endorsement, functional assistance, a reliable partner, comprehensive training, active user engagement, a proficient ERP team, robust MIS department, meticulous planning, organizational support, effective change management, well-established IT infrastructure, superior ERP software selection, and a deep understanding of the ERP concept. Critical success factors significantly impact ERP implementation success in developing countries. Organizations should consider financial, employee, application, technical, and vendor capabilities when selecting an ERP system, providing valuable insights for policymakers.

INTRODUCTION

Improved data management systems in higher education governance are crucial for transparency, accountability, and maximum accreditation, assessing aspects such as academic administration, staffing, finance, and higher education households (Nakeng, Mokwena, &

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Moeti, 2021). ERP (Enterprise Resource Planning) is a commercial solution used by universities for administrative and academic purposes, aimed at improving student services, transforming corporate processes, and increasing efficiency (Chi Chao, 2020). Implementing an ERP system can be costly and high-risk, but the benefits outweigh the costs. ERP project failure in university sector can be attributed to Critical Success Factors (CSF) such as communication, business process re-engineering, vendor support, project management, and budget constraints (Nakeng, Mokwena, & Moeti, 2021).

The costly and intricate implementation process also results in 60% of projects failing to achieve initial objectives. Previous studies indicate that while ERP systems are utilized by organizations, they often fail to achieve their objectives due to insufficient user involvement and quality factors, organization and project factors (Shukor et al., 2020; Hietala & Päivärinta, 2021). However, studies on ERP implementation and sustainability are limited, especially in developing countries. Integrating these dimensions can prevent system failure and maximize business intelligence efficiency (Musinguzi, Baker, Larder, & Villano, 2023). Scarce studies combine user commitment and quality factors with unit or cluster measurement, integrating both dimensions to assess system efficiency and prevent system failure (Huang, Chiu, Chao, & Arniati, 2019).

The successful implementation of an ERP system in Pakistani educational institutions relies on various factors, including commitment from upper management, excellent project leadership, organizational change administration, an outstanding execution team, reliable information, thorough training, business process redesign, and minimal customization (Al-Tit, Omri, & Euchi, 2019; Shatat & Shatat, 2021). However, literature rarely discusses critical success factors (CSFs) for ERP deployment in Pakistani educational institutions. This study aims to address this gap by examining how private educational organizations in Pakistan utilize their ERP systems. It proposes a comprehensive ERP implementation model for developing countries, using Pakistan as an example. The model considers influential factors across various dimensions, addressing the scarcity of research on ERP implementation models (Mahar et al., 2020; Putra, Rahayu & Putri, 2021). The study aims to identify key elements contributing to the successful adoption of ERP systems, specifically from the viewpoint of system users. The objectives are to determine the major critical success factors in ERP software systems in private educational institutes in Lahore, Pakistan and determine their importance from the user's perspective.

Relationship between project factors and An ERP system execution

Previous studies underscore the significance of effective project management in ERP implementation projects, as it involves managing tasks while considering scope, schedule, and finances, thereby ensuring project feasibility (Kirmizi & Kocaoglu, 2022; Mahar et al., 2020). This research explores the role of project factors in large private educational institutions transitioning to hybrid or cloud-based ERP systems. Effective project management is crucial for project feasibility, and a lack of it could jeopardize the project's success (Shatat & Shatat, 2021).

H1: There is a significant relationship between project factors (Project Champion, clear roles and objectives of system, high dedicated resources, project team competence, vendor support, project teamwork & composition and project management process) and ERP implementation success at level ($\alpha < 0.05$)

Relationship between organizational factors and An ERP system execution

Previous studies suggest that ERPS in industrialized nations could be applicable to Pakistan, but cultural barriers such as a tendency to assign responsibility and lack of IT infrastructure may hinder its implementation (Tayyab & Ahmad, 2023). Pakistani government and business organizations have studied ERPS, finding context significantly affects implementation. However, some studies have focused on institutions or end-users, suggesting a multi-level strategy to understand ERPS use patterns specific to local organizational culture (Shad, Chen, & Azeem, 2012; Salih et al., 2022)

H2: There is a significant relationship between organizational factors (User acceptance, organizational fit, strong and meaningful user training & education and inter-departmental communication) and ERP implementation success at level ($\alpha < 0.05$)

Relationship between technological factors and An ERP system execution

Implementing a new CERP system requires selecting a suitable package, considering supplier compatibility, and choosing from Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), or Infrastructures-a-Service (IaaS) cloud services. Clients can choose public, private, or hybrid cloud configurations (Putra, Rahayu & Putri, 2021). CERP consultants' opinions are crucial for client organizations' confidence and acceptance (Shatat & Shatat, 2021; Hancerliogullar & Damar, 2022).

H3: Technological factors (Great ERP software selected, management information system department and a good it infrastructure) has positive relationship with ERP implementation success at level ($\alpha \leq 0.05$)

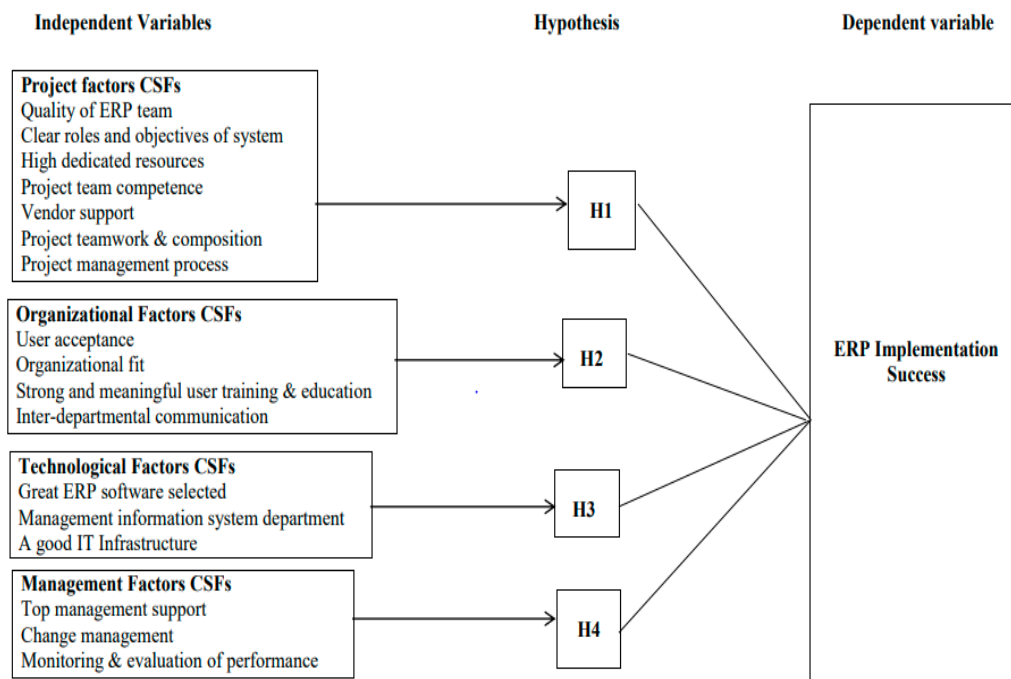
Relationship between management factors and An ERP system execution

A senior management committee with strong commitment, knowledge of ERP, financial support, and return on investment is crucial for project success (Jayeola et al., 2022). Successful ERP implementation requires managerial commitment, especially in developing nations (Kirmizi & Kocaoglu, 2022). Organizational factors like selecting a suitable system, recruiting skilled IT workers, and collaborating with suppliers influence system effectiveness (Sislian & Jaegler, 2022; Cebekhulu & Ozor, 2022).

H4: management factors (Top management support, change management and monitoring & evaluation of performance) have positive relationship with ERP implementation success at level ($\alpha \leq 0.05$)

Conceptual framework

The study presents a customized ERP adoption model, highlighting a crucial factor in the process, integrating TAM and De Lone and Mc Lean IS Success Model, offering practical implications for organizations (Christiansen, Haddara & Langseth, 2022; Mohanty, Sekhar & Shahaida, 2022; Cheung et al., 2023).



Source: Author Developed

Figure 1 Conceptual Framework

METHODOLOGY

The study used quantitative and cross-sectional research with a deductive strategy, focusing on managerial level employees aged 23-65 in private higher educational institutions in

Lahore, Pakistan, using ERP software. Data was collected using purposive sampling methodology and self-administered survey questionnaires using Google Forms. The Krejcie and Morgan table (Morgan, 1970) was used for determining the sample size, which included 400 persons. The suitable size was 300 employees (Uakarn, Chaokromthong & Sintao, 2021

Measures

The Critical Success Factors conceptual dimension, derived from a previous research article, categorizes seventeen crucial elements that influence the use of Enterprise Resource Planning (ERP) systems as research tools (Alloush & ER, 2020). The study focuses on project factors such as the quality of the ERP team, clear system roles and objectives, high dedicated resources, project team competence, vendor support, project teamwork, and project management process. The dependent variable is the success of ERP deployment; assessed using three specific questions graded using a five-point Likert scale. The scale indicates the significance of each aspect in ERP adoption, with values ranging from 1 (insignificance) to 5 (high importance) (Alloush & ER, 2020). The mean values of the 17 Critical Success Factors (CSFs) were arranged in ascending order, ranging from least significant to highly significant (Soltan et al, 2015; Billyan & Irawan 2021). The study classified low importance CSFs scores (1.00-2.33), moderate importance CSFs (2.34-3.67), and high importance CSFs (3.80-5.00) based on total mean scores. The data was analyzed using SPSS version 24, with means and standard deviations calculated for quantitative variables and frequency and percentages for qualitative variables. A hypothesis test was performed using multiple linear regression analysis and t-test. A level of significance of p-value ≤ 0.05 was considered significant.

ANALYSIS

Demographic variables

Table 1 presents the main characteristics of the survey respondents. The survey included 300 respondents aged 23-38, mostly men (59.0%), with a Master's Degree (47.0%), and a majority from Non-Academic Administrative Departments (53.7%). Most used SAP ERP Software (55.7%), with a majority from Middle-level Management (45.0%) and a minimum of 01-11 years of experience (72.3%) (Table 1).

Table 1 Demographic variables of respondents (N=300)

Variables	Frequency	Percentage	
Age (Years)			
23-38	195	65.0	
39-54	83	27.7	
55-70	22	7.3	
Gender			
Male	177	59.0	
Female	123	41.0	
Educational level			
Graduation	93	31.0	
Master	141	47.0	
More than master	66	22.0	
Type of Department			
Non-Academic Department	Administrative	161	53.7
Academic Administrative Department		139	46.3
Type of Software			
Local ERP Software	133	44.3	
SAP ERP Software	167	55.7	
Level of Management in the Enterprise			
Top Management	36	12.0	
Middle-level Management	135	45.0	
First-Line Managers	129	43.0	
Experience Years:			
01-11Years	217	72.3	
12-23 Years	83	27.7	

Normality test

The Kolmogorov-Smirnov Test showed that SAP was statistically significant more acceptable than the local ERP system, indicating its superiority in terms of system quality (Table 2).

Table 2 One-Sample Kolmogorov-Smirnov test

One-Sample Kolmogorov-Smirnov Test		Type of ERP system
N		300
Normal Parameters	Mean	1.56
	Standard Deviation	0.498
Most Extreme Differences	Absolute	0.370
Most Extreme Differences	Positive	0.312
	Negative	-0.370
Test Statistic		0.370
p-value (2-tailed)		0.000
Distribution test is normal		

The data's normality was determined using Skewness and kurtosis coefficients, revealing a normal distribution within ± 1 (Table 3).

Table 3 Statistics for assessing the normality of the observed variables in the model

Variable	Skewness	Standard Error of Skewness	Kurtosis	Standard Error of Kurtosis
ERP Implementation Success domain means scores	-0.384	0.141	-0.226	0.281
Project factors component means scores	-0.466	0.141	0.679	0.281
Organizational factors component means scores	-0.623	0.141	0.200	0.281
Technological factors component means scores	-0.359	0.141	-0.373	0.281
Management factors component means scores	-0.943	0.141	0.856	0.281

Mean Ranking of CSFs by degree of importance

Table 4 displays the importance of 17 CSFs in ERP system implementation, ranking them based on their importance level. The first fourteen CSFs were deemed highly important, and those with the highest mean score were prioritized (Table 4).

Table 4 Mean Ranking of CSFs by degree of importance in successful ERP Implementation (N=300)

CSFs	N	Mean	S. D	Rank	Importance level
Top Management Support	300	4.03	1.029	17	High
Project Champion	300	3.96	1.058	16	High
Clear Roles and Objectives of ERP System	300	3.95	1.084	15	High
Adequate ERP Software Selected	300	3.92	1.041	14	High
User Acceptance	300	3.91	1.029	13	High
Organizational Fit	300	3.90	1.034	12	High
Management Information System Department	300	3.90	1.105	11	High
High Dedicated Resources	300	3.87	1.087	10	High
Change Management	300	3.86	1.062	9	High
A Good IT Infrastructure	300	3.85	1.080	8	High
Monitoring and Evaluation of Performance	300	3.84	1.049	7	High

Project Team Competence	300	3.76	1.129	6	High
Strong and Meaningful User Training & Education	300	3.74	1.151	5	High
Vendor Support	300	3.72	1.136	4	High
Inter-Departmental Communication	300	3.66	1.187	3	Moderate
Project Teamwork & Composition	300	3.48	1.105	2	Moderate
Project Management Process	300	2.98	1.086	1	Moderate

Implementation of ERP system

Table 5 demonstrates successful ERP system implementation, with respondents prioritizing factors with high importance, with factors with the highest mean value receiving more rank (Table 5).

Table 5 Key components of a successful ERP implementation (N=300)

ERP Implementation Success	Mean	Standard Deviation	Rank	Importance Level
1.The organization has chosen a suitable system	3.75	1.193	3	High
2.The organization developed a comprehensive plan that outlined the necessary activities for system implementation	3.47	1.276	2	Moderate
3.Redesigned processes properly managed	2.98	1.100	1	Moderate
General Arithmetic Mean and Standard Deviation	3.40	0.723		

Project, Organizational, Technological and Management Critical success Factors

The study found that project factors like the quality of the ERP team, system roles and objectives, dedicated resources, team competence, and vendor support significantly impact the successful implementation of an ERP system. Organizational factors like user acceptance, organizational fit, user training, and communication also had a high impact. Technological factors, including technology, also had a high impact. All management factors had high impact on successful ERP system implementation. All management factors had high impact on successful ERP system implementation (Table 6). In the general, the average arithmetic mean of management factors is 3.91 which indicate a high impact of management factors on the successful implementation of ERP project (Table 6).

Table 6 Arithmetic mean, standard deviation, item important and importance level to Project, Organizational, Technological and Management Critical success Factors (N=300)

Project Factors	Mean	S. D	Rank	Importance level
Project Champion	3.96	1.06	7	High
Roles and Objectives of System	3.95	1.08	6	High
High Dedicated Resources	3.87	1.09	5	High
Project Team Competence	3.76	1.13	4	High
Vendor Support	3.72	1.14	3	High
Project Teamwork & Composition	3.48	1.11	2	Medium
Project Management Process	2.98	1.09	1	Medium
General Arithmetic Mean and Standard Deviation of Project Factors	3.67	0.6170		
Organizational Factors	Mean	S. D	Rank	Importance level
User Acceptance	3.91	1.03	4	High
Organizational Fit	3.90	1.03	3	High
Strong and Meaningful User Training & Education	3.74	1.15	2	High
Inter-Departmental Communication	3.66	1.19	1	Medium
General Arithmetic Mean and Standard Deviation of Organizational Factors	3.8017	0.679		
Technological Factors	Mean	S. D	Rank	Importance Level
Adequate ERP Software Selected	3.92	1.04	3	High
Strong Management Information System Department	3.90	1.11	2	High
A Good IT Infrastructure	3.85	1.080	1	High
General Arithmetic Mean and Standard Deviation of Technological Factors	3.89	0.694		
Management Factors	Mean	S. D	Rank	Importance level
High Top management support	4.03	1.02	3	High
Efficient Change Management	3.86	1.06	2	High
High Monitoring & Evaluation of Performance	3.84	1.05	1	High
General Arithmetic Mean and Standard Deviation of Management Factors	3.91	0.687		

Simple Liner, multiple linear Regression analysis and with one sample t- test using ANOVA table

The main hypothesis and study sub-hypothesis were tested through Simple Liner, multiple linear Regression analysis and with one sample t- test using ANOVA table.

H₀: There is no significant relationship between project, organizational, technological and management factors and the success of ERP system implementation at level (alpha level \geq 0.05). Table (7) showed that there was a significant impact of project, organizational, technological and management factors in the success of ERP system implementation at level

alpha level ≤ 0.05 so unaccepted null hypotheses and accepted alternative hypotheses (Table 7).

Table 7 One sample t-test results to test the Impact of Project, Organizational, Technological and Management factors in success of ERP system implementation (N=300)

Variable Name	N	Mean	S. D	t- value	Degree of Freedom	p- value	95% (C.I)
Impact of project factors on the success of ERP system implementation	300	3.67	.617	103.080	299	<.001	3.60-3.74
Impact of organizational factors on the success of ERP system implementation	300	3.80	.679	97.030	299	<.001	3.72-3.89
Impact of technological factors on the success of ERP system implementation	300	3.89	.694	97.110	299	<.001	3.81-3.97
Impact of management factors on the success of ERP system implementation	300	3.91	.687	98.615	299	<.001	3.83-3.99

Impact of the CSF's factors on the success of ERP implementation

A multiple linear regression analysis was conducted to understand the impact of factors on ERP implementation success. Results showed that the combination of factors had the greatest impact on ERP implementation success in Model four, while organizational factors had the highest r^2 value (0.178) among the four categories in Model-1 (Table 8).

Table 8 multi-regression analysis test results to the impact of the study's factors on the success of ERP implementation (N=300)

Model	Independent Variables	(r)	(r^2)	Adjusted (r^2)	β	p- value
Model 1	Project Factors	.310	.096	.093	.310	<0.01
Model 1	Organizational Factors	.422	.178	.175	.422	<0.01
Model 1	Technological Factors	.178	.032	.029	.178	<0.01
Model 1	Management Factors	.365	.133	.130	.365	<0.01
Model 2	Project Factors Organizational Factors	.433	.187	.182	.114 .360	<0.01
Model	Project Factors	.433	.188	.179	.120	

3	Organizational Factors				.363	<0.01
	Technological Factors				.016	
	Project factors				.052	
Model 4	Organizational factors	.469	.220	.209	.315	<0.01
	Technological factors				.042	
	Management factors				.214	

DISCUSSION

ERP systems should be optimized for maximum benefit post-implementation, known as "life after go-live." Key success criteria must be met throughout the system life cycle to avoid failures (Febrianto & Soediantono, 2022). Consistent support and dedication are crucial for organizational performance and project success. Pakistani educational organizations value ERP systems for operational efficiency, but different countries value factors differently (Mahmood, Khan & Bokhari, 2020). The study reveals that Pakistani educational organizations require top management support, a skilled ERP team, and clear system responsibilities for successful ERP deployment (Walter, 2021; Billyan & Irawan 2021). The SAP system was found to be more effective than local ERP, but challenges like system problems and delayed processes were identified. Factors like computer self-efficacy and organizational support positively impact ERP usage and performance (Kulikov et al., 2020). The previous studies on ERP system deployment identifies key success factors, including top management support, senior management commitment, a skilled implementation team, and clear roles and objectives (Alam & Uddin, 2019; Kulikov et al., 2020). These factors ensure satisfactory results and are often outsourced to consultancy firms. The complexity of ERP projects necessitates a skilled team, and clear roles and objectives are also crucial for successful deployment (Alam & Uddin, 2019; Odoyo & Ojera, 2020).

The study identifies Critical Success Factors (CSFs) for successful ERP system implementation, including project, organizational, technological, and management factors (Menon, 2020; Kirmizi & Kocaoglu, 2022). Project factors, such as quality ERP team, system roles, dedicated resources, and vendor support, are crucial (Rizkiana, Ritchi & Adrianto, 2021). Technological aspects, such as great software, strong management information system, and good IT infrastructure, are also essential (Supramaniam & Kuppusamy, 2011). High-level management support and top management leadership are crucial for successful deployment (Soltan et al., 2015; Billyan & Irawan 2021). Proper employee training defined objectives, efficient work plans, and careful project monitoring are

also necessary for successful ERP installation, as supported by previous studies (Supriyono & Sutiah, 2020; Kunduru, 2023).

ERP projects are more likely to succeed when all factors are investigated and managed, according to a multi-regression test. ERP standardization improves company practices, but organizations must re-engineer processes to align with ERP criteria (Sundara et al., 2021; Al-Badi & Khan, 2022). Coordination and cooperation among members are crucial for system success (Emhmed et al., 2021). Factors like organizational culture, process stability, and resistance to change can make ERP implementation challenging (Ahmadzadeh et al., 2021). The study examines factors affecting ERP system success, finding that only 22% of variance is explained by model variables (Ahn & Ahn, 2020). Additional research is needed to consider unmeasured factors like system flexibility and end user satisfaction. Results are relevant for Pakistan and similar countries, but may not apply to others in South East Asia where ERP adoption is growing (Abu-Madi et al, 2022). The study did not address cultural influences on ERP decisions and performance. Future research should use a larger sample and longitudinal approach for more robust findings.

CONCLUSION

The study focuses on the importance of evaluating Critical Success Factors for system deployment, particularly in the context of implementing SAP ERP software for small and medium-sized enterprises. It emphasizes the need to consider organizational and technological components to ensure ongoing success and prevent system failure throughout the system's life cycle. The dedication and assistance of key elements from initiation to completion are crucial for the system's success and its impact on business performance.

Implications of the Study

The successful implementation of an ERP system depends on top management support, functional assistance, a reliable partner, training programs, user engagement, a proficient ERP team, strong MIS department, planning, organizational support, change management, IT infrastructure, software selection, and understanding of the ERP concept. Prioritizing budgeting, conducting feasibility studies, setting realistic expectations, focusing on financial and employee capabilities, and balancing formal and informal methods are crucial for project success.

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