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Indexing

Enterprise Resource Planning Systems and Knowledge Management: A Review of the Literature and Conceptual Framework

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Abstract

This study provides a comprehensive review of the literature published in various articles dating back to 1998 on the role of Knowledge Management (KM) in Enterprise Resource Planning (ERP) systems. It follows the literature published in this context focusing on two basic themes: KM supporting the ERP systems and KM integration into the ERP systems. The articles addressing the basic themes regarding the relationship between KM and ERP systems published since 1998 were sorted out to conduct this research. Depending on the subject matter, most of the work on the role of KM in ERP systems was grouped into two main categories. The integration of ERP systems was further investigated, enlisting all possible research articles published so far. The current literature review on the KM and ERP relationship concludes that despite different themes explored in the literature, KM has a vital role to play in the success of the ERP system. It is a critical success factors which complements the ERP systems to the extent that its absence diminishes the very essence that is, the adaption of ERP systems for the companies signified by competitive advantage, market agility, and organizational efficiency.

Keywords: Enterprise Resource Planning (ERP) systems, enterprise systems, integration, Knowledge Management (KM), Knowledge Management Systems

Introduction

Considering the rapidly changing business environment, every organization needs a tactic or strategy for delivering better and improved value to its customers and most organizations have accepted this as a fact. But this fact seems truer today than ever before. Business competition has dramatically intensified their efforts for this purpose especially in the last several decades, in almost all organizational domains. Realizing this dire need to stay ahead and compete, the organizations have designed and developed ERP software. ERP systems are software packages that are used to combine processes and functions in an organization (Wu & Liou, 2011; Olson & Staley, 2012), using a shared information flow (Shanks & Seddon, 2000). Companies have been adopting ERP software for a decade due to its capability to combine business functions to improve their competitiveness as competition is one

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of the most powerful tools of the society. Being pervasive, it involves competitive markets of the companies, countries facing global trends, and social organizations trying to meet societal needs (Porter, 2008).

ERP and KM

The combination of ERP systems and KM promise organizations continuous revitalization and enhance competition among organizations (Huang et al., 2002) while providing a strategic initiative to manage knowledge assets (Xu et al., 2006). Due to similarities existing between KM and ERP, it is believed that an increase in KM systems in the ERP will enable companies to achieve maximum efficiency through effective use of knowledge sharing (Yuena et al., 2012). Despite the existing differences in the orientation of both ERP and KM, where KM focuses on flexibility and innovation while ERP focuses on the efficacy, the usage of both together gives out a complementary outcome (Newell et al., 2003). Considering other issues faced by the organization in implementing, supporting, and managing the ERP systems, KM has been recognized as an important issue by the respondents in a study (Chang, et al., 2000)

 According to Sedera and Gable (2010), there is a positive and significant relationship of ERP success with KM competence. The research suggests that ERP factors such as quality, relevant information and individual and organizational impacts are positively associated with KM competence which is essentially linked with knowledge creation, retention, transfer, and application. ERP helps in capturing and codifying knowledge through discussion groups, expert meetings, and other knowledge-sharing techniques which helps in transferring tacit knowledge to explicit knowledge (Parry & Graves, 2008). There exists a theoretical gap in the literature on ERP implementation of ERP systems and its knowledge integration process. However, some studies have not been able to explore knowledge integration and its processes (Mahendrawarthi, 2015).

A clearer perspective could be developed about the significance of relationships and the connections that exist between KM and ERP, with and the possibility of integrating a thorough review of research and past studies done in these two areas. For this purpose, the paper provides an overview of the past researches while exploring the relationship between ERP and KM to classify and summarize the literature. This will help to better understand the nature of the association existing between ERP and KM, hence will provide a platform for future research studies. The integration of ERP and KM is considered a necessity for Small and Medium-sized Enterprises (SMEs). The presence of a synergistic association of ERP and KM into one system is essential to meet the demands of new markets that include

the participation of all the value chain members i.e. customers, suppliers, competitors, etc. (Dwivedi et al., 2009). According to empirical research, there is a positive relationship between ERP and KMS. KMS helps in getting maximum output from the ERP (Zamhari, 2020). But the characteristics of ERP and KM are quite different, making their integration a difficult one. There is a need to thoroughly comprehend possible ways of integrating ERP and KM for the enhancement of business performance. As a result future research dedicated to ERP and KM integration is need of the time (Samiei & Habibi, 2020).

The literature review will help in understanding the nature of ERP systems based on KM to combine traditional ERP and KM effectively which is becoming a need and requirement of the organizations in the present knowledge-based economy (Li, 2006). The increased complexity in nature and technologies of the ERP calls for an immediate solution to the integration problem faced during ERP projects (Kähkönen & Smolander, 2013). ERP integration can be difficult, but it is essential due to its supporting role for the enterprise business system. Most of the ERP integration research focuses on quality concerns based on its characteristics and benefits of integration, which poses a need for research on providing a solution for the integration issues related to ERP Kähkönen and Smolander (2013) especially ones related to integrating ERP systems and KM (O'Leary, 2002).

Knowledge integration is a crucial problem in the ERP implementation process as it is influenced by an organization's socio-technical, structural, and relational factors (Pan et al., 2001). The process-based nature of organizational knowledge is a major concern for enterprise system's knowledge management when viewed from organizational memory approach (Vandaie, 2008). Hence a clear understanding of KM-related issues is quite important for future ERP implementations (Suraweera et al., 2008). Focusing on the underlying issues associated with integration, future ERP systems may have a KM module which could overcome the tradeoff differences of two managerial philosophies (Xu et al., 2006). There is a shortage of empirical research on ERP implementation, therefore extended view of KM that incorporates prior and post ERP implementation and considerations needs to be investigated (Metaxiotis & Ergazakis, 2010).

One of the major challenges ERP and KM related companies face today is the enterprise system knowledge, Parry and Graves (2008) especially the results and ramifications which are a tacit part of ERP knowledge, (Vandaie, 2008) thus inhibiting the ERP implementation success (Suraweera et al., 2008). Research needs to focus on devices facilitating KM within or between organizations (O'Leary, 2002) as the features related with mobility and internet of the device have

not been considered (Kähkönen & Smolander, 2013). Research could assist to better understand the establishment and endowment of communities developed to seek and generate knowledge of specific ERP packages, i.e. SAP or Oracle (O'Leary, 2002).

Research is needed to develop metrics for measuring the efficacy of KM practices for the formation and effective management of ERP systems (Metaxiotis & Ergazakis, 2010), one of the less developed feature of KM and best practice transfer efforts (Parry & Graves, 2008). Therefore, researchers engage in consultations with organizations to find probable measurements, that may give guidance for developing key indicators of performance and specific standardized estimates to determine the effectiveness of KM practices which might be required for the ERP system's management (Parry & Graves, 2008). Organizations are becoming more knowledge-focused but basic project management techniques and methodologies still need to accept and adopt KM (Kasvi et al., 2003). Research can concentrate on organizing efforts through the entire life cycle rather than using KM on different parts of the cycle (O'Leary, 2002). Researchers need to investigate ERP projects from perspective of the ERP stakeholder network by resolving issues related to integration, gadgets, techniques, and procedures which help in integration and examine how the concerned people are participating (Kähkönen & Smolander, 2013). A potential research area could be to study the impact of KM issues in ERP implementation on organizational success and business performance from clients instead of the vendor's perspective (Suraweera et al., 2008). One more important research area can be the globalization of ERP systems which is affected by geo-cultural barriers and standard processes (Parry & Graves, 2008). Considering the methodology involved in the research related to ERP integration, most comprehensive researches have been conducted on quality issues which include an examination of those characteristics of ERP and benefits which are derived from its integration. Therefore, there is a need for (qualitative and quantitative) research to first identify the emerging issues and later to confirm the presumptions (Kähkönen & Smolander, 2013).

In light of the research gaps identified by the previous research, the present study attempts to review the literature related to ERP and KM to understand the underlying relationship between the two constructs. This will provide clarity and thorough understanding for future empirical researches in this area as the rationales for the research emerges from the literature review. The present study attempts to review the literature to understand the nature of association between KM and ERP because the review in this study is unlike the one studied for planning and primary phase of research. A literature review could serve to inform about an ongoing trend

or practice and can help to provide a thorough understanding of a certain topic. The purpose of literature review is to develop a comprehensive understanding of a certain topic to conclude research in terms of future directions on basis of latest developments in the respective field (Mertens, 2014). The present review intends to provide the information that could be used to investigate and validate future research studies. Hence the results of the present research provide a clear and more in-depth understanding of the nature of association between KM and ERP and serve the needs of future research. This study attempts to answer the research questions given below:

RQ1. What is the focus of literature existing on KM and ERP?

RQ2. What are the basic categories that literature on the relationship of ERP and KM can be categorized into?

Enterprise Resource Planning (ERP)

ERP system or Enterprise systems are types of software systems which include modules, that provide support, to the functional areas such as financial, human resource, marketing, sales planning, etc. to ensure that the information flow across all areas remains visible (Monk & Wagner, 2012; Rashid et al, 2002). A distinction can be observed between Enterprise software or Enterprise system (ES) and ERP. Davenport (2000) describes ES as computer application packages that support many, even most, aspects of information needs of an organization. ERP contains a commercial software package thus promising absolute integration of information flow across the organization. The evolution of ERP dates back to the 1960s, a time when the computerized computer systems were mostly automating their inventory control systems. In the 1970s Material Requirement Planning (MRP) systems were developed, that planned the product or parts according to the schedule of master production, followed by the MRP II in the 1980s, thus concentrating on the manufacturing process. Then ERP systems appeared in the late 1980s and the beginning of the 1990s, possessing capability of enterprise-wide inter-functional coordination and integration (Rashid et al., 2002). It is quite rare for ERP implementation projects to acquire a static ending point (Jones & Price, 2004). About half of ERP implementations do not succeed in meeting the expectations of the adopting organizations (Jasperson et al., 2005). Organizations need continuous improvement in business activities (Davenport, 1996; Jones & Price, 2004) as they are essential in extending the life of these expensive systems and KM is one such key process inherent to the lifecycle (Jones & Price, 2004). The knowledge that is dispersed, gathered, combined, and transformed (relevant to the project) in and out

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of the organization is important to ensure a successful ERP implementation (Ebrahimi & Ibrahim, 2011).

Knowledge Management (KM)

According to Davenport and Prusak (1997), knowledge is defined as a framework, with ability to include and assess new experiences and information, a mixture of experience, standards, contextual information, and insight from an expert. Knowledge involves causal links which can be used to make sense of information whereas KM can be seen as the process which establishes and articulates these causal links (Sarvary, 1999). KM deals with those activities, which use and create knowledge, more than the knowledge itself (Hou, 2012). KM is a collective and integrated approach to create, acquire, organize, access, and use the intellectual assets of an enterprise (Grey, 1996).

KM has been around for decades, though the term "knowledge management" came into common usage in the late 1980s as it was mentioned in different conferences, books on this topic were published , and the term commonly used in business-oriented journals (Dalkir, 2013). Collaborative tools and technologies such as, Business Intelligence tools, expert systems, simulations of dynamic complex processes, decision support systems, ERP applications, other enterprise applications, and visualizing tools etc. assist and promote knowledge transfer and facilitate in understanding some of the complicated knowledge structures (Hou, 2012).

Perspectives on ERP and KM

KM can assist ERP systems across its different stages (O'Leary, 2002; Robey et al., 2002). ERP systems facilitate KM-related activities such as providing assistance to organizations to explore the potential knowledge, locate expert specialized knowledge, and disseminate and utilize knowledge of business processes (Zhang & Liang, 2006). Building a KM system based on ERP has become an urgent problem faced by most business organizations (Yuena et al., 2012). The present study identifies various themes in the literature on KM and ERP as mentioned in Table 1, especially focusing and addressing these two domains simultaneously or in collaboration. The article has been divided according to these themes under the headings of (1) KM supporting ERP system in Table 2 and (2) ERP and KM integration in Table 3.

KM Supporting ERP System

KM is utilized throughout the life cycle of the ERP system by choosing, implementing, and using the ERP system, both inputs and outputs, that is by

supporting and consulting the client (O'Leary, 2002; Robey et al., 2002). ERP implementations can be made more effective and beneficial through KM, by enhancing knowledge sourcing ability of the implementation partners (Chan et al., 2003; Gable et al., 1998; Gable & Timbrell, 2001; Leknes & Munkvold, 2006) whereas ERP implementation failures can occur due to inadequate interactions between the knowledge owners (Chan et al., 2003). ERP packages and implementation processes have special characteristics such as multiple modules, lack of business process knowledge, nonstandard organizations, etc. which makes KM and its tools vital for the implementation process (Ebrahimi & Ibrahim, 2011).

For better management of their Enterprise System's (ES) lifecycle and to grow the ES after initial implementation, clients need to adopt a lifecycle-wide knowledge sourcing whereas the consultants being the knowledge supplier and facilitator during the implementation period not only provide technical expertise, but also provide guidance in knowledge sourcing and creation activities. By performing these knowledge creation activities, for the clients, they can create a functional and pertinent system (Gable, 2005). Thus, the application of KM in implementation of ERP systems has the ability to enhance organizational performance through technology, persons and processes and all this can be achieved through effective communication between the implementer and implementing partners (Leknes & Munkvold, 2006).

Improvement in the KM-competence dimensions/phases will result in improved levels of ES success (Migdadi & Abu Zaid, 2016; Sedera & Gable, 2010). Although, all KM stages are important, from knowledge creation and later to be retained, transferred, and applied, but 'Application' phase might be the most influential with ES-success. ERP implementation success is influenced by knowledge-related issues which can be overcome by meaningful strategies eventually leading to complete benefits of ERP implementation (Suraweera et al., 2008). In ERP system management, knowledge is an important success factor for the organization. This holds great importance for the organization's suppliers and logistics providers if they intend on retaining control of their business instead of being controlled by the system itself (Parry & Graves, 2008). Implementation of the ERP systems is a continual improvement process, with KM providing major methodology support (McGinnis & Huang, 2004). Overlooking the important role of KM can be costly for the organizations, that's why, organizations are now focusing on capturing their current system knowledge, identifying the knowledge requirements, and developing a strategy (Davenport, 1998). A study conducted in the context of operational and functional performance to explore the level and direction of the relationship between KM and ERP, found that though ERP is a

precedent of KM, still it has no significant and positive impact on operational performance. KM has positive effects on operational performance and it mediates between ERP and operational performance (Acar et al., 2017).

KM and ERP Integration

Integration is an activity that makes a company a unified whole by blending inside and outside elements using technical solutions, information sharing, or collaboration among the human actors. The term integration is an ambiguous one, holding different interpretations in different domains (Kähkönen & Smolander, 2013), also in the context of information technology it holds different perspectives. Barki and Pinsonneault (2002) listed these perspectives as *Technical* (exchange of data among at least two interconnected systems), *Business* (using IT to couple standardized business processes), and S*trategic (*integration among human actors involved). ERP systems were adopted with the basic aim of providing an all-in-one integrated package for business firms, but in modern world ERP has been integrated externally and internally while constantly changing organizational environment (Kähkönen & Smolander, 2013).

Methodology

The present study uses the research methodology of a systematic literature review. The focus of the review is the research works published in scholarly journals and conference proceedings investigating the relationship existing between KM and ERP.

Research Identification

The systematic research stage begins with the identification and search of keywords and terms. The present literature review includes only those articles having KM and ERP in their titles. The common keywords were used to find articles about KM and ERP. The researcher's research strategy was based on including all the articles matching the keywords published in journals, conference proceedings, thesis reports, or even technical reports. Key words such as Enterprise Resource Planning, Enterprise systems, Knowledge Management, Integration, Enterprise-Wide systems were used to search relevant articles. The articles published from 1998 to 2020 have been included in the literature review. No restriction was imposed on the field of the journals surveyed in the context of the relationship among ERP and KM and therefore all the available journals are included in the literature review. This allowed the incorporation of diverse viewpoints on ERP and KM which belong to different domains and fields. The present study includes all possible publications, studying the relationship between

ERP and KM through a computer, dataset, internet, and other means of search. But there is always a possibility of missing some articles on the relevant topic. These articles were searched from scholarly search engines, Google Scholar and Web of Science and also Elsevier Science Direct, Emerald Insight, IEEE explore, Research gate and other links. Moreover, the researcher also used the JCR list to identify the most cited journals publishing articles on ERP and KM.

Paper Selection

A total of 300 articles from different journals and conferences were initially selected and short-listed using the keyword query. From these selected articles, a total of 150 articles have been included in the present review. The researcher read the titles, abstracts, and keywords of these selected articles. The selection of the articles was made based on first reading the abstract and then on basis of methods used in the research articles which focused on the relationship between ERP and KM. The tables given below provide an aggregate summary of articles on basic themes of KM supporting ERP and KM and ERP integration identified concerning the association between ERP and KM.

Synthesis

The papers selected using the criteria mentioned above to narrow down the scope, concentrating on the research works focusing and highlighting the association between KM and ERP leading to synthesis findings.

Results

On review of the literature of articles published related to studying the link between ERP and KM, two basic themes have been identified which are explained in the tables given below. Table 1 includes a list of literary works about ERP integration providing a detailed list of articles published on the concept of integration with ERP including both internal and external integration. Internal integration includes the merging of the internally-oriented applications that support finance, accounting, manufacturing, human resource, etc. whereas external integration discusses combining ERP systems and other information technologies. Approximately 9 percent of ERP systems integration related articles are published between 1998 and 2006 (Xu et al., 2008). However, the present review focuses on the relationship between ERP and KM which is divided into two main themes that are KM supporting ERP and KM integration with the ERP systems.

Table 1

List of Articles on the ERP Integration

References	Themes
(Bradford et al., 2003; Cannon et al., 2004; Boykin et al., 2004; Hawking et al., 2001)	ERP integration in curricula in business schools The integration of ERP into a logistics curriculum IS'97 model curriculum and ERP systems
(Frank, 2004; Johnson et al. 2004; Lenny et al., 2006a; Hsu, 2013; Nayak & Jain, 2014).	Integrating ERP system with E-commerce systems/ E-business
Samaranayake (2009)	An integration approach using improved business process models to process integration, automation, and optimization
Grant et al. (2013)	Existence of the six levels of ERP integration
Shi and Wang (2018)	Big-data ERP and business analytics integration
(Aguirre-Mayorga et al., 2012; Samaranayake, 2009)	ERP and Business Process Management System Integration
Fakoya et al. (2013)	ERP and Material Flow Cost Accounting (MFCA) Systems integration
(Bose et al., 2008; Chung et al., 2011; Tarn et al., 2002; Lenny et al., 2006b)	Integration of ERP and Supply Chain Management Systems
Bouzid et al. (2015)	reuse-based requirements elicitation approach for ERP integration
Brehm and Gomez (2010)	An approach of a Federated Enterprise Resource Planning (FERP) system based on Web Services and Peer-to-Peer (P2P)
(Chen et al., 2015; Popa & Vaida, 2016)	Cloud ERP platform Out spreading Enterprise Capabilities into the Cloud
Colombi et al. (2016)	Collapsing Design Structure Matrices use in ES integration
De et al. (2010)	Integration of ERP and Back-Office & Retail Store Management
(Ding & Sheng, 2010; Lee et al., 2011)	ERP and Product Data Management Integration

References	Themes
Ekman et al. (2014)	An extended ERP system needs to incorporate the company's business partners
Ou-Yang and Hon (2008)	An integrated APS (Advanced Planning System) and ERP framework
Kähkönen (2017)	Understanding and Managing ERP Integration
Lv et al. (2010)	Integration of heterogeneous systems (PDM, ERP, SCM, CRM, etc.) based on business collaboration.
(Nofal & Yusof, 2013; Chou et al., 2005)	Integration of Business Intelligence and ERP
(Prashanth & Venkataram, 2017; Zhao & Yu, 2013; Rambabu et al., 2013)	Integration between PLM (Product Life cycle Management) and ERP Systems
(Greasley & Wang, 2017; Greasley & Wang, 2016)	ERP and Enterprise Social Software integration
Jagoda and Samaranayake (2017)	ERP system implementation integrated framework
(Themistocleous et al., 2001; Azevedo et al., 2014)	ERP and application integration
Nikolopoulos et al. (2003)	Industrial maintenance strategy and ERP integration
(Liu, Bai, & Pérez-Edgar, 2019)	Integrating high-density ERP and fMRI measures
(Alshawi et al., 2004; Maurizio et al., 2007)	Integrating diverse ERP systems
Soliman et al. (2001)	CAD/CAM systems and ERP systems integration
(Zeng et al., 2003; Sammon & Adam, 2005)	Integration of ERP and Data Warehousing
Beretta (2002)	ERP systems Integration potential and role of process-based performance measurement systems
Rom and Rohde (2006)	Integration of ERP systems, strategic enterprise management (SEM) systems
Ruivo et al. (2014)	ERP and Customer Relationship Management Integrative Value

References	Themes
Liu et al. (2002)	Advanced Planning and Scheduling (APS) system with Enterprise Resource Planning (ERP) and Manufacturing Execution System (MES)
(Nupap et al., 2016; Klos, 2016)	Propose Knowledge Management System implementation in ERP
Pattanayak et al. (2019)	Conceptualization of hypothetical model exploring the integration of business processes with ERP to improve supply chain performance

The KM and ERP integration is considered a strategic initiative when it comes to managing knowledge assets (Xu et al., 2006). Various researchers have acknowledged the significance of knowledge of ERP users to guarantee the success of ERP implementation and integration of tacit and explicit knowledge as a major integration obstacle making ERP implementation difficult Mahendrawathi (2015) as systems integration is an ongoing issue especially for information technologies as many factors affect the success of the integration project (Hwang, 2011). Studies have warned about the difficulties and benefits of knowledge integration in the ERP implementation from the perspective of all parties but they do not explore the integration process and solution to existing barriers (Mahendrawathi, 2015). SAP's market dominance and significant market influence offers distinctive opportunities to promote the adoption of an integrated ERP Life-cycle KM framework, that accounts for unique regional context, vital players and offers options to improve ERP life-cycle support (Gable et al., 1998). KM and ERP suggested synergistic solutions, though there is a lack of sufficient evidence to support the compound effect of KM and ERP initiatives put into practice in an organization. Yet these synergistic effects between ERP and KM provide more efficacious methodologies for implementation, reduce the costs associated with implementation, increase user satisfaction and through the innovative ERP use can lead to strategic business advantages (Huang et al., 2002).

Knowledge is not a byproduct of the ERP system rather it is an important component that brings about the need for a framework for the incorporation of KM into the ERP projects. A four-phased proposed model for ERP continuous improvement incorporates KM into every major implementation phase, as integration improves the success rate of the ERP implementation (McGinnis & Huang, 2004). A model of knowledge process and transfer for maintaining and

reusing assets from external knowledge acquired during pre to post ERP implementation is suggested using the SECI model as a mediator (Mahendrawathi, 2015). Use of accepted communication methods and technologies during the ERP implementation life cycle are essential to ensure the success of the project. KM can be embedded throughout the process of ERP implementation by developing a framework that facilitates in providing improved knowledge repository, extraction and use of web-based communicational techniques (Ebrahimi & Ibrahim, 2011). ERP emphasizes improving efficiency of information processing and KM facilitates simultaneous development of the exploration and exploitation capability of the organizational knowledge, making them complementary rather than contradictory and thus if implemented at the same time it can lead to concurrent development of organizational efficiency and flexibility (Newell et al., 2003). Though few studies discussed the integration of the KM concept to ERP systems and developing ERP knowledge management, yet it was found to positively impact operating performance (Chen et al., 2007). It is difficult to get maximum benefit of KM and ERP integration, by adding KM module and ERP system together due to differences in their objectives and characteristics. To integrate two systems, changes are needed in ERP to facilitate KM implementation (Xu et al., 2006). But Yuena et al. (2012) proposed Multi-Agent based ERP knowledge management system framework, as the core of ERP and KM is quite similar in terms of sending appropriate knowledge to right people at right time. The increase in KM system in ERP will enable an organization to better achieve their goals as organizational efficiency can be improved during the ERP implementation process through effective use of KM in ERP implementation (Leknes & Munkvold, 2005). Xu et al. (2006) have also explored ERP and KM relationship and found that ERP provides KM with a proper framework to discover, classify and store knowledge.

Figure 1

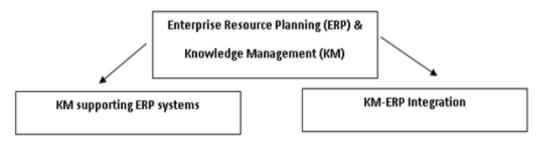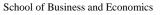*Conceptual Framework Identifying the Two Major Themes in ERP and KM Related Literature*

Table 2

Summary of Literature on KM supporting ERP

References	Types of research work	Themes
Vandaie (2008)	Conceptual	Identification of two major areas of KM, tacit knowledge management, and problem related to the process-based nature of organizational knowledge
(Leknes & Munkvold, 2006; Suraweera et al., 2008)	Case study	Focus on KM during ERP system implementations
(Suraweera et al., 2008; Ebrahimi & Ibrahim, 2011)	Survey-based conceptual framework	
Parry and Graves (2008)	Case study	Leading practices in literature, for effective KM of ERP systems
O'Leary (2002)	Case study	KM supports ERP systems across their entire life cycle
Migdadi and Abu Zaid (2016)	Empirical	Empirically testing the implicit, positive relationships between ERP-related KM competence dimensions and extended ERP success construct
Mahendrawathi (2015)	Conceptual	Addressing issues of ERP, KM, and SECI model
Gable et al. (1998)	Case study	KM facilities, approaches, and technology; exploration of alternative responsibility and role sharing scenarios; broad system architecture, and proposed strategies
Gable (2005)	Conceptual	Enterprise System (ES) investment supported by lifecycle-wide knowledge sourcing strategy

References	Types of research work	Themes
Acar et al. (2017)	Empirical	Impact of information systems on supply chain operations, and degree and direction of association among ERP and KM in operational and financial performance context
Li et al. (2006)	Conceptual	KM system development for effective management of knowledge in ERP implementation process
Chan et al. (2009)	Empirical	Effectiveness of implementing an ERP from a KM perspective
Usman and Ahmad (2012)	Conceptual	KM in specific type of project while identifying major areas of concern
Kłos (2016)	Conceptual	KM system model for manufacturing companies carrying out engineer-to-order (ETO) production based on ERP systems
Swanson & Hepner (2011)	Conceptual	KM framework for developing and managing ERP curriculum
Jayawickrama et al. (2012)	Conceptual	Integrative KM competence (IKMC) framework
Chan (2009)	Empirical	KM using an ERP system
Palanisamy (2006)	Conceptual	Managing flexibility in ERP systems using a conceptual framework
Kong (2010)	Conceptual	A framework of KMS supporting the ERP implementation
Ramburn et al. (2013)	Semi-structured interviews and qualitative data analysis	Validation of Chan (1999) model identifying Knowledge management dimensions required during ERP implementation
Adisa and Rose, (2013)	Multiple case study approach	Investigation of mediating role of absorptive capacity in knowledge

References	Types of research work	Themes
	and content Analysis	transfer in ERP implementation in SME
Jayawickrama, et al. (2012)	Conceptual	Proposed integrative KM competence (IKMC) framework test within companies in the service industry
Mala and Alagarsamy (2012)	Conceptual	Knowledge Management Process supporting ERP by solving the information-sharing problems
Rouhani et al. (2017)	Empirical	The positive relationship between Knowledge Management Process and ERP
Heredia-Calzado and Duréndez (2019)	Empirical	Application of KM and professionalization to improve ERP

Table 3

Summary of Literature on KM and ERP Integration

References	Type of Research work	Themes
Chen et al. (2007)	Empirical	ERP knowledge management to measure enterprise operating performance
McGinnis & Huang (2004)	Conceptual	A four-phased ERP continuous improvement model incorporating KM in each major implementation phase
McGinnis & Huang (2007)	Conceptual	ERP refinement model incorporating KM in all key implementation stages
Newell et al. (2003)	Empirical	Simultaneous implementation of ERP and KM in an organization
Mohamed and Fadlalla (2005)	Conceptual	ERP II leading to the new incarnation of ERP through blending of KM capabilities into ERP

References	Type of Research work	Themes
Xu et al. (2006)	Conceptual	Concurrent deployment of KM and ERP in the enterprise information systems framework
Yuena et al. (2012)	Conceptual	A proposed knowledge-based ERP Multi-Agent Management System Model
Metaxiotis (2009)	Conceptual	Exploring the rationales for the integration of KM and ERP in SMEs
Li et al. (2006)	Conceptual	Issues related to the designing of ERP systems in the knowledge-based economy
Huang et al. (2001)	Conceptual	Complementary implementation of ERP and KM systems
Metaxiotis and Ergazakis (2010)	Conceptual	KM's role in success of ERP systems while considering the possibility of its integration with ERP system
Supramaniam and Kuppusamy (2010)	Empirical	Critical success factors in adoption of ERP with KM strategies
Kumar and Gupta (2012)	Conceptual	A module of Enterprise Knowledge Management system
Al-Sabri and Al-Saleem (2013)	Conceptual	Proposed KMERP framework to manage knowledge within the ERP software
Mahendrawathi (2015)	Conceptual	Proposed model of process and transfer knowledge order to reuse assets from external knowledge in pre and post-implementation of the ERP system
Liu (2011)	Empirical	Introduced ERP Knowledge Management concept, CSF's for ERP knowledge Management and the CSF's influence on management performance

Conclusion

Based on the literature on ERP and KM, it becomes obvious that there does exist a strong link between the two, making the relationship between them complementing rather than contradictory (Acar et al., 2017). A review of literature on KM in ERP identifies KM as one of the important success factors in ERP implementation (Usman & Ahmad, 2012). This relationship can be either in terms of one system supporting the other one as shown in Table 2 or their complete amalgamation resulting in the integration of one into another i.e. Integration of KM into ERP as evident from the list of previous works in Table 3. This role of Knowledge in the life of the ERP system is so critical that it strongly impacts the very success of the ERP system implemented (Sedera et al., 2003), making KM a critical success factor for the ERP system success. The characteristics of the ERP packages and their implementation make KM tools vital during the implementation process (Ebrahimi & Ibrahim, 2011). Systematic incorporation of KM into ERP project management is not only critical but is of great strategic value (Sarvary, 1999). The past literature on the relationship between KM and ERP systems can be classified into two main types on basis of the literature reviewed. The first category of literature identifies the role of KM in supporting the ERP system and is consistent with findings of past studies. A systematic review leading to the development of a new model concludes that KM supports the ERP systems (Mahendrawathi, 2015) and the integration of the two systems, considering these two resources synergistically and simultaneously as shown in Figure 1. Another study is based on a review of literature related to the investigation and exploration of mutual relationships existing between ERP and KM. The study finds the association between these constructs according to three perspectives. The perspectives of KM impacting the implementation and use of the ERP and integration of ERP and KM are similar to the findings of the present literature review (Samiei & Habibi, 2020). Similar results have been reported in research work focusing on the success of KM implementation in an organization by combining it with ERP system by identifying variables from previous literature related to ERP leading to the success of KM system (Agrawal & Mukti, 2020).

The findings of the present literature review are consistent with a review of the literature to which identifies KM as one of the challenges faced in the ERP implementation projects (Ranjan et al., 2016).

The literature provides a strong argument in the favor of both viewpoints making it difficult to give a final verdict in favor of anyone's viewpoint. As in both the perspectives, either through the support of KM in ERP projects or integration

of both the KM and ERP system there are improvements in the outcome as compared from results obtained from ERP systems working in isolation or with KM. ERP systems with KM capacity use related knowledge in the environment from financial, material and information flows in which knowledge, information, financial and material flows are considered to be integrated in contrast to the traditional ERP systems which only integrates from financial, material and information flows, not including KM and hence fail to adapt to enterprises in the knowledge economy (Li et al., 2006). ERP systems are the integrated databases of the organization information and explicit knowledge whereas KM manages the tacit knowledge. A balanced view of ERP and KM can help in exploring and sharing both tacit and explicit knowledge and thus both the systems in tandem can enhance the organizational capabilities in the processing of information and exploitation and exploration of knowledge (Newell et al., 2003). Even the context and process of ERP and KM suggest that these systems have a complementary relationship and synergetic outcome but only when the designs of processes related to tasks fits into the meta-routines imposed by ERP and KM along with social processes nurtured within functions and cross-functions (Huang et al., 2001).

KM is a key critical factor in ERP implementation and their integration is not an easy task and is rather a complicated process because their characteristics are different Metaxiotis and Ergazakis, (2010), with ERP focusing on the management of physical assets and KM focusing the management of the knowledge assets (Azhdari et al., 2013) and similar too in the sense that both send right knowledge to the right people at right time (Yuena et al., 2012). Research shows that various KM-related challenges impacting the ERP systems success such as inadequate training, lack of technical and process knowledge, lack of management support and change management, lack of process knowledge, and lack of customization and contextualization of knowledge (Ramburn & Seymour, 2014). According to McGinnis and Huang (2004) KM in ERP implementation can face challenges such as knowledge carrying bodies are perpetual, lack of check and balance process on knowledge, huge breath and volume of knowledge prevent it to consolidated into a single deliverable outcome at the end of implementation. The major issues associated with KM in ERP implementations are poor business process documentation, unwillingness to leave the old system, poor requirement identification, the ineffectiveness of awareness programs, and fear of increased workload (Suraweera et al., 2008)**.** All the above challenges make it imperative to revise and replace the old methodologies of ERP implementation and create new ones by incorporating KM (McGinnis & Huang, 2004). ERP and KM integration is quite expedient for modem organizations as both systems share the common goal

of enhancement of business performance and hence to some extend tend to complement each other as well (Metaxiotis & Ergazakis, 2010). ERP systems based on KM combine traditional ERP and KM effectively and are suitable in the knowledge-based economy being a need of present enterprises. ERP based on KM is not an independent system rather it integrates all the systems of the enterprise by sharing and transferring knowledge effectively (Li et al., 2006). Hence the disadvantages of the traditional ERP system are overcome by integration of KM capacity, improving the organizational capability operating in the knowledge based economy and their integration giving strategic initiative to organizations for attaining and sustaining the competitive advantage.

Future Research Directions

Future research studies could use the theoretical platform provided in the present study to investigate the rationale to empirically test the integration of ERP and KM by developing a tool. The role of Knowledge management practices in the ERP system could be studied, validating the findings of the present literature review suggesting KM supports ERP systems as can create synergy when practices and routines of the organization fit in with the meta routines of ERP and KM (Huang et al., 2002). Another interesting research area for future studies could be to review the literature on the models developed and tested supporting the two themes of KM and ERP literature that is KM supporting the ERP system and ERP and KM implementation. Other possibilities for future research lie in studying the methods and mechanisms that could facilitate the role of KM in ERP or the integration of ERP and KM. Also, research in this field should be directed towards studying the impact of the relationship between KM and ERP on the organizational outcomes on an individual, group, and organizational level and with focusing the strategic implications of both, with either KM supporting ERP or KM integration with the ERP system. The future studies could make a valuable addition to the present literature review by reviewing the studies providing possible solutions to KM and ERP integration and by further suggesting proposed models or testing the proposed ones.

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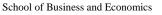
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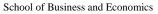
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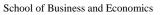
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