Critical Success Factors in Small and Medium Enterprise ERP Implementations

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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 firms' 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 the small and medium enterprises that constitute the majority of U.S. employer firms. A qualitative modified Delphi study with an expert panel of U.S. manufacturing 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 organization, 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 and the triple bottom line for any size enterprise in the manufacturing industry. 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.

1. Introduction

Leaders of mid-to-large organizations use enterprise resource planning (ERP) applications, also known as decision-support systems, to make financial and operational decisions. As many companies continue to expand on a global scale, there may be an increasing need for ERP applications to provide visibility, collaboration, and communication throughout organizational supply chains due to increased competition and customer demands (Vermeulen, Niemann, & Kotzé, 2016). To minimize barriers and consequences when implementing change, leaders of organizations should devise a constructive approach (Al-Haddad & Kotnour, 2015). Managers should analyze their current business environment, reflect on the organization's strategic vision, and act on the issues many organizations currently face.

ERP applications are implemented in manufacturing environments to provide operational visibility throughout an organization's supply chain network. There are roughly 350,000 manufacturing organizations in the United States as of the first quarter of 2018 (U.S. Department of Labor, 2018). As new manufacturers enter the market and existing manufacturers 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 business processes with implementation deliverables [4, 5, 6] (Bintoro, Simatupang, Putro, & Hermawan, 2015; Ravasan & Mansouri, 2016; Shiri, Anvari, & Soltani, 2014). Because of these failure rates, it is important to identify ways to mitigate these failures. One Delphi study had a small sample size of ERP consultants to build a consensus on critical success factors in South Asian small and medium enterprises (Bansal a& Agarwal, 2015). No Delphi researchers have focused on building a consensus using a large sample size of ERP consultants in the United States, according to our review of the literature.

As the global market shrinks because of technological and logistical advances, organizational leaders are looking for ways to make strategic decisions to maintain or increase their market share in their respective industries. Firms have turned to ERP systems to make their operational, tactical, and strategic processes more efficient and effective (Shao, Wang, and Feng, 2015). An ERP system is categorized as an integrated, customized and packaged software-based system that handles most system requirements in all functional areas of a business such as finance, human resources, manufacturing, sales, and marketing (Lin ,2010). In addition to using ERP systems as a tool to make day-to-day business decisions, leaders can also use these systems as tools to improve knowledge sharing within the organization (Ifinedo & Olsen, 2014; Xie, Allen, & Ali, 2014). 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 businesses positively, the implementation and installation of these applications do come with potential risks. In one survey of 117 executives, 40% of the panelists stated that their ERP projects failed to achieve their business case after 1 year of going live (Tsai, Li, Lee, & Tung, 2011). Because of the complexity of system functionalities, the implementation and assimilation process is always associated with high risk, leading to a high failure rate of ERP systems (Shao et al., 2015). With organizations of any kind and size increasingly adopting these systems to avoid technical obsolescence and to create a sustainable competitive advantage (Maditinos, Chatzoudes, & Tsairidis, 2012), further analysis was required to identify ways to leverage these tools to improve business performance, both internally and externally. We focused on identifying a consensus among a panel of ERP manufacturing 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 (Rockart, 1979), a knowledge gap regarding critical success factors identified in the literature versus those applied in manufacturing environments still exists (Deokar & Sarnikar, 2016; Khan, Nicho, & Takruri, 2016; Tarhini, Ammar, & Tarhini, 2015). 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 (Conteh & Akhtar, 2015; Ravasan & Mansouri, 2016; Sudhaman & Thangavel, 2015). According to researchers, implementation failures have cost large enterprises from $6 million to $100 million to implement (Conteh & Akhtar, 2015; Maas, Fenema, & Soeters, 2014; Mo & He, 2015). In more extreme cases, companies have filed for bankruptcy due to supply chain disruptions attributed to their ERP implementations (Haddara & Hetlevik, 2016; Joia, Macêdo, & Oliveira, 2014; Love, Matthews, Simpson, Hill, & Olatunji, 2014). With this level of investment and the expectation for operational optimization, it is important for firms 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 the manufacturing industry (Hughes, Dwivedi, Rana, & Simintiras, 2016; Maas et al., 2014). 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 (Saade & Nijher, 2016). The current study may be important because research on the interactions between ERP applications and positive social change is also lacking (Grabski, Leech, & Schmidt, 2011; Elbardan & Kholeif, 2017; Seth, Goyal, & Kiran, 2017).

Given the rise in complexity, adversity, and uncertainty across the manufacturing landscape, the desirability and feasibility of conventional ERP implementation critical success factors may require

reassessment among small and medium manufacturers (Alharthi, Alassafi, Walters, & Wills, 2017; Turner, Kutsch, & Leybourne, 2016). Due to the increased competitiveness and customer expectations within the small and medium manufacturing sector, ERP implementation critical success factors should be reviewed periodically for refinement (Rashid et al., 2018; Sharma, Dixit, & Qadri, 2015). Technological advancements during what has been referred to as Industry 4.0, or the fourth industrial revolution, have changed the way small and medium manufacturing organizations conduct business, creating paradigm shifts in organizational culture and leadership approaches (De Soete, 2016; Elkhani, Soltani, & Ahmad, 2014; Jackson, Nelson, & Proudfit, 2014).

As small and medium manufacturers embrace the Internet of Things (IoT), future-oriented technologies have triggered a requirement for leaders to develop lean, automated environments (Qin & Kai, 2016). Forecasting the global trends of the IoT; of the four industries that included healthcare; communication; and natural resources such as food, water, and energy; and technology would significantly affect the manufacturing industry over the next 10-15 years (Basl, 2016). To remain competitive in their respective markets, manufacturing leaders are looking to ERP vendors and consultants to develop and deliver innovative products, services, and processes (Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014; Qin & Kai, 2016). 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 Industry 4.0.

2. Literature review

To build a consensus among panelists regarding the critical success factors in ERP implementations, we chose the critical success factor framework (Rubin & Seeling, 1967) as the conceptual framework for this study. In the most cited study regarding critical success factors, Rockart (1979) defined critical success factors as competencies necessary to ensure successful performance. Rubin and Seeling (1967) 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 (1969) concluded that project manager selection and leadership support are also critical success factors in project implementations. Figure 1 includes a summary of critical success factors in projects as identified by various researchers.

Martin[16] (1976)	Locke[14] (1984)	Cleland and King[25] (1983)	Sayles and Chandler[26] (1971)	Baker, Murphy and Fisher[9] (1983)	Pinto and Slevin[7] (1989)	Morris and Hough[11] (1987)
Define goals	Make project commitments known	Project summary	Project manager's competence	Clear goals	Top management support	Project objectives
Select project organizational philosophy	Project authority from the top	Operational concept	Scheduling	Goal commitment of project team	Client consultation	Technical uncertainty innovation
General management support	Appoint competent project manager	Top management support	Control systems and responsibilities	On-site project manager	Personnel recruitment	Politics
Organize and delegate authority	Set up communications and procedures	Financial support	Monitoring and feedback	Adequate funding to completion	Technical tasks	Community involvement
Select project team	Set up control mechanisms (schedules, etc.)	Logistic requirements	Continuing involvement in the project	Adequate project team capability	Client acceptance	Schedule duration urgency
Allocate sufficient resources	Progress meetings	Facility support		Accurate initial cost estimates	Monitoring and feedback	Financial contract legal problems
Provide for control and information mechanisms		Market intelligence (who is the client)		Minimum start-up difficulties	Communication	Implement problems
Require planning and review		Project schedule		Planning and control techniques	Trouble-shooting	
		Executive development and training		Task (vs. social orientation)	Characteristics of the project team leader	
		Manpower and organization		Absence of bureaucracy	Power and politics	
		Acquisition			Environment events	
		Information and communication channels			Urgency	
		Project review				

Figure 1. Seven sets of critical success factors identified in the literature. Reprinted from "A New Framework for Determining Critical Success/Failure Factors in Projects," by W. Belassi and O. I. Tukel, 1996, *International Journal of Project Management, 14*, p. 143. Copyright 1996 by Elsevier Science Ltd and IPMA. Reproduced with permission.

Although Martin (1976) and Sayles and Chandler (1971) performed studies on the benefits of information systems, their findings were too broad in scope regarding enterprise implementations (Belassi & Tukel, 1996). In studying complex systems such as ERP applications, researchers may consider analyzing all phases of these projects to create a more manageable framework (Baxter & Sommerville, 2011). To address this gap in the research, Ho and Lin (2004) and Ngai, Cheng, and Ho (2004) created critical success factor frameworks for ERP implementations, as outlined in Figure 2. 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.

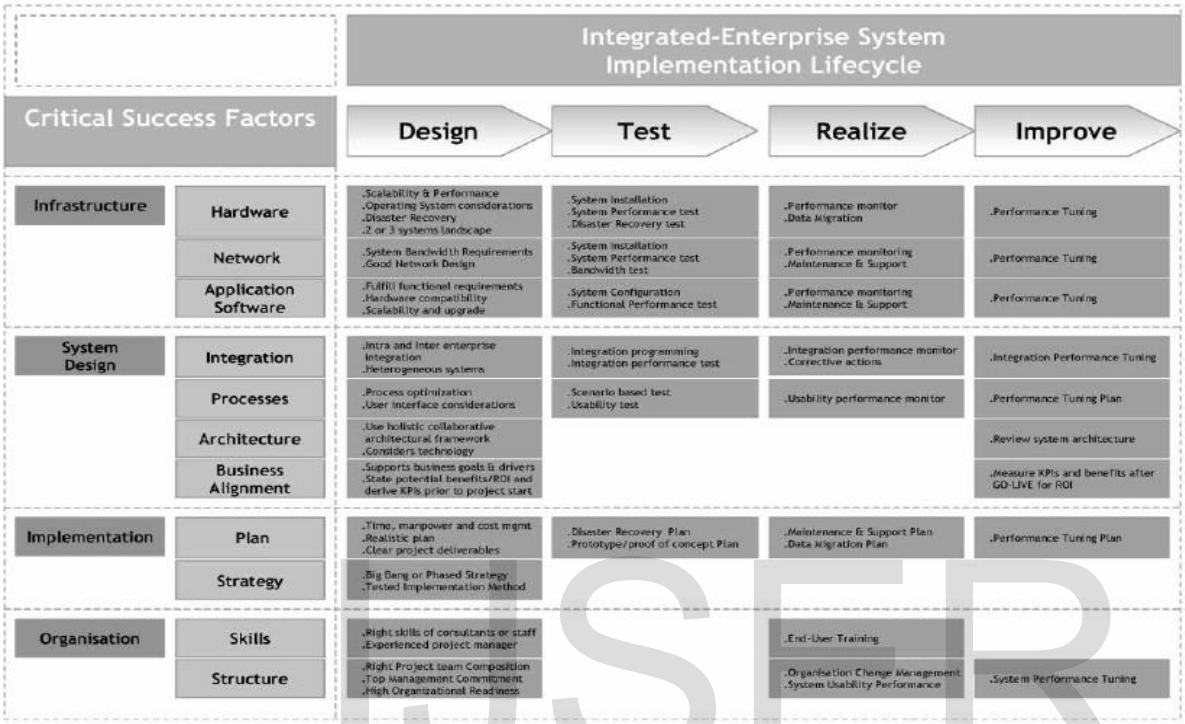

Figure 2. Integrated-enterprise system implementation critical success factor framework reference matrix. Adapted from "Critical Success Factor Framework for the Implementation of Integrated-Enterprise Systems in the Manufacturing Environment," by L. T. Ho and G. C. I. Lin, 2004, *International Journal of Production Research, 42*, p. 3736. Copyright 2004 by Taylor and Francis Group, LLC.

The identification of critical success factors in the ERP consulting community is highly subjective due to the empirical evidence of implementing these applications in various environments (Sun, Ni, & Lam, 2015). Failed traditional ERP applications focus on the profitability aspect of an organization, whereas sustainable ERP (S-ERP) applications are focused on all aspects of the triple bottom line (Bintoro et al., 2015; Chofreh, Goni, Shaharoun, Ismail, & Klemeš, 2014; Malaurent & Avison, 2015). Chofreh et al. (2016) posited that S-ERP systems are based on people, planet, and profit, which in turn will create a collaborative, synergistic, sustainable environment for business partners and communities. With the increase in collaboration and

strategic relationships between business partners, a demand to support these organizational systems will spur firms to increase their workforces, resulting in a positive impact to communities around the world.

In addition to the positive effect to firm's triple bottom line, 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 (Bronnenmayer, Wirtz, & Göttel, 2016b). Additionally, the results could provide valid a foundation for educational and training programs (Denzin & Lincoln, 2005). 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 tenured consultants are aligned with the recent technological developments. The results of the study may contribute to positive social change by mitigating the risk of failed ERP implementations by outlining a forward-looking view of critical success factors through the lens of ERP manufacturing consultants given their expertise in the field.

In ERP implementations, researchers have stated consultants are integral to the success of the project (Ravasan & Mansouri, 2016; Sudhaman & Thangavel, 2015; Tsai et al., 2007). Because ERP providers that support the manufacturing industry focus on niche markets, selecting ERP manufacturing 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, we conducted this study 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 (Forcht, Kieschnick, Aldridge, & Shorter, 2007; Habibzadeh, Meshkani, & Shoshtari, 2016). By using the capabilities of ERP applications, not only can leaders of

organizations improve their operational efficiencies, they can also enhance their supply chain visibility, resulting in a competitive differentiation (Ghosh & Biswas, 2017; Ram, Wu, & Tagg, 2014).

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 (Chen, 2010).

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 (Baykasoğlu & Gölcük, 2017; Leyh & Sander, 2015; Shao, Feng, & Hu, 2016; Sun et al., 2015; Tarhini et al., 2015). With the lack of consensus regarding critical success factors identified in the literature versus those applied in small and medium manufacturing environments (Alshardan, Goodwin, & Rampersad, 2015; Venkatraman & Fahd, 2016), 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 small and medium manufacturers, a limited amount of research has included consultants as the sample. Because ERP manufacturing consultants are viewed as experts both from an IT and best business practice perspective (Bansal & Agarwal, 2015; Chang, Wang, Jiang, & Klein, 2013), the results of this study may contribute to the theoretical body of knowledge by referring to the perspectives of the expert panel of ERP manufacturing 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.

In performing a literature search on positive social change and ERP implementations, the search results uncovered the gap still exists on the research topic (Elbardan & Kholeif, 2017; Seth et al., 2017). Narrowing this gap may contribute to positive social change by working toward building a consensus among ERP manufacturing consultants and scholars to improve project success and the triple bottom line for large enterprises and small and medium enterprises in the manufacturing industry. By producing the results of the study, 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 manufacturing 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 small and medium manufacturing firms 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 small and medium manufacturers in the United States. Positive social change occurs when ERP providers and users create a positive impact on the industrial sectors they serve, educate, and certify (Lin, Ma, & Lin, 2011). 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 business success. Positive social change within ERP implementations may to enhance employee knowledge, critical thinking skills, and organizational collaboration (Al-Johani & Youssef, 2013; Le Pennec & Raufflet, 2016). ERP applications have been shown to provide a sustainable competitive advantage to organizations by empowering employees to share

ideas and promote job stability (Azevedo, Romão, & Rebelo, 2014; Beheshti, Blaylock, Henderson, & Lollar, 2014). 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 (Gajic, Stankovski, Ostojic, Tesic, & Miladinovic, 2014; Pishdad, Koronios, Reich, & Geursen, 2014).

4. Purpose and research questions

4.1 Purpose of the study

The purpose of this qualitative modified Delphi study was to identify a consensus among an expert panel of 42 ERP manufacturing 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 (Habibi, Sarafrazi, & Izadyar, 2014; von der Gracht & Darkow, 2013). We conducted this study to reduce the scholar-practitioner gap regarding critical success factors identified in the literature versus those applied in manufacturing environments. Building a consensus among ERP manufacturing consultants and scholars on ways to improve project success and the triple bottom line for organizations in the manufacturing industry may lead to positive social change. ERP applications can contribute to social change by providing firms with additional operational visibility, both internally and externally (Hassan & Mouakket, 2016). Additionally, sustainable ERP (S-ERP) applications could provide a solution to support sustainable initiatives for an organization and its environment (Chofreh et al., 2016). 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.

4.2 Research questions

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

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

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

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

4. 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 (Adler & Ziglio, 1996; Linstone & Turoff, 2002). 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 (Linstone & Turoff, 2002; von der Gracht & Darkow, 2013). 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 (Brady, 2015; Dalkey & Helmer, 1963; Dalkey, Rourke, Lewis, & Snyder, 1972). In this study, the purpose of the Delphi approach was to predict a future outcome using expert opinion (Dalkey & Helmer, 1963; Dalkey et al., 1972).

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 (Habibi et al., 2014; Romano, 2010). 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 manufacturing 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 (Hung, Chang, Hung, Yen, & Chou, 2016; Zeng, Wang, & Xu, 2015). 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.

4.1 Population and sampling

The target population for this study was ERP manufacturing consultants in the United States with ERP implementation experience. ERP manufacturing consultants are regarded as the experts in their specified manufacturing sector and are highly trained in the technical and practical implementation of enterprise applications (Chang et al., 2013; Mitra & Mishra, 2016). 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 small and medium manufacturing organizations implementing ERP applications (Mayeh, Ramayah, & Mishra, 2016; Soler, Feliks, & Ömürgönülşen, 2016), 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 (Joshi, Kuhn, & Niederman, 2010; Orr & Orr, 2013). 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 participants for this study were selected based on ERP implementation experience, not their geographical region. We solicited participants for this study through the following 10 groups on LinkedIn: (a) SAP Community; (b) Dynamics AX ERP Professionals Group; (c) Oracle ERP User Network; (d) JD Edwards OneWorld and EnterpriseOne Professionals; (e) Microsoft Dynamics 365; (f) QAD Community; (g) Infor Global Solutions Professionals; (h) Netsuite Users Gro Up; (i) Epicor ERP 10 Consultants; and, (j) Acumatica ERP Software User Group. These LinkedIn groups are focused on connecting ERP consultants to share knowledge and best practices on their respective applications and can range from 175 to 342,000 members.

The study involved a purposive sampling technique to ensure meaningful results in the study. Participants were selected based on the following criteria: (a) at least 5 years of experience implementing ERP applications; (b) perform ERP implementations in the United States; (c) perform ERP implementations in the industrial or manufacturing sector; and, (d) perform ERP implementations for small and medium enterprises (firms that employ fewer than 500 employees). The ERP manufacturing 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.

4.2 Data collection and instrumentation

The Walden University Institutional Review Board granted approval for this study (09-17-18-0643463). The study involved three rounds of data collection and analysis. In the first round, the expert panel of ERP

manufacturing 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 (Elnasr, Sobaih, Ritchie, & Jones, 2012; Hsu & Sandford, 2007). 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 manufacturing 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 (Diamond et al., 2014; Fox et al., 2016; Paoloni et al., 2017). In the current study, 4 pertained to desirable or feasible; 5 pertained to highly desirable or highly feasible. In performing this methodical approach, we attempted to narrow the gap between the critical success factors identified in the literature versus the critical success factors employed in the field of ERP consulting.

The Round 1 instrument in this study was limited to the critical success factors identified by Saade and Nijher (2016), 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 manufacturing 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 (2002), 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.

The Round 1 survey also included demographic questions pertaining to (a) age range, (b) gender, (c) education level, (d) years of experience, (e) number of implementations completed in small and medium manufacturing environments (organizations that employ less than 500 employees), and (f) geographic region. Identifying the demographic characteristics of the study participants validated the level of distribution among the expert panel regarding their expertise and experience. The participants were also encouraged to add additional ERP factors not outlined in the survey. After reviewing the responses, the 10 critical success factors with the highest frequency were moved to Round 2 of the study.

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 ratings 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 manufacturing 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.

4.3 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.

4.4 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 (1951) 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 (Heitner, Kahn, & Sherman, 2013; Tavakol & Dennick, 2011). Ranging from 0 to 1, the closer the coefficient value is to 1, the more reliable

the scale (Anderson & Gerbing, 1988). A value greater than or equal to 0.7 is an acceptable reliability coefficient (Nunnally, 1967; Wijkstra et al., 1994).

4.5 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 (Iamratanakul, Badir, Siengthai, & Sukhotu, 2014; Remus, 2007). For the narrative data, we searched for common themes 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 (Heitner et al., 2013).

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 manufacturing 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 manufacturing 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, we described the distribution of these variables 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 small and medium manufacturing environments, we used frequency counts and percentages and the mode.

The research question pertained to the level of consensus among ERP

manufacturing 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.

5. Results

5.1 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 business management and leadership roles are typically those who lead ERP implementation projects in SMEs (Bronnenmayer et al., 2016a).

Table 1

Panelists' Age Range (N = 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

The second characteristic of the panel of experts we 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 manufacturing industry. Along with mining, construction, and agriculture, the manufacturing industry shows some of the highest levels of industrial segregation in the United States in terms of gender (Blau & Kahn, 2017).

Table 2

Panelists' Gender (N = 42)

Gender	*N*	%
Male	32	76.19
Female	10	23.81

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 a tenured group of manufacturing consultants.

Table 3

Panelists' Years of Experience (N = 42)

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

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 (2006) noted, consultants are continually furthering their

education to share their knowledge with clients during ERP implementations and organizational change initiatives.

Table 4

Panelists' Highest Education Level (N = 42)

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

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.

Table 5

Participants' Implementations Completed in Small and Medium Manufacturing Environments (N = 42)

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

The sixth panelist characteristic was the participants' geographic region. With the highest percentage of panelists implementing ERP solutions in the Midwest, the data show that manufacturing organizations in this region of the United States are still investing in their operations, although researchers have noted declines in production in the industrial Midwest (Hannigan, Cano-Kollmann, & Mudambi, 2015; Low & Brown, 2017).

Table 6

Participants' Geographic Region (N = 42)

Region	*N*	%
Northeast	11	26.19
Midwest	13	30.95
Southeast	6	14.29
Southwest	4	9.52
West	8	19.05

5.2 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.

5.3 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 (Nunnally, 1967; Wijkstra et al., 1994). 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 (Godoe & Johansen, 2012).

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. See Table 9 for Cronbach's alpha by item for Rounds 2 and 3.

Table 9

Reliability of Instruments by Item

	Desirability		Feasibility	
Critical success factor	Round 2 Cronbach's alpha	Round 3 Cronbach's alpha	Round 2 Cronbach's alpha	Round 3 Cronbach's alpha
Cultural change readiness	0.809	0.875	0.801	0.862
Top management support and commitment	0.805	0.881	0.799	0.884
ERP fit with the organization	0.810	0.873	0.789	0.872
Business process reengineering	0.802	0.869	0.784	0.871
Quality management	0.805	0.874	0.797	0.876
Detailed data migration plan	0.782	0.873	0.771	0.860
Small internal team of the best employees	0.809	0.870	0.806	0.865
Open and transparent communication	0.793	0.873	0.783	0.877
Contingency plans	0.772		0.771	
User feedback usage	0.780		0.786	

5.4 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.

5.5 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. Table 10 outlines the results of Round 2.

Table 10

Round 2 Results

	Desirability		Feasibility	
Critical success factor	Top two responses %	Median	Top two responses %	Median
Cultural change readiness	95.74	5.00	87.23	4.00

Top management support and commitment	100.00	5.00	100.00	5.00
ERP fit with the organization	100.00	4.00	95.75	4.00
Business process reengineering	85.11	4.00	87.23	4.00
Quality management	91.49	5.00	97.87	4.00
Detailed data migration plan	89.36	5.00	87.23	5.00
Small internal team of the best employees	100.00	5.00	95.75	4.00
Open and transparent communication	78.12	4.00	85.11	4.00
Contingency plans	80.85	4.00	70.21	4.00
User feedback usage	85.11	4.00	72.34	4.00

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.

Table 11

Round 3 Results

	Desirability		Feasibility	
Critical success factor	Top two responses %	Median	Top two responses %	Median
Cultural change readiness	95.24	5.00	85.71	4.00
Top management support and commitment	100.00	5.00	100.00	5.00
ERP fit with the organization	100.00	4.00	100.00	4.00
Business process reengineering	85.71	4.00	85.71	4.00

Quality management	90.47	5.00	97.61	4.00
Detailed data migration plan	88.10	5.00	85.71	5.00
Small internal team of the best employees	95.24	5.00	95.24	4.00
Open and transparent communication	78.57	4.00	83.33	4.00

5.5 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 (Diamond et al., 2014; Fox et al., 2016; Paoloni et al., 2017); however, because there was a high level of consensus for all eight critical success factors, we increased the cutoff 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, we increased the cutoff for consensus on feasibility 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.

6. Discussion

The responses from the expert panel of manufacturing consultants align with the body of literature. Leadership support is a CSF on which many researchers have reached a consensus (Aldholay, Isaac, Abdullah, & Ramayah, 2018; Loonam, Kumar, Mitra, & Abd Razak, 2018; Shao et al., 2016). The panel of ERP manufacturing 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 company-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 company 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 (Elkhani et al., 2014; Mitra & Mishra, 2016). Leadership effectiveness increases the probability of an organization to change (Aarons, Ehrhart, Farahnak, & Hurlburt, 2015). Researchers have stated that there is not a "one-size-fits-all" change management approach (Hamstra, Yperen, Wisse, & Sassenberg, 2013; Wang & Zhu, 2010). Although many researchers have argued for transformational leadership as the preferred approach over transactional leadership (García-Morales et al., 2012; Grant, 2012), transactional leadership still has its place in organizational environments.

In some business environments, employees will be empowered by the transformational leadership characteristics the project provides through the means of decision-making opportunities (Elkhani et al., 2014), while other employee populations will look to be rewarded for participating in the change initiative (Joia et al., 2014). Cullinane, Bosak, Flood, and Demerouti (2017) stated that standardized, lean practices could lead to reduced job enrichment and engagement among employees. Maas et al. (2014) 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 (2018) found that employees are empowered and motivated to make a positive impact on the organization, leading to increased innovation and creativity in the workplace.

6.1 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 (Flynn et al., 2015). 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 (Kennedy, 2012). 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 (Huang, 2016). 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 (Bergman, Rentsch, Small, Davenport, & Bergman, 2012). 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 (Ulhøi & Müller, 2014).

6.2 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. (2014) 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 (Kim & Altmann, 2013). 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 (Borgogni, Russo, & Latham, 2010). 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 (Harms & Crede, 2010). 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 (Le Pennec & Raufflet, 2016). 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 (Kareem, 2016). To make a positive impact on the corporation's environment and community, leaders of organizations must first assess the key variables for success before acting upon the organizational change initiative.

6.3 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 (1995) 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 (2015) 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 (Davis, Bagozzi, & Warshaw, 1989; Venkatesh, Morris, Davis, & Davis, 2003; Zigurs & Buckland, 1998), 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.

7. Limitations and recommendations

7.1 Limitations

Due to the iterative nature of Delphi studies, attrition is always a risk (Gray, 2016; McMillan, King, & Tully, 2016). 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 (Diamond et al., 2014; Fox et al., 2016; Paoloni et al., 2017). 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 manufacturing 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 manufacturing consultants in the United States did not include ERP manufacturing consultants from any other geographical area. Selecting ERP manufacturing consultants from other geographical areas may have produced different results due to varying cultures, work environments, and leadership styles. García-Sánchez and Pérez-Bernal (2007) 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 business 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 (2007) cautioned consultants and software vendors to be aware of cultural differences in other countries.

We used an established list of 22 consolidated critical success factors to conduct the survey. Although we allowed the expert panel of ERP manufacturing consultants to provide additional factors not outlined in the survey, there was the potential risk of influence given we provided the panelists 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 LMSs or CRM applications.

7.2 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 (2003) 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 organizational environments (Turner, 2014). In the literature, the common theory cited among ERP critical success factors is DeLone and McLean's (1992, 2003) information systems (IS) success model (Mwayongo & Omar, 2017; Siricha & Theuri, 2016). The DeLone and McLean IS success model is the most adopted and most cited theory in information systems research (Mudzana & Maharaj, 2015; Zouine & Fenies, 2015). DeLone and McLean (2003) provided an update to their original model to respond to the change and progression that occurred across the IS landscape after the publication of their seminal work.

Researchers have updated the DeLone and McLean (2003) 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 (1992) success model (Seddon, 1997; Seddon & Kiew, 1996). Although researchers who refuted the original model aimed to provide more theoretically sound studies, the DeLone and McLean model (1992) continues to outperform the modified models (Mudzana & Maharaj, 2015; Petter & McLean, 2009; Rai, Lang, & Welker, 2002; Stocker & Müller, 2016).

In addition to the various theories that have been used to measure ERP the success of ERP implementations in small and medium environments, 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 (Gajic et al., 2014), but the balanced scorecard model was the most cited model in the literature (Fu, Chang, Ku, Chang, & Huang, 2014; Gajic et al., 2014; Shen et al., 2016; Uwizeyemungu & Raymond, 2009). Although it is used to monitor financial and business 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 (Shen et al., 2016). First introduced by Kaplan and Norton (1996), 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. (2016) 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 blockchain technology continue to grow, the critical success factors outlined in this study may require reassessment for small and medium manufacturing enterprises. 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.

Because small and medium enterprises make up a large portion of the employer firms in the United States, an additional analysis that focuses on this population may be required given their constraints compared to large enterprises. Small and medium enterprises may face greater challenges in adopting technology as compared to large enterprises (Ghobakhloo, Hong, Sabouri, & Zulkifli, 2012). Because most ERP research has been focused on large enterprises (Conteh & Akhtar, 2015; Maas et al., 2014; Mo & He, 2015), studies that focus on small and medium enterprises outside of the manufacturing industry may benefit other organizations. Given leaders of firms will most likely take part in only a few ERP implementations during their career, reviewing the results of firms regardless of industry may assist in alleviating potential issues that may arise during an implementation.

7.4 Recommendations for application

The current study supported and expanded upon the literature on the critical success factors in ERP implementations in small and medium manufacturing enterprises. Researchers concluded when top management works closely with ERP users, the communication between business groups is enhanced, and conflict resolution becomes attainable (Maditinos et al., 2012). Iveroth (2016) 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, firms must provide open, transparent communication and structures to spawn innovation (Chenhall, Kallunki, & Silvola, 2011). 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 (Conceição & Altman, 2011). 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 (Senge, 1990). In creating learning organizations during times of change, employees are empowered to learn, creating a larger probability for employees to embrace change (Benson, 2016). Additionally, learning organizations enable stakeholders to remain current on technological advances, providing benefits to both the individual and the organization (Lozano, 2014). 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 (Marques, Agostinho, Zacharewicz, & Jardim-Gonçalves, 2017). With ERP blockchain integrations, transactions are visible to all network participants, increasing the auditability, trust, and increasing the confidence in the data (Gromovs & Lammi, 2017; Li et al., 2018). 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 (Dai & Vasarhelyi, 2017; Wang, Wu, Wang, & Shou, 2017). 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.

8. Conclusion

Although very little research has been performed on the topic, ERP applications can enable leaders to improve their triple bottom line (TBL). By providing visibility throughout a firm's global supply chain, these applications can track the usage of raw materials and ensure all the firm's facilities are remaining environmentally responsible (Turner, 2014). For the people perspective of the TBL, researchers have found that the implementation phase of ERP applications have led to empowerment, job enrichment, and innovative behavior (Krog & Govender, 2015b; Maas et al., 2014). Finally, given ERP applications integrate the operational and financial functions of an organization, research has shown that 80% of the Fortune 500 companies have implemented these solutions for improved decision-making and higher profitability (Maas et al., 2014). By leveraging ERP applications, leaders can promote positive social change by providing additional job opportunities and higher wages due to increased efficiencies.

While we focused on ERP implementations in small and medium manufacturing environments in this study, the results can have a positive impact on social change in other industries such as healthcare, hospitality, and education. 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 manufacturers, the unconventional view of software implementations as it pertains to small and medium manufacturing 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 (Bordia, Restubog, Jimmieson, & Irmer, 2011).

With some organizations expanding across the country and the world, firms also experience differing environmental cultures. Latta (2009) outlined the importance of identifying subcultures within an organization's system where resistance may arise. To validate this finding, an American manufacturer that expanded to Spain uncovered that out of the top five challenges within the new facility, employee resistance to change was tied for first along with the lack of technical knowledge of the employee base (Gil, Ruiz, Escrivá, Font, & Manyes, 2017). During times of change, employees look back on previous experiences, and poor change management history (PCMH) can influence employee perceptions of organizational change (Bordia et al., 2011). 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 (Gillespie & Mann, 2004). 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 (Kareem, 2016). To make a positive influence on the corporation'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 (Sikdar & Payyazhi, 2014). 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 (Sikdar & Payyazhi, 2014). When cultural change is perceived as an organization's core values, assumptions, and interpretations, the link

between employees and culture is apparent (Borgogni et al., 2010). 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 (Harms & Crede, 2010). 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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