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Long Paper

Enterprise Resource Planning System Implementation Framework for Selected State Universities

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Abstract

Purpose - The highly competitive education environment poses a great challenge to State Universities in the Philippines. Consequently, the need to take on new information system solutions to properly address partial and unintegrated systems is a must. This research is focused on developing an Enterprise Resource Planning (ERP) system implementation framework that would serve as a tool for improving the university's operational efficiency.

Method - In this study, the ERP critical success factors were determined through the Delphi Method, and weights were assigned to indicate their importance based on experts' consensus using Principal Component Analysis. Data collated from the selected state universities were summarized and treated to determine their readiness for the ERP system.

Results - It was observed that the university with high awareness and the finest ICT practices has a strong potential in adopting the system. The organizational and socio-economic factors identified remarkably have a greater impact on the successful implementation of the system, thus, achieving this requires improvement in organizational performance and effectiveness. Generally, most of the universities in the study are ERP-ready and find the proposed framework highly acceptable as a useful reference.

Conclusions - Strong executive leadership and commitment are essential elements to ensure success. It was also established that the socio-economic factors are more perceptible, therefore, enhancing employee's knowledge of the benefits of the ERP system can increase their flexibility and involvement in ERP system projects.

Recommendations - It is recommended that these universities consider using the Readiness Assessment provided in this study to assist in decision-making and the proposed framework as a guide in planning and strategizing for effective ERP implementation.

Practical Implications -The framework developed may be used as a springboard for improving the university's IT infrastructure and for upgrading their technologies leading to enhanced user experience and increased operational efficiency. This can further serve as the basis for policy intercession in the future.

Keywords – State Universities, ERP System, Critical Success Factors, Readiness Assessment, Implementation Framework

INTRODUCTION

Higher Education Institutions (HEIs) worldwide are influenced by existing modern technology and are concurrently affected by environmental pressures for change, including globalization, government pressures, and generally the diverse expectations of stakeholders. More efficient management processes are required to cope with these continuing changes. Universities were challenged to adopt new strategies using ERP systems to improve their performance and outlive the highly competitive environment in education. Higher education institutions resort to using Enterprise Resource Planning (ERP) Systems to cope with this changing environment (Abugabah & Sanzogni, 2010). The academe is now more aware of the advantages of ERP not only in instruction and research but also in the aspects of administration and operation. Unlike other applications, little research has been conducted about ERP systems in a university environment, and yet, it is the largest software application adopted by universities, along with significant investments in their implementation (Rani, 2016)".

The Commission on Higher Education (CHED) in the Philippines, is determined to make the country's education system globally at par with that of highly industrialized countries. Given this fast-paced globalization driven by information and communication technologies, the government is committed to affording free quality tertiary education by providing a higher budget with allocation for research, ICT development, and campus modernization (Crisolo, 2018). The "Higher Education Modernization Act of 1997," CHED Memorandum Order No. 20, and "Public Higher Education Reform Framework" granted state universities and colleges (SUCs) the right to corporatize and manage their incomes. Thus, the assessment of the income collection and utilization of SUCs has become mandatory (Manasan & Revilla, 2015). The regulated support and increased expectations have paved the way for the opportunity to adopt software systems in their operations, particularly in planning their resources. The categorical taxonomy of higher education planning includes academic planning, resource planning, and facilities planning. Resource planning includes human resources, budget, and procurement planning. These are critical areas of an institution's administration and management and at the same time the areas that are closely monitored and controlled by government agencies including the Department of Budget and Management (DBM), Commission on Audit (COA), and Civil Service Commission (CSC).

The SUCs in Region IVA area that were covered in this study is comprised of five (5) state universities that have envisioned their institutions to be a 21st-century university that provides excellent education to their clients. Though there is existing utilization of Information Systems (IS) in these universities such as electronic enrolment and payment, electronic remittances, accounting systems, and tracking systems, none among them are investing in the use of an ERP system. Currently, these information systems are only partial and are not fully integrated thereby affecting their operational efficiency. Long queues to avail of university services influenced students' satisfaction. There is no established system to track down the students' lifecycle in the university. Real-time data access is limited thus, decision-making is compromised and higher operational costs are incurred. Inadequate technologies are not readily available for personnel which resulted in lower motivation and high turnover. ERP system can be used as an answer to address these concerns. ERP is a software system that integrates all business functions in the educational environment including the integration of systems for student administration, human resource management systems, and financial systems (Rani, 2016). This is a solution that state universities may adopt to integrate and increase the efficiency of their processes.

This study aims to develop a framework for ERP system implementation that can be utilized by selected state universities in Region IVA. Specifically, it seeks to describe the present status of these state universities including their profile, ICT practices related to ERP solutions, ICT challenges, and perception of ERP system. It also intends to identify the critical success factors (CSFs) in terms of organizational, tactical, and technological factors, as well as other factors such as risks, socio-economic, and sustainability factors for implementing an ERP system. Further, this study seeks to assess the level of readiness of these universities for an ERP system and then develop an ERP system implementation framework based on their readiness level and determine its acceptability. The framework is expected to serve as a tool in planning and strategizing for campus ERP, as a guide for increasing operational efficiency, and as a reference for upgrading their technologies in general. This research is limited to the study of the above-mentioned variables and covers university data from 2015 to 2020.

LITERATURE REVIEW

Enterprise Resource Planning

According to Jacobs (2018), "From the managers' point of view, the term Enterprise Resource Planning (ERP) is a comprehensive software approach to support decisions concurrent with planning and controlling the business. For the information technology community, ERP is a software system that integrates application programs in the different functions of the organization such as finance, manufacturing, supply chain management, sales and marketing, human resources, and others. This integration is accomplished through a database shared by all the functions and data-processing applications (Jacobs, 2018). Experts have a consensus that implementing an ERP system can increase the reliability of internal control and increase the value of sustainable operations (Huang et al., 2019). For Abugabah and Sanzogni (2010), an ERP system is used by organizations to integrate their operations between different functional areas and focus on having their data accomplished in one place to extract information and enhance their decisions. ERP system allows organizations to re-engineer, not simply automate, their business processes. ERP system increases the level of productivity and profitability by providing capacity for better data analysis, and improved organizational performance and efficiency (Soliman & Karia, 2016). According to Rani (2016), it is a software system that processes institution-wide transactions on a single software system and a single database. These multi-functional systems are designed to streamline almost every aspect of how institutions operate. The studies of Ara and Al-Mudimigh (2011), defined ERP as a management technique and the key to successful implementation is through the use of a project management life cycle. Many companies regard ERP system implementation as a project management. ERP projects involve various management functions, including 5 phases of project management such as project initiation, planning, execution, control, and closing. Caldwell (2020) cited that "ERP implementation is a multi-phase project commonly managed by a project team composed of stakeholders from all functional groups in the organization and the process typically takes a few months up to a year at large organizations. The project includes reengineering business processes to take advantage of the new system's capabilities, configuring the software, migrating the organization's data, and training users".

ERP in Higher Education Institutions

Government support for higher education is gradually declining as they prepare these institutions to become self-sustaining. These caused higher education institutions to resort to using ERP systems to cope with this changing environment (Abugabah & Sanzogni, 2010). ERP in education is the main integration of all its business functions which involves the integration of systems for student administration, human resource management systems, and financial systems. Universities differ from other organizations because they have different environments and situations, and they use ERP technologies for academic purposes. Faculty and staff commonly interact with core institutional

activities through ERPs, and students need more information and better E-learning environments (Abdulghaffar, 2010). Most of the HEIs are non-profit organizations and strictly follow government policies. HEIs mainly have two activities, administrative activities, and academic activities. Administrative activities include human resources, finance, procurement, general administration, etc. while academic activities include student admission to publishing results, attendance, class schedule, course bidding, etc. Even though these two are different activities, both are interconnected (Rabaii, Bandara, & Gable, 2009).

Sabau et al. (2009) emphasized that the basic aim of ERP implementation is to help improve schools and colleges and increase their research productivity and teaching effectiveness at a reasonable cost. Their study enumerated ERP's advantages for higher education including (1) More accurate information access for planning, decision-making, and managing the institution as well as its functional areas such as human resources, skill management, planning, budgeting and forecasting, research, project management, as well as accounting; (2) Increased returns and decreased expenditures; and (3) Quality services for the faculty, students, and employees since they can access integrated, and validated information in real-time. Integrated workflow reduced or eliminated the manual processes. Soliman and Karia (2016), enumerated in Table 1 the main characteristics of ERP systems and their usefulness for HEIs. Although the implementation of ERP in HEIs has numerous benefits, it is perceived as challenging. On the other hand, ERP vendors are also aware of this fact, which is why they already developed and expanded their solutions to cater to the needs of the HEIs (Rani, 2016). Organizations must ensure that the chosen ERP system covers the complete university's business processes. Understanding the current system and the existing process must be done before implementing ERP to identify the changes required at the time of implementation (Hidayanto, 2013). The ERP system should convey value to the user through experiences and the benefits derived from using the system. Their perceptions of its usefulness and usability affect their "behavioral intention" to use the ERP system (Calisir et al., 2009; Ruivo et al., 2012 cited in Lofty, 2015). According to Buverud et al. (2011), it is crucial and important to identify ERP benefits from the user's point of view because the user's awareness of ERP benefits impacts ERP implementation success.

Table 1. Main Characteristics of ERP Systems and Usefulness for HEIs (Soliman & Karia, 2016)

Characteristics	Usefulness
Integration	Increase data integrity and reliability through a campus-wide integration on a common system.
Completeness (Generic function)	A single platform that provides more unified integration between education delivery and technology.
Homogenization	Maintain consistent data definitions to support sophisticated data analysis for decision-making.
Real-Time	Access to data in real-time.
Adaptability	Accessible and user-friendly support services to students, faculty, and management.
Best Practices	Industry best practices provide integrated workflow and less manual processes.

Higher Education Institutions particularly the State Colleges and Universities (SUCs), are now required by the government of its performance based on outputs and outcomes. In the Philippines, HEIs were given the right to manage their income but correspondingly, are also subjected to an assessment on how they allocate and utilize it (Manasan & Revilla, 2015). The regulated support and increased expectations from the government and stakeholders have led them to adopt software systems in their operations, particularly in planning their resources. Nowadays, the academe has a better understanding and enhanced level of awareness of the advantages of ERP not only in instruction and research but also in the aspects of administration and operation (Rani,

2016). At present, most HEIs have computerized their academic and administrative activities, but all are in bits and pieces. Systems are not integrated which requires manual intervention. Aside from that it is time-consuming, there is a lack of transparency, and sometimes prone to human error. If the system is properly integrated, it will greatly improve the overall working efficiency and proper academic planning, and it may also improve the quality of education (Rabaii, Bandara, & Gable, 2009).

At present, few studies have been conducted about ERPs in a university environment, compared to other environments, even though it is often the largest software application adopted by universities (Soliman & Karia, 2016). It is still in the infancy stage so it should be tailored specifically to address the academic functionality (Abugabah, 2010). ERP for higher education should start with the organization structure including strategy/policy, data flow, business process structure, and academic functionalities (Noaman & Ahmed, 2015). Sabau et al. (2009), enumerated different functionalities of an ERP system in higher education including admission, semester scheduling, graduation, human resources, financial, reporting, and general aspects such as automatic ID generation and communication. Table 2 summarizes the different benefits derived from the ERP system.

Table 2. Types of ERP System Implementation Benefits (Tarhini, 2015)

Types	Description
Operational benefits	Automated cross-functional processes.
IT infrastructure benefits	Reduction in cost of maintaining legacy systems.
Tactical benefits	Use of data for better planning and resource management.
Strategic benefits	System's ability to support business growth.
Organizational benefits	Acceleration of business learning, empowerment of staff, higher employee morale and satisfaction.

Critical Success Factors for Implementing ERP System

Critical success factors (CSFs) are those factors that need to be considered and managed to ensure the success of a project and to explain differences in project outcomes (Huang et al., 2019). Exploring the critical factors will provide sufficient information as to why they are critical and to what extent they are important to users, vendors, and consultants (Curko, 2012). Various CSFs were studied and despite the diversity, some factors are commonly stated by authors. Alturkistani (2015), concluded that the extensive research on implementation's critical success factors are valuable assets that could be used to build new implementation methods. An assessment of critical factors is essential before ERP deployment. Zouaghi & Laghouag (2013), indicated that effective ERP implementation, yielding operational, managerial, strategic, technological, and organizational benefits, is commonly based on an appropriate implementation strategy as well as a set of objective factors that contribute greatly to the project's success.

According to Dezdar (2012), the nature of ERP implementation problems should be analyzed in terms of strategic, organizational, and technical dimensions. Rajan & Baral (2015), considered technology, organization, and user as important factors and predicted that factors relating to individual and organization will together contribute to the adoption decision of the ERP user. Sabau, et al. (2009), proposed a unified success factors model. This model divided the critical factors into four (4) perspectives: strategic, tactical, organizational, and technological. Strategic factors are related to the mission of the project and management support, focusing mainly on planning while tactical focus on implementing. The organizational perspective focuses on organizational structure, culture, and business processes. The technological perspective focuses on the technical aspects like IT infrastructure, hardware, and software requirements for configuring an ERP system. The tactical perspective includes communication and interdepartmental cooperation. The analysis of ERP literature shows that the organizational aspects are

more important than the technological aspects. ERP is a management technique and involves various management functions (Ara & Al-Mudimigh, 2011). The major problems of ERP implementation are not technological but are mostly organization and human-related issues. The extant literature reviews showed that CSFs are evolving but top management commitment is still at the top of ERP implementation success (Arthur, 2017). Organizational factors include top management support, project scope, and user involvement (Sabau et al., 2009). Organizational support and training (Rajan & Baral, 2015). Top management support, organization plan and vision, culture, implementation strategy, and allocating resources (Curko et al., 2012). Resources and budget (RSM, 2016). Clear definition of needs and objectives, ownership by stakeholders, adequate technology planning, and user involvement (Zouaghi & Laghouag, 2012). The compilation of critical success factors collated from various references is summarized in Table 3 below.

Table 3. List of Common ERP Critical Success Factors

Critical Success Factors	Corresponding References
Top management support and commitment	Nallaperumal, 2020; Kiran, 2019; Arthur, 2016; Tarhini, 2015; Alturkistani, 2015; Guido, et al., 2015.
Organization support	Rajar & Baral, 2015; Rajan & Baral, 2015.
Project schedules/ plans	Nallaperumal, 2020;
Project goals and objectives	Nallaperumal, 2020; Tarhini, 2015; Arthur, 2016.
Project management	Nallaperumal, 2020; Alaqeel, et al., 2017; Arthur, 2016; Tarhini, 2015.
Change management	Arthur, 2016; Tarhini, 2015; Alturkistani, 2015.
User involvement	Tarhini, 2015.
Implementation strategy	Nallaperumal, 2020; Guido & Pierluigi, 2015.
Business Process Reengineering (BPR)	Nallaperumal, 2020; Alaqeel, et al., 2017; Arthur, 2016; Guido & Pierluigi, 2015; Tarhini, 2015.
Resources	Tarhini, 2015.
Communication	Nallaperumal, 2020; Arthur, 2016; Tarhini, 2015.
Legacy systems	Guido & Pierluigi, 2015.
Project team	Kiran, 2019; Arthur, 2016; Tarhini, 2015.
User training and education	Nallaperumal, 2020; Kiran, 2019; Alaqeel, et al., 2017; Arthur, 2016; Alturkistani, 2015; Tarhini, 2015; Rajan & Baral, 2015.
Consultants	Nallaperumal, 2020; Tarhini, 2015; Kiran, 2019.
Culture	Nallaperumal, 2020;
IT Infrastructure	Nallaperumal, 2020;
Scope of the project	Kiran, 2019.
IT maturity	Akiki et.al., 2012; Adbelghaffar & Azim, 2010
Testing	Nallaperumal, 2020; Kiran, 2019.
System customization	Nallaperumal, 2020; Alturkistani, 2015; Tarhini, 2015; Guido & Pierluigi, 2015.
Costs	Nallaperumal, 2020; Alturkistani, 2015.
ERP selection	Nallaperumal, 2020; Tarhini, 2015.
People resistance	Nallaperumal, 2020; Guido & Pierluigi, 2015.
Data Migration	Alturkistani, 2015
System Integration	Alaqeel, et.al., 2017.
Fit between IT & dept.	Heierhoff, 2011; Alturkistani, 2015; Rajan & Baral, 2015.
Dedicated staff	Arthur, 2016; Tarhihi, 2015.
Project/technology planning	Nallaperumal, 2020; Kiran, 2019; Arthur, 2016.
Technical limitations	Abubagah, 2010
ERP vendor support	Tarhini, 2015.
Troubleshooting	Tarhini, 2015.
Steering Committee	Tarhini, 2015.
Understanding requirements	Alturkistani, 2015; Guido & Pierluigi, 2015
Monitoring and performance evaluation	Curko, et al., 2012; Akiki et al., 2012
Assign roles and responsibilities	Hidayanto et al., 2013; Heierhoff, 2011

Risks and Challenges Associated with ERP Implementation

Ahmad et al. (2016), enumerated that lack of top management participation in the implementation, misunderstanding of the importance of the ERP system, resistance to change, inadequate financial resources, complexity, and too many requirements were identified as barriers to implementing Campus ERP. According to Soliman & Karia (2016), much of the research indicates that the failure of implementation is not the ERP software in itself but the high level of complexity of the number of changes that ERP causes. The major problems of ERP implementation are non-technologically related issues but mostly are organization and human-related issues. The top ten risk factors of ERP system are (1) lack of top management commitment; (2) ineffective communication; (3) insufficient training; (4) weak user support; (5) lack of effective project management; (6) legacy system; (7) misunderstanding between users; (8) unqualified project team composition; (9) ineffective process engineering; and (10) misinterpreting change requirements.

In the study of Tsai et al. (2010), ERP implementation requires a substantial number of investments and takes many years to complete. More so, their effectiveness is hard to evaluate. According to Features (n.d.), the most common reasons for ERP failure are poor planning and poor project management, poor change management execution, and change in organization goals during the ongoing project. On the other hand**,** the biggest challenge may be seen in the fact that ERP is costly and there are possibilities for employees' resistance (Alshaer, 2016). "The ERP system can persuade universities to take on a more practical approach to education. Cultural changes are another consequence. Further, the ERP system may result in a loss of academic control that increases the transparency of academic transactions due to its administrative authority model of governance. Another challenge is the dynamic and complex large integrated packaged solute, an IT staff or management who are sufficiently well-trained to understand these complexities may not be available in the universities (Soliman & Karia, 2016)". The table below shows the top ten risk factors of ERP implementation.

Table 4. Top Ten (10) Risk Factors of ERP System (Soliman & Karia, 2016)

Priority	Factors
1	Lack of top management commitment
2	Ineffective communication
3	Insufficient training
4	Weak user support
5	Lack of effective project management
6	Building bridges to legacy system
7	Misunderstanding between department users
8	Unqualified project team composition
9	Ineffective business process reengineering
10	Misinterpreting change requirements

Based on the published work of Caldwell (2020), common ERP implementation challenges include: (a) Project management; (b) Project planning; (c) Data integration;(d) Data quality; (e) Change management; (f) Cost overruns; and (g) Continuous improvement. Rani (2016) emphasized that to improve the implemented education ERP projects, there must be successful communication and cooperation between two completely different groups of people: the management of the HEI who is not familiar with IT, its development, and implementation; and IT experts who usually lack experience on implementing IT solutions for the special needs of the academe. According to Ganesh and Mehta (2010), the Critical Failure Factors (CFFs) of ERP implementation must also be identified to capture the full benefits of ERP systems. Hausmann et al. (2014), concluded that 45% of organizations report significant challenges in enforcing company-wide policies and in gaining departmental support. Even though an ERP strategy can lead to significant benefits, the challenge lies in effectively implementing it across the entire organization.

ERP Readiness Assessment

A readiness assessment is a method by which different dimensions of the organization are assessed and the readiness of each section for the ERP system is evaluated. It is a separate stage carried out before the implementation phase to determine the organization's readiness for an ERP system (Shiri, 2015). It is conducted to determine whether an organization has outgrown its current systems, where weaknesses exist, and if they are ready for a new ERP platform (RSM, 2015). Key findings from the readiness assessment include key strengths, areas to develop, possible challenges or barriers to effective change and implementation, and potential strategies for addressing the challenges or barriers (Capacity Building Center for States, 2019). The common method in creating a practical framework of ERP implementation readiness assessment is generally divided into four stages: Stage 1. Identifying the determinants of ERP implementation readiness; Stage 2. Building an assessment tool using the identified determinants; Stage 3. Determining significance or weight of each determinant; and Stage 4. Creating an assessment scheme for each determinant of ERP implementation readiness (Hidayanto, 2013). Alaqeel et al. (2017), emphasized that successful ERP implementation in higher education includes assessment of the institution's readiness, commitment to change, adequate amount of resources, involvement of the right stakeholders, accurate and accessible data, and investment in training and change management. Hausmann et al. (2014), conferred that there must be a clear understanding of the issues and challenges to achieve greater effectiveness in IT projects. Demographic information is also a factor to consider to scrutinize possible differences between organizational sizes.

Assessing other factors affecting ERP implementation is also indispensable. Risk readiness is conducted to promote a common understanding of good practices and a means to consistently assess risks (http://www.responsiblemineralsinitiative.org). On the other hand, socioeconomic readiness impacts the organization's quality of life. This readiness needs to be recognized to assist the management in strategizing interventions that foster both social and cognitive readiness. Eliminating hindrances to quality of life and opportunities exploration are ways to attain socio-economic readiness (Buheji & Ahmed, 2020). According to Barletta et al. (2021), sustainability readiness is used to address organizations' needs for building sustainable capabilities. A high sustainability readiness means that the organization's sustainability strategy is being implemented. Soft aspects such as competence, capabilities, responsiveness, and adaptation come into play to effectively adapt to changing environments. To best understand the requirements for the new system and to select an appropriate ERP system, organizations should conduct an internal audit of all their existing processes and policies.

Framework for Implementing ERP System

Developing a framework helps to provide a better understanding of how the process can be managed to bring benefits to the implementing organizations (Govindaraju, 2012). Fryling mentioned that a framework that produces success in an ERP implementation entails extensive research on ERP, management commitment, a well-defined plan for the project, empowered decision-makers, effective project management skills, and reliable resources dedicated to the project (as cited in Arthur, 2016). The paper of Ahmad et al. (2011) has designed a campus ERP implementation framework divided into four phases, which was patterned from a hybrid framework developed by previous scholars (Table 5).

Another framework was developed in the study of Subramanian (2018) emphasizing a risk-based approach to ERP implementation. It is composed of six (6) phases including preparation (acceptance and selection stage), planning (contract, project timeline, framework, implementation strategy, and technical infrastructure), implementation (deployment and configuration, data migration and testing), "Go Live" (organizing "go-live" and training), integration and risks management. Managing

complex changes to practice and policy is a characteristic of an effective implementation framework. It should stress the need to deviate from the status quo and the guarantee of achieving the shared vision. The team members should also have a clear understanding of their roles, responsibilities, and accountabilities (bushcenter.org/publications/resourcesreports). According to Hadfield (n.d.), the framework should give the users a chance to walk through the system and should have the following characteristics: (a) Holistic (people, process, tools)- consider the organization and processes and do not focus on technology alone; (b) Quality-Focused – establish documentation and provide reports to clarify the actual cost savings and to see the benefits of the results; and (c) Embrace Uncertainty – build in system reviews throughout a project. In the study of Donkor (2011), the learner's acceptance of technology was assessed using the Technology Acceptance Model (TAM). Its hypothesis proved that perceived usefulness and ease of use of technology are predictors of user attitude toward using the technology, following behavioral intentions, and actual usage.

Table 5. Detailed Campus ERP Framework (Ahmad et al., 2011)

Phase	Deliverables	Responsibilities
1	**Project Initiation** a. Business environment analysis b. Internal analysis c. External analysis d. Current ICT environment analysis e. Selection	User (Administrator, IT Department, Academic Department, Student Affairs Department, Finance Department, Human Resource Department)
2	**Project Preparation** a. Scope and objective of the project b. Schedules c. Project organizational structure d. Policy and procedure	User, Consultant, Vendor
3	**Realization** a. Business Requirements b. Test scenario c. Integration methodology d. Migration Plan e. Skills development f. "Go-Live" g. Acceptance test	User, Consultant, Vendor
4	**Operation and Maintenance** a. Post-implementation plan b. Reporting	User, Consultant, Vendor

CONCEPTUAL FRAMEWORK

The paradigm below describes the present status of the selected state universities with consideration of their profile, ICT practices, ICT challenges, and perceptions about ERP. The different dimensions and predictors called Critical Success Factors (CSFs) are also included as inputs to ensure the success of the ERP project. These CSFs are then subjected to the Delphi Method and Principal Component Analysis to determine the weight of each CSF, followed by the assessment of universities' readiness for an ERP system. The resulting readiness level led to the development of the framework for implementing the system.

METHODOLOGY

Research Design

The descriptive research design and in-depth qualitative method were used in gathering, analyzing, and interpreting the data from the respondents. These methods

enable the assessment of the existing ICT status of the selected state universities and their opinions about the readiness of their university for an ERP system.

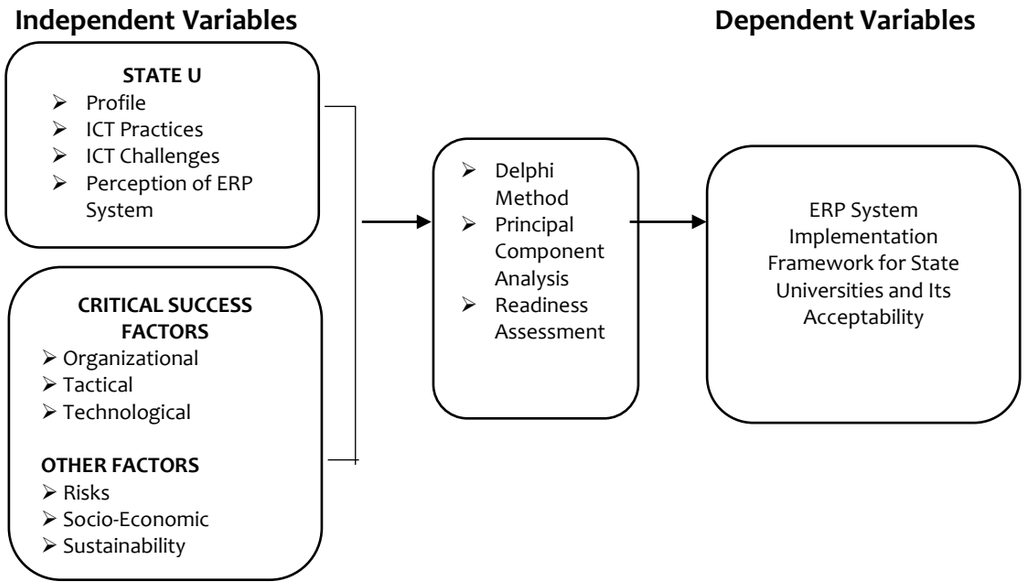

Figure 1. Research Paradigm

Respondents of the Study

The main respondents were composed of 145 personnel from five selected State Universities (SU) in Region IVA coded as SU1, SU2, SU3, SU4, and SU5. These universities are state-funded in the region providing full tuition subsidy for students. The respondents were taken from both the main and satellite campuses of these universities since they are stand-alone campuses with complete administrative offices where all the university operations and transactions are conducted, and where major ICT facilities are located. Other data sources included 13 participating employees from 10 selected industries who acted as expert panels for the Delphi Method. Both the respondents and participants were categorized into 3 groups comprised of an administrator, IT personnel, and a system user.

Data Gathering Procedure

Data were collected through surveys, interviews, and extensive literature reviews. Following the interview, the researcher prepared an initial survey instrument for profiling and for determining the present ICT status of the state universities, simultaneous with listing down Critical Success Factors (CSFs) sought through extensive literature. It was followed by benchmarking with industry ERP implementers/ experts through the Delphi Method using the collated CSFs from Table 3 and Table 4. These experts provided additional inputs and assisted the researcher in categorizing the CSFs into different dimensions (organizational, tactical, technological, and other factors). Data from the Delphi Method were then tallied using Frequency Count and Percentages. An Interquartile Range (IQR) was used to determine their consensus for each CSF. CSFs chosen by at least 60% of the expert panels are regarded as critical for potential ERP system implementation. Mean values of the ratings were used for assigning weights of the CSFs through Principal Component Analysis. This weight indicates CSF's importance based on experts' consensus. PCA has many alternative uses, among which is assigning weights while computing an index (Sendhil et al., 2017).

Research Instrument

The final survey instrument was constructed by incorporating the identified CSFs with the previously prepared survey instrument for assessing the state universities' readiness for the ERP system. This instrument was tested for validity using the Average Congruency Percentage (ACP) and Content Validity Index (Saiful & Yusoff, 2019) for

Individual Items (I-CVI) while its reliability was tested using Cronbach's Alpha. The survey was then administered to the selected state universities. Responses collated were summarized using weighted mean and standard deviation.

Statistical Treatment

To find the significant difference among the responses of the different groups of respondents within a university, a one-way analysis of variance (ANOVA) was applied. Pearson Correlation was used to test the significant relationship between the university's ICT status and its readiness for an ERP system. Then the total readiness values were computed followed by the ranking method to show the universities' readiness levels. An ERP system implementation framework was then developed based on their level of readiness and then tested for its acceptability. Acceptability testing was summarized using weighted mean and percentages. Kruskall-Wallis was also introduced to determine the significant difference among the state universities based on their ranking. SPSS was used to compute the above statistical data. The rating scales used for interpreting the readiness level are shown in the table below:

Table 6. Rating Scales Table for Interpreting Readiness Values

Rating Scale	Point Intervals						Verbal Interpretation
	Org'l	Tact'l	Tech'l	Risk	SocEco	Sust	
5 4 High	1.40-1.80	0.98-1.45	1.18-1.75	1.01-1.50	1.24-1.85	1.11-1.65	Ready
3 Medium	0.70-1.30	0.49-0.97	0.59-1.17	0.51-1.00	0.62-1.23	0.56-1.10	Approaching Readiness
2 1 Low	0.00-0.60	0.00-0.48	0.00-0.58	0.00-0.50	0.00-0.61	0.00-0.55	Developing Readiness
Point Intervals = Highest Rating Scale x Category Weight							

RESULTS

Selected State Universities Current Status

Profile

The data in the table below shows that budget allocation does not depend on the number of programs offered, the number of workforce, or the number of enrollees but on university performance. A separate budget is allocated annually for ICT development, which means that these universities have enough available resources to finance any ICT projects as long as it is included in their procurement plan. They can explore technology improvement opportunities that can be part of their ICT development projects to help them manage their budget and income more efficiently. Table 7 below shows the ranking of the state universities based on the enumerated profile.

Table 7. Summary Ranking of State Universities' Status in Terms of Profile

State Univ.	Yrs. of Existence (1 being the oldest)	No. of Campuses (Man, Satellite, Extension)	SUC Level	Total No. of Programs Offered	% of Programs Accred.	No. of Work force	Ave. No. of Enrollees (2015-2020)	Ave. Budget (2015-2020)	Ave. Budget for ICT Devt.
SU1	1	3.5	1.5	2	3	2	2	1	1
SU2	4	1	1.5	1	5	1	1	2	2
SU3	2	5	4	4	1	4	3	4	4
SU4	3	2	4	5	2	5	5	5	5
SU5	5	3.5	4	3	4	3	4	3	3

ICT Practices, Challenges, and Perceptions

Due to the high involvement of the majority of the respondents in their existing ICT practices, they were not burdened with the challenges they encountered. There is also high awareness about ERP systems which may be attributed to organizational orientation on process improvement opportunities and widely disseminated ICT projects. It is true that nowadays, the academe has a better understanding and enhanced level of awareness of the advantages of ERP not only in instruction and research but also in the aspects of administration and operation. User awareness of ERP benefits impacts implementation success. Table 8 below revealed that SU5 topped in ICT practices and awareness about ERP systems but oppositely the one which experienced high ICT challenges while SU2 turned out to be at the bottom, though they only have faced moderate challenges.

Table 8. Summary of State Universities' Status in terms of ICT Practices, Challenges and Perceptions

State Universities	Ave. WM	ICT Practices	Ave. WM	ICT Challenges	Ave. WM	Perception of ERP System
SU1	3.74	Highly Practiced	2.64	Moderately Present	3.52	Very Much Aware
SU2	2.82	Moderately Practiced	2.96	Moderately Present	2.94	Moderately Aware
SU3	3.54	Highly Practiced	3.17	Moderately Present	3.02	Moderately Aware
SU4	3.24	Moderately Practiced	3.32	Moderately Present	3.43	Very Much Aware
SU5	4.30	Practiced	3.91	Highly Present	3.85	Very Much Aware

Critical Success Factors (CSFs)

In this study, there are twelve organizational factors identified (Table 9). Based on the weights computed using PCA as shown in Figure 2, the availability of resources was found to be the most significant among the organizational factors while the change management program is the least important. Since an ERP system is quite costly, it is crucial to set aside suitable resources such as financial and human resources. Cost entails the amount spent on software, external services, and internal costs plus maintenance therefore adequacy of resources dedicated to the project and return tradeoffs must also be considered before committing to ERP implementation.

Table 9. Mean Distribution of Organizational Factors Based on Experts' Consensus

ORGANIZATIONAL FACTORS	Weighted Mean	Qualitative Description	Interquartile Range (IQR)
1. Training program	4.77	Absolutely Critical	0.5
2. Top management support and	4.69	Absolutely Critical	0.5
3. Technology planning	4.69	Absolutely Critical	1.0
4. Change management program	4.69	Absolutely Critical	1.0
5. Organizational flexibility	4.62	Absolutely Critical	1.0
6. Communication with stakeholders	4.54	Absolutely Critical	1.0
7. IT maturity	4.54	Absolutely Critical	1.0
8. Implementation strategy	4.46	Absolutely Critical	1.0
9. Scope of the company's IT-related projects	4.46	Absolutely Critical	1.0
10. Project management and evaluation	4.38	Absolutely Critical	1.0
11. Adequate resources	4.23	Absolutely Critical	1.0
12. User involvement and commitment	4.15	Very Critical	1.0
Average Weighted Mean	**4.52**	**Absolutely Critical**	

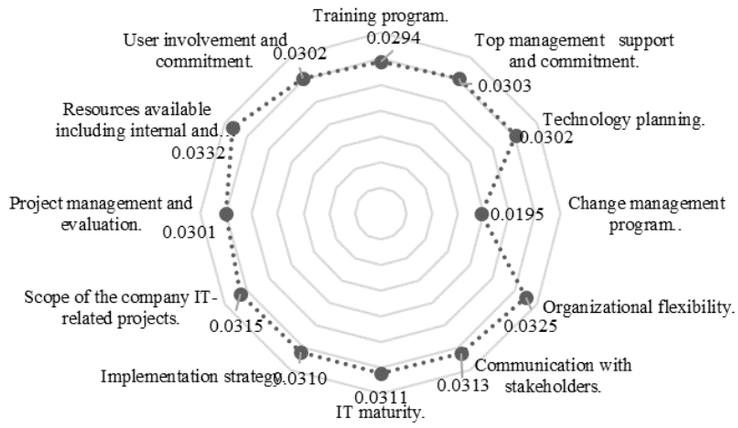

Figure 2. Organizational CSFs Weights

There are eleven (11) tactical factors chosen by experts (Table 10). The composition of the Project Team weighed the highest while the legacy system was weighted the lowest (Figure 3). Competent, capable, and multidisciplinary team members understand new processes better, so it is crucial to select the best personnel with the appropriate knowledge and skills for the project.

Table 10. Mean Distribution of Tactical Factors Based on Experts' Consensus

TACTICAL FACTORS	Weighted Mean	Qualitative Description	Interquartile Range (IQR)
1. Business process reengineering (BPR)	4.77	Absolutely Critical	0.0
2. Monitoring and feedback (e.g. process quality, innovative efforts, resistance to change, etc.)	4.77	Absolutely Critical	0.0
3. Project team	4.46	Absolutely Critical	1.0
4. User education and training	4.38	Absolutely Critical	1.0
5. Documentation of roles, responsibilities, and accountabilities	4.38	Absolutely Critical	1.0
6. Willingness to adopt e-working	4.31	Absolutely Critical	1.0
7. Enterprise-wide communication	4.23	Absolutely Critical	1.0
8. Formalized project plans and schedules	4.15	Very Critical	1.0
9. Software development	4.00	Very Critical	0.0
10. ERP vendor and consultant experience	3.77	Very Critical	0.5
11. The practice of legacy system	3.62	Very Critical	1.0
Average Weighted Mean	**4.26**	**Absolutely Critical**	

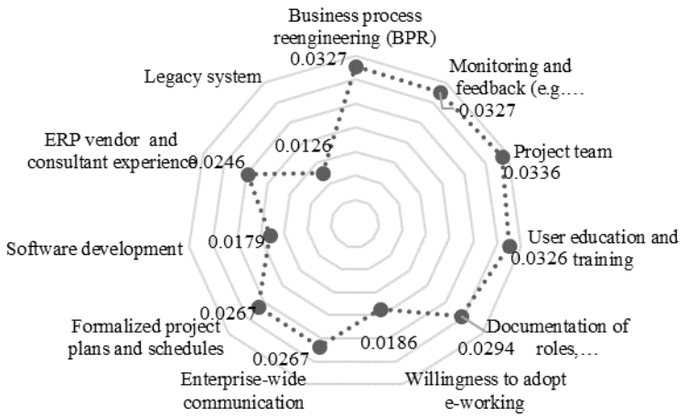

Figure 3. Tactical CSFs Weights

For technological factors, twelve (12) have been identified (Table 11). Partial automation of key processes was identified as the most essential technological factor.

Accordingly, this is a common economic option if finances are limited but this is still an advantage for later installation of the ERP system. The succeeding radar chart in Figure 4 illustrates the weights and importance of each factor.

Table 11. Mean Distribution of Technological Factors Based on Experts' Consensus

TECHNOLOGICAL FACTORS	Weighted Mean	Qualitative Description	Interquartile Range (IQR)
1. Well-established IT infrastructure	4.77	Absolutely Critical	0.0
2. System upgradeability	4.69	Absolutely Critical	0.5
3. Security	4.62	Absolutely Critical	1.0
4. Partial automation of key processes	4.38	Absolutely Critical	1.0
5. Centralized database	4.38	Absolutely Critical	1.0
6. Support from the existing IT vendors	4.31	Absolutely Critical	1.0
7. Vendor meets organizational needs	4.31	Absolutely Critical	1.0
8. Fit between software and processes	4.31	Absolutely Critical	1.0
9. Integration with other applications	4.31	Absolutely Critical	1.0
10. Preparedness for data migration and customization	4.31	Absolutely Critical	1.0
11. Open system architecture	4.23	Absolutely Critical	0.5
12. IT awareness program	4.15	Very Critical	0.0
Average Weighted Mean	**4.40**	**Absolutely Critical**	

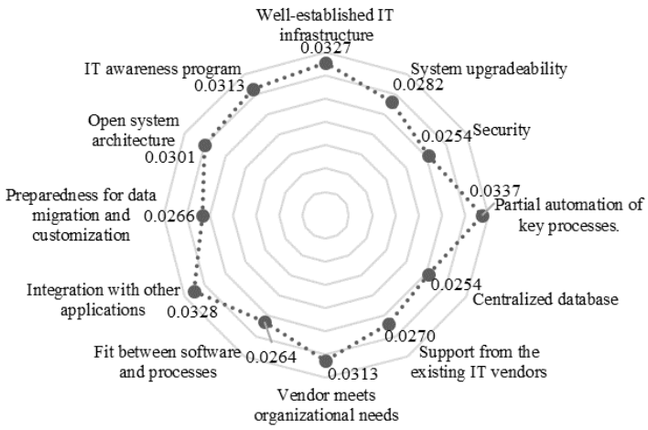

Figure 4. Technological CSFs Weights

Generally, organizational factors were also found to be the most important among the three CSF dimensions. This data worked in parallel with the pieces of literature that management commitment is still at the top of ERP implementation success. Organizational factors include top management support, organization plan, and vision, culture, implementation strategy, and allocation. All these factors emanate from the top management who leads the organization. Figure 5 below presents the weight of each dimension.

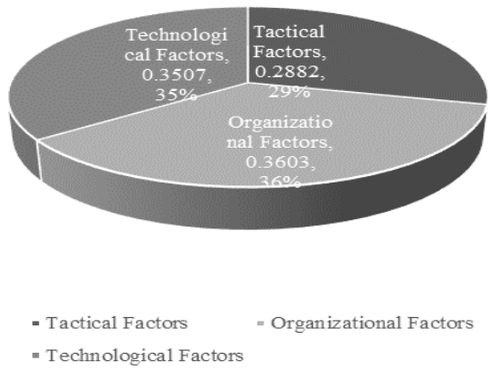

Figure 5. General Weights of the 3 Major CSFs Dimensions

Other Factors

Based on experts' consensus, there are ten risk factors identified (Table 12). The technical limitation is the most crucial among all the risk factors identified. This is the inability of either the computer software or hardware to achieve some functionality. Due to this, difficulties in integration and system fit could be possible. Figure 6 below shows the weights of each of these factors.

Table 12. Mean Distribution of Risk Factors Based on Experts' Consensus

RISKS FACTORS	Weighted Mean	Qualitative Description	Interquartile Range (IQR)
1. Misunderstanding of change requirements	4.46	Extremely Present	1.0
2. Inadequate testing plans	4.46	Extremely Present	1.0
3. Failure to get user support	4.31	Extremely Present	1.0
4. Attempts to build bridges to legacy application	4.31	Extremely Present	1.0
5. Lack of financial resources	4.23	Extremely Present	1.0
6. Technical limitations	4.15	Highly Present	1.0
7. Lack of top management support in the implementation	4.15	Highly Present	1.0
8. Lack of effective project management methodology	3.92	Highly Present	1.5
9. Conflicts between user departments	3.85	Highly Present	2.0
10. Resistance to change	3.85	Highly Present	2.0
Average Weighted Mean	**4.17**	**Highly Present**	

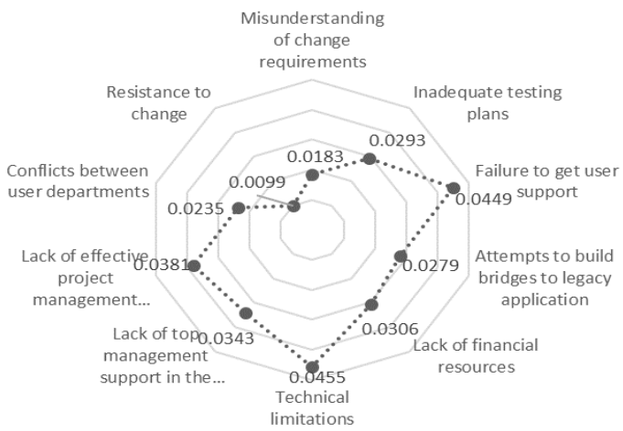

Figure 6. Weights of Risk Factors

On the other hand, Table 13 below presents eleven (11) socio-economic factors considered by experts. Figure 7 shows that the most essential are employee flexibility and

empowerment. This emphasizes the importance of "user value" which is a success measure of an ERP system.

Table 13. Mean Distribution of Socio-Economic Factors Based on Experts' Consensus

SOCIO-ECONOMIC FACTORS	Weighted Mean	Qualitative Description	Interquartile Range (IQR)
1. Increases data integrity, validity, and reliability	4.92	Extremely Evident	0.0
2. Increases productivity and improves performance	4.85	Extremely Evident	0.0
3. Up-to-date and timely information from the system	4.85	Extremely Evident	0.0
4. Streamlines business processes and reduces paper works	4.85	Extremely Evident	0.0
5. All information available and wider information dissemination	4.69	Extremely Evident	0.5
6. More efficient resource utilization	4.62	Extremely Evident	0.5
7. Adds flexibility and empowerment to do the job more efficiently	4.46	Extremely Evident	1.0
8. Provides detailed information for easy decision-making	4.23	Extremely Evident	1.0
9. Impacts individual performance	4.23	Extremely Evident	1.0
10. Decreases overall operating costs	4.23	Extremely Evident	1.0
11. Improves forecasting	4.15	Highly Evident	1.0
Average Weighted Mean	**4.55**	**Extremely Evident**	

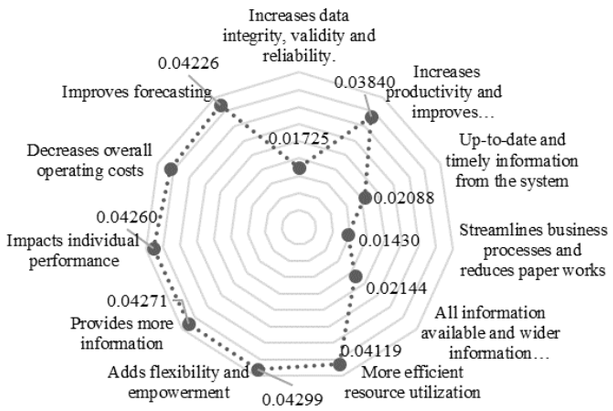

Figure 7. Weights of Socio-Economic Factors

For sustainability, there are twelve (12) factors found to be critical to ERP success (Table 14). Efficient communication and information dissemination were found to be the most important sustainability factor as shown in Figure 8 while the project management plan was the least.

Socio-economic factors have greater weight than the rest of the other factors. Socio-economic factors are more profound than the risk factors. This accounts for more apparent benefits that impact not only the organization but the individual employee as well. Risk identification is the key. Risks will be lesser since preventive and predictive approaches can be used to address the risk before ERP implementation. The distribution of their weights is shown in Figure 9 below.

Table 14. Mean Distribution of Sustainability Factors with Expert Panel Consensus

SUSTAINABILITY FACTORS	Weighted Mean	Qualitative Description	Interquartile Range (IQR)
1. Continuous top management support before and during implementation	4.77	Extremely Important	0.5
2. Qualified and experienced project team composition	4.77	Extremely Important	0.5
3. Consistent budget allocation for ICT development programs and projects	4.77	Extremely Important	0.5
4. Efficient communication and information dissemination	4.77	Extremely Important	0.5
5. Effective integration strategies	4.62	Extremely Important	1.0
6. Continuous education and training for managers, IT personnel, and process users	4.62	Extremely Important	1.0
7. Dedicated staffs	4.62	Extremely Important	1.0
8. Effective Project Management Plan for ICT projects	4.54	Extremely Important	1.0
9. Considerations of critical success factors in implementing ICT projects	4.54	Extremely Important	1.0
10. Dedicated consultants and ERP vendors	4.54	Extremely Important	1.0
11. Empowered steering committee	4.46	Extremely Important	1.0
12. Embedding sustainability in the organization's vision and mission	4.31	Extremely Important	1.0
Average Weighted Mean	**4.61**	**Extremely Important**	

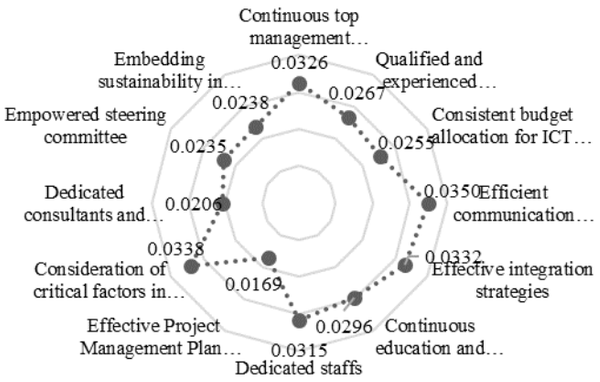

Figure 8. Weights of Sustainability Factors

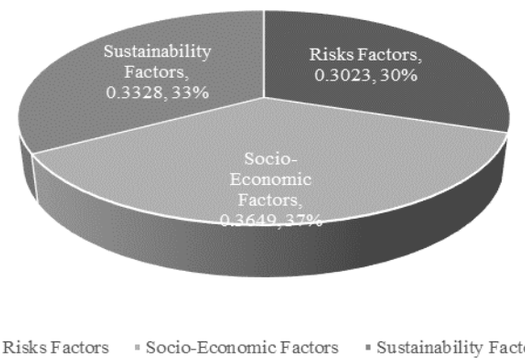

Figure 9. General Weights of the Other Factors

Readiness Assessment

A readiness assessment was conducted to determine whether the universities have outgrown their current systems, where weaknesses exist, and if they are ready for an ERP platform. Key findings from the readiness assessment include key strengths, areas to develop, possible barriers to effective change and implementation, and potential strategies for addressing the barriers.

Table 15 presents that SU1 ranked highest in organizational readiness. This indicates that it has potential for ERP system implementation. SU5, on the other hand, did not top in the most important dimension but led in the other two dimensions of technological and tactical factors, which made it the university with the highest readiness for the ERP system. This result may be linked to SU5's profile on ICT practices and high awareness about ERP. SU5 also topped in almost all individual factors on technological readiness, particularly in having partial automation of their key processes which is the most significant among the given factors. For tactical readiness, SU5 got the highest rank, particularly on the competency of the IT project team members. On the other hand, SU2 got the lowest rank in all major factors. They also have the lowest readiness value which also matches their ICT and awareness profile. This means that they need to put more effort into enhancing their readiness for the ERP system. Assessment of the universities' readiness based on the CSFs corresponds with the weight prescribed by the industry experts. The indices of the state universities are statistically significantly different.

Table 15. Readiness Ranking Based on the General Weights of the Critical Success Factors

Factors	**Total Weight**	**SU1**		**SU2**		**SU3**		**SU4**		**SU5**	
		Ave. WM	**TRV**	**Ave. WM**	**TRV**	**Ave. WM**	**TRV**	**Ave. WM**	**TRV**	**Ave. WM**	**TRV**
Org'l (36%)	.3603	4.14	1.4912	3.26	1.1745	4.14	1.4906	3.67	1.3231	4.12	1.4843
Rank			1st		5th		2nd		4th		3rd
Tech'l (35%)	.3507	3.92	1.3720	3.13	1.0978	4.08	1.4310	3.65	1.2802	4.22	1.4801
Rank			3rd		5th		2nd		4th		1st
Tact'l (29%)	.2882	3.97	1.1443	3.15	0.9080	3.98	1.1472	3.74	1.0781	4.13	1.1905
Rank			3rd		5th		2nd		4th		1st
TOTAL (100%)	1.000		4.0104		3.1803		4.0688		3.6814		4.1549
Overall Rank			**3rd**		**5th**		**2nd**		**4th**		**1st**

Note: TRV – Total Readiness Value = Total Weight x Ave. Weighted Mean

The correlation test also reveals that university readiness is correlated with ICT practices and challenges. Thus, improving ICT practices related to ERP solutions will lead to an increase in readiness while a decrease in the challenges will also increase readiness. Other factors such as socioeconomic, sustainability, and risk factors are equally important in implementing ERP. The universities' readiness assessment in terms of these factors was done to assist in eliminating hindrances, in strategizing interventions, and in building sustainable capabilities.

SU5 leads in rank in terms of socio-economic factors, which is the most important among "other factors" (Table 16). This means that the university and its personnel are socio-economically ready and knowledgeable of the ERP benefits. This will impact the personnel's behavioral intention to use the ERP system once they implement this in the future. The university is at the same rank in terms of risk readiness, which indicates that even if there is a possibility for more challenges along the way, particularly the most critical, which is technical limitations, the university can cope with this. SU5 topped the readiness for "other factors". Since these risks were already identified in this study,

proper strategies can be devised ahead. On the other hand, SU3 leads in terms of sustainability factors, particularly the most essential, which is efficient communication and information dissemination of their IT projects. SU2 consistently ranked last in all three categories. Their indices are also statistically significantly different

Table 16. Readiness Ranking Based on the General Weights of Other Factors

Factors	Total Weight	SU1		SU2		SU3		SU4		SU5	
		Ave. WM	TAV	Ave. WM	TAV	Ave. WM	TAV	Ave. WM	TAV	Ave. WM	TAV
SocEco (37%)	0.3649	4.22	1.5401	3.24	1.1824	4.20	1.5328	4.08	1.4890	4.24	1.5474
Rank			3rd		5th		2nd		4th		1st
Sust. (33%)	0.3328	4.13	1.3743	3.10	1.0315	4.26	1.4175	3.97	1.3210	4.12	1.3709
Rank			2nd		5th		1st		4th		3rd
Risk (30%)	0.3023	2.78	0.8404	2.89	0.8737	3.36	0.9855	3.41	1.0309	3.92	1.1850
Rank			5th		4th		3rd		2nd		1st
TOTAL (100%)	1.0000		3.7548		3.0876		3.9358		3.8409		4.1033
Overall Rank			**4th**		**5th**		**2nd**		**3rd**		**1st**

Note: TAV – Total Assessment Value = Total Weight x Ave. Weighted Mean

The overall readiness assessment shows that almost all the state universities except SU2 are now ready for possible ERP system implementation. Table 17 below indicates that 3 out of 5 universities or 60% are high in organizational readiness while 4 out of 5 or 80% are high in technological and tactical readiness. To elevate the organizational readiness of the other 2 universities, a stronger management commitment and support, as well as efficient organization planning and resource allocation, are necessary. As what has been written, this aspect is considered the most important. For "other factors", 2 out of 5, or 40% have high-risk readiness while 4 out of 5, or 80% have high readiness in terms of socioeconomic and sustainability aspects. To increase risk readiness, the 3 universities should take note of the identified barriers to implementing campus ERP and work out possible strategies to overcome these barriers and integrate them into the implementation plan. Research indicates that failure of implementation is mostly attributed to the complexity of changes brought about by ERP. More so, 1 out of 5 universities, or 20% has been assessed as approaching readiness for ERP system. A major effort should be exerted to improve their readiness in all dimensions.

Table 17. Summary Table of State Universities' Readiness for ERP System Implementation

State Univ	Org'l.		Tact'l.		Tech'l.		Risks		Soc-Eco.		Sust.		Verbal Interpretation
	Ave. WM	VI	Ave. WM	VI	Ave. WM	VI	Ave. WM	VI	Ave. WM	VI	Ave. WM	VI	
SU1	4.14	H	3.97	H	3.92	H	2.78	M	4.22	H	4.13	H	Ready
SU2	3.26	M	3.15	M	3.13	M	2.89	M	3.24	M	3.10	M	Approaching Readiness
SU3	4.14	H	3.98	H	4.08	H	3.36	M	4.20	H	4.26	H	Ready
SU4	3.67	M	3.74	H	3.65	H	3.41	H	4.08	H	3.97	H	Ready
SU5	4.12	H	4.13	H	4.22	H	3.92	H	4.24	H	4.12	H	Ready

Note: H = High; M= Medium; L= Low

ERP System Implementation Framework

The design foundation for the framework (Table 20; Figure 10) follows the main phases of the ERP implementation with due consideration to the uniqueness of the situation in government-owned higher education. Further, the readiness level of these state universities served as a pillar in developing the framework. Mainly, it is customized

for the said universities since the status of the factors considered were based on their current situation. Difficulties, weak and lacking areas were considered as areas for improvement. Since ICT practices and challenges could affect the readiness of the state universities for ERP systems, the existing difficulties should be properly addressed and included in the development of the implementation framework.

It is presented in Table 18 that the majority of the needs of the state universities for organizational readiness focused on the improvement of the Change Management Program while less alarming on the practice of legacy system which should be the least of their concern because it was weighted lowest by the industry experts and accordingly ERP system was meant to replace the old one, not to complement it. On the other hand, the technological readiness need of these universities lies in their existing internal system which may be addressed by allocating additional resources to improve their IT infrastructure before the potential implementation of an ERP system.

Table 18. Summary of Areas for Improvements Based on Assessment of Critical Success Factors

State Universities	**Critical Success Factors**		
	Lowest Weighted Org'l Readiness Factor	**Lowest Weighted Tact'l Readiness Factor**	**Lowest Weighted Tech'l Readiness Factor**
SU1	Existing Change Management Program	The practice of legacy system	Centralized database
SU2	Existing Change Management Program	The practice of legacy system	Data security
SU3	Existing Change Management Program	The practice of legacy system	Centralized database
SU4	Sufficiency of IT projects training program.	The practice of legacy system	Centralized database
SU5	Existing Change Management Program	The practice of legacy system	Data security

Table 19 presents that most of the risks that need to be addressed are human factors that may require top management initiative for improvement, particularly in proper planning, communication, and motivation. The rated socio-economic and sustainability factors which are true for all universities, are vital for a higher education ERP system since the cost of ERP might be too much for a non-profit university but can be economical in the long run if enhanced IT infrastructure and proper integration strategies are in place.

Table 19. Summary of Areas for Improvements Based on Assessment of Other Factors

State Universities	Other Factors		
	Highest Weighted Risks Factor	**Lowest Weighted Socio-Economic Factor**	**Lowest Weighted Sustainability Factor**
SU1	Users misunderstanding of change requirements	Probable decrease in overall operating costs	Integration strategies for new IT projects
SU2	Technical limitations	Probable decrease in overall operating costs	Integration strategies for new IT projects
SU3	Users misunderstanding of change requirements	Probable decrease in overall operating costs	Integration strategies for new IT projects
SU4	Failure to get user support	Probable decrease in overall operating costs	Integration strategies for new IT projects
SU5	Weak top management support	Probable decrease in overall operating costs	Integration strategies for new IT projects

Table 20. Details of State Universities ERP Implementation Framework

Phases	Activities	CSFs	Responsibilities
Pre-Project	a. Assess university readiness, anticipate risks and benefits b. Set goals for the project c. Define results	➢ Top management commitment ➢ Communication with stakeholders ➢ User Involvement ➢ Coordinating resources	• Management • IT Personnel • Faculty • Academic Dept. • Student Affairs Dept. • Finance Dept. • Human Resource Dept. • Administrative Dept.-Users-
Initiation	a. Select an appropriate ERP Software that matches the university's requirements b. A canvass of Vendors & Consultants and send RFP c. Create the Database in a spreadsheet/ CSV file d. Conduct Feasibility Study e. Contract with Vendors & Consultants	➢ Top management commitment ➢ University-wide communication ➢ Experienced vendor and consultants	• Management • IT Personnel • Faculty • Academic Dept. • Student Affairs Dept. • Finance Dept. • Human Resource Dept. • Administrative Dept. -Users-

Table 20. Details of State Universities ERP Implementation Framework (cont.)

Phases	Activities	CSFs	Responsibilities
Planning	a. Set specific project objectives & scope of implementation b. Chart a Project Plan/ Schedules with realistic timelines c. Organize Project Teams (Steering Committee and Project Working Committee) and assign roles d. Establish policies & procedures specific to the ERP system project	➢ Top management commitment ➢ Clear scope of IT project ➢ Technology Planning ➢ Project Teams ➢ Documentation of Roles ➢ Formalized and well-defined project milestone ➢ Support from IT vendor ➢ Implementation Strategy	• Users • Consultants • Vendor
Implementation	a. Conduct workshops to determine Business Process Requirements and identify customization points b. Customize and configure the software for the university c. Plan Testing Scenarios d. Make a Communication Plan including an IT awareness program e. Design Integration Strategies f. Migrate or convert university data from database or previous software g. Conduct Training h. Create a Change Management Program i. GO LIVE for full implementation j. User Acceptance Testing k. Documentation	➢ Top management commitment ➢ BPR and system customization ➢ Communication ➢ IT awareness program ➢ Project Management ➢ Integration Strategies ➢ Preparedness for data migration ➢ IT Education and Training Program ➢ Change Management Program ➢ Adequate resources	• Users • Consultants • Vendor • Project Teams
Maintenance	a. Establish Post-Implementation Plan - Support System - Changes/ Enhancements - System Upgrading - System Audits - Employee Retention/ Succession Program b. Standardize feedback mechanism and reporting	➢ Top management commitment ➢ System of monitoring and feedback ➢ Empowered decision-makers ➢ Users satisfaction level	• Users • Consultants • Vendor • Project Teams

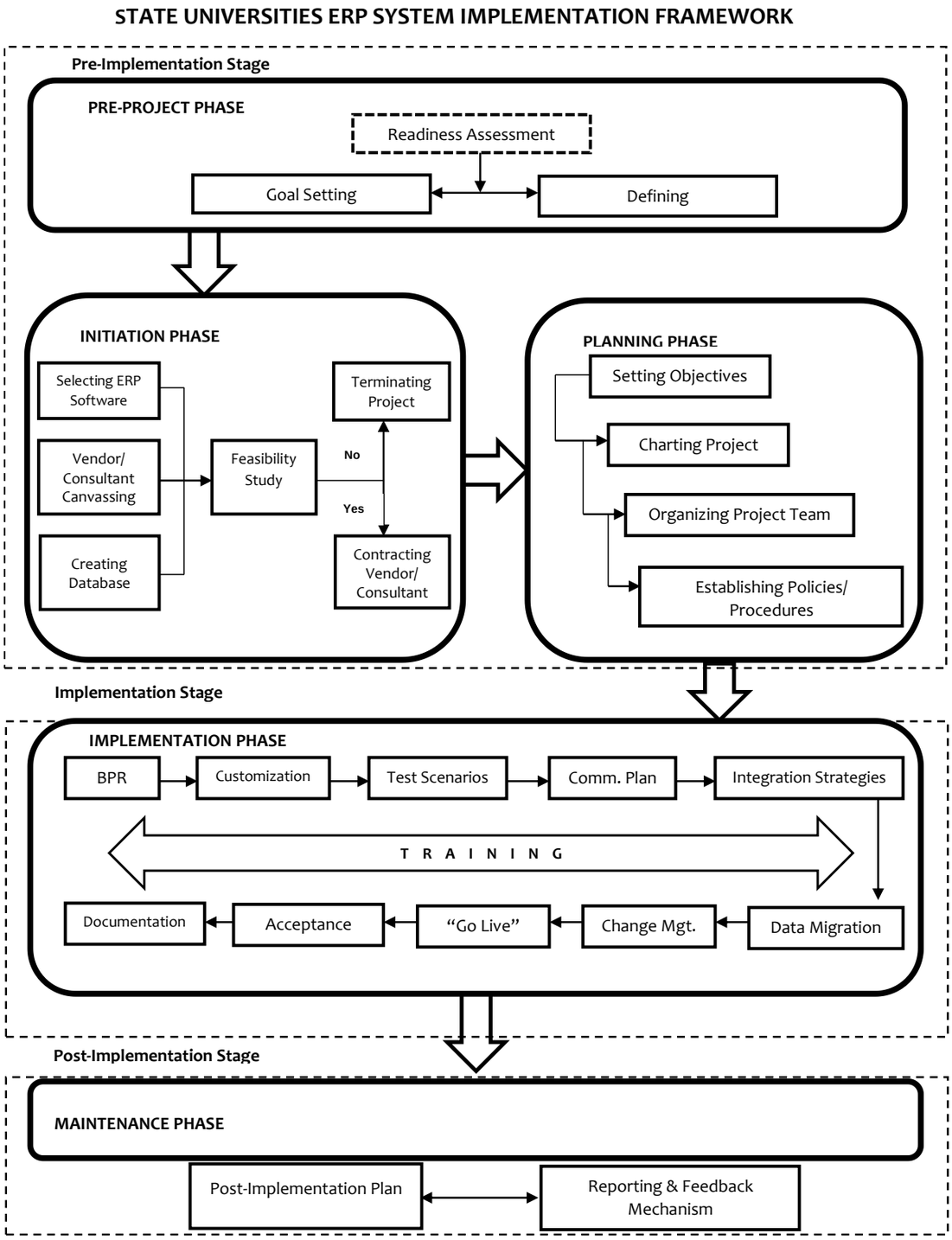

Figure 10. ERP System Implementation Framework

DISCUSSION

The implementation framework designed by the study provided an avenue to assist the selected state universities in leveling up their ICT facilities and in turning their institutions into real "smart campuses". Since there is always a separate budget allocated for ICT development every year, ERP system implementation could be one relevant project that they can invest in. Most of these universities have a high awareness of ERP systems and have high involvement in their existing ICT practices, which helped them overcome the challenges easily. With this profile, the prospect of allocating funds for an ERP system is a must consideration.

The most important critical success factors identified such as availability of resources, qualified human resources for the team, and partial automation also fit the profile of the universities, which means that it is advantageous on their part to succeed in implementing an ERP system. Organizational factors play a major role in this endeavor.

This is so because the vision, initiative, planning, and willingness to invest in the ERP system begin from the executive management leading the organization. However, the current partial and unintegrated automation in these universities also posed a risk which could lead to difficulty in integration and technology fit for the requirements of the ERP system. Communication and awareness campaign are other equally relevant factors since these is the only means to facilitate the diffusion of the new system in the organization and at the same time motivates the stakeholders to participate in the change. Most importantly, its emphasis on "user-value" is another consideration, to make them know about the intended purpose and the benefits they can derive from installing this technology. The results of the Readiness Assessment indicate the high readiness of almost all of these selected state universities which implies that they also have big potential for ERP system implementation. The framework created contains specific approaches to control critical activities, thus, it can guide the universities on how to strategize in implementing the ERP system efficiently and successfully.

CONCLUSIONS AND RECOMMENDATIONS

The result of the study showed that the university with the finest ICT practices and high awareness has a strong potential for ERP system solutions. Practice enhances competence which later influences acceptance and engagement in the ERP project. Organizational factors remarkably have the biggest impact on successful ERP systems, thus, achieving this requires improvement in organizational performance and effectiveness. Strong executive leadership and total commitment to providing the needed resources are said to be the essential elements to ensure success. In this study, it was also established that the socio-economic factors are more perceptible, therefore, enhancing employee's knowledge of the benefits and value of the ERP system can increase their flexibility and involvement in ERP system projects. Since the majority of the state universities are ERP-ready, this indicates the feasibility of the adoption of the ERP system. Moreover, the ERP system must be aligned with the university's strategic planning and must be designed specifically to address the needs of the university. Hence, a long-term roadmap and framework are considered valuable tools to achieve it. In this study, the ERP system implementation framework developed is highly acceptable and comprehensively outlined comprised of three stages and five project phases. It starts with the decision for adoption based on the readiness assessment and ends with implementation. It is recommended that these universities consider using the Readiness Assessment provided in this study to assist in decision-making and the proposed framework as a guide in planning and strategizing for effective ERP implementation.

IMPLICATIONS

The study can be a new milestone in the Philippines' educational system, particularly for government-owned higher education institutions. Though ERP systems have long existed in the manufacturing industries and universities abroad, the application of this to the Philippine setting is not common. This is a new strategy that can be adopted by universities to improve their performance. Since their current systems lack integration, the output of this study can be a helpful tool to start thinking about funding this technology. The Readiness Assessment done in this study is the first step and can assist the selected state universities in deciding and in identifying probable blockages for implementing an ERP system. They have now the base data of their readiness status and they can plan for corrective actions to improve their readiness. The implementation framework developed on the other hand, may be used as a springboard for improving the university's IT infrastructure, for incorporating strategies throughout the ERP system planning in the university, and for upgrading their technologies in general. Eventually, this can lead to enhanced user experience and increased operational efficiency.

If pursued, the effectiveness of ERP system implementation in these sampled state universities can serve as the basis of the concerned government agencies for standardization. Once the benefits are measured, policy formulation related to ERP system implementation in all SUCs is possible in the future.

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DECLARATIONS

Conflict of Interest

The author declares no conflict of interest in this study.

Informed Consent

Participants were informed about the study.

Ethics Approval

Ethics approval was secured from the university.

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