Mitigation Strategies for ERP Implementations in Higher Education

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Abstract:- **Organizational leaders have increasingly turned to enterprise resource planning (ERP) applications, also known as decision-support systems, to make their organization's operational, tactical, and strategic processes more efficient and effective in the changing global marketplace. High failure rates in ERP systems implementations make these projects risky, however. Most prior research on critical success factors for conventional ERP implementation has been on large enterprises, resulting in a gap in knowledge on these factors in higher education institutions. A qualitative modified Delphi study with an expert panel of U.S. consultants and three iterative rounds of data collection and analysis revealed consensus on 8 critical success factors in ERP implementations, with the highest agreement on top management support and commitment, enterprise resource planning fit with the institution, quality management, and a small internal team of the best employees. In addition to furthering knowledge in the fields of leadership and enterprise applications, the study expands enterprise resource planning experts' and scholars' understanding of strategies to improve project success within the higher education sector. Practitioners in the ERP industry can also apply approaches outlined during ERP implementations to mitigate risk during these engagements. Implications for positive social change include additional job opportunities and higher wages through increased efficiencies in ERP applications.**

Keywords:- *Enterprise Resource Planning (ERP), Higher Education, Digital Transformation, Change Management, Risk Management, Implementation, Critical Success Factors (CSFs), Critical Failure Factors (CFFs).*

I. INTRODUCTION

Leaders of higher education institutions use enterprise resource planning (ERP) applications, also known as decision-support systems, to make financial and operational decisions. As many institutions continue to expand on a global scale through distance learning offerings, there may be an increasing need for ERP applications to provide visibility, collaboration, and communication throughout the organization due to increased customer demands and expectations [1]. To minimize barriers and consequences when implementing change, leaders of organizations should devise a constructive approach [2]. Managers should analyze their current environment, reflect on the organization's strategic vision, and act on the issues many organizations currently face.

ERP applications are implemented in environments to provide operational visibility throughout an organization. As institutions grow through the emergence of online education and update their legacy systems, there will be an increasing need to identify ERP critical success factors. Many researchers have indicated high failure rates in ERP systems implementations on the metrics of budget, schedule overruns, and overall fit of planned operational processes with implementation deliverables [4], [5], [6]. Because of these failure rates, it is important to identify ways to mitigate these failures.

As the global market shrinks because of technological advances, organizational leaders are looking for ways to make strategic decisions to maintain or increase their market share in their respective industries. Institutions have turned to ERP systems to make their operational, tactical, and strategic processes more efficient and effective [8]. An ERP system is categorized as an integrated, customized, and packaged software-based system that handles most system requirements in all functional areas of an institution such as enrollment, finance, human resources, financial aid, and marketing [9]. In addition to using ERP systems as a tool to make day-to-day operational decisions, leaders can also use these systems as tools to improve knowledge sharing within the operation [10]. With ERP applications, organizational leaders can enable departments and facilities to share knowledge and collaborate instead of operating out of disparate systems.

Although empirical field experience has shown that ERP systems affect institutions positively, the implementation and installation of these applications do come with potential risks. In one survey of 117 leaders, 40% of the panelists stated that their ERP projects failed to achieve their business case after one year of going live [11]. Because of the complexity of system functionalities, the implementation and assimilation processes are always associated with high risk, leading to a high failure rate of ERP systems [12]. With organizations of any kind and size increasingly adopting these systems to avoid technical obsolescence [13], further analysis was required to identify ways to leverage these tools to improve operational performance, both internally and externally. The focus of this study was on identifying a consensus among a panel of ERP consultants as to the desirability and feasibility of critical success factors in ERP implementations in the United States.

ERP implementations cost organizations capital, human resources, and time. Although research on critical success factors in ERP implementations dates back to the 1970s [14], a knowledge gap regarding critical success factors identified in the literature versus those applied in higher education environments still exists [15], [16]. Depending on the source or survey, researchers have estimated between 70% and 85% of ERP implementations fail based on metrics such as cost, schedule overruns, or overall fit [17], [5]. According to researchers, implementation failures have cost large enterprises from $6 million to $100 million to implement [17], [18]. With this level of investment and the expectation for operational optimization, it is important for institutions to identify the critical success factors that are integral to an implementation.

Despite the identification of a myriad of ERP implementation critical success factors in the literature, implementation failures continue to occur at a high rate in a number of different industries [18], [21]. Given the shift in managerial approaches, including the rise of partially distributed teams and other factors, the critical success factors previously noted in the literature may no longer apply [22]. The current study may be important because research on the interactions between ERP applications and positive social change is also lacking [23], [24].

Given the rise in complexity, adversity, and uncertainty across the higher education landscape, the desirability and feasibility of conventional ERP implementation critical success factors may require reassessment among higher education institutions [25]. Due to the increased customer expectations within the higher education sector, ERP implementation critical success factors should be reviewed periodically for refinement [26]. Technological advancements have changed the way institutions operate, creating paradigm shifts in organizational culture and leadership approaches [27], [28].

As institutions embrace the Internet of Things (IoT), future-oriented technologies have triggered a requirement for leaders to develop lean, automated environments [29]. To remain competitive in their respective markets, leaders are looking to ERP vendors and consultants to develop and deliver innovative products, services, and processes [30]. The results of an in-depth analysis of critical success factors implemented in the field may help to narrow the scholar-practitioner gap by aligning the most cited critical success factors in the literature with those implemented during the rise of intelligent technologies such as artificial intelligence, machine learning, and deep learning.

II. LITERATURE REVIEW

To build a consensus among panelists regarding the critical success factors in ERP implementations, the critical success factor framework [31] was chosen as the conceptual framework for this study. In the most cited study regarding critical success factors, Rockart [14] defined critical success factors as competencies necessary to ensure successful performance. Rubin and Seeling [31] first introduced the critical success factor framework to analyze the effect of project managers in the success or failure of projects in the government sector. In response to this seminal study, Avots [32] concluded that project manager selection and leadership support are also critical success factors in project implementations.

Although Martin [33] and Sayles and Chandler [34] performed studies on the benefits of information systems, their findings were too broad in scope regarding enterprise implementations [35]. In studying complex systems such as ERP applications, researchers may consider analyzing all phases of these projects to create a more manageable framework [36]. To address this gap in the research, Ho and Lin [37] and Ngai, Cheng, and Ho [38] created critical success factor frameworks for ERP implementations. In their conclusions, Ho and Lin and Ngai et al. found that if leaders of organizations performed a systematic consideration of critical success factors during each phase of the implementation, the risk of project failure could be reduced.

This study may contribute to positive social change by reducing the risk of implementing unprofitable ERP solutions. For ERP vendors, this study may assist in educating, certifying, and employing additional members of their workforce through the successful delivery of consulting services [42]. Additionally, the results could provide valid a foundation for educational and training programs [43]. This approach will be beneficial for ERP vendors to provide a reliable and validated education plan that will assist in successfully onboarding new hires, as well as a continuous improvement process to ensure experienced consultants are aligned with the recent technological developments.

In ERP implementations, researchers have stated consultants are integral to the success of the project [5], [11]. Because ERP providers that support the higher education industry focus on niche markets, selecting ERP consultants from various ERP vendors could potentially provide a broader view of critical success factors for this industry. As ERP implementations cost organizations hundreds of thousands of dollars in capital and resource hours, this study was conducted to identify the CSFs that could potentially mitigate the risk in these projects.

Along with the risk mitigation strategies, deploying critical success factors in ERP implementations can lead to a strategic competitive advantage [44]. By using the capabilities of ERP applications, not only can leaders of organizations improve their operational efficiencies, they can also enhance their visibility, resulting in a competitive differentiation [45].

ERP applications were first established in the 1970s, but the industry continues to grow, both in size and capabilities. With project teams continuing to experience failed ERP implementations, it is important for leaders within organizations first to understand how IT and business to synergize to increase operational efficiencies and profitability [46].

A review of the literature uncovered ERP implementations continue to fail due to a number of reasons. Although researchers have concluded that top management support, user feedback, training and education, project management, and ERP package selection are factors that can mitigate the risk of failed implementations, a gap still exists [12], [16]. With the lack of consensus regarding critical success factors identified in the literature versus those applied in higher education environments [47], [48], the goal of this study was to narrow the scholar-practitioner gap.

Although recent research on ERP critical success factors has focused on a limited amount of case studies on higher education institutions, a limited amount of research has included consultants as the sample. Because ERP consultants are viewed as experts both from an IT and best business practice perspective [7], the results of this study may contribute to the theoretical body of knowledge by referring to the perspectives of the expert panel of ERP consultants to build a consensus on critical success factors within ERP implementations. In producing the results, the scholar-practitioner gap may be narrowed by reviewing and implementing the top critical success factors identified in this study.

To identify a consensus among a panel of ERP consultants, the future-oriented approach of the modified Delphi technique may contribute to positive social change by improving the efficiencies and work environments for employees in higher education institutions in the United States. The results of this qualitative modified Delphi study may contribute to the ERP body of knowledge by revealing consensus about the critical success factors of implementations in higher education institutions in the United States. Positive social change occurs when ERP providers and users create a positive impact on the sectors they serve, educate, and certify [49]. The study's results may provide information that is beneficial for leaders of organizations, as well as ERP vendors throughout each phase of future implementations. Application of the results of this study could also improve the implementation methodologies of ERP providers and increase the probability of successful ERP implementations by mitigating the risks that arise during the implementation life cycle by instituting the critical success factors outlined in this study.

The findings of the study may also have the potential to influence operational success. Positive social change within ERP implementations may to enhance employee knowledge, critical thinking skills, and organizational collaboration [50]. ERP applications have been shown to provide a sustainable competitive advantage to organizations by empowering employees to share ideas and promote job stability [51]. In implementing ERP applications, leaders can promote positive social change by providing additional job opportunities and higher wages through the increased efficiencies ERP applications provide within an organization [52], [53].

III. PURPOSE AND RESEARCH QUESTIONS

A. Purpose of the Study

The purpose of this qualitative modified Delphi study was to identify a consensus among an expert panel of 42 ERP consultants as to the desirability and feasibility of critical success factors in ERP implementations in the United States. The purpose of a Delphi study is to acquire a reliable consensus among a panel of experts through a series of surveys [54], [55]. This study was performed to reduce the scholar-practitioner gap regarding critical success factors identified in the literature versus those applied in different environments. ERP applications can contribute to social change by providing institutions with additional operational visibility, both internally and externally [56]. By integrating sustainable operations, processes, and information through knowledge-sharing within an organization, organizational leaders could have a positive effect on social change by fostering employee collaboration, innovation, and empowerment.

B. Research Questions

I undertook this study to identify a consensus among a panel of ERP consultants as to the desirability and feasibility of critical success factors in ERP implementations in the United States. To provide a value justification and merit to the critical success factors identified in the literature, the consultants' perceptions of desirability were assessed. To measure the practicality of the critical success factors identified in the literature, the consultants' perceptions of feasibility were assessed. The research question and subquestions were as follows:

RQ1: What is the level of consensus among ERP consultants as to the desirability and feasibility of critical success factors for ERP implementations?
SQ1: What is the level of consensus among ERP consultants as to the desirability of critical success factors for ERP implementations?
SQ2: What is the level of consensus among ERP consultants as to the feasibility of critical success factors for ERP implementations?

IV. METHOD

The goal of this study was to establish a consensus to the desirability and feasibility of critical success factor benchmarks for ERP implementations. The Delphi method was selected for this study given its record as a good approach to anticipate long-term trends in technology [57]. The Delphi technique is a qualitative research design used to establish a consensus through the input from a panel of experts without the requirement of face-to-face interaction [54]. Developed by Dalkey and Helmer at the RAND Corporation in 1953, the researchers were asked by the U.S. military to solicit expert opinion to the selection of the optimal U.S. target system while also reducing the munitions output by establishing a prescribed number of atomic bombs [58]. In this study, the purpose of the Delphi approach was to predict a future outcome using expert opinion [58].

The traditional Delphi technique consists of three rounds of surveys to reach a consensus. Also, the typical panel size in a traditional Delphi study consists of six to 12 experts [54].

Because the expert panel of consultants were asked to comment on existing critical success factors and propose modifications in the first round of the study, the approach was a modified study as compared to a classical Delphi study. Because the Delphi study was designed with a target sample of 50 ERP consultants to narrow a gap in the research, to align this study with the types of Delphi studies identified in the literature, a modified Delphi approach was conducted [59], [60]. This modified Delphi study was administered through SurveyMonkey.com, a secure online survey provider. While there is not much consensus among the ERP implementation of critical success factors in the literature, using the Delphi method helped to find a consensus as to the desirability and feasibility of critical success factors in ERP implementations in the United States.

A. Population Sampling

The target population for this study was ERP consultants in the United States with ERP implementation experience.

Because consultants spend a large amount of time at customer sites during implementations, they are typically distributed across the United States to support multiple client facilities and projects. Due to the increasing number of higher education institutions implementing ERP applications, determining the number of consultants in the target population in the United States that support these implementations was difficult. With the U.S. government estimating the number of consultants nationwide growing to 993,000 by 2020, a minimum of 200,000 consultants would be included in the ERP application industry segment [62]. Although the current study could have included ERP project managers as the expert panel to expedite the rate of reply, choosing ERP consultants provided a ground level view of the critical success factors that can be implemented in ERP implementations.

The study involved a purposive sampling technique to ensure meaningful results in the study. The ERP consultants self-selected based on the criteria provided in the invitation. After completing the informed consent, the participants were presented with screening questions where they were prompted to check yes or no in response to each question. If they selected no for any of the questions, they were thanked for their interest and were not able to access the survey.

B. Data Collection and Instrumentation

The study involved three rounds of data collection and analysis. In the first round, the expert panel of ERP consultants were asked to comment on the existing critical success factors that they thought were most desirable and propose modifications. Focusing on the desirability and modifications in Round 1 is noted as an acceptable and common approach in modified Delphi studies [63]. After reviewing the responses, the top 10 most desirable critical success factors with the highest frequency were moved to Round 2 of the study. To provide a value justification and merit to the critical success factors identified in the literature, perceptions of desirability were selected for this study. To measure the practicality of the critical success factors identified in the literature, the perceptions of feasibility were selected for this study.

In Round 2 the panelists rated the desirability and feasibility of the critical success factors using a Likert-type scale. The critical success factors with the highest ratings of desirability and feasibility in Round 2 were moved to Round 3, during which the ERP consultants rated the remaining critical success factors for desirability and feasibility. Subsequent rounds of rating were not required as consensus was reached in Round 3.

To determine the level of consensus, researchers have identified when 75% of experts select 4 or 5 on a Likert-type scale, consensus has been met [64]. In the current study, 4 pertained to desirable or feasible; 5 pertained to highly desirable or highly feasible. In performing this methodical approach, the gap between the critical success factors identified in the literature versus the critical success factors employed in the field of ERP consulting could be narrowed.

The Round 1 instrument in this study was limited to the critical success factors identified by Saade and Nijher [22], who performed a literature review of 37 case studies from different countries and contexts. The results resulted in a consolidated list of 22 distinct critical success factors that can be applied to the five ERP implementation stages identified by Saade and Nijher: (a) the organizational state, (b) business requirements gathering, (c) the proposed technical solution, (d) implementation, and (e) post-implementation.

The data collection instruments consisted of online surveys administered through SurveyMonkey.com. In the first round, the expert panel of ERP consultants were asked to rate the critical success factors on a 5-point Likert-type scale. The ratings on the scales ranged from 1 to 5: 1-highly undesirable, 2-undesirable, 3-neutral, 4-desirable, and 5-highly desirable. Using the definitions outlined by Linstone and Turoff [65], the following desirability descriptions were included to provide clarity for the participants: 1-highly undesirable: will have a major negative impact to the implementation; 2-undesirable: will have a negative impact to the implementation with little positive to no positive effect; 3-neutral: will have no impact on the implementation; 4-desirable: will have a minimal positive impact to the implementation with little negative effect; and 5-highly desirable: will have a positive impact to the implementation with no negative effect.

In Round 2 the panelists rated the desirability and feasibility of the critical success factors using two separate 5-point Likert-type scales. The instrument included the 10 top critical success factors identified in Round 1. The rat-

ings on the scale ranged from 1 to 5: 1-highly undesirable/highly infeasible, 2-undesirable /infeasible, 3-neutral, 4-desirable/feasible, and 5-highly desirable/highly feasible. In Round 2, the participants were provided with the same descriptions for desirability as were used in Round 1.

The critical success factors with the highest ratings of desirability and feasibility in Round 2 were moved into Round 3, during which the ERP consultants rated the remaining critical success factors for desirability and feasibility. The same desirability and feasibility descriptions used in Round 2 were presented to the participants in Round 3. Subsequent rounds of rating were not required as consensus was reached in Round 3.

C. Field Test
Prior to IRB approval, the study included a field test of the Round 1 survey to test the clarity and relevance of the open-ended questions on the survey and identify ambiguities in the objective, definitions, and survey questions. No data were collected.

Eight experts with knowledge of ERP implementations and item construction reviewed the surveys for face and content validity of the questions. The participants in the field test did not participate in the main study. The field test experts were emailed the Round 1 survey questions for feedback. After reviewing the questions, the experts were asked to provide feedback on the clarity and relevance of the questions by responding to two questions about the survey. The feedback from this field test assisted in identifying areas that needed revision before the main study began.

D. Internal Consistency Reliability
To test the internal reliability of each of the items pertaining to critical success factors in Round 2 and Round 3, Cronbach's coefficient alphas were calculated in SPSS using the main study data. Cronbach's alpha is used to examine the internal consistency reliability of multipoint scales [66]. Ranging from 0 to 1, the closer the coefficient value is to 1, the more reliable the scale [67]. A value greater than or equal to 0.7 is an acceptable reliability coefficient [68].

E. Data Analysis
Round 1 survey responses were coded using the open coding method to categorize, sort through, and compare the new critical success factors identified by the participants [69]. For the narrative data, common themes were searched to group the new critical success factors into thematic categories given thematic analysis is the most used analysis tool in the first round of a Delphi study [66].

In the first round, the top 10 critical success factors with the highest desirability were moved to Round 2 of the study. The Round 2 data were comprised of the ERP consultants' ratings of the desirability and feasibility of the top 10 most desirable critical success factors from Round 1 using two separate 5-point Likert-type scales. Numeric rating data were analyzed with SPSS to determine frequencies, the median, and internal consistency reliability of the

scales. Only the top two percentages with a median score of 3.5 or higher on both the desirability and feasibility scales were included in Round 3. Round 3 data were comprised of the ERP consultants' ratings of the remaining critical success factors for desirability and feasibility.

Demographic data were analyzed to describe the characteristics of the sample. For the nominal variables of gender and geographic region, the distribution of these variables were described using the mode and frequency counts and percentages. For the ordinal variables of age, highest level of education attained, years of experience, and number of implementations completed in higher education environments, frequency counts and percentages and the mode were used.

The research question pertained to the level of consensus among ERP consultants as to the desirability and feasibility of critical success factors for ERP implementations. To answer the research question and subquestions, the critical success factors with the highest consensus on desirability were used to answer Subquestion 1. The critical success factors with the highest feasibility were used to answer Subquestion 2. The critical success factors with the highest consensus on both desirability and feasibility were used to answer the primary research question.

V.   RESULTS

A. Panel Demographics
The following tables display aggregated demographic characteristics of the panelists. Table 1 indicates the age range of the panel of experts. The two major age groups, 45 to 54 and 55 to 64, indicate that individuals with years of experience in operations management and leadership roles are typically those who lead ERP implementation projects [42].

Age	N	%
21 and under	0	0.00
22 to 34	2	4.76
35 to 44	6	14.29
45 to 54	15	35.71
55 to 64	16	38.10
65 and over	3	7.14

Table 1:- *Panelists' Age Range (N = 42)*

The second characteristic of the panel of experts assessed was gender. The demographic data showed a disproportionately large percentage of male panelists compared to female panelists. These results may reflect the gender gap in the higher education industry, but additional research will be required.

Gender	N	%
Male	32	76.19
Female	10	23.81

Table 2:- *Panelists' Gender (N = 42)*

The third panelist characteristic was years of experience. Regarding the years of experience of the panelists, more than two thirds of the panelists had more than 10 years of ERP implementation experience. The data indicated that the expert panel had extensive ERP implementation experience and represented an experienced group of consultants.

Years	N	%
5 to 10 years	8	19.05
11 to 15 years	22	52.38
16 to 20 years	4	9.52
21 years or more	8	19.05

Table 3:- *Panelists' Years of Experience (N = 42)*

The fourth panelist characteristic was highest education level. More than 80% (34) of the participants held a master's degree. One reason may be due to the financial, operational, and technological acumen required to implement an ERP solution successfully. As Jensen [71] noted, consultants are continually furthering their education to share their knowledge with clients during ERP implementations and organizational change initiatives.

Education	N	%
High school diploma	0	0.00
Bachelor's degree	8	19.05
Master's degree	34	80.95
Doctoral degree	0	0.00

Table 4:- *Panelists' Highest Education Level (N = 42)*

The fifth panelist characteristic was the number of implementations the participants completed in SMEs. Due to the nature of some of the screening questions that required the participants to have at least 5 years of experience implementing ERP solutions, roughly 85% of the participants had performed at least six implementations in SMEs.

Number of implementations	N	%
1 to 5	6	14.29
6 to 10	18	42.86
11 to 15	7	16.67
16 to 20	6	14.29
20 or more	5	11.90

Table 5:- *Participants' Implementations Completed (N = 42)*

B. Narrative Results

Out of the 18 narrative responses received, five common themes were identified: (a) rewards and recognition, (b) realistic project scope, (c) extensive testing and sign-off (d) defined roles and responsibilities, and (e) extensive end-user training. Due to the high frequencies of the rated critical success factors in the survey, the suggested critical success factors were not moved to Round 2.

C. Internal Consistency Reliability

Upon completing Round 2, Cronbach's alpha was used to test the internal consistency reliability of the multipoint Likert scale. In this round, the value of 0.8 exceeded the acceptable reliability coefficient of 0.7 [67]. Cronbach's alpha measure indicated that overall, the Round 2 survey items were 80% reliable for rating the desirability and feasibility of the critical success factors identified in the study. Because Cronbach's alpha does not measure consistency and stability over time, Cronbach's alpha was also used to test internal reliability in Round 3 [73].

In Round 3, the remaining eight critical success factors were analyzed. Referring back to the initial plan to include the median score with the percentage agreement, the median score became the tie-breaker for the research question and both subquestions. In reviewing Cronbach's alpha, similar to Round 2, overall the Round 3 items were 80% reliable for rating the desirability and feasibility of the critical success factors.

D. Round 1

The responses indicated that quality management and detailed data migration plan and readiness were the most desirable critical success factors followed by top management support and commitment. The panelists reached 100% consensus in regard to desirability on quality management, detailed data migration plan and readiness, and top management support. Of the 22 most desirable critical success factors rated in Round 1, the critical success factors moved to Round 2 were: (a) cultural change readiness, (b) top management support and commitment, (c) ERP fit with the organization, (d) business process reengineering, (e) quality management, (f) detailed data migration plan, (g) small internal team of the best employees, (h) open and honest communication, (i) contingency plans, and (j) user feedback usage.

E. Round 2

Based on the results of the analysis of the Round 2 data, only the top two percentages of 75% or higher on both the desirability and feasibility scales were moved to Round 3. As in Round 1, top management support and commitment was the critical success factor with the highest consensus. When including feasibility in the survey, the consensus increased for the two factors of ERP fit in the organization and small internal team of the best employees. These two factors are directly connected to the top management support and commitment factor as leadership decisions directly affect the selection of the ERP application and the forming of the project teams for the implementation.

F. Round 3

All of the eight critical success factors met the threshold for inclusion in the final list of critical success factors. Table 11 shows the results of Round 3. The consensus as to the desirability and feasibility of the top critical success factor of top management support and commitment remained the same throughout all rounds of the study. Also, similar to Round 2, ERP fit with the organization was of the highest rated critical success factors in Round 3.

G. Consensus Reached

Research Subquestion 1 pertained to the level of desirability of critical success factors in ERP implementations. The original cutoff for consensus was set at 75% based on the literature [64]; however, because there was a high level of consensus for all eight critical success factors, the cutoff was increased to 90%. The panelists reached 90% consensus on the level of desirability of the following five critical success factors: (a) cultural change readiness, (b) top management support and commitment, (c) ERP fit with the organization, (d) quality management, and (e) a small internal team of the best employees. The panelists reached 100% consensus on desirability for both top management support and commitment and ERP fit with the organization. Top management support and commitment had the highest median of 5.00, resulting in the factor with the highest level of consensus on desirability.

Research Subquestion 2 pertained to the level of feasibility of critical success factors in ERP implementations. As with desirability, the panelists reached 100% consensus on feasibility for both top management support and commitment and ERP fit with the organization. The median score was 5.00 for top management support and commitment, indicating this factor had the highest level of consensus for feasibility. Consistent with the approach used for desiraability, the cutoff for consensus on feasibility was increased to 90%. The panelists reached 90% consensus on feasibility of the following four critical success factors: (a) top management support and commitment, (b) ERP fit with the organization, (c) quality management, and (d) a small internal team of the best employees.

The primary research question pertained to the level of desirability and feasibility of critical success factors in ERP implementations. The four critical success factors on which the expert panelists reached 90% consensus on the levels of desirability and feasibility are: (a) top management support and commitment, (b) ERP fit with the organization, (c) quality management, and (d) a small internal team of the best employees. Top management support and commitment was the critical success factor with the highest consensus for desirability and feasibility, followed closely by ERP fit with the organization.

VI. DISCUSSION

The responses from the expert panel of consultants align with the body of literature. Leadership support is a CSF on which many researchers have reached a consensus [12], [74]. The panel of ERP experts found it desirable and feasible to have top management support and commitment to successfully implement a solution in SMEs. In defining top management support and commitment as the institution-wide support of empowered decision makers, leaders should not view an ERP implementation as a technology project; rather, they should view it as a strategic initiative. Although the study results converge with the body of literature, researchers have differing views on leadership approaches to implement during times of organizational change.

Although cultural change readiness met the minimum level of desirability, this CSF did not meet the minimum feasibility criteria in the final round; however, cultural change readiness was also aligned with top management support and commitment. Leaders may need to assess the risks associated with large organizational changes as well as undertake a cultural assessment before embarking on a large project. Because the level of change involved in an ERP implementation, some leaders encounter resistance from their workforce, which may require a change in leadership approach [28], [61]. Leadership effectiveness increases the probability of an organization to change [75]. Researchers have stated that there is not a "one-size-fits-all" change management approach [76]. Although many researchers have argued for transformational leadership as the preferred approach over transactional leadership [77], transactional leadership still has its place in organizational environments.

In some environments, employees will be empowered by the transformational leadership characteristics the project provides through the means of decision-making opportunities [28], while other employee populations will look to be rewarded for participating in the change initiative [20]. Cullinane, Bosak, Flood, and Demerouti [78] stated that standardized, lean practices could lead to reduced job enrichment and engagement among employees. Maas et al. [18] argued against Cullinane et al.'s finding by indicating that reduced job enrichment and engagement could be mitigated by engaging employees in the implementation of these business process reengineering and lean initiatives. Validating Maas et al.'s finding, Chow [79] found that employees are empowered and motivated to make a positive impact on the organization, leading to increased innovation and creativity in the workplace.

A. Small Internal Team of the Best Employees

In creating cross-functional teams of the organization's best employees, leaders can harness the innovative thoughts of the employee base to build ideas organically and create a knowledge-sharing environment. The literature indicates that having a servant leadership style can enable leaders to help employees contribute to the overall organizational vision [80]. Researchers have found that

servant leaders are more empathetic and incorporate EI, which enables them to enhance their leadership competencies by promoting the strengths of others [81]. In tying the small internal team of the organization's best employees with open and transparent communication, employee decision-making can be increased by developing communication channels of information. In providing these small teams with tools to be successful, leaders can assist their employees in making decisions that benefit all parties, including the organization by displaying open, honest communication.

When composing a group of the organization's best employees, leaders could also assess the leadership competencies of each group member. Shared leadership enables team members to express their different abilities and opinion in a decision-making process, enabling different decision-making styles to be demonstrated by individuals [82]. By instituting shared leadership practices, leaders of organizations can increase the trust, collaboration, and autonomy among team members, even after a project or initiative is complete.

B. ERP Fit with the Organization

Technology has enabled increased communication and visibility among organizations, resulting in a shift in managerial approaches to remain competitive in their respective markets. Current study findings align with the literature. In a survey of 169 IT leaders regarding users' resistance to enterprise applications, Joia et al. [20] concluded that leaders could mitigate this resistance by ensuring that the applications are well designed, are easy to use, and have simple interfaces. To ensure ERP fit within an organization, leaders and software providers have incorporated collective intelligence by creating new functionality within the new ERP application. This collaborative approach has led to increased user satisfaction and adoption of the new technology.

When culture is perceived as organizational core values, assumptions, and interpretations, the link between employees and culture is apparent [27]. Leaders may introduce strategies and goals, but followers refine and make the strategies relevant. Leaders who can adapt this form of thinking will attribute organizational success to positive group norms and will form normative ties with employees [28]. In the body of research literature, although the leadership approaches have been successfully implemented in a variety of environments, the selected approach depends upon the objective.

Trust, an often-overlooked component to successfully implement change, is a critical factor among all stakeholders. For effective relationships to be created, nurtured, and propagated, trust must be distributed within the organization to build team spirit by demonstrating open and transparent communication throughout the project lifecycle. Leaders should foster an atmosphere in which trust and respect thrive and innovation flourishes in building a learning organization which is necessary for sustainable development. To make a positive impact on the institution's environment and community, leaders of organizations must first assess the key variables for success before acting upon the organizational change initiative.

C. Quality Management and a Detailed Migration Plan

The current study findings converge with the literature. To address the issue that technological fit alone will lead to a competitive advantage for leaders of organizations, Goodhue and Thompson [83] created a task-technology fit (TTF) model to ensure a positive influence on individual performance. Goodhue and Thompson created an instrument to measure eight factors: (a) data quality, (b) locatability, (c) authorization, (d) compatibility, (e) timeliness, (f) reliability, (g) ease of training, and (h) relationship. The current study findings about the critical success factors of detailed data migration plan and quality management fit into the data quality factor Goodhue and Thompson measured.

Tripathi and Jigeesh [84] used the TTF model to evaluate the fit and adoption of a cloud computing solution in an organization, concluding that if leaders of organizations institute a detailed data migration plan that includes audits throughout the data cleansing and conversion process, users of the organization could incur a high level of data quality in the business application, resulting in an increase in productivity. Although the TTF model has been modified or used in conjunction with other models such as technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT) model, researchers continue to use the TTF model in studies to measure system fit, usage, and performance in the workplace.

Of the eight critical success factors rated for desirability and feasibility in the final round, only two focused on the technological aspect: ERP fit with the organization and a detailed migration plan. Given the remaining six factors—cultural change readiness, ERP fit with the organization, business process reengineering, quality management, a small team of the best employees, and open and transparent communication—focused on people or process, the current study findings could have a positive influence on social change by applying these critical success factors to any organizational change initiative.

VII. LIMITATIONS AND RECOMMENDATIONS

A. Limitations

Due to the iterative nature of Delphi studies, attrition is always a risk. Although there were no indications that the panelists dropped out of the study due to its duration, the voluntary nature of the study limited understanding the reasons panelists dropped out of subsequent rounds of the study. Another limitation of the study was the original consensus threshold, which was set at 75% based on the literature [64]. The high level of consensus for the eight critical success factors in Round 3 led to increasing the cutoff to 90% for desirability and feasibility to determine which critical success factors were the most desirable and feasible among the panelists.

Although the panelists met the selection criteria, the selection of ERP consultants could have been too narrow of a scope. Given individuals such as project managers may have previous consulting experience, the blending of the consulting and project manager roles in the study may have provided a different perspective, resulting in the identification of new critical success factors in Round 1. Additionally, the self-selected expert panel of ERP consultants in the United States did not include ERP consultants from any other geographical area. Selecting ERP consultants from other geographical areas may have produced different results due to varying cultures, work environments, and leadership styles. García-Sánchez and Pérez-Bernal [85] found that in countries such as China and Mexico, leaders do not use decision support systems such as ERP applications; rather, leaders follow their cultural traditions of experience and intuition to make operational decisions. With leaders in some countries facing difficulty implementing western technologies due to technological infrastructure or the skill level of the employee base, Avison and Malaurent [86] cautioned consultants and software vendors to be aware of cultural differences in other countries.

An established list of 22 consolidated critical success factors was used to conduct the survey. Although the expert panel of ERP consultants were allowed to provide additional factors not outlined in the survey, there was the potential risk of influence given the panelists were provided with a list of critical success factors. Given the comments were not mandatory, the comments may not have reflected the thoughts of the panelists in the study. The methods used should be transferrable not only in ERP implementations, but for non-ERP projects as well such as CRM and HCM applications.

B. Recommendations for Further Research

The Delphi study was limited by the experience and expertise of the panelists. The study is also limited by the application of a modified qualitative Delphi approach. This limitation could be addressed by implementing a quantitative or mixed methods Delphi approach, or a design different from Delphi. A quantitative or mixed methods approach for the current Delphi study could expand the scope of the panel to a more heterogeneous group, such as project managers, end users, and the organization's implementation teams. This approach may provide additional insight to the cultural or organizational challenges different groups face throughout the implementation lifecycle.

Christensen and Raynor [87] identified three purposes of theories: (a) to pinpoint causation, (b) to move toward predictability, and (c) to assist in analyzing successes and failures. Prior qualitative research has generated theories pertinent to institutional environments [88]. In the literature, the common theory cited among ERP critical success factors is DeLone and McLean's information systems (IS) success model [89]. The DeLone and McLean IS success model is the most adopted and most cited theory in information systems research [90]. DeLone and McLean [91] provided an update to their original model to respond to the change and progression that occurred across the IS land-scape after the publication of their seminal work. Researchers have updated the DeLone and McLean model with various modifications to fit different information systems' environments and cultures. Along with DeLone and McLean's update to the model, other commonly cited studies focused on the respecification and extension of the DeLone and McLean success model. Although researchers who refuted the original model aimed to provide more theoretically sound studies, the DeLone and McLean model [89] continues to outperform the modified models [90], [91].

In addition to the various theories that have been used to measure ERP the success of ERP implementations, many models were identified. Models such as petri nets, decision trees, fuzzy cognitive maps, and causal models have been used to measure critical success factors by modelling the interrelations with people, processes, and technology [52], but the balanced scorecard model was the most cited model in the literature [92]. Although it is used to monitor financial and operational processes, the balanced scorecard model could be used in ERP implementations to align the vision, objectives, and measures of an organization throughout an ERP implementation lifecycle [92]. First introduced by Kaplan and Norton [93], the scorecard model could also be used in ERP implementations to define the multi-dimensional features and potential effects throughout the entire project lifecycle. Shen et al. [92] concluded that because the primary objective for a balanced scorecard is transform the visions of leaders of an organization into strategies and measures, using the balanced scorecard as a tool to build strategic processes, objectives, and measures takes a slightly different approach as successfully implementing ERP applications.

As the implementation base for ERP integrations such as artificial intelligence continue to grow, the critical success factors outlined in this study may require reassessment for higher education institutions. With this study focusing on internal commitment, collaboration, accountability, and trust, additional research may be required to assess the validity of existing critical success factors when an organization includes additional business partners and applications into the implementation.

C. Recommendations for Application

The current study supported and expanded upon the literature on the critical success factors in ERP implementations in higher education institutions. Researchers concluded when top management works closely with ERP users, the communication between operational groups is enhanced, and conflict resolution becomes attainable [13]. Iveroth [95] stated that leaders of organizations should invest at least 50% of the budget of a technology project for establishing future state processes, training, education, and communication. To remain competitive in the market, institutions must provide open, transparent communication and structures to spawn innovation. By maintaining close relationships internally as well as externally, all stakeholders involved will be able to assist in the innovation of the products and services of a technology and professional services organization.

Expert panelists in this study identified leadership competencies needed to successfully implement these applications. During ERP implementations, personnel within organizations require process changes, leadership, and change management. During this process, leaders should build learning organizations. Learning organizations are organizations with individuals who focus on: (a) a shared vision, (b) systems thinking, (c) mental models, (d) team learning, and (e) personal mastery [96]. In creating learning organizations during times of change, employees are empowered to learn, creating a larger probability for employees to embrace change. Additionally, learning organizations enable stakeholders to remain current on technological advances, providing benefits to both the individual and the organization [97]. Using these characteristics during times of change within an organization may provide immense benefits by harnessing innovative and creative ideas that can be implemented in new organizational processes and procedures.

With a decentralized decision-making model, the critical success factors identified in this study move outside of an organization's four walls [98]. With ERP blockchain integrations, transactions are visible to all network participants, increasing the auditability, trust, and increasing the confidence in the data [11]. As time and volume make the blockchain ledger more secure, more users within organizations may begin to transact immediate contracts, orders, and payments, essentially eliminating payment terms and increasing cash flow [30]. Similar to the introduction of cloud computing, 3-D printing, Industry 4.0, and IoT, it comes down to education and knowledge sharing of blockchain capabilities before it is universally adopted.

VIII. CONCLUSION

While ERP implementations in higher education institutions were the focus in this study, the results can have a positive impact on social change in other industries such as healthcare and hospitality, and manufacturing. Although the applications in these industries have different functions and serve different purposes, the critical success factors outlined in this study could also be applied to hospitality management systems, healthcare management systems, and learning management systems. Also, because the industries previously mentioned operate in different environments and cultures than higher education, the unconventional view of software implementations as it pertains to academia could also lead to positive social change by viewing the software implementation through a different lens.

When embarking on a large endeavor such as an ERP implementation, leaders of organizations may encounter resistance when implementing change. These leaders should recognize ways employees could embrace change to mitigate the risk of failed implementations. With institutions employing faculty members across the country and the world, leaders also experience differing environmental cultures.

Latta [99] outlined the importance of identifying subcultures within an institution's system where resistance may arise. During times of change, employees look back on previous experiences, and poor change management history (PCMH) can influence employee perceptions of organizational change [100]. With this finding, leaders must look outside of conventional leadership methods to alleviate the risk of resistance. By becoming proactive in the identification of resistance, the adoption of change can uncover the advantages among stakeholders within the organization.

Trust is a critical factor among all stakeholders, yet it is often overlooked when implementing change. For effective relationships to be created, nurtured, and propagated, trust must be distributed within the organization to build team spirit [101]. Leaders should foster an atmosphere in which trust and respect thrive and innovation flourishes in building a learning organization which is necessary for sustainable development. To make a positive influence on the institution's environment and community, leaders of organizations much first assess the key variables for success before acting upon the organizational change initiative.

Regardless of the approach, providing transparency at the departmental level to gain buy-in to implement change at that level and will encourage input from lower level personnel during the change initiative. Once the change is rolled out at the organizational level, leaders can create a holistic, organic environment that leads to innovative actions and decision-making. When cultural change is perceived as an organization's core values, assumptions, and interpretations, the link between employees and culture is apparent. Leaders may introduce strategies and goals, but followers refine these strategies and make them relevant. Furthermore, leaders who can adapt this form of thinking will undoubtedly attribute organizational success to positive group norms and will form normative ties with employees [102]. In reviewing the literature, although the leadership approaches have been successfully implemented in a variety of environments, the selected approach depends upon the objective.

The goal of this modified Delphi study was to reach a consensus among a group of experts as to the desirability and feasibility of critical success factors in ERP implementations in the United States. Of the original 22 critical success factors in Round 1, the panel of experts reached 90% consensus on the level of desirability and feasibility on four critical success factors: (a) top management support and commitment, (b) ERP fit with the organization, (c) quality management, and (d) a small internal team of the best employees. Top management support and commitment had the highest consensus, followed closely by ERP fit with the organization.

Leaders typically refer to their cognitive abilities to make decisions, and ERP applications could assist them in making those decisions typically performed with the lack of information. Although many users utilize Excel spreadsheets and disparate systems, by installing a system

that brings all data into one centralized application, leaders, teams, and departments would be able to collaborate, share data, and make better-informed decisions.

The results of the study are important to the fields of leadership and enterprise applications as the findings build on the body of knowledge for both disciplines. Regardless of the size of the organization, knowledge sharing is important both upstream and downstream. Leaders can benefit from this study to applying the new knowledge from this study within their organizations during times of change. Practitioners in the ERP industry can benefit from this study's findings by applying approaches outlined during ERP implementations to mitigate risk during these engagements.

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