The perspective of national ERP vendors in achieving ERP project success in government organizations: A case of Saudi Arabia

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Abstract

Government organizations in the Gulf Cooperation Council region are governed by strict rules and regulations. In such a context, most of Enterprise Resource Planning (ERP) projects are managed by the national ERP vendors. The aim of this paper is to explore Key Influencing Factors (KIFs) from the perspective of national ERP vendors throughout pre-implementation and during implementation of ERP projects. This research specifically focuses on the ERP implementations in government organizations in the Gulf Cooperation Council region. To achieve research objectives, we conducted a mixed methods study on 10 national ERP vendors involved in government sector projects in Saudi Arabia – the country which represents a 90% market share in Gulf Cooperation Council region. KIFs were identified through in-depth group interviews and prioritized using a multi-criteria decision analysis method (i.e. Analytic Hierarchy Process – AHP). Findings suggested a list of KIFs (15) that are grouped into four main categories namely sponsors and leadership, IT capabilities, change management, and project management. The prioritization of the KIFs by means of the AHP method reveals the ERP capabilities and the stakeholder managers to be the most important factors, and user orientation and ERP-business alignment to be the least important ones. Findings of this study would extend the knowledge of ERP implementations from the vendor perspective in the government sector; and propose a set of clearly understood and prioritized KIFs for practitioners to develop strategies appropriate for ERP implementation interventions.

Keywords

ERP, KIFs, CSFs, AHP, government organizations, ERP implementation, multi-criteria decision analysis method, vendors.

1. Introduction

Countries in the Gulf Cooperation Council (GCC) region (i.e. Saudi Arabia, Bahrain, Kuwait, Oman, Qatar, and the United Arab Emirates) have rentier economies, where the economies have been dominated by the governments since the advent of oil and gas. Therefore, the government sector is the key and most powerful player of economic development and welfare in this region (Choudrie et al., 2017; Hvidt, 2011). Government organizations in the GCC region are governed by strict rules and regulations. In such a context, 84% of Enterprise Resource Planning (ERP) projects are conducted by the national ERP vendors, not international ERP vendors such as SAP and Oracle (Schneider et al., 2018; Van Wart et al., 2017). This behavior is quite apparent in any government sector ERP project due to affordability of national ERP systems, ease of support and maintenance of national ERP systems, best fit for region specific business practices etc. (Liang & Xue, 2004; Xue et al., 2005).

This paper explores the Key Influencing Factors (KIFs) from the perspective of national ERP vendors throughout pre-implementation and during implementation of ERP projects. The research specifically focuses on the ERP implementations at government organizations in the GCC region (See figure 1). KIFs refer to the conditions or attributes that are thought to significantly influence the success rates of ERP systems (Finney & Corbett, 2007). This study identifies KIFs by employing in-depth interviews and prioritizes the identified KIFs using a multi-criteria decision analysis method. Thus, this study's objectives are;

(1) to identify KIFs for the implementation of ERP systems from the ERP vendors' perspective

(2) to establish a multi-criteria decision analysis method suited to prioritize any influencing factors identified.

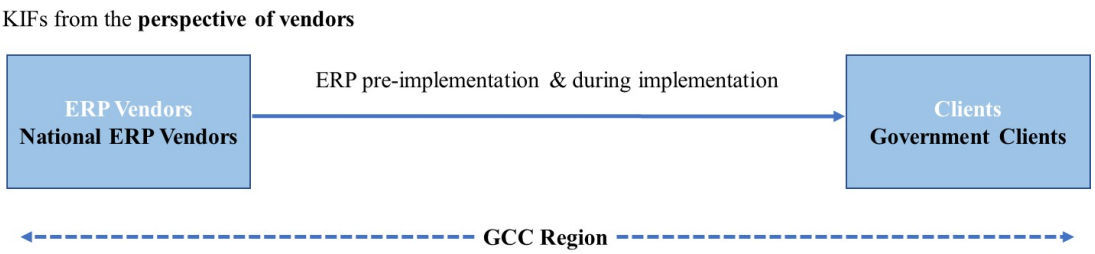

Figure 1: Research Scope

This research is particularly noteworthy for four reasons. Firstly, it focuses on KIFs in pre-implementation and during implementation of ERP projects in government organizations in the GCC region. Although previous research has identified KIFs of ERP particularly in the private sector (Ranjan, Jha, & Pal, 2018; Saygili, Ozturkoglu, & Kocakulah, 2017), studies which focus specifically on the government sector are scare. Government sector projects have unique aspects compared to private sector (e.g. different expectations and reporting requirements) (Choudrie et al., 2017; Weerakkody et al., 2019). Moreover, the government organizations in the GCC region are unique as those organizations are governed by strict rules and regulations. Secondly, this study takes a vendor perspective. Though, there are many studies that investigate the client perspective to achieve ERP implementation success (Bansal & Agarwal, 2015; Baykasoğlu & Gölcük, 2017; Jayawickrama & Yapa, 2013; Reitsma & Hilletofth, 2018; Saygili et al., 2017), the vendor perspective in ERP implementations has been largely overlooked (Garg & Garg, 2013; Momoh et al., 2010; Van Wart et al., 2017). Yet, vendors are particularly important while implementing ERP systems in government organizations due to the complexity it involves (Choudrie et al., 2017; Weerakkody et al., 2019). Most of ERP projects are supported by implementer / implementation partners, who work as a conduit between ERP vendor and clients, supporting the ERP implementation process (Sarker, Sarker, Sahaym, & Bjørn-Andersen, 2012). In the GCC region, ERP vendors directly engage with clients without the use of implementation partners. Moreover, government clients in the GCC region have minimum knowledge on the ERP implementations, thus solely depend on ERP vendors. Since the vendors engage in various ERP implementation projects, they have extensive knowledge on KIFs. Thirdly, this study focuses on national vendors, those vendors are different from international ERP vendors such as SAP and Oracle. ERP projects conducted by national vendors face different challenges as oppose to ERP projects conducted by international ERP vendors (Xue, Liang, Boulton, & Snyder,

2005; Jayawickrama & Yapa, 2013; Baykasoğlu & Gölcük, 2017). International ERP vendors are still unable to dominate the ERP market in the GCC region, in which local vendors are the preferred by local organizations owing to costs, regulatory and social contextual issues, and to the fit between ERP systems and local management features (Liang & Xue, 2004; Xue et al., 2005). Such specificity allows us to have contextualized research findings which could lead to actionable management insights (Bamberger, 2008; Johns, 2006). Finally, our research contributes to a better understanding of KIFs for successful ERP implementation by considering contextual features when determining KIFs – e.g. economic status of the country where the organization is situated – developing countries, culture – culture in GCC region and sector –public sector. There is lack of research which explain the impact of various contextual features on the importance of KIFs (Vargas & Comuzzi, 2020).

To achieve the research objectives, we used a mixed methods approach and studied 10 national ERP vendors who had a long history of ERP implementations within the government sector in Saudi Arabia – the country which represents a 90% market share in the GCC region. Saudi Arabia is the largest GCC country in terms of area, population, and oil export and reserves (Wiseman & Anderson, 2012). It is also the third largest economy in the Middle East and one of the top twenty economies in the world.

The paper proceeds in the following manner. The next section reviews literature on ERP systems, challenges related to ERP implementations, KIFs and Critical Success Factors (CSFs) and establishes the research gap. The subsequent section explains the research methodology, which is followed by the analysis and empirical results section. The paper concludes by discussing implications for research and practice, limitations, and future research directions.

2. Literature Review

ERP systems are information systems that are essential for organizations to improve business processes (Jayawickrama et al., 2019). The success of ERP implementation is linked to several benefits, such as improvements in the efficiency of business processes, the attainment of integrated real-time information, the achievement of better business performance, the enactment of result-based management, compliance with regulation

demands, the sustainment of a competitive advantage, and a response to the desire to deliver new services (Acar, Tarim, Zaim, Zaim, & Delen, 2017; Bharosa et al., 2013; Kautz et al., 2007; McLeod & Doolin, 2012; Nguyen, Tate, Calvert, & Aubert, 2017). The technical benefits are related to the limitations of former legacy systems, which include the coexistence of heterogeneous systems, difficulties in affecting evolution, limitations in integration capabilities, and endless (and high) maintenance costs (Bharosa et al., 2013; Jayawickrama et al., 2019; Mayère et al., 2008).

In essence, the implementation of an ERP system is a socio-technically complex process the outcome of which is shaped and influenced by multi-dimensional stakeholders and business activities (Kähkönen, Alanne, Pekkola, & Smolander, 2017; McLeod & Doolin, 2012). The success of ERP implementation depends on the interplay between technology and human actions (Mueller, Mendling, & Bernroider, 2019). Orlikowski and Iacono (2001) and McLeod and Doolin (2012) stressed how the boundaries between the technological and social aspects of the implementation of ERP systems are blurred; therefore, the implementation process should be conceptualized as a complex phenomenon (Orlikowski & Iacono, 2001). Thus, identification of the various dimensions of the technical and social aspects of organizations and of their impact on the implementation process is a vital problem that still in debate (Mayère et al., 2008). The KIFs or CSFs approach views the implementation of an IT system as reciprocal relationship between technological and social phenomena (McLeod & Doolin, 2012). Further, CSFs highlight the importance of understanding the complex scenarios of the relationships between an organization's social environment, the people enacting the business processes, and the system supporting such processes (McLeod & Doolin, 2012).

2.1. Challenges Related to ERP Implementations

There are many challenges related to ERP implementations and these challenges are increasingly complicated (Menon, Muchnick, Butler, & Pizur, 2019). Research suggested that ERP system benefits are not as straightforward to come by as organizations would like to believe (e.g., Buonanno et al., 2005; Howcroft et al., 2004; Chien & Tsaur, 2007; Yen Teoh & Pan, 2008) and ERP system implementations are globally affected by unusually high global failure rates linked to improper planning considerations (e.g., Liang et al., 2007; Yen Teoh & Pan, 2008; Dong et al., 2009;

Fadelelmoula, 2018; Rashid et al., 2018). Mayère et al. (2008), Buonanno et al. (2005), and Momoh et al. (2010) found that ERP system implementations were taking longer than expected due to organizations failing to properly account for key project activities in their implementation planning processes and therefore developing unrealistic expectations concerning timeframes.

Some studies have revealed that ERP system implementations had gone over budget because organizations have failed to take into account specific implementation costs which are not attributable to software vendors (i.e., project management, organizational change management, hardware upgrades) (e.g., Liang et al., 2007; Yen Teoh & Pan, 2008; Dong et al., 2009). Thus, the ERP systems are socio-technically complex and that many reported implementations had therefore ended up being difficult, lengthy, and over-budgeted, resulting, in some cases, in their termination before completion (Buonanno et al., 2005; Mayère et al., 2008; Momoh et al., 2010). Thus, it is important to understand the KIFs of ERP implementations.

2.2. KIFs and CSFs

According to Saade and Nijher (2016, p. 73), CSFs are "essential to ensure that a successful ERP implementation proves to be a profitable venture for an organization". CSFs include limited number of critical areas which are required for the success of the projects (Rockart, 1979), thus cannot be rated / ranked. Therefore, this research focuses on KIFs – the conditions or attributes that can be rated that are thought to significantly influence the success rates of ERP systems (Finney & Corbett, 2007). However, we drew insights from CSFs literature to establish the theoretical foundation of our study.

Since the late 1990s, information systems (IS) research scholars have made great progress in relation to gauging the "success" of ERP systems (Hong & Kim, 2002; Dezdar & Sulaiman, 2009). In this respect, the approach developed by Rockart (1982), has been largely adopted in IS research to identify the KIFs or CSFs of IT projects (Dezdar & Sulaiman, 2009; Holsapple et al., 2017).

Butler and Fitzgerald (1999), Markus and Tanis (2000), and Somers and Nelson (2004), agreed that the CSFs of an ERP system implementation can be classified according to the key social enablers and the activities associated with it, and to the ERP system itself

and its related technical capabilities. For example, Somers and Nelson (2004) identified 21 CSFs from the clients' perspective concluding that the most important factors as top management support, project team competency, and interdepartmental co-operation, whilst the least relevant among them all was the use of consultants. This study suggests that an ERP implementation process could be viewed as an intersection between its key enabling players and its core-required activities. Reitsma and Hilletofth (2018) explained project team, technical possibilities, strategic decision-making, training and education, minimum customization, software testing and performance measurement as most important CSFs from the ERP user perspective.

Al-Mudimigh et al. (2001), Finney and Corbett (2007), Ngai et al. (2008), Shao (2019) asserted that top management commitment/support as a key CSF in implementing ERP. Barth and Koch (2019)) identified project management, external assistance, the composition of the ERP team and the usage of a multiple system landscape as CSFs in ERP upgrade projects. Further, factors involved are; business case (i.e., considering the project's objectives, needs, and benefits), project management, change management, training, and communications. These factors largely provide evidence for the interrelationship between the social and technical environment particularly focusing on strategic management elements.

However, Finney and Corbett (2007) found that, in relation to ERP system implementation, the CSF literature lacked research from the perspective of key stakeholders outside the implementing organization, and variance in the details of some predominant factors (e.g., change management). In addressing this claim, we conducted in-depth group interviews of 10 national ERP vendors (i.e. a key stakeholder outside the implementing organization), who have a long history of ERP implementations within government sector of Saudi Arabia to identify the KIFs of ERP projects, and to identify their perception about the importance of the KIFs based on the multi-criteria decision analysis method.

2.3. Research Gap

Although much CSF research has contributed to the IS literature during the last few decades (Baykasoğlu & Gölcük, 2017; Kurnia, Linden, & Huang, 2019), most previous CSFs research regarding ERP systems has been focusing on the private sector and on

the clients' perspective (e.g., Reitsma & Hilletofth, 2018; Saygili et al., 2017; Amoako-Gyampah, 2004; Finney &Corbett, 2007; El Sawah et al., 2008; Françoise et al., 2009; Momoh et al., 2010; Garg & Garg, 2013; Jayawickrama & Yapa, 2013; Bansal & Agarwal, 2015; Saade & Nijher, 2016). The concern here is that, to date, research has failed to provide insights into the prioritization of the KIFs of ERP systems from the perspective of the ERP vendors, particularly those dealing with the government sector (Van Wart et al., 2017). The government sector ERP implementations are complex and distinctively different from the private sector and there is a void in knowledge pertaining to this (Weerakkody et al., 2019; Choudrie et al., 2017).

Dezdar and Sulaiman (2009) analyzed the literature produced between 1999 and 2008 in relation to the CSFs of ERP systems, and developed a taxonomy consisting of 17 factors, more than 70 percent of which were consistent with the work of Somers and Nelson (2004) and Finney and Corbett (2007). Ram and Corkindale (2014) reviewed the accumulative CSFs of ERP systems in the literature in order to categorize the factors identified in the pre-, during, and post-implementation stages of such systems. By conducting a systematic literature review of ERP CSF literature produced in between 2005 and 2016, Wijaya, Prabowo, and Kosala (2017) identified management support, commitment, business process reengineering, ERP performance, user training and education and ERP integration as most important CSFs. A systematic literature review of ERP CSF literature published between 2006 and 2016 highlighted six main CSFs as culture, communication and change management, infrastructure, business process reengineering management, training and education, project management and project team (Mahraz, Benabbou, & Berrado, 2020). The aforementioned studies carried out meta-analyses across the literature on ERP system implementation in order to provide researchers with comprehensive lists of CSFs. However, Dezdar and Sulaiman (2009) found that most research on the CSFs of ERP systems had focused on private sector companies in developed countries in Europe and North America, and little had been conducted on their counterparts in developing countries. Vargas and Comuzzi (2020) highlighted the importance of identifying CSFs considering the contextual factors such as economic status of the country where the company is situated – i.e. developing or developed country. Table 1 includes previous research which is helpful in establishing the theoretical foundation of our study. However, research which explains KIFs from the perspective of national ERP vendors in the GCC region are scare. Through our

study, we address this neglected, yet important research gap. Government sector ERP projects have unique aspects compared to private sector (e.g. different expectations and reporting requirements) (Choudrie et al., 2017; Weerakkody et al., 2019). Moreover, the government organizations in the GCC region are unique as those organizations are governed by strict rules and regulations. In the GCC region, the vendors play an important role as the clients have a minimum knowledge on ERP systems. Moreover, the vendors involve in a number of ERP projects, thus have extensive knowledge on ERP. Therefore, it is important to understand KIFs from the perspective of national ERP vendors in the GCC region, so that the national ERP vendors can focus on the prioritized KIFs and ensure that the ERP implementations will be successful.

Table 1 - overview of existing research which is helpful in establishing the theoretical foundation of our study

Study	Context	Method	Theory	Main Findings
Vargas and Comuzzi (2020)	Not specified	Systematic literature review	Literature related to ERP systems and CSFs	It is important to consider the contextual features (e.g. economic status of the country the organization is situated – developing or developed, culture, sector – private or public, and size of the organization, when determining CSFs.
Kurnia et al. (2019)	Small-and-medium enterprises (SMEs) located in various countries	Systematic literature review and success stories reported by 30 SMEs	Literature related to ERP systems and CSFs	The CSFs of ERP implementations in SME context is different from large organizations. For example, SMEs heavily rely on vendors for ERP implementations. Thus, CSFs such as team competence and balanced team are less important factors in SME context.
Shatat (2015)	Organizations in Oman	Quantitative study	Literature related to ERP systems and ERP implementation	Main CSFs during ERP implementation in organizations situated in Oman include top management support, user involvement, clear goals & objectives, strategic IT planning, vendor support, teamwork & composition, monitoring & evaluation of performance, and education on new business processes.
Halim, Arafeh, Sweis, and Sweis (2019)	Organizations in Jordan	A descriptive, quantitative, and qualitative approach	Literature related to ERP systems	Public sector organizations should focus on project management maturity, change management, organizational environment factors and team building during ERP implementations.
Tarhini, Ammar, Tarhini, and Masa'deh (2015)	Not specified	Systematic literature review	Literature related to ERP systems and CSFs	Mainly cited CSFs in literature published between 2000 and 2013 include top management support and commitment, training and education, project management, clear objectives of the ERP system, careful change management and interdepartmental communication.
Nagpal, Kumar, and Khatri (2017)	Not specified	Interpretive structural modeling and extends it by using total interpretive structural	Literature related to ERP systems and CSFs	There are interdependencies between CSFs. Most dominant CSFs have high ability to influence ERP implementation success. Other SCFs indirectly influence ERP implementation success.

		modeling and cross-impact matrix-multiplication approach		
Abukhader (2015)	Private hospitals in Saudi Arabia	Quantitative study	Literature related to ERP systems and ERP system implementations in Saudi Arabia	Most cited CSFs are top management commitment and support. Change management has a limited contribution to ERP implementation success in the context of private hospitals in Saudi Arabia.
Mutahar (2016)	Organizations based in Saudi Arabia – a mix of private and public organizations	Quantitative study	Literature related to ERP systems and CSFs	IT infrastructure, training, goals, vendor support, Business Process Reengineering, top management and maturity are the main CSFs of ERP implementations. Cost, project management and data accuracy are less significant factors.
Delgir and Pourjabbar (2018)	Financial institutions in Iran	Survey method and interviews	Literature related to ERP systems and CSFs	Most influential CSFs of ERP implementations in companies situated in Iran include appropriate selection of software, training and practice, and top management support.
Santos, Santana, and Elhimas (2018)	ERP implementation in public administration	Literature review and exploratory case study	ERP in public sector organizations and CSFs literature	There are specific CSFs in public sector organizations such as bureaucracy and social construction of technological legacy. There are some CSFs which are similar to private organizations, however the application of these CSF is different in public organizations. For example, team competency is more bureaucratic in public organizations.
Basri and Siam (2017)	Educational sector of Saudi Arabia	Quantitative study	Literature related to ERP and change management	Sense of urgency and project management are two important CSFs of ERP implementations in educational sector of Saudi Arabia.

3. Research Methodology

In this study we adopted a mixed methods approach – a combination of qualitative and quantitative methods. Firstly, we developed a hierarchical model of KIFs based upon qualitative data drawn from in-depth group interviews. Secondly, taking a quantitative approach, Analytic Hierarchy Process (AHP) method - one of the multi-criteria decision analysis methods was used to prioritize the KIFs based on the overall average of the preferences expressed by the ERP vendors. Figure 2 illustrates the sequence of the research methods adopted. The following paragraphs provide detailed explanations of research methods adopted in our study.

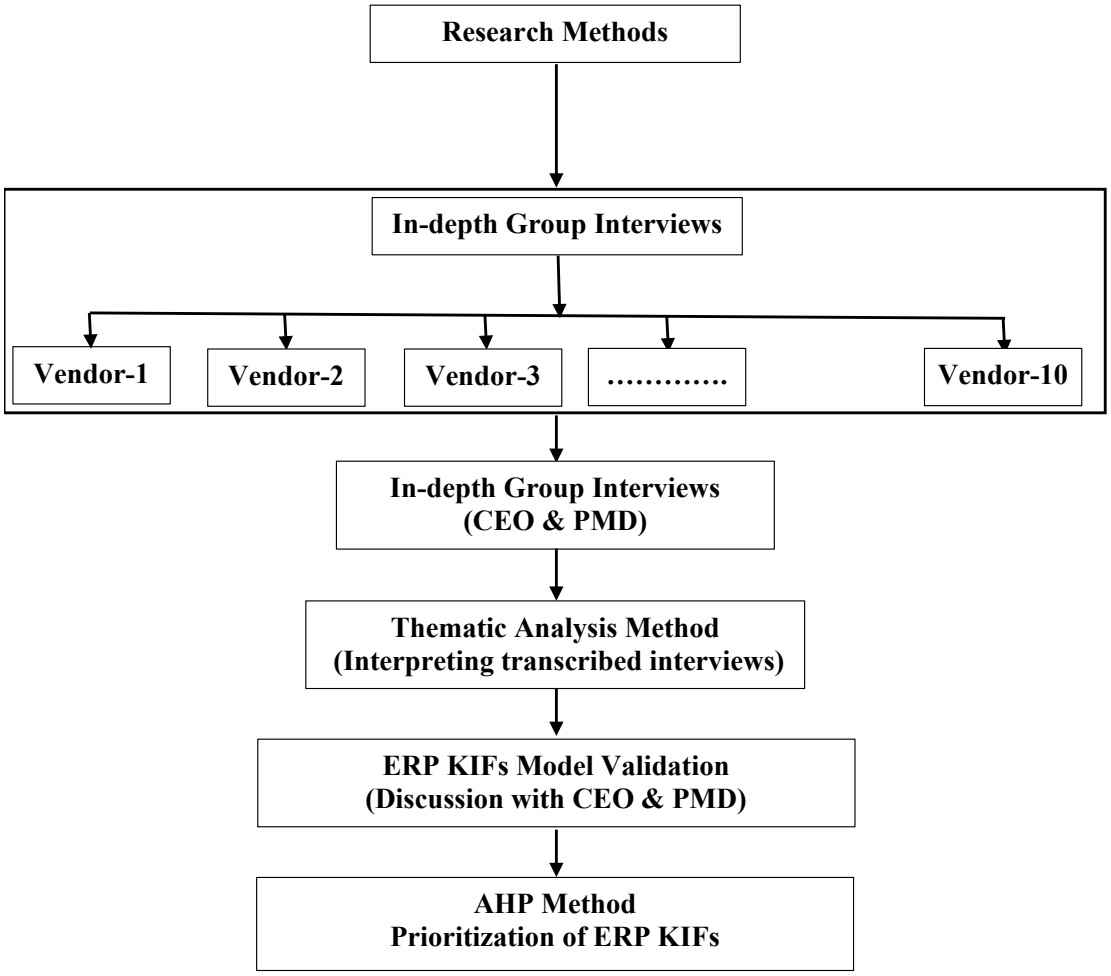

Figure 2: The adopted research methods.

3.1. In-depth Group Interviews

The research objectives were to explore KIFs studying the significant national ERP vendors operating in Saudi Arabia. We conducted in-depth group interviews with 10 vendors (see Table 2) that allowed us to gain better insights into the complex socio-technical setting of the research subject and to then interpret how certain actions could affect people's attitudes and behaviors. In-depth interviews are one of the main data collection techniques in qualitative research (Mann, 2016; Myers & Newman, 2007; Roulston & Choi, 2018; Travers, 2019). In-depth interviews allow researchers to "reach beyond the superficial layers of their (i.e. interviewee's) experience in order to generate informative, novel accounts of the phenomenon of interest" (Schultze & Avital, 2011, p. 3). A strategic IS project (e.g., the implementation of an ERP system) always involves complex, intertwined scenarios involving social and political interactions and interventions, which obscure its real-life context (Liang and Xue, 2004; Dong et al., 2009). In-depth group interviews are appropriate for our study as it provides the ability to understand a complex phenomenon from the viewpoint of main stakeholder (i.e. national ERP vendors) involved in the phenomenon of study (Mann, 2016; Schultze & Avital, 2011).

3.2. Participants

The most appropriate national vendors were identified through purposive sampling method. To identify the sample vendors, we used informal contacts and thereafter used chain referral or snowball sampling to identify other national vendors in Riyadh (i.e. the capital of Saudi Arabia where the majority of large companies have their headquarters). This process led us to a number of suitable organizations and then we selected the 10 vendors who would respond and agree to take part in the study. All these organizations had over 15 years of experience in implementing ERP systems within the government sector. Table 2 presents basic information concerning the selected organizations.

Table 2: General information about the national vendors of ERP systems.

No	ERP vendors	Age of the vendor organization	No of branches	Age of ERP system	Number of government implementations	Number of successful implementations	Number of partially successful implementations	Number of failed implementations
1	Vendor_1	18	2	18	22	17	2	3
2	Vendor_2	30	3	26	11	9	2	0
3	Vendor_3	18	1	15	25	21	2	2
4	Vendor_4	32	3	27	32	25	5	2
5	Vendor_5	20	3	15	23	19	2	2
6	Vendor_6	33	6	27	47	41	5	1
7	Vendor_7	32	7	25	57	48	7	2
8	Vendor_8	23	2	17	45	38	6	1
9	Vendor_9	26	3	20	31	26	3	2
10	Vendor_10	22	2	18	23	19	4	0

3.3. Data Collection

In proceeding towards our data collection journey, we asked the CEOs for permission to carry out in-depth group interviews with the CEO and their Project Management Directors (PMDs). This helped us to explore the success factors constructed by each vendor organization by its key members. The data collection process unfolded in 2018 with a total number of 20 key participants taking part in the interview process, which ranged from 30 to 45 minutes in duration, depending on the interviewees' schedules and availability. During these group interviews, we asked questions and probed when necessary to enrich the data. All the data gathered in the interviews were recorded and transcribed verbatim.

In addition, to ensure the integrity of the results derived from the previous interviews, to go through and clarify the research themes (Borenstein, 1998) and to increase the validity of our research findings (Borenstein, 1998; Yin, 2014), we carried out follow-up discussions with the same CEOs and PMDs for about 30 minutes. This helped us to understand whether we have reached to a data saturation (Orlikowski, 1993). In an attempt to obtain a consensus and a convergence of opinions among the key participants, the ERP system implementation KIFs model was illustrated with clear definitions of the identified factors (Benlian, 2011).

3.4. Data Analysis

In relation to the first research objective, we followed the six-step thematic analysis guideline developed by Braun and Clarke (2006) to analyze the empirical data (see table 3). The first step involves formalizing the collected data; this entailed transcribing the interviews and then scanning the transcripts to the end of gaining prior knowledge, initial analytic interests, and thoughts.

The second, third, fourth and fifth steps involve iterative procedures, including (respectively) the generation of the initial codes, the search for themes, the review of any themes identified, and their definition and labeling. To ensure that we had completely understood all the concepts produced by the participants, we subjected the aforementioned steps to several iterations. The second step involved the coding of the transcripts to generate all possible initial codes. Any ambiguous codes were clarified and explained by the participants through follow-up phone conversations. In the third, fourth, and fifth steps, we refocused the analysis phase to sort and collate the relevant codes into potential themes; the themes were then refined, defined, and named. In the sixth and last step, in order to increase the validity of our overall findings (Yin, 2014), we reported them back to the participants for validation and feedback. The information collected through company websites and project reports was used as a means of data triangulation when identifying KIFs.

Table 3: The six steps followed in thematic analysis

Step	Description of the activities
Data formalization	▪ Transcribing the collected data ▪ Going through the collected data several times ▪ Gaining prior knowledge ▪ Noting down initial analytic interests and thoughts
Generation of initial codes	▪ Generating all possible codes across the entire data ▪ Assigning empirical relevant to each generated code
Search for themes	▪ Reviewing the codes and their empirical evidence ▪ Organizing the codes into potential subjects
Review of themes	▪ Developing common themes ▪ Reviewing the appropriateness of the themes and sub-themes in relation to the coded extracts
Definition and labeling of themes	▪ Generating clear definitions and names for each theme ▪ Refining the overall story of each theme and of the entire data set
Production of the report	▪ Reviewing the final report of the analysis with the participants

	▪ Reviewing the final report of the analysis in relation to the research questions and the literature ▪ Producing the final report of the analysis

Adopted from Braun and Clarke (2006)

3.5. Analytic Hierarchy Process (AHP) Method

To prioritize KIFs in terms of their impact on system success in organizations, previous studies have made use of a number of methods, including the scoring and ranking methods, mathematical optimization models, and multi-criteria decision analysis models (Tan et al., 2012; Kilic et al., 2014). In relation to the second objective, we chose the AHP method which was developed by Thomas L. Saaty in the 1970s, due to its ability to systematically provide structured and simple solutions to problems (Jayawickrama et al., 2017) and also ease of use over other available multi-criteria decision analysis techniques (Anderson et al., 2009). The AHP method has proved to be a highly effective and popular technique that has been applied to a broad spectrum of disciplines, including the IS field (Salmeron & Herrero, 2005). This method enables the structuring of the decision-making problem in a hierarchal model that consists of multiple levels, going from the ultimate goal, objectives (criteria), sub-objectives, and finally to the alternative levels (Saaty, 1990). Accordingly, this systematic structure provides a logical view of the relationships inherent in decision-making problems and assesses the relative importance of the evaluation criteria; this helps decision makers to accurately compare homogeneous alternatives (Lee & Kozar, 2006). The AHP method has been used as a synthesizing mechanism in group decision-making (Lai et al., 2002). The AHP method is appropriate for this study as it enables decision makers (e.g. CEOs and PMDs) to make intuitive judgments based on the quantification of the relative priorities for different KIFs identified through in-depth group interviews. Moreover, using AHP method KIFs can be prioritized or ranked based on the overall preferences expressed by the decision makers (Jayawickrama et al., 2017).

According to Saaty (1990), the AHP method involves three basic steps: decomposition, comparative judgment, and priority synthesis. In the decomposition step, the hierarchal structure of the problem is constructed on three main levels. The highest level represents the ultimate problem goal, while the middle one involves the importance criteria and sub-criteria. The lowest level represents the decision alternatives. The comparative judgment step involves a pairwise comparison of factors on the same level

based on the highest-level objective. The results of this comparison process are then arranged into a comparison matrix. In the priority synthesis step, a composite weight is calculated for each alternative in the comparison matrix by means of the eigenvalue method to determine the relative priority of each alternative. Section 4.3 includes a detail explanation about the application of AHP method in our research.

4. Analysis and Empirical Results

In general, the data suggested that most government organizations had implemented an ERP system at some point. The most frequently implemented ERP modules were inventory, HR, administrative communication, and archiving systems. According to the national vendors, the government sector in Saudi Arabia was enthusiastic and aware of the different benefits gained by having a fully integrated and automated ERP system with a rich informative data warehouse.

The empirical evidence shows that, to carry out the implementation process successfully, the Saudi Arabian government organizations rely completely on the national vendors' expertise. For example, the PMD of Vendor_5 reported:

> *"We understand and appreciate the government organizations' deficiency in many of the attributes required for the introduction of ERP systems. We know that, to gain a more meaningful outlook for their business, government organizations seek strategic partnerships with the vendors."*

Further, government organizations are keen on carefully selecting the national vendors best suited to take the lead in implementing their own customized ERP systems. The selection of the "right" national vendor—that is, the one that best met the client's needs and requirements—was regarded as a critical stage by government organizations. Although usually the cost of an ERP system implementation process is important in evaluating and selecting the vendor (Holsapple et al., 2017; Ram & Corkindale, 2014), the participants suggested that the most important criteria for government organizations were the capabilities and reputation of the vendor.

Participants also commented that the relationship between government organizations and national vendors of ERP systems was, in general, respectable and governed by the nature of their shared interests, as the CEO of Vendor_8 commented:

"We both appreciate the complexity of the implementation process and the weaknesses of the client in terms of the IT capabilities and the confusion of the workplace…[Therefore] we, as the vendor, have the flexibility to go further, far beyond the scope of the project, and to deal with other added needs and requirements."

Most of the participants explained that the relationship between national vendors and government organizations during the implementation process was of an integrative and allied in nature; it relied primarily on the ERP systems' capabilities and on the national vendors' expertise. Therefore, some participants commented that implementations as a detailed and a long process.

4.1. The KIFs of ERP System Implementation

4.1.1. Sponsors and Leadership

The factors within this cluster refer to the key ERP system implementation players; that is, those players the support, cooperation, commitment, leadership, decisions and interventions of which crucially affect implementation success. The participants agreed that the key feature that should be possessed by those key sponsors is strong leadership and authority; their roles and interventions should already be determined in the project planning. The participants also agreed that, in some cases, the role played by and the intervention of "top management" was critical to the success of an ERP system implementation in government organizations. Although, in many instances, the top management's role is limited to participating in some steering committee meetings, its interventions can sometimes lead to settling disputes and preventing conflict between the parties involved. The participants also explained management stability as an issue in Saudi Arabian government organizations. According to the CEO of Vendor_7:

"We understand that government organizations are not based on systematic or institutional approaches; therefore, we sometimes rely on the confidence and support of key managers...[Therefore] changing or reshuffling those managers can sometimes result in serious delays."

According to the participants, it can take almost five years for an ERP system to go completely live. Key manager recycling or reshuffling is therefore to be expected;

therefore, workplace changes occurring at different levels—for instance, in relation to authority, business processes, power, requirements, scopes, etc.—will certainly affect implementation progress.

Data also suggested that the importance of facilitator role played by “IT managers” during implementation process from both an administrative and a technical point of view. The participants explained that, in order to respond to any needs that should arise during the implementation process, IT managers should foster good relationships with top management or senior management staff. Therefore, “project team” is considered as a key factor because it is viewed as the strategic arm of the national ERP vendor. Generally, project team members are made up of national ERP vendor, government organization’s IT staff and representatives from each department linked to ERP system’s operation. In order to develop, plan, steer the required interventions and to allocate resources, the team members should have strong knowledge and experience in strategic IT projects.

Another key player is the stakeholder manager. In this context, stakeholders are the end-users of the ERP system; thus, their reactions and interactions can affect or be affected by the ERP project implementation process. Accordingly, stakeholder managers are directly responsible for creating positive relationships between their employees, as the end-users, and the ERP system. According to our participants, “stakeholder managers” must consider themselves to be the owners of the system, key drivers of its success, and project team members rather than mere facilitators. Their cooperation, commitment, input, and positive interactions with the project team during the implementation process are positive indicators of later success. The PMD of Vendor_1 commented:

> *"The stakeholder managers should understand that the purpose of the system’s implementation is to serve them before serving other departments, the top management, or the organization itself."*

Most participants pointed out ERP vendor expertise as another important factor. Different participants highlighted this by stating that government organizations in the GCC region lack a good understanding of their business requirements; therefore, they

are heavily dependent on vendor expertise to respond to their needs, issues, and requirements.

4.1.2. IT Capabilities

Our participants outlined the importance of ERP system, IT infrastructure, and IT personnel capabilities, which they identified as key determinants of ERP system implementation success. They also explained that, due to a lack of national guideline standards and ambiguity of certain business processes—which stemmed from the complicated nature of the national legislative system in Saudi Arabia—the scope of most ERP systems developed by national vendors was limited to the common and core business of the daily procedures of government organizations. Therefore, the ERP system capabilities' organizational fit was still an issue and depended on vendor expertise. The CEO of Vendor_4 commented:

> *"The majority of the modules of our system are limited to the common and core business of daily procedures in the government organizations…We cannot go beyond the major core business and modules because the government legislation is very complicated…[Therefore] we cannot say that our ERP modules support automation 100 percent…We cannot say that our ERP modules support digging for more and more information to enable the obtainment of 100 percent fruitful data through the data warehouse…But our system is adequate for the current circumstances."*

Concerning the IT infrastructure, the participants explained that most government organizations operated adequately sophisticated data centers in terms of up-to-date networks and platforms. However, many organizations still lacked automation in many areas (e.g., inventory, purchases and procurement, financial and HR systems) and faced shortages of professional and skilled IT staff. The PMD of Vendor_2 reported:

> *"Many complicated business units of government organizations were not IT based before the implementation of the ERP system…Just imagine the inventory unit in a large organization…several inventories scattered across the country with thousands and thousands of items."*

A similar view was pointed out by the CEO of Vendor_10 in relation to the lack of skilled national IT staff in Saudi Arabia:

> *"Due to the lack of professional business analysts in many government organizations, it is our job to understand the business process…We also take on the role of dealing with some requirements in the data center, such as security and networking, and integration and interface issues."*

The participants stated that most government organizations lacked experienced and skilled business analysts and saw this situation as one of the greatest challenges hindering the development of IT transformation.

4.1.3. Change Management

The participants agreed that the implementation process is challenging due to the complexity, scale and it required a dynamic change management approach. Data suggested that these change management approaches must consider three essential elements: “ERP business alignment”, “user orientation”, and “resistance to change”. The participants noted that the Saudi Arabian government sector was subject to legal regulations, rules, and procedures that, at times, were conflicting, overlapping, and ambiguous, and, in some cases, did not provide alternative dynamic models suited to resolve any emerging conflicts and tensions. Although the Saudi Arabian government sector ERP systems were being developed as per the common rules of business process management, the project team and the top management could act as bottlenecks in relation to settling all and any political and organizational structure issues and to setting the rules pertaining to ERP system business alignment. The PMD of Vendor_4 commented:

> *“The government legislation is very complicated … our system and [I think others as well] cannot guarantee the automation of ERP modules 100 percent. Every government organization has its own methods to overcome business processes and procedures conflict and tensions between ERP modules, but we must document the best of fit solution and then signed by the project team, particularly if this solution will require substantial changes in future if there is a request of change”.*

The participants revealed that ERP implementations could also be seen as ways of transforming business practices because most government organizations in Saudi Arabia were still paper based and not automated. Effective change management needs to deal with the resistance to change that may be triggered by the heavy load of extra tasks. In this regard, incentives and forms of compensation need to be offered to employees in order to encourage them to increase the levels of ERP interactions in their daily routine tasks. A great deal of user training and orientation is also required to increase employee awareness of the new systems and to synchronize the level of knowledge among stakeholders.

4.1.4. Project Management

Participants pointed out that, albeit being an essential factor of ERP project success, project management is a complex task involving many multi-dimensional attributes; therefore, every national vendor had its own customized project management philosophy and methodology. The CEO of Vendor_6 reported:

> *"Every single project is treated and managed individually and differently…This depends on the expertise of the project team, their preferences, and the project context, although we do have essential common attributes and standards."*

Accordingly, we identified three essential factors in an ERP project: namely, “project management scoping”, “project management planning”, and “project management controlling”. The PMD of Vendor_3 explained:

> *"In my opinion, explaining the abstract core of project management elements is more beneficial than going through a long list of useless project management details that, in essence, are not practically applicable to the majority of the IT projects in Saudi government organizations."*

This was also confirmed by the CEO of Vendor_9, who reported:

> *"Once the contract is signed, our approach is to reach a complete agreement in regard to the scope of the project…Then, we introduce the project plan to the client—and it must be a dynamic plan, because there are always exceptions…[Therefore] we consider strong project management control to be*

the real key to success…As the implementation goes on, we need to exercise a good degree of control over all the implementation stages and issues."

4.2. The Research Hierarchical Model of ERP System Implementation KIFs

In tables 4A and 4B, we summarize the ERP system implementation KIFs identified in the previous sections with the empirical evidence drawn from the ERP national vendors. Figure 3 shows the hierarchical model of the ERP system implementation KIFs that we identified from the perspective of Saudi Arabian ERP system vendors based on their experience within the national government sector. We presented this model to the participants for review and revision of the main cluster themes and of the set of KIFs concerning ERP system implementation success; this was done in order to reach conclusions that reflected the participants' perspectives in regard to this subject. As described in Figure 3, we identified 15 KIFs grouped into four cluster themes. These were: sponsors and leadership (six factors), IT capabilities (three factors), change management (three factors), and project management (three factors).

Table 4A: ERP system implementation KIFs identified through the thematic analysis of the empirical data collected from Saudi Arabian ERP system vendors based on their experience within the government sector—clusters 1 and 2

No	Cluster	Factors	Description	Support from national vendors									
				1	2	3	4	5	6	7	8	9	10
1	Sponsors and Leadership	Top Management	The top management's role was limited to participating in some steering committee meetings; however top management interventions could lead to settling disputes and preventing conflict between the parties involved.	✓	✓	✓		✓	✓		✓	✓	✓
		Management Stability	Any key changes in the management chain can negatively affect the performance of an ERP system implementation, as the management style in the government sector in Saudi Arabia is based on the social-cultural paradigm, rather than on formal, systematic, or institutional approaches.				✓	✓		✓		✓	✓
		IT Managers	They are first in line in terms of responsibility for ERP system implementation projects. To facilitate the collaboration and coordination between the parties involved, they must foster good and trusting relationships with the top management and stakeholder managers.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Project Team	It is the actual leader of an ERP system implementation. However, its technical role is almost negligible due to its members' lack of experience in strategic IT projects.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Stakeholder Managers	These are the managers of the benefitting departments. Their role is to support the implementation while facilitating communication between project teams and their own employees (i.e., the end users of the ERP systems).	✓		✓			✓		✓	✓	✓
		ERP Vendor	To carry out the implementation process, Saudi Arabian government organizations rely completely on national vendor expertise; therefore, the selection of the "right" national vendor is regarded as critical.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	IT Capabilities	ERP Capabilities	This refers to the capability and scope of the ERP in terms of range, reach and automation. The more an ERP system is capable of enabling the integration of end-to-end business process automation in cross-functional departments, the more swiftly the organization can react to changes in business conditions.	✓	✓				✓	✓	✓		
		Physical IT Infra. Capabilities	This refers to the level of sophistication of the data center in terms of the solidity of its IT applications and of how up-to-date the networks and platforms are in supporting the implementation of the ERP system.	✓		✓			✓		✓	✓	✓

		IT Personnel Capabilities	This refers to the IT staff's understanding of and expertise in any IT areas necessary to effectively undertake the ERP project.			✓		✓				✓	✓

Table 4B: ERP system implementation KIFs identified through the thematic analysis of the empirical data collected from Saudi Arabian ERP vendors based on their experienced within the government sector—clusters 3 and 4

No	**Cluster**	**Factors**	**Description**	**Support from national vendors**									
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
3	**Change Management**	**ERP business alignment**	Although national vendors developed ERP systems by considering the circumstances, needs, and requirements of government organizations, their scope is limited to the common and core business models. Thus, reaching suitable compromises on the application of business-driven changes to the ERP system or of ERP system-driven changes to the business is crucial due to the complexity of the national legislative system.	✓				✓	✓				✓
		Users' orientation	Installing an ERP system can be seen as a way of transforming business practices and therefore raising stakeholder awareness of the system (e.g., by organizing training programs and awareness campaigns) would maximize the latter's daily adherence to it for tasks and routines.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Resistance to change	An ERP system is a complex IT-based transformation that involves heavy load of extra tasks for the stakeholders. This may result in some degree of resistance to change that may slow down the implementation process.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	**Project Management**	**Project management scoping**	This is a formal document drawn up between the vendor and the client; it precisely and accurately states the current situation and the client's needs and requirements, and proposes how the capability of the ERP system can achieve the project goals and what work is required in order to deliver the project successfully. It lists the modules, features, functions, tasks, and implementation deadlines in detail, and sets the project cost.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Project management planning	This is a road map that sets a schedule for the implementation processes and stages. It usually involves a set of plans and of activities according to the modules to be implemented. Based on the stages and modules, it must also specify the stakeholders involved and their responsibilities and duties toward the vendor and the project team.	✓	✓	✓	✓	✓	✓		✓	✓	

	Project management controlling	This refers to the strong coordination needed between the related sponsors and leaders to carefully follow the implementation processes in order to ensure that progress matches project management scoping and planning, and to carry out any responses and interventions as required.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

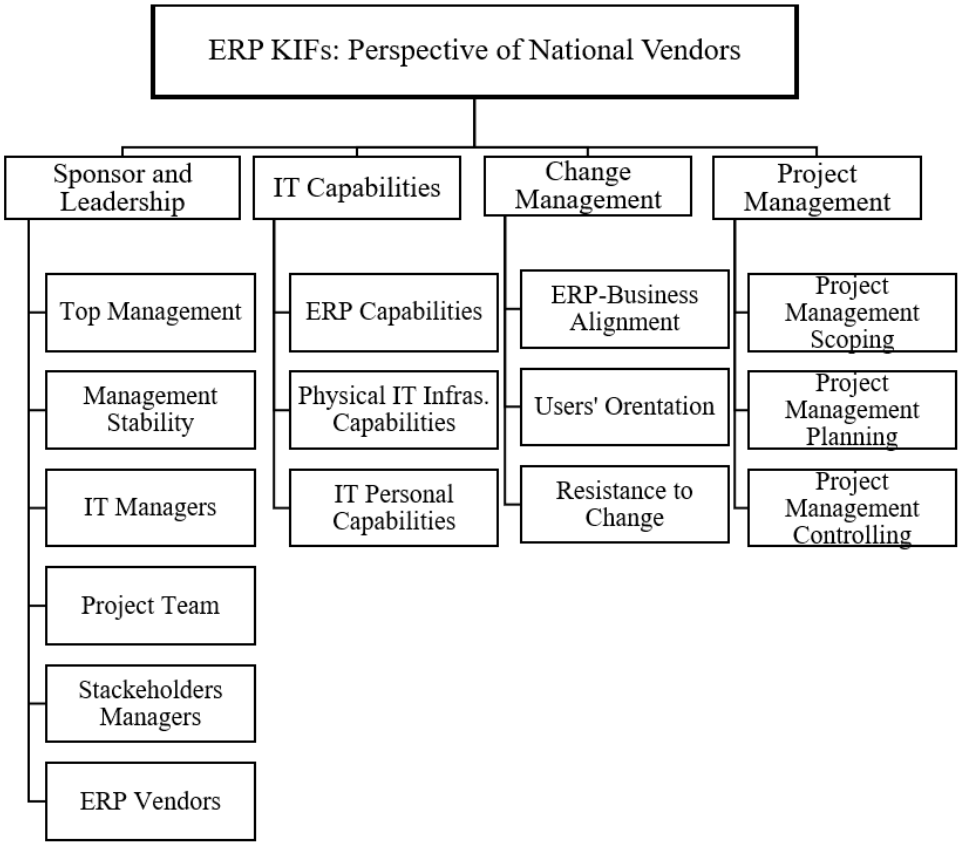

Figure 3: ERP system implementation KIFs hierarchical model.

4.3. The AHP Method and the Prioritization of the ERP System Implementation KIFs

To reach a shared understanding of the most important factors in achieving ERP system implementation success in Saudi Arabian government organizations from the national ERP vendor perspective, we ranked the KIFs using AHP method.

We adopted the steps suggested by Saaty (1990, 2008) to prioritize the evaluation factors in a structured and consistent fashion. First, the problem definition was coincided with the study's objectives. Second, we contacted 10 Saudi Arabian ERP system vendors to conceptualize the research's AHP model of ERP system implementation KIFs (see Figure 3). Third, we constructed the pairwise comparison matrices (i.e., each upper level theme was used to compare the factors in the immediately lower level) to obtain the priority weight for each cluster (e.g., sponsors and leadership) and then the overall priority weight for the entire set of factors.

We conducted a further 30-minute group interview discussion with the national vendor participants (i.e., CEOs and PMDs). To maintain consistency, these group interview discussions were conducted with the same participants of the first round of in-depth interviews. After an introduction, the participants were requested to complete a survey (i.e., a set of pairwise comparison matrices) from the perspective of their organizations. The participants were also asked to compare, on a pairwise basis, the factors on each level with respect to the upper theme, as suggested by Saaty (1990) (i.e., wXY: the importance of X over Y) for all the factors in the same category and at the same level with respect to the relative standard scale measurement. The participants thus evaluated the relative importance of all second level factors within their corresponding category (e.g., the relative importance of top management vs. management stability with regard to sponsors and leadership). The pairwise comparison was measured using an odd number ratings scale (see Table 5) because this method makes a reasonable distinction among the measurement points and enables the determination of a middle point (Benlian, 2011).

The participants also compared all first level themes against each other (e.g., sponsors and leadership vs. IT capabilities). Overall, the participants carried out 30 pairwise comparisons (i.e., six for first level main category factors and 24 for second level ones).

After having derived the wXY rates for all levels and factors, we obtained the rate of the importance of attribute Y over X (i.e., the reciprocal comparison) as 1/wXY. To remedy any potential inconsistencies incurred in constructing the comparisons, the participants were given a chance to review their consistency on an Excel sheet (i.e., a free AHP Excel program) and correct their judgments (Benlian, 2011) if they found their comparisons to be too inconsistent (i.e., CR>10%).

Table 5: Participant verbal judgment values on a numerical scale (Saaty, 1990).

Verbal judgment	Numerical scale
Extremely more important (Ex)	**9**
Extremely more important (VS)	**7**
Strongly more important (S)	**5**
Moderately more important (M)	**3**
Equally important (Eq)	**1**

At the end of the survey process, we combined the set of final pairwise comparison matrices of the judgments made by individual national vendors by taking the geometric mean of the judgments for each category in the research hierarchy model (Jayawickrama et al., 2017); this is referred to as aggregating individual judgments (Saaty, 1990). We compiled five pairwise comparison matrices, which included the main cluster of themes and the four secondary ones. To determine the weight for the alternative factors (e.g., top management) with respect to other same level factors (e.g., sponsors and leadership), we executed a hierarchical synthesis to normalize the pairwise comparison matrix. Finally, we ranked the 15 ERP system implementation KIFs by multiplying the weight of each by the weight of the corresponding cluster theme (Chin et al., 2008; Salmeron & Herrero, 2005; Huang et al., 2004). For example, to obtain the final top management priority, we multiplied the weight of the top management factor by that of the sponsors and leadership theme.

In addition, to ensure overall consistency, we calculated the CR of the final aggregated pairwise comparison matrices (Chin et al., 2008; Salmeron & Herrero, 2005; Huang et al., 2004). The CR of the main factor cluster was 0.007 (0.7%), which fell within the acceptable range. As shown in Table 6, we found both sponsors and leadership, and IT capabilities to be the most critical factors in this cluster, with factor weights of 0.36 (36%) and 0.41 (41%), respectively. In contrast, we found the change management and

project management factors to be less important, with factor weights of 0.11 (11%) and 0.12 (12%), respectively.

Table 6: Matrix data for the main factor cluster and their priority weighting

	Sponsors and Leadership	IT Capabilities	Change Management	Project Management	Factor Weight (W)	Priority (%)	Rank
Sponsors and Leadership	**1.00**	**1.00**	**3.00**	**3.00**	**0.36**	**36%**	**2**
IT Capabilities	**1.00**	**1.00**	**5.00**	**3.00**	**0.41**	**41%**	**1**
Change Management	**0.33**	**0.20**	**1.00**	**1.00**	**0.11**	**11%**	**4**
Project Management	**0.33**	**0.33**	**1.00**	**1.00**	**0.12**	**12%**	**3**

Table 7 shows the construction of the pairwise comparison matrix for the data pertaining to the sponsors and leadership cluster, the CR of which was 0.079 (CR=7.9%). The factor weights demonstrate that the stakeholder managers factor—w=0.49 (49%)—was valued more highly than others. In addition, the project team factor—w=0.22 (22%)—was ranked as the second most important in the sponsors and leadership cluster. The rest of the factors showed less important weight values.

Table 7: Matrix data of the sponsors and leadership cluster and priority weight

	Top Management	Management Stability	IT Managers	Project Team	Stakeholder Managers	ERP Vendor	Factors Weight (W)	Priority (%)	Rank
Top Management	**1.00**	**3.00**	**3.00**	**0.33**	**0.20**	**1.00**	**0.10**	**10%**	**3**
Management Stability	**0.33**	**1.00**	**0.33**	**0.33**	**0.11**	**0.20**	**0.04**	**4%**	**6**
IT Managers	**0.33**	**3.00**	**1.00**	**0.14**	**0.11**	**1.00**	**0.06**	**6%**	**5**
Project Team	**3.00**	**3.00**	**7.00**	**1.00**	**0.33**	**3.00**	**0.22**	**22%**	**2**
Stakeholder Managers	**5.00**	**9.00**	**9.00**	**3.00**	**1.00**	**7.00**	**0.49**	**49%**	**1**
ERP Vendor	**1.00**	**5.00**	**1.00**	**0.33**	**0.14**	**1.00**	**0.09**	**9%**	**4**

All the CRs of the pairwise comparisons for the IT capabilities, change management and project management clusters registered the same value of 0.060 (CR=6.0%). Tables

8, 9, and 10 produced almost the same results, with ERP capabilities (w=0.75 => CR=75%), resistance to change (w=0.75 => CR=75%) and project management controlling (w=0.75 =>CR=75%) being the most important factors in their respective clusters.

Table 8: Data matrix for the IT capabilities cluster and priority weight

	ERP Capabilities	Physical IT Infra. Capabilities	IT Personnel Capabilities	Factor Weight (W)	Priority (%)	Rank
ERP Capabilities	**1.00**	**7.00**	**5.00**	**0.75**	**75%**	**1**
Physical IT Infra. Capabilities	**0.14**	**1.00**	**1.00**	**0.12**	**12%**	**3**
IT Personnel Capabilities	**0.20**	**1.00**	**1.00**	**0.13**	**13%**	**2**

Table 9: Data matrix for the change management cluster and priority weight

	ERP-Business Alignment	Users' Orientation	Resistance to Change	Factor Weight (W)	Priority (%)	Rank
ERP-Business Alignment	**1.00**	**1.00**	**0.14**	**0.12**	**12%**	**3**
User Orientation	**1.00**	**1.00**	**0.20**	**0.13**	**13%**	**2**
Resistance to Change	**7.00**	**5.00**	**1.00**	**0.75**	**75%**	**1**

Table 10: Data matrix for the project management cluster and priority weight.

	Project Management Scoping	Project Management Planning	Project Management Controlling	Factor Weight (W)	Priority (%)	Rank
Project Management Scoping	**1.00**	**1.00**	**0.14**	**0.12**	**12%**	**3**
Project Management Planning	**1.00**	**1.00**	**0.20**	**0.13**	**13%**	**2**
Project Management Controlling	**7.00**	**5.00**	**1.00**	**0.75**	**75%**	**1**

The final picture of the KIFs' prioritization process is outlined in Table 11. At a glance, it can be observed that *ERP Capabilities* were ranked as the most important factor, with

an overall weight of 0.308 (w=30.8%). The second most important factor was *Stakeholder Managers,* with an overall weight of 0.176 (w=17.6%). *Project Management Controlling*, *Resistance to Change* and *Project Team* registered upper intermediate weights at 0.090 (w=9.0%), 0.083 (w=8.3%), and 0.079 (7.9%), respectively. *IT Personnel Capabilities*, *Physical IT Infrastructure Capabilities*, *Top Management*, and *ERP Vendor* recorded intermediate score weights of 0.053 (w=5.3%), 0.049 (w=4.9%), 0.036 (w=3.6%), and 0.032 (w=3.2%), respectively. Least importance was accorded to *IT Managers*, *Project Management Planning*, *Management Stability*, *Management Project Scoping*, *User Orientation*, and *ERP-Business Alignment*, with weights of 0.022 (w=2.2%), 0.016 (w=1.6%), 0.014 (w=1.4%), 0.014 (w=1.4%), 0.014 (w=1.4%), and 0.013 (w=1.3%), respectively. Table 12 shows the factors' prioritization and weights based on their corresponding cluster themes and categories.

Table 11: Final prioritization and ranking of the ERP system implementation KIFs' hierarchical model.

Rank	Factors	Cluster Factor Weight	Main Factor Weight	Overall Factor Weight	Priority (%)
1	**ERP Capabilities**	**0.75**	**0.41**	**0.308**	**30.8%**
2	**Stakeholder Managers**	**0.49**	**0.36**	**0.176**	**17.6%**
3	**Project Management Controlling**	**0.75**	**0.12**	**0.090**	**9.0%**
4	**Resistance to Change**	**0.75**	**0.11**	**0.083**	**8.3%**
5	**Project Team**	**0.22**	**0.36**	**0.079**	**7.9%**
6	**IT Personnel Capabilities**	**0.13**	**0.41**	**0.053**	**5.3%**
7	**Physical IT Infra. Capabilities**	**0.12**	**0.41**	**0.049**	**4.9%**
8	**Top Management**	**0.10**	**0.36**	**0.036**	**3.6%**
9	**ERP Vendor**	**0.09**	**0.36**	**0.032**	**3.2%**
10	**IT Managers**	**0.06**	**0.36**	**0.022**	**2.2%**
11	**Project Management Planning**	**0.13**	**0.12**	**0.016**	**1.6%**
12	**Management Stability**	**0.04**	**0.36**	**0.014**	**1.4%**
13	**Project Management Scoping**	**0.12**	**0.12**	**0.014**	**1.4%**
14	**User Orientation**	**0.13**	**0.11**	**0.014**	**1.4%**
15	**ERP-Business Alignment**	**0.12**	**0.11**	**0.013**	**1.3%**
				1.000	**100%**

Table 12: Final prioritization and ranking of the ERP system implementation KIFs' hierarchical model based on their corresponding cluster themes.

No	Main Factors	Min Factors Weight	Factors	Cluster Factor Weight	Overall Factor Weight	Priority (%)	Rank
1	IT Capabilities	0.41	ERP Capabilities	0.75	0.308	30.8%	1
			Physical IT Infra. Capabilities	0.12	0.049	4.9%	7
			IT Personnel Capabilities	0.13	0.053	5.3%	6
2	Sponsors and Leadership	0.36	Top Management	0.10	0.036	3.6%	8
			Management Stability	0.04	0.014	1.4%	12
			IT Managers	0.06	0.022	2.1%	10
			Project Team	0.22	0.079	7.9%	5
			Stakeholder Managers	0.49	0.176	17.6%	2
			ERP Vendor	0.09	0.032	3.2%	9
3	Project Management	0.12	Project Management Scoping	0.12	0.014	1.4%	13
			Project Management Planning	0.13	0.016	1.5%	11
			Project Management Controlling	0.75	0.090	9.0%	3
4	Change Management	0.11	ERP-Business Alignment	0.12	0.013	1.3%	15
			User Orientation	0.13	0.014	1.4%	14
			Resistance to Change	0.75	0.083	8.2%	4
					1.000	100%	

5. Discussion and Conclusion

Data suggested of 15 KIFs grouped into four main categories: *Sponsors and Leadership, IT Capabilities, Change Management, and Project Management* (see Figure 3). These factors are on par with the previous studies such as Somers and Nelson (2004), Markus and Tanis (2000), and Butler and Fitzgerald (1999), who hypothesized that the implementation process of an ERP system implementation is based on the IT capabilities of and roles played by key enabling players in facilitating the key activities (i.e., in the case of this research, Change Management and Project Management) required during the implementation process.

In addition, Ke and Wei (2008) explained that the key sponsors of ERP system implementations play a major role in defining the organizational culture required for ERP implementation success—such as motivating employees to improve their skills and to support innovation; this was also validated by the key enabling players. Within the cluster of sponsors and leadership (see Ke and Weid, 2008), we identified six essential factors which play a vital role throughout the implementation process. Although some of these factors have been identified by previous scholars—such as top management (e.g., Shao, 2019; Finney & Corbett, 2007; Mudimigh et al., 2001), IT managers (e.g., Yu, 2005), project team (e.g., Rothenberger et al., 2010; Ngai et al., 2008) and ERP vendor (e.g., Ram et al., 2015)—our data suggested additional factors such as *management stability* and *end-user managers* (to whom we referred as Stakeholder Managers) factors, as an expected result of cross-cultural differences (Choudrie et al., 2017). While some client focused studies have identified stakeholder managers (managers who benefit in departments) as insignificant (Bansal & Agarwal, 2015; Ram et al., 2015; Saade & Nijher, 2016), our data suggested that their *stakeholder managers* as a key factor identified by the national vendors. Their role is to support the implementation while facilitating communication between project teams and their own employees (i.e., the end users of the ERP systems), to tackle any issue at early stages through managing politics and networking.

Moreover, data also suggested that *management stability* as an important factor. This factor is more effective in environments—like that of GCC government organizations—in which the relationship between the parties and the methodology of the workplace is driven by the social-cultural paradigm (Choudrie et al., 2017), rather than by formal, systematic, or institutional methods. We believe that management instability affects the homogeneity that is needed between the parties during the implementation process of an ERP system, thus causing an imbalance in the required key activities. In addition, the results of our thematic analysis of the empirical data illustrate how stakeholder managers must consider themselves to be the owners of the ERP system and that it is being adopted to their advantage. Therefore, the reactions of end-users/employees and their interactions with the system are significant indicators of success.

Kulkarni et al. (2017) and Bharadwaj (2000) conceptualized IT capability as IT infrastructure, IT personnel (i.e., technical and managerial IT skills), and other IT related resources; this, in turn, is consistent with the findings of both our and other existing research—i.e., ERP capabilities (e.g., Kositanurit et al., 2006), IT infrastructure capabilities (e.g., Ditkaew & Ussahawanitchakit, 2010) and IT personnel capabilities (e.g., Ram et al., 2015).

In addition, the participants exposed variances in the details pertaining to some key activities (e.g., change management and project planning), between various ERP system implementations, as these always depend on project context and customized to the local norms (Choudrie et al., 2017). These variances had also been exposed and validated in the prior related literature, with some studies (e.g., Ram et al., 2015; Dezdar & Sulaiman, 2009) asserting that the ERP system implementation KIF or CSF literature produced variance in the details of some predominant factors related to change management and project planning. One justification of such variances is that ERP systems differ from other IT systems (Somers & Nelson, 2004) because they include organizational strategy-related components (Markus & Tanis, 2000), and must therefore be approached taking their peculiarity into account (Dezdar & Sulaiman, 2009).

The second research objective of our study was to establish a multi-criteria decision analysis approach suited to prioritize the KIFs of the research model based on the AHP method. The results revealed that, while *ERP system capabilities* and *stakeholder managers* were ranked as the most important factors, *user orientation* and *ERP-business alignment* were prioritized as the least relevant (see Table 11, 12). Although the set of KIFs identified in our research can be validated by previous studies (e.g., Ram & Corkindale; 2014, Dezdar & Sulaiman, 2009; Ngai et al., 2008; Finney & Corbett, 2007; Al-Mudimigh et al., 2001; Somers & Nelson; 2004), our prioritization of them differs and provides an unique perspective.

For example, though *top management* had been ranked as the most important CSF in the existing literature, it was classified relatively a less important factor in our research (i.e., it was ranked eighth out of our 15 factors). This may be due to significant differences between the government and private sector. In the private sector, top managers have a great deal of discretion over resource allocation, whereas the GCC

government sector's legislation system limits the power of top management (Alkraiji, 2016). Hence, in this research context, national ERP vendors believe that top management is not of the top KIFs in government sector ERP projects although it is still critical for success.

ERP capabilities was ranked as the most important in the list of identified KISs. In the GCC region, national vendors of ERP systems have developed their offerings based on their expertise of the GCC government sector's business model. Each ERP system is unique in various aspects, such as its functionality, reliability, adaptability, and flexibility, and its ability to support customization, integration, and end-to-end business process automation. Therefore, a system must possess the capabilities needed to meet and fit in with the client organization's needs, requirements, and business processes (Kulkarni et al., 2001; Liang & Xue, 2004; Schneider et al., 2018). There may be, therefore, differences in interest between a client who desires a tailored business solution and a vendor who prefers to develop generic ERP system capabilities applicable in a broad market; this issue represents a hindrance to the success of an ERP system implementation (Hong & Kim, 2002).

In contrast, *ERP-business alignment* and *user orientation* were shown to be the least significant KIFs of ERP system implementations. The participants revealed that national ERP vendors had developed their systems according to the common practices, procedures, and rules of the GCC government sector's business model. They had done so in order to enhance the integration of cross-functional ERP system modules and increase process automation, thus reducing the complications involved in ERP-business alignment. In addition, the participants explained that most end-users were passionate about new IT systems, which may have made user orientation relatively less important than other factors.

In summary, this study explored and ranked the KIFs of ERP projects from the perspective of national ERP vendors, as national ERP vendors dominate the ERP market at government organizations in Saudi Arabia. Prioritizing the KIFs is important for ERP success. The results of our study do not indicate that any KIF is unimportant, rather highlight the importance of management focusing on the KIFs, which are critical to emerging situations in ERP implementation and during implementation phases with confident decision-making. The findings highlighted the necessity of the management

to establish and maintain quality relationships with all stakeholders during the implementation process of ERP systems, particularly with sponsors and leaders, as this would enhance the technical capabilities of the project, whilst facilitating the acquisition of the essential expertise. Our research calls both national vendors and government organizations for better planning decisions such as the adoption of a best-fit cultural approach and maintaining alliances with key stakeholders and users in the implementation processes of the ERP systems.

5.1. Key Contributions and Implications of the Research

Our research has several implications for researchers and practitioners. Theoretically we extend the understanding of ERP implementation in four aspects: national ERP vendors perspective, government organizations, developing economies, and the AHP method. The CSFs previously reported for ERP system implementations had placed a heavy emphasis on firms operating in developed countries (Dezdar & Sulaiman, 2009), research also shows that such projects face additional challenges within different social and cultural contexts (McLeod & Doolin, 2012; Xue et al., 2005), particularly in those of developing countries. Yet, little work has aimed at empirically prioritizing the KIFs of ERP system implementations in a structured and systematic way in developing countries. This systematic prioritization will help to benchmark factors and allocate resources into most important ones.

Further, as indicated by the meta-analysis of the KIFs or CSFs found in the ERP system implementation literature, much of the previous work on KIFs or CSFs had been analyzed from the clients' perspectives, despite ERP vendors have become an essential part of contemporary organizations owing to the high degrees of outsourcing undertaken by strategic management in leading the implementation of ERP systems (Faisal & Raza, 2016). To the best of our knowledge, this study is the first to offer a systematic ranking of KIFs based on a national vendor perspective within a developing country context. In Saudi Arabia, as in most developing countries, most government organizations rely heavily on outsourcing to lead the implementation process of their IT projects (Gulla & Gupta, 2011), particularly strategic business ones such as those involving ERP systems (Faisal & Raza, 2016). Taking this into account, the opinions and perspectives of national vendors in relation to the KIFs of ERP systems could be important for clients and/or the government sector.

Further, government sectors are often even more challenging than those of the private sector due to the complexities involved in implementing ERP systems (Van Wart et al., 2017). A few research (e.g., Dezdar & Sulaiman, 2009; Al-Mashari et al., 2006) had highlighted a shortage of ERP system implementation research focused upon developing countries, with much of it being centered on private firms within the context of developed economies, despite the fact that these projects face additional challenges in developing countries (Al-Mashari et al., 2006). Accordingly, the outcomes of our research address these gaps in the literature.

Furthermore, in the normative literature, there is a dearth of studies prioritizing the CFSs of ERP system implementations based on structured and systematic methods. Our research has developed a novel reference model for the KIFs of ERP system implementations within the Saudi Arabian government context from the perspective of national ERP vendors. This could potentially provide several new insights, add to the accumulative literature, and complement the clients' perspective (i.e., that of CIOs, project teams, managers, and end-users), as well as enable others to relate their views to those reported here. We extend the knowledge of KIFs in ERP systems, which have produced substantial deviations and variances in terms of their findings previously (Dezdar & Sulaiman; 2009). ERP system implementations are dynamic processes that involve "vice versa interactions" between the ERP system and its local social environment in shaping the firm's use of the former; therefore, it is difficult to draw a line between an ERP system and its context (Xue et al., 2005). Therefore, the outcomes of this study can act as benchmarks and can be said to add to the accumulative literature on the subject. The AHP method extends the methodological knowledge into the field of the KIFs/CSFs of ERP system implementations.

Practically, the study provides a few important insights to ERP implementors in the government sector. Based on the analysis of the empirical data, we found that both sponsors and leadership and IT capabilities to be the most significant clusters of ERP implementation representing almost 77% of AHP research model. The findings exposed that ERP capabilities and stakeholder managers are the predominant factors of AHP research model constituting approximately 48.4% from the overall identified factors. Therefore, ERP practitioners, are suggested to evaluate the ERP vendor and ERP capabilities based on similar government organizations as this will help to discover

strengths and limitations of the ERP modules and to value the "best of fit" over the "best practice" solutions in order to gauge the most suitable choice for government organizations.

Also, stakeholder managers factor, that is negated in the literature, requires more attention from government organizational practitioners. The findings explained that the enthusiasm of stakeholder managers could boost the success of ERP implementation and mitigate resistance to change among the end users. The ERP system is expected to limit abuses and powers, control the workflow and procedures, and determine precisely the deficiencies in workflow system and thus enhance accountability.

Results exposed an additional factor which is management stability that is seen to be critical to the success of ERP implementation at least within the government organizations in Saudi Arabia where the level of institutional maturity is much lower than in the private sector. Therefore, any change in the organizational structure during ERP implementation will make sponsors and leadership cluster the bottleneck of the success. Nevertheless, the AHP research model can provide decision makers—particularly those in developing nations—with a better understanding of the KIFs involved in the implementation of ERP systems, enabling them to better judge and assess the risks of the project, adopt the appropriate risk mitigation strategies, and develop suitable intervention strategies.

5.2. Research Limitations and Future Work

Although the empirical results reported here are promising and valuable, it is worth noting some limitations of this study. Since Saudi Arabia represents a 90% market share in GCC, results of this study can be generalized to countries in the GCC region. Moreover, the results can be generalized to similar regions/countries in the world with similar characteristics - e.g. regions/countries in the world where ERP vendors are more dominant. Any generalizations to other populations of our results, drawn from qualitative data, should be made with caution. Future research would consider viewpoints of both vendor and client organizations in the GCC region, so that the richness of results can be enhanced. Also, based upon the recommendations of the CEOs of our vendor organizations and due to time constraints, we interviewed only two representative "key participants" (i.e., the CEO and the PMD) from each vendor.

Therefore, to ensure a holistic view of the KIFs, future work could include the vendor teams directly involved in ERP system implementations (including post implementation) within the government sector. Future research could also make a comparison, based on the perspectives of national ERP vendors, of the KIFs affecting the public and private sectors in Saudi Arabia.

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