ERP system implementation in large enterprises – a systematic literature review

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Abstract

Purpose – Enterprise resource planning (ERP) implementation brings with it a set of challenges. In order to gain a better understanding of these and they can be mitigated during the implementation process, the purpose of this paper is to use Esteves and Bohórquez (2007) classification based on ERP lifecycle framework, and content analysis to review the literature on ERP implementation in a structured format with a focus on larger enterprises, and provide a platform for practitioners to plan implementation with minimum possibility of failure.

Design/methodology/approach – Esteves and Bohórquez (2007) classification based on the ERP lifecycle framework is used to develop and present a comprehensive structured review of the literature on ERP system implementation in large enterprises (LEs), with a particular focus on pre-implementation, implementation, and post-implementation.

Findings – Drawing from the literature, organisations can plan implementation based on the findings and strategies presented in the study. This can lead to a better understanding of implementation with minimal probability of failure. The authors find that top management support, good project management teams, and good communications are the top three most important critical successful factors during implementation. The authors also identify critical gaps in current research. Existing research focusses predominantly on the implementation phase, but research on pre- and post-implementation is lacking, and that no industry standard implementation methodology has been developed.

Research implications – This review primarily focusses on the literature in the area of ERP implementation. ERP implementation planning involves access to effective implementation strategies. Despite the literature identifying a myriad of different ERP implementation models, no standard industry ERP implementation model has been developed. The findings for ERP implementation are repetitive, inconsistent, and lack empirical research, rendering these two of the most critical areas for future research, and collaboration between ERP practitioners, system developers, and researchers. Researchers, in turn, need to become more innovative in terms of their research techniques when examining ERP implementation.

Practical implications – This paper provides guidance to researchers and practitioners with an insight into published research work and their findings. It provides a better understanding of ERP implementation, which can be applied towards overcoming operational difficulties during the implementation process.

Originality/value – This study is innovated in its use of Esteves and Bohórquez (2007) classification based on the ERP lifecycle framework, and content analysis to present a comprehensive structured literature review of the ERP implementation literature with a specific focus on pre-implementation, implementation, and post-implementation in LEs between the period 1989 and 2014. The technique and time period used in this study differs from those of other studies on ERP implementation. The paper brings together theoretical and practical developments on ERP implementation under a single source, which should aid practitioners, researchers and ERP developers with future research and decision making.

Keywords ERP systems, Critical success factors, ERP implementation, Large enterprises

Paper type Literature review

1. Introduction

Today's operational processes and supply chains are far more complex than a decade ago. They involve complex business functions involving different departments, with a need for the most to up-to-date information, and critical linkage with upstream and downstream partners to name a few. Enterprise resource planning (ERP) systems have proved to be the

solution to the information needs of many businesses, but a costly mistake for many others. Davenport (1999) reports that ERP implementation can be challenging, time-consuming, and expensive, and can place tremendous stress on corporate time and resources. Indeed, approximately 66-70 per cent of ERP implementation projects failed to achieve their implementation objectives in some way (Lewis, 2001; Carlo, 2002; Shores, 2005; Ward *et al.*, 2005; Zabjeck *et al.*, 2009). Surveys show that even projects with the most favourable conditions, ERP implementation failure is common (Liao *et al.*, 2007).

The ERP literature on implementation is extensive (Esteves, 2009; Møller *et al.*, 2004). It covers areas such as uncertainty management using ERP systems (Koh *et al.*, 2006), specific methods of ERP requirements analysis (Vilpola and Kouri, 2005; Vilpola *et al.*, 2007), relevance of local or cultural aspects to consider during implementation (Liang and Xue, 2005; Yousef *et al.*, 2006), pre-implementation issues (Brem *et al.*, 2008), and critical success factors (Akkermans and Helden, 2002; Hong and Kim, 2002; Huang *et al.*, 2005). Whilst the existing literature is voluminous and complex, it nevertheless highlights a glaring need for greater understanding of ERP implementation failures, and need for a single literature source, which practitioners and researchers alike can use as a reference point for better understanding of the nature and possible causes of implementation failures, and how they may go about limiting these in order to increase the chances of future successful implementations.

Initially developed only to manage and predict material requirements, and despite the difficulties and high costs of implementation, ERP systems have matured into a comprehensive advanced technology software, capable of taking on complex tasks and organisational activities, providing them with a unique integration characteristic. ERP systems are being implemented extensively, with all major Fortune 500 companies adopting a system (Panorama Consulting Group, 2010).

ERP systems are often implemented to address issues of organisational failure in information coordination due to the application of legacy systems (Nah *et al.*, 2003). These legacy systems usually offer ageing solutions that are difficult to maintain, and no longer meet organisational needs (Bradley, 2008). The literature suggests new ERP systems enhance information coordination, by integrating data flow across different departments; previously working in "silos" due to a lack of system integration. The benefits offered by properly selected and implemented ERP systems, include time and cost reduction in processes, faster transaction processing, operational performance improvement, financial management, customer services, web-based interface, and more effective communication (Kogetsidis *et al.*, 2008).

Proper planning and implementation of ERP systems are necessary in order to enhance the strategic value of organisations (Bancroft *et al.*, 1998; Becerra *et al.*, 2000; Gobeli *et al.*, 2002). However, too many organisations are still suffering implementation failures, and many others fear implementation because of the costs and lack a single reliable reference source on the pros and cons of implementation. With this in mind, this paper uses Esteves and Bohórquez (2007) structured literature review approach based on the lifecycle framework, and content analysis to develop and present a comprehensive structured literature review of ERP system implementation in large enterprises (LEs), with a particular focus on pre-implementation, implementation, and post-implementation.

By following the literature review structured approach, this paper aims to achieve three objectives: first, provide a platform for researchers to recognise the different aspects of ERP implementation that have been addressed. Second, provide a starting point for further research in the area. Third, whilst providing a review of articles, it presents and discusses various critical success factors (CSFs), implementation strategies, and models that enable a better understanding of the implementation process. We also identify the critical gaps in current research. Existing research focusses predominantly on the implementation phase,

but research on pre- and post-implementation is lacking, and that no industry standard implementation methodology has been devised.

The paper is organised as follows: the next section introduces the literature ERP systems starting with a definition and history of ERP systems. This is followed by the literature on implementation in LEs with a focus on pre-implementation, implementation, and post-implementation. It also reviews different methodologies and implementation models proposed to enhance the understanding and knowledge of the ERP system implementation process.

2. Definition of ERP system

According to Davenport (1998), ERP systems generally comprise different software modules, which allow organisations to automate and integrate the majority of business functions by accessing, and sharing common information, data, and practices across the enterprise in real-time. The author further explains the anatomy of ERP systems being at "the heart of an [ERP] system is a central database that draws data from, and feed data into a series of applications supporting diverse company functions. Using a single database dramatically streamlines the "flow of information throughout a business". A defining feature of an ERP system is the integration of different organisational functions, so that information is entered only once, and is thereafter available across the organisation with real-time updates (Davenport, 1998).

At the operational level, Gable (1998) defines ERP as a "comprehensive packaged software solution, which seeks to integrate the complete range of business processes and functions in order to present a holistic view of the business from a single information and IT architecture". Similarly, Nah *et al.* (2001) and Stemberger and Kovacic (2008) define ERP system as a "packaged business software system that enables companies to effectively and efficiently manage resources (material, human resources, finance, etc.) by providing a total integrated solution for an organisation's information-processing needs".

3. Research methodology

Proper planning and implementation of ERP systems are necessary in order to enhance the strategic value of organisations (Bancroft *et al.*, 1998; Becerra *et al.*, 2000; Gobeli *et al.*, 2002). However, too many organisations are still suffering implementation failure, and many others fear implementation because of the costs, which we hypothesized is related to the lack of a single reliable reference source on the advantages and disadvantages of implementation. With this in mind, this paper uses Esteves and Bohórquez (2007) classification based on the ERP lifecycle framework to develop and present a comprehensive structured review of the literature on ERP system implementation in LEs, with a particular focus on pre-implementation, implementation, and post-implementation, since these factors are identified by scholars as contributing towards successful ERP implementations (Gattiker and Goodhue, 2005; Jacobs and Bendoly, 2003; Soh *et al.*, 2000; Mabert *et al.*, 2003). The structured approach is appropriate since David *et al.* (1999) argue that research in the ERP area must not proceed haphazardly, rather it must develop a systematic mean for identifying the patterns under these systems.

By following Esteves and Bohórquez (2007) structured literature review approach, this paper aims to achieve three objectives: first, provide a platform for researchers to recognise the different aspects of ERP implementation that have been addressed. Second, to contribute to further research in the area of ERP implementation. Third, whilst providing a review of articles, it presents and discusses various CSFs, implementation strategies and models which enable a better understanding of the ERP implementation process, and how practitioners and researchers may draw upon these findings to develop a better implementation strategy.

Due to the volume of literature under review, each stage of the research methodology is summarised and presented in a three-stage methodological framework in Figure 1. The outline of the methodological framework is similar to one proposed by Tranfield *et al.* (2003).

3.1 Step 1: search of databases to identify research on ERP system
Phase 1: this study uses electronic research databases such as Swetwise, ProQuest, EBSCO, Emerald, SceinceDirect, WileyInterscience, and ACM Digital Library to identify electronic
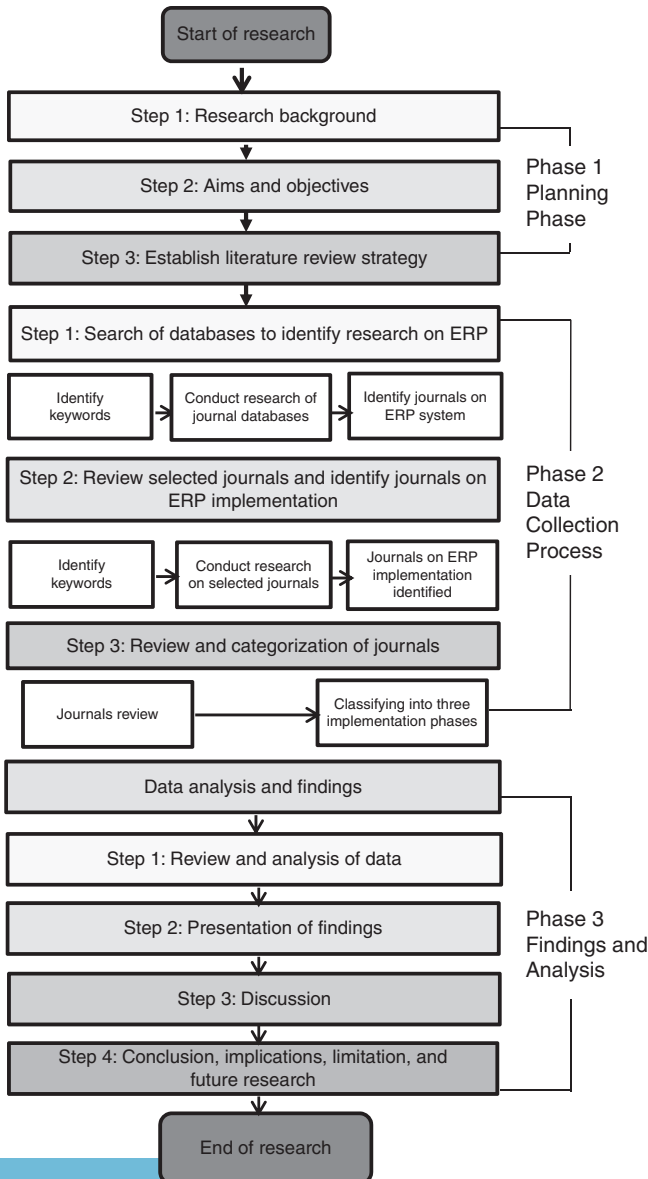

Figure 1.
Literature review methodological framework summary

journals and articles on ERP systems and ERP system implementation. The search keywords are: MRP, ERP, enterprise resources planning system, and enterprise systems. The initial search identifies a sample of 952 research papers on ERP implementation and systems using the keywords. Research on ERP systems such as SAP, Oracle, Peoplesoft, Baan, Infor, Sage, etc., are included in the study.

3.2 Step 2: reviewing the literature and selecting journals on ERP implementation

As the focus of this study is on ERP implementation, keywords ERP implementation, the search keywords are further defined to include, SAP, IT implementations, post-implementation, ERP implementation strategies and models are used to identify only those research papers relating specifically to ERP implementation between 1998 and 2014. There is considerable literature on ERP system implementation prior to 1998. However, Botta-Genoulaz and Millet (2005) advise only the most recent literature should be included in current studies. As a result, 725 research papers are dropped as they are not specifically related to ERP implementation, or they are from a period prior to this study. An additional 12 duplicated research papers are removed from the sample (Wolfswinkel *et al.*, 2013). Following this filtering process, a sample of 215 published research papers are identified for the purpose of the literature review, which satisfies the required criteria set out for the research. The literature review sample is contained within 28 journals on ERP implementation and systems (Table I). The focus of the review process is on abstracts, keywords, research findings, etc., of research papers, which enables the identification and selection of papers on ERP implementation (Figure 2).

3.3 Step 3: review and categorisation of papers

Esteves and Bohórquez (2007) classification based on the ERP lifecycle framework is adapted to classify the literature review sample into three groups (pre-implementation, implementation, and post-implementation). Once classified, a comprehensive and detailed review of the abstract of each research paper is undertaken. Although time consuming, a minimum of 45-60 minutes is spent on each journal. This process is critical in order to gain an understanding of the theme of the study, its methodology, and findings. This not only provides for a suitable understanding of the areas in implementation, but also generates a

Communication of ACM (*CACM*)	Internal Journal of Production and Operations Management (*IJPOM*)
Computer in Human Behaviour (*CHB*)	Journal of Computer Information Systems (*JCIS*)
Computers in Industry (*CI*)	Journal for Global Information Management (*JGIM*)
Decision Support Benefit (*DSB*)	Journal of Engineering and Technology Management (*JETM*)
Decision Support System (*DSS*)	Journal of Enterprise Information Management (*JEIM*)
European Journal of Operational Research (*EJOR*)	Journal of Enterprise Management (*JEM*)
Harvard Business Review (*HBR*)	Journal of Information Systems (*JIS*)
Industrial Management and Data Systems (*IMDS*)	Journal of Information Technology (*JIT*)
Information and Management (*IM*)	Journal of Manufacturing Technology (*JMT*)
Information System Research (*ISM*)	Journal of Operational Management (*JOM*)
International Journal of Accounting Information Systems (*IJAIS*)	Journal of Software and Evolution (*JSE*)
International Journal of Agile Management (*IJAM*)	MIS Quarterly
International Journal of Management and Enterprise Development (*IJMED*)	Software Quality Journal (*SQJ*)
International Journal of Production Economics (*IJPE*)	Technovation
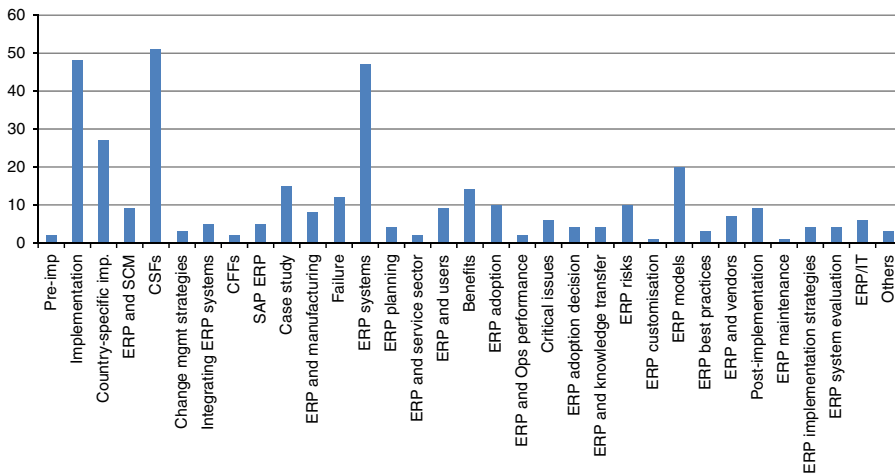
Figure 2.
Research areas
investigated in
publications

plethora of information that is subsequently applied in this review. Due to the subjective nature of the classification of papers, content analysis is used to provide rigour to the process. Content analysis provides greater knowledge and understanding of the research topic, improve classification, and provide rigour (Cumbie *et al.*, 2005), resulting in better categorisation. This, in turn, has a positive impact on the analysis, since all papers on the same topic are grouped together, improving comparison, referencing, and findings.

4. ERP systems for LEs
Although there are no precise definitions of a LE in the literature, they are identified by certain characteristics. These are capital intensity, number of years in existence, variety of products, size of market share, and resource usage. Organisations with 500 or more employees are also considered as LEs.

Many organisations, especially manufacturing firms, feel pressured to cut costs and improve profitability and productivity; whilst at the same time improve quality because of increasing competition and globalisation (Nah *et al.*, 2001, Lengnick-Hall *et al.*, 2004). Service firms are increasingly expected to improve responsiveness, and public enterprises such as city governments are increasingly expected to reduce costs, and provide better services to their constituents (Davenport, 2000). ERP systems are designed to facilitate the flow of information in organisations, by integrating data processing and information management activities in the main areas of a business. ERP usage has had a huge informational impact on many organisations (Holland and Light, 1999), especially through enhancing control, and permitting a centralised view for top corporate executives, or allowing a controlling matrix structure through real-time information sharing (Quattrone and Hopper, 2005). Studies confirm that the introduction of new business and organisational practices are highly correlated with labour productivity (Falk, 2005). Similarly, ERP systems have becoming a platform for electronic business, business-to-business, and business-to-customer applications, allowing organisations to reduce inventory cost, better manage supply chain and customer relationships (Beheshti, 2006).

In an effort to realise the benefits of ERP systems, major organisations have installed ERP software in their IT systems, with all major Fortune 500 companies having done so (Panorama Consulting Group, 2010[1]). The size and location of these organisations varies, with the majority being based in North America, and Asia-Pacific (31 per cent each), and

14 per cent in Europe and South America. According to a 2012 report by Lucintel Research[2], the global ERP software industry is estimated to have reached $47.5 billion in 2011, with a 7.9 per cent compound annual growth rate (CAGR), and is forecast to attain an estimated $67.7 billion by 2017 with 6.1 per cent CAGR from 2012 to 2017.

The next section discusses the literature on the process of ERP implementation. Researchers believe that before any discussion on ERP implementation can be undertaken, it is essential the many factors directly impacting or contributing to the implementation process should be first discussed. Therefore, the literature on benefits, challenges, CSFs is first discussed. This is followed by the main discussion on the three phases of implementation, pre-implementation, implementation, and post-implementation, and different implementation models and strategies.

4.1 Benefits of ERP systems

Even though the benefits resulting from ERP implementation vary from organisation to organisation, the literature agrees on the common benefits all organisations can achieve by implementing an ERP system (Table II).

The findings in Table II for the benefits of ERP systems are important because despite high implementation costs, no evidence of persistent negative performance associated with ERP investments is found (Hendricks *et al.*, 2007).

Despite the many positive aspects of ERP systems, there are downsides. Evaluating the moderating effects of ERP investment on organisational performance, Lu and Jinghua (2012) report that corporate governance has a positive moderating effect on the relationship between ERP investments and firm performance. However, they observe firms with higher levels of diversification perform worst after ERP implementation.

4.2 ERP implementation challenges

ERP implementation is the process through which technical, organisational, and financial resources are configured to provide an efficient operating system (Fleck, 1994). However implementing ERP systems can be difficult, time-consuming, and expensive for organisations (Shehab *et al.*, 2004). Implementation complexities and associated challenges are due to the nature of ERP systems, which treat cross-organisational business processes in a value web as the fundamental building block of the system (Daneva and Wieringa, 2008).

Benefits	Authors
Organisation learning	Shang and Seddon (2002)
Improved supply chain performance	Shahat and Uddin (2012)
Reduction in production cost	Hawkings *et al.* (2004), Hasan *et al.* (2011), Olson *et al.* (2013)
Reduction in financial cost	
Increased profits	Hendrick *et al.* (2007), Hunton *et al.* (2003), Hayes *et al.* (2001)
Increase in ROI and ROA	
Centralised information	Hasan *et al.* (2011), Beheshti (2006), Spathis and
Improved information response time	Constantinides (2003)
IT system standardisation	Beheshti (2006), Spathis and Constantinides (2003)
Integration	
Improvement in business processes	Shang and Seddon (2002)
Enhanced reporting function	Shang and Seddon (2002), Spathis and Constantinides (2003)
Improved financial reporting	
Technology upgrade	Shang and Seddon (2002)
Attain, expand, and extend enterprise systems	
Improved planning and control	Olson *et al.* (2013)

Table II.
Benefits of
ERP systems

This delivers a shared system, which lets the business activities of one company become an integral part of the business of its parameters, creating system capabilities far beyond the sum of the ERP component's individual capabilities, where each functionality offered, matches the unique needs of each stakeholder group.

ERP systems are developed on "best practice" models. As a result, their implementing often requires organisations to restructure their business processes around those practices, which is evident in recent studies. For instance, Maguire *et al.* (2010) find the introduction of ERP systems often result in key organisational changes, which, if not managed carefully, can result in conflict within an organisation. This conflict is especially evident in relation to the question of how to integrate ERP systems, what should happen to the legacy system, and how the business processes of the organisation should be revised. This necessary realignment is often cited as the source of many implementation failures (Soh *et al.*, 2000). According to Hirt and Swanson (2001), organisations that plan to adopt ERP systems but lack a "realignment strategy" may suffer technical and administrative problems, and usually experience, at the very least, delays in project implementation, or even complete implementation failure. Other factors found to affect the effectiveness of ERP system implementation, includes external consultant support, knowledge transfer, and the technical aspects knowledge transfers, all of which are essential during an implementation process. Surprisingly, the role of top management support is found to be less important than that provided by users (Maditinos *et al.*, 2011). Examining ERP acceptance challenges from a Saudi Arabian cultural perspective, Alhirz and Sajeev (2015) find power distance and individualism have no significant impact on acceptance, however, uncertainty avoidance have a significant influence. In addition, user involvement and satisfaction has a positive influence on ERP systems, leading to system acceptance.

These challenges often result from the fact the functionality ERP systems offer, usually covers thousands of business activities. In order to achieve the benefits offered by ERP systems, these complex and varied challenges have to be overcome.

4.3 CSFs
In order to achieve successful ERP implementations, organisations must understand and address a variety of CSFs. CSFs are those conditions that must be met in order for an implementation process to occur successfully for a manager or an organisation (Bradley, 2008). To be sure, CSFs are those key areas in which favourable results are absolutely necessary for a business to successfully compete. CSFs, therefore, represent managerial or enterprise areas that must be given special and continued attention to bring about high performance in an organisation's current operating activities and its future success. CSFs are rooted in the managerial literature.

The literature generally agrees with Rockhart (1979) on the importance of CSFs during implementation. Boynton and Zamud (1984) highlight two of the main strengths of the CSF method. First, it generates user acceptance at the senior managerial level, where these managers seem to intuitively understand the thrust of the CSF method, and consequently strongly endorse its application as a means of identifying important organisational areas that need attention. Second, it facilitates a structured top-down analysis of the organisational planning process by focussing on the core sets of essential issues, and then proceed to refine these, allowing for a desirable evolving role for CSFs. Addressing CSFs can therefore significantly improve the chances of a successful ERP implementation (Pinto and Slevin, 1987).

Criticisms of CSF models suggest they rely excessively on the opinion of managers, without any other parties participating in the implementation processes. Davis (1980) argues that the approach stresses too much on the importance of certain factors only; while ignoring many other important aspects that can play as crucial a role during the

implementation process. Munro and Wheeler (1980) examined these weaknesses, and developed a new approach to overcome them by incorporating manager's subjective opinions into the decision-making process for establishing CSFs, thus broadening the scope of information input in establishing CSFs.

4.3.1 CSFs for ERP implementation. The literature identifies several CSFs which influence and guide successful ERP implementations, and which have a direct impact on their outcome. CSFs for successful ERP implementation are identified as top management support, presence of a champion, good communication with stakeholders, effective project planning, business process re-engineering (BPR), and using a business analyst on the project team (Bancroft *et al.*, 1998; Bingi *et al.*, 1999). Bingi *et al.* (1999) extended this list to include, implementation time and cost, ERP vendors, selecting right employees, and employee morale.

In an important study undertaken, and after an extensive literature review and taking into account the practitioner's recommendations, Somers and Nelson (2001) summarise and present the previous works in a comprehensive taxonomy of CSFs for ERP implementation. They rate CSFs by a degree of importance during ERP implementation as follows:

(1) top management support;

(2) project team competence;

(3) inter-departmental cooperation;

(4) clear goals and objectives;

(5) project management;

(6) inter-departmental communication;

(7) management of expectation;

(8) project champion;

(9) vendors' support;

(10) careful package selection;

(11) data analysis and conversion;

(12) dedicated resources;

(13) use of steering committee;

(14) user training on software;

(15) education on new business processes;

(16) BPR;

(17) minimal customisation;

(18) architecture choices;

(19) change management;

(20) partnership with vendors;

(21) use of vendors' tool; and

(22) use of consultant.

The literature shows researchers often focus on a specific phase of implementation, specific CSFs, or compared the relative importance of CSFs. Drawing from a comprehensive

literature review, and broadly in line with Bancroft *et al.* (1998) and Bingi *et al.* (1999), Nah *et al.* (2001) classify CSFs, and apply CSFs into Markus, Axline, Petrie and Tanis' (2000) process-oriented ERP lifecycle model to show which CSFs are important at a particular phase. Important CSFs identified are: ERP team work and composition, top management support, business plan and vision, effective communication, project management, project champion, appropriate business and legacy systems, change management programmes, culture, BPR, minimum customisation, software development, testing, trouble shooting, monitoring, and evaluation of performance.

Umble *et al.* (2003), adapting a holistic approach, not only identify CSFs, but also implementation procedures critical to a successful implementation. CSFs identified for successful implementation are: a clear understanding of strategic goals, top management commitment and support, organisational change management strategy, good implementation team, data accuracy, extensive education and training, focussed performance measures, and multi-site issues. Ehie and Madsen (2005), Sarkar and Lee (2003), Umble *et al.* (2003), Kim *et al.* (2005), Motawani *et al.* (2005), Nah and Delgado (2006), Maguire *et al.* (2010), and Almajali *et al.* (2016) all report similar findings for CSFs and ERP implementation.

5. Three-phase implementation process

As discussed in the research methodology section, this study adopts Esteves and Bohórquez (2007) classification of the ERP lifecycle framework, focussing on the three essential implementation phases, pre-implementation, implementation, and post-implementation. These areas are reviewed in next sections.

5.1 Pre-implementation phase

Pre-implementation is a critical phase, as the steps taken and strategies adopted will have a direct impact on the implementation process and the outcome of the implementation. Pre-implementation involves activities such as planning for technology introduction, deciding on the role of vendors and in-house resources, providing preliminary training, planning the logistics of the change, deciding whether a pilot study is to be used, and whether everything is to be changed at once, or a gradual phase-in is to be used (Abidnour-helm *et al.*, 2003).

Herold *et al.* (1995) argue the pre-implementation phase demands additional research attention because of its role in shaping the attitude of those who will be charged with the implementation. The authors suggest that the pre-implementation phase may be the "starting point" of the attitudes, which will shape future implementation phases. Because these early attitudes may be central in shaping early behaviours (such as resistance, involvement, feedback, etc.), it is important to understand the nature and origin of such attitudes. The authors identify the complete understanding of CSFs for implementation as one of the most important factors for pre-implementation consideration.

5.2 Implementation phase

Abidnour-helm *et al.* (2003) point out the actual implementation phase can take a long period of time, and identifying when it ends maybe difficult. Akkermans *et al.* (2003) and Prahalad and Krishnan (2008) suggest that it can take between 12 and 30 months to implement a ERP system, depending on the size of the firm. This is because the implementation phase involves various activities essential for the success of the implementation. During this process, top management should be proactively involved (Aladwani, 2001).

5.2.1 ERP system implementation models. The literature identifies a myriad of different ERP system implementation models, designed to overcome implementation challenges. Table III presents a sample of such models.

Bancroft *et al.* (1998)	Focus phase (planning phase)
	"as is" phase (analysis of current business)
	"to be" phase (system designing phase)
	Construction and testing phase
	Implementation phase
Markus, Axline, Petrie and Tanis (2000)	Chartering phase
	Project phase
	Shakedown phase
	Onward and upward phase
Rajagopal (2002)	Initiation
	Adoption
	Adaption
	Acceptance
	Routinisation
	Infusion

Table III.
ERP system
implementation
models

Umble *et al.* (2003) implemented a technically focussed strategy, which although aims to cover both pre- and post-implementation aspects, lack both a pre-implementation system alignment and post-implementation system evaluation process. In addition, adopting a reverse engineering process, Soffer *et al.* (2003) developed a model that captures available ERP implementation alternatives at different levels, therefore aligning ERP systems with the needs of enterprises. This model explores an ERP system's functionality, and the findings particularly stress the importance of ERP systems being aligned with organisational needs and not vice versa.

Santos *et al.* (2004), adapting a differing approach to CSF, develop a model to investigate the relationship between key factors experienced during implementation. The authors observe that factors such as "best fit" with current processes resistance to change, training and workforce allocation, are all key factors that affect implementation results. Focussing on the role of CSFs and the interrelationship between them, King and Burgess (2005) present a model for ERP CSFs which draws on existing interrelationships and apply simulation to better understand these interrelationships and CSFs, and use these to encourage further exploration of the more appropriate implementation strategies arising from these interactions.

Drawing upon the 4P[3] business model, Marnewick and Labuschagne (2005) propose a model for ERP implementation, which is divided into four main sections: software, customer mind-set, change management, and the flow of processes within the system. Whilst El Sawah *et al.* (2008), taking an evaluative approach, propose a model to predict implementation success rates as a function of interrelated CSFs and organisational culture.

Lea and Gupta (2005) propose a prototype model of a multi-agent system to collect information and interact with users in order to facilitate ERP implementation. Also, in an attempt to minimise implementation risks and improve decision making, Hakim and Hakim (2010) proposed a practical model for measuring and controlling ERP implementation risks. This model analyses the decision-making process from three different perspectives: strategic, tactical, and executive. Overall, it reveals ERP implementation teams should plan the process with a view of these perspectives.

5.2.2 ERP system implementation strategies. Beyond the archetypes for the different ERP implementation models identified in the various literatures, researchers have also examined ERP implementation strategies in detail. Although ERP solutions are supplied with pre-built software and in-built business process functions, there are no industry standard ERP implementation strategies. Instead, each organisation approaches the implementation process according to its own business strategy and requirements. Therefore, Yusuf *et al.* (2004) recommend that before embarking on an ERP implementation,

organisations should not only plan for resource availability, but also assess its readiness for the changes that ERP implementation will unleash.

Analysing commonly applied strategies, Mabert *et al.* (2003) recommend following several factors during implementation, which are considered essential in order to enhance the understanding of the procedures required (Table IV).

Beheshti (2006) propose an implementation strategy based on the one-time complete conversion from an old legacy system to new ERP system, which is similar to Zhang and Li's (2006) complete conversion. Another proposed implementation method is the gradual replacement of legacy programme with ERP system. This approach is best suited to those organisations in which different ERP modules are being implemented across the organisation, and also for the organisations that seek control over the implementation process by implementing one module at a time.

Analysing ERP implementation from a vendor's perspective, Helo (2008) suggests starting the ERP implementation process at a slow pace to allow employees to familiarise themselves with the ERP system and the implementation process, while focussing on the simpler modules, such as finance and human resources. This is partially supported by Maas *et al.* (2014), who investigate the impact of organisational control and empowerment on ERP system usage. The authors find that empowerment strategy is positively related to increased system usage whilst an inverted-U relationship is observed for organisational control. They find that the more users utilise the system to its fullest extent, the more likely the organisation is to attain ERP system benefits.

Daneva (2003), noting the complexities resulting from ERP customisations, proposes a method of "composition and reconciliation" to achieve a working realignment strategy suitable for ERP implementation. This method envisages organisations exploring standard ERP functionalities, first, to find out how closely they match existing business processes and data needs, and second, selecting the most suitable combination of functionalities present.

Another common approach to avoid the complexities of realignment and customisation, involves organisations selecting the "best" modules within an ERP system (such as human resources, accounting, product lifecycle management, and inventory management) and

Mabert *et al.* (2003)	Upfront planning
	Minimum customization
	Managing implementation process
	Communication
Botta-Genoulaz and Millet (2005)	Phased optimisation
	(1) Operational
	(2) Tactical
	(3) Strategic
Sankar and Rau (2006)	Step-by-step implementation
	Big-bang implementation
	The rollout implementation
Zhang and Li (2006)	Complete conversion
	Progressive conversion
	Special type progressive conversion
	Parallel conversion
Verville *et al.* (2007)	Project team formation
	Requirement definition
	Evaluation and selection criteria
	Marketplace analysis
	Acquisition strategy
	Acquisition issues

Table IV.
ERP system
implementation
strategies

implementing these instead of a complete ERP system (Alshawi *et al.*, 2004). In line with the recommendations for addressing the complexities arising from ERP customisation, Federici (2009) advises that an initial part of ERP planning should involve preparing strategies for organisational change, and then determining the criteria for the selection of the "right" ERP vendor to assist in implementation. This is consistent with Aladwani (2001), who argues that ERP implementation requires matching appropriate strategies with the suitable stage to overcome resistance sources (habits and perceived risks) effectively. Kremmergaard and Rose (2002) take this suggestion one step further, by proposing a change of project managers during each implementation phase; since each phase requires a specific set of competencies and skills.

Since implementation processes involve various associated risks, Dey *et al.* (2010) propose a risk management framework for ERP implementation, which categorise risk factors into a planning, implementation, and operational phase. However, the authors report that the implementation phase is the one most vulnerable to failure. In addition, the effect of other on-going projects, including the management of the overall IT architecture, and non-availability of resources for organisational transformation, are the most critical risk factors for implementation. Summarising, Velcu (2010), using an analytical approach to investigate ERP system implementations, reports that when ERP system implementation strategies are aligned with business strategy, it is more likely that ERP implementation will be completed on budget and on time.

5.3 Post-implementation phase

The post-implementation phase is important in the implementation process. Davenport (1998) argues against any prevailing assumptions of treating ERP as a project that has a termination date. According to Nah *et al.* (2001), concerns relating to ERP system implementation do not end once the system becomes operational. Consistent with these views, Willis and Willis-Brown (2002) point out that once the ERP system is successfully set up, it has a "go-live" date, but implementation is not the end of the ERP journey, rather, the post-implementation or exploitation stage is where the real challenges begin. Post-implementation involves critical processes such as testing the system for effectiveness, checking reliability, data integrity, system utilisation, and most importantly, assessing and evaluating the benefits of system implementation (Nah *et al.*, 2001). The post-implementation literature suggests the benefits of a fully functional ERP system are realised in one to three years after implementation (Caldwell, 1998).

Caldwell (1998) observes that during the post-implementation phase, many firms suffer an initial three to nine months productivity dip after the ERP system "goes live". In addition, organisations often encounter a wide range of risks (including technical pitfalls, emergent business needs, inadequate user behaviour, and deficient system design) when using, maintaining, and enhancing the new ERP system (Peng and Nunes, 2009).

Palet *et al.* examine risk factors affecting the long-term viability of ERP projects. The authors report risk factors such as loss of qualified IT experts after implementation, inaccurate master production schedules, user resistance, loss of ERP-related know-how, lack of vendor support, failure to produce an appropriate material requirement plan, and inefficient integration between modules are primary risk factors that can affect the viability of ERP projects.

Nah *et al.* (2011), using different research motivation from Caldwell (1998), observe similar phenomenon as the author. In addition, they identify five maintenance activities pertaining to ERP implementation in the post go-live phase. These include corrective maintenance (trouble shooting, importing new data objects, and updates from vendor), adaptive maintenance (transfer, testing, modification and enhancement, etc.), perfective

maintenance (version upgrades), preventative maintenance (routine administration, monitoring workflow), user support (continuing training of users and helpdesk-type support services), and external parties (coordination and administration with vendors, consultants and external users organisation).

Cotteleer and Bendoly (2006) utilise an empirical research technique to investigate the influence of ERP implementation on organisational performance. They conclude that performance along key metrics motivating ERP projects improve significantly after system deployment.

Examining product performance and post-implementation impact on usage, Wickramasinghe and Karunasekara (2012) find no significant differences in perception among different user groups towards ERP system performance. However, problem-solving support, authority, and decision rights, and over performance improvements are identified as important post-implementation outcome of ERP usage that discriminates between management and operational end users.

The literature is consistent in observing the importance of evaluating ERP system post-implementation performance, to determine whether the system satisfies organisational requirements, particularly given the financial and time investment in the project (Francoise et al., 2009). To facilitate such evaluation, Wei (2008) proposes an assessment framework for new ERP system performance based on implementation project objectives. The study identifies appropriate performance indicators, and set a consistent evaluation standard for ERP processes, and establishes a feedback mechanism between the desired objectives of ERP adoption, and the effects of ERP implementation.

Mandal and Gunasekaran (2003), examining post-implementation feedback, propose a feedback system to help organisations constantly monitor the implementation performance, and post-implementation strategies to measure the effectiveness of ERP systems, including the measurement of objectives achieved, cost estimates, and improvements in IT infrastructure. Concentrating on post-implementation, Nicolaou (2004) examines ERP post-implementation phases, and identify factors such as review of overall project scope and planning, review of driving principles for project development, evaluation of misfit resolution strategies, evaluation of attained benefits, and evaluation of user and organisational learning, which contribute towards post-implementation review.

Chou and Chang (2008) also examine post-ERP implementation performance from the perspective of managerial intervention. They find that both customisation and organisational mechanisms affect intermediate organisational benefits in post-implementation and this influences the overall benefits achieved by an organisation following ERP implementation. In a later study, Hsu et al. (2015) observe increases in user satisfaction in terms of overall service quality including system and information quality, which impacts employee level of system usage due to improved service quality.

Staehr et al. (2012) examine post-implementation periods in four manufacturing companies, and propose a framework for understanding the benefits businesses achieve from ERP implementation. The framework consists of nine themes, namely, environmental context, organisational context, chartering and project phase, techno change management, educational training and support, people resources, efficient use of ERP system, business process improvements, and project extension to leverage off the ERP system.

Studying the risk reduction efforts in post-implementation phase, Tian and Xu (2015) find that the ERP systems can help in reducing firm risk in post the implementation phase and the risk reduction effort was stronger for ERP systems with a greater scope of functional and operational module. In addition, in the higher uncertainty operating environments, the risk reduction efforts are proportionally higher.

Moalagh and Ravasan (2013) propose a framework to evaluate post-implementation success based on what is described as three constructs, rather than themes as used by Staehr et al. (2012).

These constructs are managerial success, organisational success, and individual success. This framework can be used to determine a firm's success, and required improvement projects can be proposed. Considering post-implementation enhancement decisions, Cao *et al.* (2013), consistent with Staehr *et al.* (2012) and Moalagh and Ravasam (2013), find that proactive ERP adopters, who employ post-information review practices and obtain favourable performance outcomes, are more likely to make system enhancement. As already stated above, it appears that the findings and conclusions of most post-implementation studies are similar to each other, with different names being used to describe the same things.

6. ERP implementation success attributes

Success for ERP system implementation is achieved when an organisation is able to better perform all its business functions, and the adopted ERP system achieves the implementation objectives (Wei *et al.*, 2007). Umble *et al.* (2003) measure implementation success as benefits achieved, such as personnel reduction, better inventory management, reduction in IT costs, and improvements in ordering and cash management. Other factors used to measure success, include an overall reduction in planning and scheduling cycles, reductions in delivery times, reduction in production times, reduction in inventory stocks, reduced late deliveries, and increased productivity (KMPG, 1997). Similarly, end-user satisfaction and their constructive perception about a new ERP system are a commonly used measure of system success (Delone and McLean, 1992). Indeed, Calisir and Calisir (2004) find that user's perception and perceived usefulness, is a significant determinant of end-user satisfaction, which assists in the maximum utilisation of the ERP system. Likewise, Sun *et al.* (2005) find that end users' involvements determine the success of implementation. Bhatti (2006) also measured ERP success in terms of projects' completion time, compliance within budget, users' satisfaction, and overall system utilisation. Chang *et al.* (2008) corroborate these findings and confirm that "users" are the most significant determinant affecting the ERP usage and eventually the success of ERP implementation. Among the factors influencing ERP system acceptance, Elkhani *et al.* (2014) find transformational leadership and self-efficacy influence the perceived usefulness of the system. In addition, transformation leadership also influences the perceived ease of use via incorporating self-efficacy measures.

7. ERP implementation failure attributes

Several studies examine failed ERP system implementations, and considered strategies for successful implementation (Sumner, 1999; Mabert *et al.*, 2001; Amid *et al.*, 2012). Within this stream of the literature, the most common cause of ERP implementation failure identified is a combination of poor planning and high customisation of ERP software (Scheer and Habbermann, 2000). Conversely, one of the key factors associated with successful implementations, is implementation with minimal customisation, as this eases the burden on implementation teams, avoiding technical pitch falls, and generally save resources (Sumner, 1999; Shehab *et al.*, 2004).

Markus, Tanis and Fenema (2000) and Markus, Axline, Petrie and Tanis (2000) identify several other attributes associated with implementation failures, including approaching ERP implementation from an excessively functional perspective, inappropriately cutting the scope of the project, eliminating user training, inadequate testing, not improving business processes initially, underestimating data quality problems, fragile human capital, and data migration problems.

Huang *et al.* (2004) argue that ERP system appears to present unique on-going risks, due to its uniqueness. They identified several factors and constructed a framework to analyse

and prioritise these factors into the order of importance. The factors in the order of importance are:

- lack of top management commitment;
- ineffective communication;
- insufficient training;
- lack of user support;
- poor project management;
- relying on legacy systems;
- inter-departmental conflicts;
- composition of project team;
- failure in redesigning business processes; and
- lack of clarity about required changes.

The results of this study can assist practitioner in assessing the risks associated with ERP implementation.

Adopting a different approach, Xue *et al.* (2005) use a case study in China to investigate the ERP implementation failure in vendor practices in China. They observe that vendor failure to adapt to local culture, BPR, managing local human resources, lack of information sharing, failure to understand cultural characteristics, lack of adaptability towards a changing business and economic environment, lack of cost control functions (i.e. adapting to changing costs), and failure to understand technical issues are the main causes of ERP implementation failure.

In another country-specific study, Amid *et al.* (2012) examine critical failure factors in Iranian companies and identify and classify failure attributes as vendors and consultants, human resources, managerial, project management, processes, organisational, and technical issues (Table V).

Momoh *et al.* (2010) performed an in-depth analysis of the literature from 1997 to 2009. They identify causes of ERP implementation failure as excessive customisation, dilemma of internal integration, poor understanding of business implications and requirements, lack of change management strategy, poor data quality, misalignment of IT with business, hidden costs, limited training, and lack of top management support.

Wilson *et al.* (1994)	Changes in personnel
	Lack of discipline
	Organisational resistance
	Lack of organisational commitment
Sun *et al.* (1997)	Poor data accuracy
	Limited user involvement
Soh *et al.* (2000)	Mismatch between organisation requirements and functionalities offered
Langenwalter (2000)	Lack of readiness for integration
Markus, Tanis and Fenema (2000) and Markus, Axline, Petrie and Tanis (2000)	Lack of focus on user education and training
Motwani *et al.* (2002)	Excessive customisation
Sammons and Adam (2005)	Inadequate organisational analysis
Kamhawi (2008)	Costs
	Project duration
	Technical challenges
	Management changes

Table V.
Implementation
failure attributes

8. Discussion

As observed, the ERP literature has developed into a vast mature research field. Due to the potential high costs and low-success rate of ERP system implementation, it is critical that the causes of ERP implementation failures are identified and better understood. Through this understanding, solutions leading to greater implementation success may be found (Calisir and Calisir, 2004). The literature on ERP implementation covers areas such as uncertainty management, pre-implementation, implementation, and post-implementation issues, and CSFs required for successful implementations, as well as the impact of ERP on organisational performance (Al-Mashari *et al.*, 2003; Hitt *et al.*, 2002).

Implementing ERP systems require organisations to restructure their business processes around the new ERP system. This often results in key organisational changes, especially in relation to questions of how to integrate ERP systems, what to do with legacy systems, and how organisational business processes should be revised. However, if these changes are not managed carefully, they can, and often result in organisational conflict (Maguire *et al.* 2010). The area of most focus in the literature is on CSFs, such as specific phases of implementation, and comparison of the relative importance of CSFs. Focussing on specific phases such as pre-implementation is critical, as the steps taken and strategies adopted in this stage will impact directly on implementation, and the outcome of the overall implementation process. This phase should be considered as the "starting point" of the attitudes that will shape future implementation phases. Because of its role in shaping the attitude of those charged with the implementation, this phase demands additional research attention (Herold *et al.*, 1995). Moreover, because these early attitudes are central in shaping early behaviour, it is important to understand the nature and origin of such attitudes.

The top three most important CSFs to be considered at particular stages of the implementation process are top management support, good project teams, and good communications. Lesser, but still important CSFs are, having a good business plan, vision, having a project champion, appropriate business and legacy systems, change management programmes, culture, BPR, minimum customisation, software development, testing, trouble shooting, monitoring, and the evaluation of performance (Markus, Axline, Petrie and Tanis, 2000; Bancroft *et al.*, 1998; Bingi *et al.*, 1999; Nah *et al.*, 2001; Umble *et al.*, 2003; Ehie and Madsen, 2005; Sarkar and Lee, 2003; Umble *et al.*, 2003; Kim *et al.*, 2005; Motwani *et al.*, 2005; Nah and Delgado, 2006; Maguire *et al.*, 2010). The results from a meta study of organisations adapting ERP systems further define these into key benefits of operational, managerial, strategic, IT infrastructure, and organisational benefits (Shang and Seddon, 2002). The adaption of ERP systems also assist organisations to consistently and significantly improve stock returns (Hayes *et al.*, 2001), increase return on assets, return on investment, and asset turnover (Hunton *et al.*, 2003; Hendriclk *et al.*, 2007).

Successful ERP system implementation is achieved when organisations are able to better perform all its business functions, and the adopted ERP system achieves the implementation objectives (Wei *et al.*, 2007). Organisations can measure implementation success as benefits achieved, such as personnel reduction, better inventory management, reduction in IT costs, and improvements in ordering and cash management (Umble *et al.*, 2003). However, users are the most significant determinant effecting ERP usage and the therefore the eventual success of ERP implementation; as this assist in the maximum utilisation of the ERP system (Sun *et al.*, 2005; Bhatti, 2006; Chang *et al.*, 2008).

The most common causes of ERP implementation failures are a combination of poor planning and high software customisation (Scheer and Habbermann, 2000), lack of top management commitment; ineffective communication; insufficient training; lack of user support, poor project management, relying on legacy systems, inter-departmental conflicts, poor composition of project teams, failure in redesigning business processes and, lack of clarity about required changes. Focussing on these areas will assist practitioners in

reducing the risks associated with ERP implementation (Huang *et al.* 2004). However, concerns relating to ERP system implementation do not end once the system becomes operational. The real challenge begins during post-implementation stage. This phase involves critical processes such as testing the system for effectiveness, checking reliability, data integrity, system utilisation, and most importantly, assessing and evaluating the benefits of system implementation (Nah *et al.*, 2001; Huang *et al.*, 2004). During the final implementation phase, organisations will often encounter a wide range of risks, including technical pitfalls, emergent business needs, inadequate user behaviour, and deficiencies in system design (Peng and Nunes, 2009).

Beyond the archetypes for different ERP implementation models that have been examined in the literature, attention has also focussed on ERP implementation strategies. The ERP strategic literature takes several approaches, modelling, tactical, or strategic. Other strands of the literature take a contingent approach. Despite the fact that ERP solutions are supplied with pre-in-built software and in-built business process functions, industry and researchers are unable to devise an industry standard ERP implementation strategy. All that the literature is able to offers in this area is an assertion that different strategic approaches might be more effectively used in certain situations.

From a vendor's point of view, an implementation strategy could start by focussing on implementing simple ERP modules such as finance, human resources management, product lifecycle management, and inventory management, rather than attempt to implement a complete ERP system (Alshawi *et al.*, 2004; Helo, 2008). Another strategy organisations could explore is standard ERP functionalities, first, to find out how closely they match existing business processes and data needs, and second, selecting the most suitable combination of functionalities present.

For certain, an initial part of ERP planning must involve preparing strategies for organisational change, and then determining the criteria for the selection of the "right" ERP vendor to assist in the implementation (Federici, 2009). This will assist organisations to overcome user resistance. Alternatively, since each stage of the implementation process requires specific sets of competencies and skills, implementing organisations could organise project managerial change during each implementation phase. However, all of these strategies typically fail to fully address the complexities associated with ERP implementation. As a result of these inadequacies, organisations are left with the unsatisfactory situation where each approaches implementation according to its own business strategy and requirements. This presents a second critical area of future research and collaboration for researchers and manufacturers.

The benefits of a fully functional ERP system are realised in one to three years after implementation. However, many organisations may suffer an initial three to nine months productivity dip after the system "goes live" (Caldwell, 1998, Nah *et al.*, 2011). In this, the literature is unified in observing the importance of evaluating ERP system post-implementation performance, to find out if the system satisfies organisational requirements, particularly given the investment of resources and time in the project (Francoise *et al.*, 2009). One framework for evaluating post-implementation success is based on Moalagh and Ravasan's (2013) three constructs technique. These constructs are managerial success, organisational success and individual success. This framework can be used to determine a firm's success, and a required improvement project can be proposed. Proactive organisations adapting favourable ERP performance outcomes are more likely to make system enhancements (Cao *et al.*, 2013; Staehr *et al.*, 2012; Moalagh and Ravasam, 2013).

9. Conclusion
The ERP literature is vast, dates back almost three decades, and provide a rich source of information on ERP systems. The literature shows that top management team support, good

project teams, and good communication are the three most important CSFs for achieving successful implementations. Still, due to ever developing technology and improvements in business processes, coupled with the need to integrate cross-functioning departments and partners into the supply chain, there is a continued need for further research in the area of ERP system implementation. However, future research needs to be more innovative, and focus more specifically on areas of ERP implementation where critical knowledge remains missing. The literature provides a myriad of different models designed to overcome ERP implementation challenges. However, one of the most difficult and as yet unresolved areas of ERP implementation is identifying and agreeing on industry standard implementation model. ERP system suppliers, users, and researchers should combine resources to focus on research in this area. It is interesting to note that researchers have focussed more on the implementation phase while research in pre- and post-implementation is limited.

In recent years, important developments in the IT field in general, and in ERP systems in particular have taken place. There are many new entrants in the industry offering ERP systems with more advanced software at competitive prices to LE and small- and medium-sized enterprises (SMEs). Newer versions of ERP systems now come in the on-demand format, software as a service is becoming more common. As a result of the advancements in IT software, companies are investing more in their IT infrastructures, and in upgrading and implementing new software systems such as ERP. This creates a significant opportunity for manufacturers and suppliers of ERP systems to attract new customers, and researchers to expand research in the area of ERP implementation and provide potential customers with greater knowledge of the products they may wish to purchase in the future.

In order to stay abreast of the developments in IT and ERP implementation, researchers should focus less on techniques using simply questionnaires and more on empirical or case studies of organisations that have adapted ERP systems to better understand actual problems faced during pre- and post-implementation. It is this critical and missing knowledge that the existing literature fails to adequately address and provide solutions for. In order for a real explosion in companies adapting ERP systems to take place, research must effectively address these critical missing areas. Organisations considering adapting ERP systems need to have a better understanding of the advantages and disadvantages of investing in these systems. It is no longer adequate for the future literature to simply regurgitate the findings of current studies. The huge advances in IT have provided companies with the opportunity for greater investment in IT infrastructure, and in upgrading and implementing new ERP software systems. However, without adequate research to guide their purchasing decisions, many are unlikely to commit to initial or future purchases out of share fear of entering the unknown.

In light of new developments in IT, it can be concluded that ERP implementation will continue to be the area of interest for future researchers. It would be beneficial all round, for manufacturers and suppliers of ERP systems to team up with researchers, so that the missing knowledge can start to be acquired by analysing transactions from start (pre-implementation) to finish (post-implementation).

9.1 Implication of study on theory and practice
This study draws much of the existing literature on ERP implementation into a single study, allowing us to take stock of where we have reached in terms of existing knowledge, and where we may go from here. Our study shows that in terms of theory, we have a good understanding of the theoretical background/framework of ERP implementation. However, in practical terms, there is still a long way to go in order to fully understand the drivers of the ERP pre-implementation and implementation phase. Nevertheless, this paper provides practitioners with a single place to examine the intricacies of ERP implementation and highlights different implementation models and strategies for comparison and decision-

making purposes. Drawn from the findings, the exclusive focus on each implementation phase could contribute towards overcoming the complexities of ERP systems implementation.

Despite the literature identifying a myriad of different ERP system implementation models designed to overcome implementation challenges, no standard industry ERP implementation model has been identified. Moreover, as an initial part of ERP planning must involve preparing strategies for organisational change, organisations need access to effective implementation strategies. However, findings in both these areas are repetitive, inconsistent, and lack empirical research, which means these remain two of the most critical areas for future research, and collaboration between ERP practitioners, ERP system developers, and researchers. However, organisations need to be also proactive in this area, by informing and providing access to researchers when considering an ERP implementation project. Researchers, in turn, need to become more innovative in terms of their research techniques when examining ERP implementation, and may find it beneficial to employ more meta-analysis techniques in the study of these areas.

9.2 Research limitations
The main imitation of the study is its focus on ERP implementation in LEs, which limits its findings. A further limitation is the focus on the ERP implementation only, that is, after the decision to implement ERP system has been made. As a result, this study does not consider the factors such as an organisation's need to implement ERP systems, implementation pre-requisites, budget planning and selection of vendors or implementation team.

Due to resource limitations, access to the Scopus Database was not possible. Therefore, not all research journals from that database are included in this study.

9.3 Future research recommendations
Future research should focus on the development of an industry standard ERP implementation strategy, and case and other empirical studies on pre- and post-ERP implementation. Furthermore, ERP implementation in SMEs has seen a substantial increase in recent years. A study of ERP implementation in SMEs is recommended. Finally, investigating the differences between ERP implementation in LEs and SMEs could be an interesting area of future research.

Notes
1. Panorama Consulting Solution is an independent organisation which studies ERP implementation across the globe. It helps firms evaluate and select ERP software and manages the implementation of the software.

2. Lucintel is a premier global market research and management consulting firm. It provides actionable results that deliver significant value and long-term growth to clients from various industries. Lucintel has created measurable value for more than 12 years and for thousands of clients in more than 70 countries worldwide.

3. 4P model is a business marketing model and stands for people, price, promotion, and product.

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