

A higher education model for developing competencies for critical ERP implementation roles: the case of Kenya

Elizabeth W Wamicha
Department of Information Systems, University of Cape Town
South Africa

Lisa F Seymour
Department of Information Systems, University of Cape Town
South Africa

Abstract

Enterprise Resource Planning (ERP) Systems are enterprise wide systems designed and developed with the aim of integration and optimization of organizational business processes. As these ERP systems evolve, ERP vendors and Higher Education institutions (HEIs) continue to investigate how appropriate curriculum are developed to support these new solutions. Students in Higher Education Institutions who intend to become future ERP implementers need to have appropriate competencies. In the context of developing countries, and Kenya specifically, ERP education is a very new area with a high level of potential. This paper focuses on this unique potential and the growing need to analyze the current state of ERP education and current demands for ERP based competencies. This in-depth literature analysis can provide a good basis for future work in the area of ERP education and competency building and support the proposed development of a framework that can help ERP education experts understand and explain this dynamic environment.

Keywords

ERP Systems, Competencies, Curriculum, Education, Developing Contexts

Introduction

Enterprise Resource Planning (ERP) Systems have been described as enterprise wide systems that are designed and developed with the aim of integration and optimization of organizational business processes (Moon, 2007). ERP systems are a consolidation of business practices that have been accumulated by vendors through past organizational implementations and allow for streamlining of business operations (Shang & Seddon, 2000). Over time ERP systems have become a practical solution applied in numerous organizations worldwide (Moon, 2007) and organizations are investing substantially into ERP systems. In 2013, the ERP software market grew by \$25.4 billion which was a 3.8% growth from 2012 (SAP University Alliance, 2015). For more than a decade now, customers adopting ERP systems are no longer restricted to large organizations; small and medium sized companies are now viewing adoption of ERP systems as a long term strategy (Bala & Venkatesh, 2013; Markus, Axline, Petrie, & Tanis, 2000).

The first wave of ERP implementation was mainly reactive and focused on the growing need to automate business processes (Ansen, 2014). With the onset of the second wave of ERP implementations, customers running ERP systems continue to demand ERP software that is flexible, mobile and cost transparent (Hamerman, Moore & Margerie, 2011). With this evolution of ERP systems, ERP vendors and Higher Education institutions (HEIs) continue to investigate how appropriate curriculum are developed to support these new solutions (Hawking, McCarthy & Stein, 2004). Students in Higher Education Institutions who intend to become future ERP implementers need to have competencies from initial stages of planning to

implementation to actual strategic use of ERP systems (Antonucci et.al, 2004). .There is also a call to teach not only theoretical concepts but enabling students to understand these concepts deeply on ERP systems (Scholtz, Cilliers, & Calitz, 2012). There is also an emphasis on the need to teach students to learn as reflexive and reflective practitioners do. This can offer students insight on what to expect once they get into the workplace (McHardy & Allan, 2000; Pedler, 2011). In the context of developing countries, and Kenya specifically, ERP education is a very new area with a high level of potential. It has been argued that developing contexts have the unique opportunity to build a completely new infrastructure of teaching and position a new pedagogy that moves away from rule based thinking to model based reasoning (Kort, Reilly, and Picard, 2001). Besides pedagogy, concern has also been raised about competency sets in developing countries. In Kenya for example, it was found that Kenya faced a lack of specialized competencies and knowledge in ERP implementation and usage (Otieno, 2010). A Kenyan based qualitative study was carried out on 35 Kenyan organizations running ERP solutions (Abdullahai & Acosta, 2012). The results of the study showed that they came up with several challenges or gaps that these Kenyan organizations faced, chief among these was lack of adequate skills to carry out business process reengineering and ERP implementations. Other studies have also argued that competency gaps exist and the authors outlined specific competencies required of business process analysts involved in enterprise systems management (Chakabuda, Seymour and van der Merwe, 2014).

Hence, the main objectives of our broader study are to:

1. investigate the competencies required for critical ERP roles in organizations in Kenya
2. describe how HEI curriculum and pedagogy can develop these competencies in students
3. investigate HEI-software vendor partnership interventions that can impact these competencies

The main concern of our broader study is to describe and explain an ERP curriculum in developing contexts and how this can be aligned to industry demanded competencies. This is in line with the argument that Information systems research needs to drive positive and transformative change in developing contexts (Avgerou, 2008; Avgerou 2010). This paper presents a review of current literature which follows a concept-centric approach as suggested by Webster and Watson (2002). Webster and Watson (2002) recommended this approach to focus on synthesizing concepts rather than only summarizing other authors' material. In order to extract the main concepts, keywords were picked based on the main objectives of the study. The following sections of the literature review look into greater detail at the main themes of the study using the concepts identified as a guide. The themes are: a) The Kenyan context b) ERP education c) Evaluation of student learning and d) Critical ERP implementation roles.

Review themes and concepts

While much has been done in ICT and IS research in developed countries such as North America and Europe, developing countries including those in Africa continue to have issues that are not well analyzed in IS research (Avgerou, 2010). In addition to this, an unfortunate assumption is made that developing countries will have no challenges in adopting already existing knowledge (Hawking, 2011). Gaining a clearer analysis of this context is urgent since substantial funding is being spent on Information Systems in these countries (Heeks, 2010; Hawking, 2011). Education within the IS arena has also been viewed as critical and several authors argue that enhancing educational achievements in developing countries is important for using IS optimally (Ngwenyama, Andoh-Baidoo, Bollou, & Olga, 2006). This argument remains as important in the case of Enterprise Resource Planning (ERP) systems and ERP systems education which are a prominent research area in information systems literature (Klaus, Rosemann & Gable, 2000).

Authors have described ERP as large scale software aimed at meeting varied requirements of different users in the organization (Gustaf, 2006). ERP has also been discussed in the context of the next generation of enterprise systems known as ERP II (Møller, 2005). ERP II is formed through layers that have specific components moving from the foundation layer with core components such as the database to the portal layer with the collaborative components (Møller, 2005). Others have provided a consolidated definition of ERP systems by stating that these systems attempt to integrate information and business processes and also provide a shared product and customer database (Schlichter and Kraemmergaard, 2009). While others attempt to distinguish ERP from ERP II by arguing that ERP focuses mainly on the back office processes while ERP II is more customer centric (Norton, Coulson-Thomas, Coulson-Thomas & Ashurst, 2012). These

varied definitions and perspectives signify the dynamic changes occurring in the ERP system as a product. In terms of competency building for ERP systems covering critical roles and their competencies, research have not been dynamic. This is especially so in developing contexts, most of these studies hardly delve into mapping the dynamic changes in enterprise systems with competencies required to implement and manage them; more so with the education required to raise competencies of professionals who are expected to know how to implement and strategically use these information systems (Leyh et al., 2011).

The Kenyan Context

Several countries in Sub-Saharan Africa are experiencing major growth in the area of Information and Communication Technology (ICT) (Mbarika, Payton, Kvasny, & Amadi, 2007). In addition to this, the digital divide in countries such as Kenya continues to reduce at a rapid rate especially in areas such as development and establishment of telecommunications infrastructure (Brännström, 2012). Other critical areas such as electronic governance and improvement of government processes have also been initiated and implemented at a rapid rate in the continent but have not seen equally rapid progress in the area of research (Estevez & Janowski, 2013). In general, development of information systems research in developing countries has been slow (Avgerou, 2008; Avgerou, 2010). Other studies agree with this perspective, that information systems and ICT have potential in the continent to enable strategic and transformative development but hardly any research has delved into this rapidly growing area (Thompson & Walsham, 2010). Studies have also shown that there is a growing need to research issues of information systems and ICT from a context perspective such that we do not assume that what works in one context will automatically work in another (Heeks, 2010). Further to this, there is an emphasis on the idea that the current trend of ERP systems in developing countries is that of growth and dynamic change (Otieno, 2010). In this regard hardly any studies have been carried out regarding ERP education and ERP competency requirements in developing countries. However, some countries in the Middle East and North Africa (MENA) region have made progressive steps towards developing research in ERP curriculum (Akre, Rajan, & Nasser, 2014) and in South Africa, there has been interesting work developed around ERP Education and curricula (Ansen et al., 2014; Calitz, 2010; Scholtz et al., 2012). In the analysis of literature relevant to Kenya, several studies have covered success factors required for successful ERP implementations (Mose, Njihia, & Magutu, 2013; Otieno, 2010). No articles in the area of ERP curriculum were found but several acknowledge the need for further analysis of competency requirements in the use of ERP systems (Abdullahai & Acosta, 2012; Makokha, Musiega, & Juma, 2013; Otieno, 2010; Wanjugu & Ngugi, 2015).

HEI ERP education models

Given the broad area of ERP systems and ERP systems education, several studies show that Universities at a global level are at different levels of maturity regarding how they deliver ERP systems curriculum and how they organize their course offerings (Boyle & Strong, 2006; Holland & Light, 2001; Hustad & Olsen, 2014; Jensen, Fink, Møller, Rikhardsson, & Kræmmergaard, 2005; Antonucci, 2004). In line with this, authors on ERP curricula specify the rising need to continuously evolve pedagogy (Katz, 2000) with the aim of developing students that are ready to work effectively with ERP systems (Ask et al., 2008; Hawking and McCarthy, 2005).

In an effort to develop dynamic curricula a variety of approaches have been used such as the importance of including hands-on approaches in curricula and the usage of ERP by academia (Noguera & Watson, 2004; Pridmore, Georgia, Turner, & Prince, 2014; Leyh et al., 2011). Studies have also attempted to develop holistic frameworks that provide a comprehensive and appropriate for linking required competencies with ERP adoption in any given IS university curriculum (Scholtz, Cilliers, & Calitz, 2012). Other approaches have included a multi-course approach that addressed a three tiered approach and ERP integration across multiple business courses (Peslak, 2005; Springer, Ross, & Humann, 2007; Bradford et al., 2003; Peslak, 2005). Other studies have focused on pedagogical change and pedagogical innovation to stimulate reflective learning of enterprise systems (Hustad and Olsen, 2011; Ask et al., 2008; Hawking, McCarthy, & Stein, 2005). Another recurring concept in ERP Education literature is the extent of collaboration with industry. Most of the literature encountered supports strong industry collaboration when developing ERP systems curriculum such as embedding industrial knowledge into curriculum and the use of industry-based projects to facilitate learning (Hawking, McCarthy, & Stein, 2005; Stewart & Rosemann, 2001).

Student Learning

Critical concepts within this theme focus on the idea that it is not enough to understand competencies required for ERP roles or even how ERP based curriculum should be structured. It is also critical to establish evaluation criteria to assess if students are actually learning what they have been taught. A popular tool for student learning evaluation is The Blooms taxonomy developed by Bloom, Hastings, & Madaus (1971) it has been used widely in providing evaluation in education with the aim of enabling students become reflective learners who are able to apply theoretical concepts taught at the class room level. Some research has used the tool in the development of ERP based curriculum (Atif et al. 2011; Chakabuda et al.2014). In addition to this, when addressing ERP curriculum it is important to go beyond the process of curriculum development to actually understanding the process by which students move from superficial learning to deeper and more reflexive and reflective learning (Ryan & Ryan, 2013). The tool also provides a popular taxonomy used in evaluating the process of student learning including learning concepts in ERP systems (Atif et al., 2011; Fürbringer, Freund, Glardon, Nienhaus, & Stammbach, 2002.; Rashid et al., 2011). Research covering student learning has also looked into simulation of learning processes using cognitive learning tools (Cronan, Leger, Robert, Babin, & Charland, 2012). Among the student learning theories that have been applied in the area of student learning include the Organizational Learning Theory (Argyris & Schön, 1978; Argyris, 1967; Argyris, 1976; Cangelosi & Dill, 2010; Huber,1991). The authors addressed the learning process of organizations that were constantly evolving to survive, learning processes in teams and development of four constructs of organizational learning. Another theory of interest is the experiential learning theory (Fenwick, 2001; Jewer, 2014; Kirkham & Seymour, 2005; A. Y. Kolb & Kolb, 2005; D. A. Kolb & Boyatzis, 2000; Scholtz et al., 2012; Watson & Schneider, 1999). These studies address the best ways to establish the most efficient way to facilitate learning and competency attainment for students undertaking IT based courses.

Critical ERP implementation roles

In any given ERP implementation process, establishing designated roles during the process of implementation is critical. Studies carried out indicate that leadership, open and honest communication and a balanced implementation team are among the necessary conditions for successful implementations (Sarker & Lee, 2003). In order for successful implementations to take place, clear business objectives must be met. It is also necessary to have roles that cover the core competencies of change strategies, technical installation as well as formulate a robust project management and business process reengineering (BPR) strategies (Al-Mashari, Al-Mudimigh & Zairi, 2003; Mandal & Gunasekaran, 2003). Figure 1 outlines the core roles for successful ERP implementation:

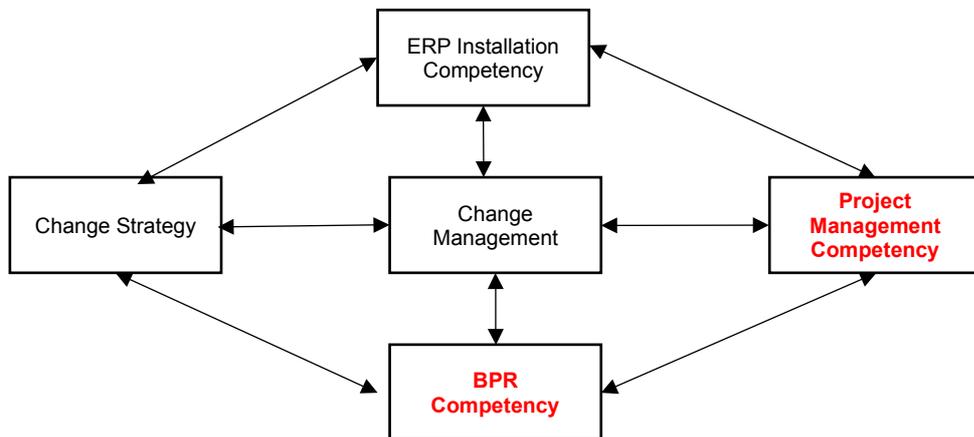


Figure 1: Core competencies for effective ERP implementation (Al-Mashari et al., 2003)

This particular study intends to focus on two critical areas which are Project management and Business Process Redesign. In the case of project management, there is a focus on the importance of ERP project managers (Al-Mashari et al., 2003). The authors emphasize the need for ERP project managers to have capabilities at both tactical and strategic levels (Chen, Law, & Yang, 2009). Several studies have investigated the importance of project managers in successful implementation of ERP systems and include competencies in project planning, defining goals of the project and identifying a qualified team (Kræmmergaard & Rose, 2002). There is an indication that further research is required to investigate how skilled project managers act as a predictor of IS success (Petter, DeLone, & McLean, 2013). Other research places the argument that ERP implementations would often require external expertise from consultants who can reduce client learning burdens and increase technical and business expertise required for the implementation process (Soltani, Elkhani, & Bakri, 2013).

The second area is Business Process Re-engineering or BPR. BPR is seen primarily as an antecedent of Business Process Management (BPM) (vom Brocke & Rosemann, 2010) and as a radical re-thinking of business processes in order to generate major improvements in the organization; this in turn leads to the need to continually improve organizational processes (Hammer & Champy, 2000). BPR has been defined as improving organization processes through aggressive process redesign and introduction of new processes (Seethamraju, 2012). It is a major prerequisite for taking full advantage of the ERP software that is to be implemented (Al-Mashari et al., 2003). BPR provides one of the four distinct aspects that guide between specific organizational needs and requirements for competence building (Masini & Van Wassenhove, 2009) and it forms a part of the Business Process Management movement that began in the 1980s (Harmon, 2010). Business Process Management (BPM) trends span a period of more than thirty years (1980s – 2000s) and have been defined as focusing on continuous process improvement (Braccini et al., 2011; Scheer & Nüttgens, 2000). BPM is defined as a critical management practice that is focused on ensuring that there is an alignment of all components of an organization in order to enable organizational effectiveness and efficiency (Sonteya & Seymour, 2012; Xu, 2011). BPM also facilitates Enterprise Systems (ES) integration of business processes throughout an organization (Xu, 2011). In this regard, BPM forms part of the process layer of many ERP systems (Møller, 2005) and some of the benefits of a robust BPM strategy is operational efficiency that lowers operating costs and increases customer satisfaction (vom Brocke & Rosemann, 2010). Efforts have been made to develop the process management cycle that includes designing, documenting and implementing critical processes (vom Brocke & Rosemann, 2010). Given the critical nature of implementing a robust BPM strategy, organizations have felt the need to revamp competencies around BPM (Chakabuda et al., 2014; Sonteya & Seymour, 2012). There is also a call to improve process analyst competencies to meet organizational competitiveness and has been compounded by the increase in demand for qualified professionals in this area (Sonteya & Seymour, 2012).

These two critical roles of project management and business process analysis require professionals with highly specialized skills especially during the complex process of ERP implementation. Often organizations, especially in developing countries would find it difficult to internally hire individuals with all the necessary competencies or even manage the cost of hiring and managing an external high quality consultant (Bingi, Sharma, & Godla, 1999; Chen et al., 2009; Lapiedra, Alegre, & Chiva, 2011; Wang & Chen, 2006). More prevalent in developing countries is the scarcity of individuals with the requisite competencies as well as the high cost of consultants who can facilitate project management processes and business process management functions during ERP implementations (Amid, Moalagh, & Zare Ravasan, 2012).

Resultant theoretical model

Much has been done in the area of ERP education and competency building but studies covering these two aspects have largely studied them separately; not much has been done in trying to align them. It is critical to note that there are gaps in knowledge concerning pedagogy for ERP education, presentation of teaching strategies, maturity of ERP curriculum and employability of students. Figure 2, the contribution of this study, summarizes the literature reviewed in this study and presents it within a nomological network.

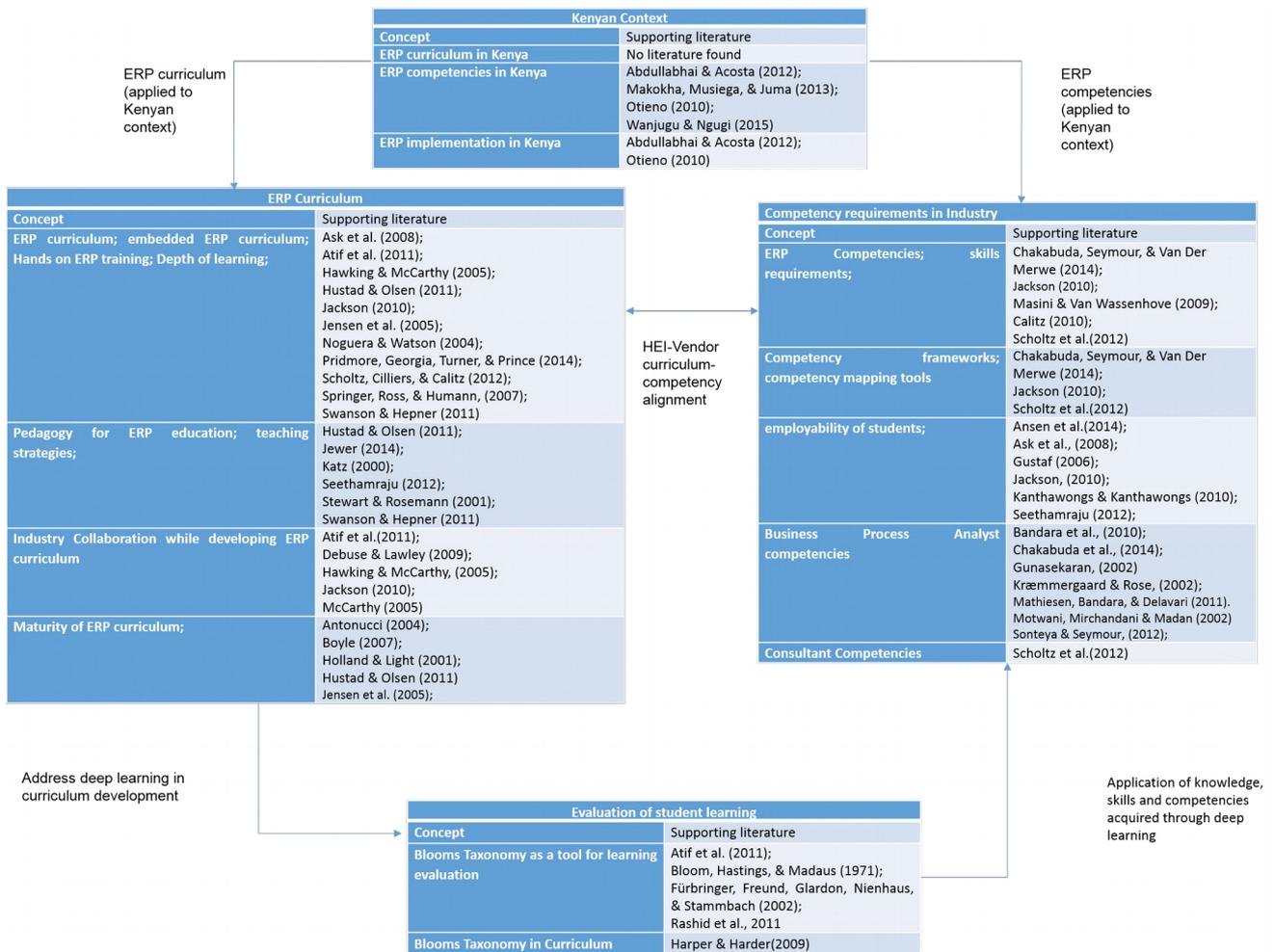


Figure 1. Summary of the focus of the review for the study

Conclusion and future directions

This study analyzes the ERP systems environment with a specific focus on the areas of ERP education and ERP competency building. As presented in the paper, there are a number of opportunities whether practical or research oriented in this area. These opportunities can enhance ERP education in terms of pedagogy and curriculum in contexts where the concept is relatively new such as in Kenya. In addition to this, comprehensive research around ERP education and competency building is still lacking and further study is needed. Future directions in this area include intensive empirical investigation of the competencies required for project management and process analyst roles, with a focus on the Kenyan context. The expected output of the research includes a comprehensive description of appropriate HEI curriculum and pedagogy and HEI and software vendor partnerships that is primarily aligned to organizational requirements. Further investigation is also required in order to understand how these can enhance competency attainment through deep student learning.

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