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Identification of key success factors and challenges for ERP systems – A Systematic Literature Review

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***Abstract* – Organizations need information system as a tool for decision making. Enterprise Resource Planning (ERP) systems are a tool of information systems to achieve work efficiency. ERP systems are the best solution to maintain a competitive advantage for most organizations. Successful implementations of ERP systems have a lot of benefits for the organizations. But the fact that many organizations have failed in implementing ERP systems, but also many organizations have succeeded in implementation of ERP systems. It is the challenge for the organizations to implementation of ERP systems success. The purpose of this study is to propose identify key success factors and challenges for ERP systems. This study employs Systematic Literature Review approach for review and summary about the key success factors of ERP implementation.**

Keywords: Critical success factors, Challenges, ERP systems, Systematic literature review.

I. INTRODUCTION

Organizations are radically changing to enhance synchronization between business and information system strategies to maintain a competitive advantage and improve performance of the organizations. Information systems are a vital tool for organizations to increase productivity and work efficiency. Considering the complexity of problems in the system, organizations should have a traceable tool to analyze and respond to issues significant to problem solving skills. Enterprise Resource Planning (ERP) systems will be consider to support organizations with the synergy for all the functions of existing departments within the organizations. ERP systems involve all management functions and integrate to produce products with efficiently and effectively, such as: accounting, finance, manufacturing, sales, marketing, purchasing, inventory and human resources. Therefore, the improvement of business performance is needed to control the business process. It is important for organizations to understand about the Critical Success Factors and challenges for ERP systems for the organizations have competitive advantage.

The purposes of this study were to serve three goals. First, was to identify some key success factors for ERP systems. Second, was to find the definition of all key components. Third, the study would give information about the challenges for ERP systems. This literature review was to answer the research questions:

a. What are key success factors for ERP systems?
b. What are challenges for ERP systems?

II. THEORETICAL BACKGROUND

A. Critical Success Factors of ERP Systems

According to Hawari et al. (2010), The ERP systems are one of the solution to improve work efficiency, increase performance of organizations. According to Bento et al. (2013), a significant of ERP systems has focused to identify the Critical Success Factors (CSFs). The measurable success of the ERP's with efficacy is an issue very present; a significant of ERP systems has focused to identify the Critical Success Factors (CSFs). According to Bintoro et al. (2015) argues that ERP implementation success is a compilation and analysis of CSFs. The CSFs domain for ERP systems are top management support and involvement, project team competence, and interdepartmental co-operation, change management, business process re-engineering, project management, user training (Bintoro et al. 2015; Leyh et al. 2015; Tarhini et al. 2015). This proves that ERP systems are valuable assets, value adding, and helping managers to make decision to improve work efficiency in order to improve the performance of organizations.

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B. Challenges for ERP systems

The implementing of ERP systems will change the business process and designed to serve and support the various functions within the organizations to serve and support multiple business functions and achieve work efficient. According to Yan Xu et al (2008), the business value for ERP system will able to integrate of information. Integrating of ERP systems can determine that the application is running well with there is no repetition of work, and increasing work efficiency and effective. It is the challenge of ERP systems.

III. RESEARCH METHOD

This research utilizes the Systematic Literature Review (SLR) approach that was proposed by Kitchenham et al. (2004). This approach is divided into several sections, consist of:

A. Search process

To identify information of this research, the search process is a manual search of conference processes and journal papers between the year 2005 and year 2016. The searching process uses Google Scholar and Science Direct as a search engine to find papers related to the intended subject. The keywords utilized to the search term of the papers are: "key success factors ERP systems" and/or "critical success factors ERP systems". The results were 88 papers of journal or conference that shows the title to a related subject. Based on this, the papers were selected to base on the title, keywords and abstract to answer the research question. The search result was processed by using the following processes:

a) Candidate selection is performed for reviewing based on the title, keywords and abstract.
b) Selected selection is performed for reviewing based on the full text of the papers.

The result search criteria of studies shown table 1.

Table 1. Number studies in selected sources

Source	Candidate studies	Selected studies
Academia	1	1
ACM Digital	10	4
AIS Electronic Library (AISeL)	3	0
CCSE	1	1
Elsevier	5	2
	19	7
	1	0
	1	0
Total	**88**	**29**

After studying further, the researchers have selected studies of 29 papers that will be included as the foundation of this study with 10 papers selected from conference proceeding and 19 papers selected from journal that reviews and primarily to answer the research question. The selected paper from the conference proceedings and journal are shown in table 2 and table 3. An initial scoping study was conducted to determine the resources to be searched and the search terms to use for each resource.

Table 2. Selected conference of list papers

Conference Name	Number of papers
Forum on Information Technology and Applications	1
Global Software Engineering Critical	1
Hawaii on System Sciences	1
IFIP on Towards The E-Society	1
Informatics Panhellenic	1
Information Systems and Design of Communication	1
Innovative Computing Information and Control	1
Service Operations and Logistics and Informatics (SOLI)	1
Service Systems and Service Management	1
Workshop on Software Engineering for Systems of Systems	1
Total	**10**

Table 3. Selected journal of list papers

Journal Name	Number of papers
ACM Computing Surveys (CSUR)	1
Advanced Manufacturing Technology	2
Advances in Engineering & Technology	1
Business Information Systems	1
Business Management and Economic Research(IJBMER)	1
Business Process Management	3
Business Research	1
Enterprise Information Management	2
Enterprise Systems	1
Information & Management	1
Information Systems	3
Knowledge Based System	1
Quality & Reliability Management	1
Total	**19**

B. Inclusion and exclusion criteria

Inclusion criteria are used to determining that piece of literature are needed. The criteria are listed below:

a) Studies that describe the criteria for CSFs of ERP systems
b) Articles published between the year 2005 and year 2016. It is the reason for information update.
c) Academic journals and conference only.
d) The data are collected from several sources, such as: ACM Digital, Emerald, IEEEXplore Digital Library, Elsevier, Taylor Francis, Palgrave, and Springer Link.
e) Papers based on quantitative or qualitative analysis or a mix both.
f) Studies that use the SLR article type.

Exclusion criteria are used to determining that piece of literature found by search term is excluded. The criteria are listed below:

a) The topic is not relate by the research questions.
b) Any publication before the year 2005.
c) Papers with non-academic databases.
d) Papers based on weak analysis, such as: editorial paper, unpublished paper, opinion, papers redundancy, and research for the one CSF of ERP systems, panel discussion, master thesis, technical reports, etc.
e) Studies with no SLR as the article type.

C. Data collection

The data are extracted of papers consist of:

- The paper journal or paper conference and full reference.
- Categorize with use the SLR article type.
- Main topic area based on keyword of papers
- Study summary including form the research questions
- CSFs components based on literature
- Categorize topic of ERP systems based on CSFs components

D. Data analysis

Data analysis was consist of:

- The number of SLRs published based on year and their source.
- The number of studies in each major category related research question.
- The quality score for each SLRs
- CSFs issue of ERP systems
- Challenge of ERP systems

IV. RESULT

This section is the summary and results of the study. The researchers discuss for the answers to research questions.

A. Search results

The researcher identified 29 articles from this search process. The results of the search procedure of list papers in the process systematic review about id study, source, year, authors, title, and categorize topic is shown in Table 4.

Table 4. Systematic review studies

ID	Source	Year	Authors	Title	Categorize topic
S01	IEEEplore	2014	Ali and Sikandar	Critical Success Factors for Software Outsourcing Partnership (SOP): A Systematic Literature Review	Implementation
S02	Springer	2010	Al-mudimigh et al	ERP Implementation : An Integrative Methodology	Selection/adoption
S03	Springer	2014	Alpers et al	A Systematic Approach for Evaluation and Selection of ERP Systems	Selection/adoption
S04	JSTOR	2016	Altamony & Hamzah	The Relationship between Change Management Strategy and Successful ERP Implementations : A Theoretical Perspective	Challenge
S05	Emerald	2015	Bambang PK et al	Actors' interaction in the ERP implementation literature:	Implementation
S06	ACM	2013	Bento et al	ERP Measure Success Model ; A New Perspective	General
S07	ACM	2013	Burgess et al	Paradimatic Approaches Used to Enterprise Resource Planning System Research : A Systematic Literature Review	General
S08	IEEEplore	2008	Chia Chia Lin et al	A Study of Information System Reengineering as ERP Is Introduced to Businesses Adapting to the E-Business Era	Implementation
S09	Emerald	2016	Farzaneh et al	Organizing ERP Research : A Knowledge-Centric Approach	Challenge
S10	Emerald	2005	Fiona Fui & Janet Lee	Critical factors for successful implementation of enterprise systems	Implementation
S11	IEEEplore	2008	Fotini et al	ERP Systems Business Value : A Critical Review of Empirical Literature	Challenge
S12	IEEEplore	2011	Haddara et al	ERP Systems in SMEs: A Literature Review	Selection/adoption
S13	Springer	2011	Leech et al	A Review of ERP Research : A Future Agenda for Accounting Information Systems	Challenge
S14	Springer	2015	Leyh et al	Critical Success Factors for ERP System Implementation Projects : An Update of Literature Reviews	Implementation
S15	Emerald	2016	Madhavi et al	Centralization and the success of ERP implementation	Implementation
S16	Springer	2013	al	Studying key users ' skills of ERP system through a comprehensive skill measurement model	Challenge
S17	Elsevier	2007	Mcginnis et al	Rethinking ERP success : A new perspective from knowledge management and continuous improvement	General
S18	Academia	2012	Musa et al	Knowledge Management in Success of ERP Systems	Challenge
S19	Springer	2012	Nazemi et al	ERP : a literature survey	Implementation
S20	Inderscien ce	2016	Ranjan et al	Literature review on ERP implementation challenges	Challenge
S21	Emerald	2014	Saja Albliwi et al	Critical failure factors of Lean Six Sigma : a systematic literature review	Implementation
S22	ACM	2013	Shaul et al	Critical Success Factors in Enterprise Resource Planning Systems : Review of the last decade	Challenge
S23	Emerald	2007	Sherry F &Martin C	ERP implementation:a compilation and analysis of critical success factors	Implementation
S24	CCSE	2015	Tarhini et al	Implementation from Stakeholders ' Perspective : A Systematic	Implementation
S25	Elsevier	2008	Vandaie & Ramin	The role of organizational knowledge management in successful ERP implementation projects	Challenge
S26	ACM	2016	Vargas and Johan G	Approaches for Integration in System of Systems : A Systematic Review	Selection/adoption
S27	IEEEplore	2010	Xu et al	A Methodology for Successful Implementation of ERP in Smaller Companies	Implementation
S28	IEEEplore	2008	Yan Xu et al	A Review of Literature on Enterprise Resource Planning Systems	Implementation
S29	IEEEplore	2009	Yanhong & Zhang	ERP Implementation Process Analysis Based on the Key Success Factors	Implementation

B. Quality evaluations of SLRs

Based on the result data extraction on papers, the researchers categorize in the entire categorize topics are: implementation, challenge, selection/adoption, and general. The result quality evaluation of SLRs is: Implementation (45%), Challenge (31%), Selection/adoption (14%), and General (10%). Figure 1 indicates that the main category topic of ERP systems are implementation (45%) and challenge (31%). The summary of categorize topic of ERP systems is shown in figure 1.

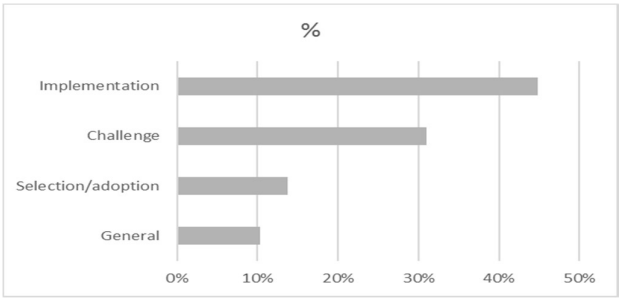

Figure 1. Categorize topic of ERP systems

C. *Quality factors*

The researcher explored the relationship between the quality score for the SLR article type that were published between year 2005 and 2016. Table 5 show that the number of studies published by year has been relatively increasing trend. The result shows that topic about the CSFs in the implementation of ERP systems is attracting and can be the challenge to further research. The average quality score for studies each year is shown in Table 5.

Table 5. Quality scores of studies (by publication date)

Year	Mean quality score	No of studies	ACM	Elsevier	Emerald	JSTOR	IEEEXplore	CCSE	Academia	Interscience	Springer
2016	3.50	5	1		2	1				1	
2015	3.33	3			1			1			1
2014	2.17	3			2						1
2013	3.00	4	3								1
2012	3.75	2							1		1
2011	3.50	2					1				1
2010	2.75	2					1				1
2009	2.50	1					1				
2008	2.63	4		1			3				
2007	3.25	2		1	1						
2006	-	0									
2005	3.50	1			1						
	3.08	29	4	2	7	1	6	1	1	1	6

D. Mapping CSFs based on literature

The mapping CSFs based on literature for All CSFs components are listed below and a brief description is given. Table 6 indicates that the topic of the articles is respect to further research. Based on papers, the researchers categorize in CSFs components from each paper. After that, the researchers have sorted and make summaries is divided by number of papers. The summarize for mapping CSFs components indicates that the CSFs issue of ERP systems has influence are: Management (31%); Organizational (29%); Software system design (19%); Users (14%); and Technology (7%). The concluded that the main component of the CSFs issue in implementation of ERP systems such as:

Table 6. Mapping CSFs components based on literature

CSFs ISSUE	COMPONENTS	Frefuency	%	Ali and Sikandar (2014)	Al-mudimigh et al. (2010)	Alpers et al. (2014)	Altamony & Hamzah (2016)	Bambang PK et al. (2015)	Bento et al. (2013)	Burgess et al. (2013)	Chia-Chia Lin et al. (2008)	Farzaneh et al. (2016)	Fiona Fui & Janet Lee (2005)	Fotini et al. (2008)	Haddara et al. (2011)	Leech et al. (2011)	Leyh et al. (2015)	Madhavi et al. (2016	Mahdavian et al. (2013)	Mcgrimis et al. (2007)	Musa et al. (2012)	Nazemi et al. (2012)	Ranjan et al. (2016)	Saja Albliwi et al. (2014)	Shaul et al. (2013)	Sherry F and Martin C (2007)	Tarhini et al. (2015)	Vandaie and Ramin (2008)	Vargas and Johan G (2016)	Xu et al. (2010)	Yan Xu et al. (2008)	Yanhong and Zhang (2009)
USERS	User training and education	10	4%		√			√	√				√				√	√	√						√	√	√					
	Project team and best people	9	4%					√							√		√		√		√			√		√	√			√		
	Acceptance user and user involvement	9	4%				√		√				√		√	√		√	√	√					√							
	New mindset and New business opportunity	3	1%					√		√			√																			
	Feedback user resistance	2	1%					√											√													
	Subtotal	33	14%	0	1	0	1	4	2	1	0	0	3	0	2	1	2	2	4	1	1	0	0	1	2	2	2	0	0	1	0	0
ORGANIZATIONAL	Business Process Reengineering	16	7%		√		√	√				√	√				√	√		√	√	√	√			√	√	√			√	√
	Organizational change	8	4%		√		√	√				√		√		√		√												√		
	Coordination, cooperation and collaboration	8	4%	√	√			√	√															√		√				√	√	
	Organizational culture	7	3%					√	√				√	√								√		√						√		
	Organization readness and transparancy	6	3%									√		√			√	√									√			√		
	Clear goals and objective	5	2%									√	√				√									√				√		
	Business strategi, Implementation strategy & timeframe	5	2%								√	√		√												√		√				
	Organizational structure	4	2%					√								√		√						√								
	Size of organization	3	1%						√						√							√										
	Organizational learning	1	0%										√																			
	Success stories of previous projects	1	0%										√																			
	Organizational innovation	1	0%																				√									
	Subtotal	65	29%	1	3	0	2	5	3	0	1	5	5	4	1	2	3	4	0	1	1	3	2	3	0	4	2	2	0	5	2	1
MANAGEMENT	Management support & commitment	15	7%	√	√		√	√	√			√	√				√	√				√		√		√	√			√	√	
	Project management	11	5%		√			√	√							√	√		√		√			√	√		√					√
	Knowledge management	11	5%							√		√	√		√	√				√	√	√	√	√				√				
	Change management plan	10	4%		√			√				√					√	√			√		√			√		√			√	
	Effective & timely communications	7	3%	√	√								√					√					√	√		√						
	External consultant support	5	2%		√			√							√											√	√					
	Evaluation of management	4	2%										√							√			√					√				
	Management paradigm	3	1%							√													√					√				
	Project champion	3	1%										√										√			√						
	Transformation leader and role of leadership	2	1%													√									√							
	Subtotal	71	31%	2	5	0	1	4	2	2	0	3	5	0	2	3	3	3	1	2	3	2	6	4	2	5	3	4	0	1	2	1
Technology	Integrating	8	4%			√					√				√									√				√	√		√	√
	Technological (adequate infrastructure)	5	2%					√			√				√											√			√			
	Technical knowledge	2	1%																		√							√				
	Subtotal	15	7%	0	0	1	0	1	0	0	2	0	0	0	2	0	0	0	0	0	1	0	0	1	0	1	0	2	2	0	1	1
Software System Design	ERP performance	15	7%		√	√		√	√		√	√	√	√	√			√	√			√			√	√					√	
	Software development (post implementation phases)	11	5%		√	√			√	√		√	√		√	√		√		√		√										
	Data accuracy, reliability,validity	7	3%			√			√		√	√													√	√			√			
	Minimal ERP customization	4	2%					√	√				√												√							
	IT legacy systems	3	1%		√								√						√													
	Sistems quality	2	1%			√			√																							
	Information quality	1	0%						√																							
	System configuration	1	0%																													
	Subtotal	44	19%	0	3	4	0	3	6	1	2	3	4	1	2	1	0	2	2	1	0	2	0	0	3	2	0	0	1	0	1	0
	Total	228	100%	3	12	5	4	17	13	4	5	11	17	5	9	7	8	11	7	5	6	7	8	9	7	14	7	8	3	7	6	3

MANAGEMENT
The major component CSFs issues in management are Management support and commitment; Project management; Knowledge management; Change management plan, Effective & timely communications, External consultant support; Evaluation of management; Management paradigm; Project champion; Transformation leader & role of leadership.

ORGANIZATION
The major component CSFs issues in organizational impact are Business Process Reengineering; Organizational change;
Coordination, cooperation and collaboration; Organizational culture; Organizations readness; Clear goals and objective; Business and implementation strategi; Organizatioal structure; Size organization; Organizational learning; Success stories; Organzational innovation.

SOFTWARE SYSTEM DESIGN
The major component CSFs issues in software system design are ERP performance; Software development; Data accuracy, reliability validity; minimal ERP customization; IT legacy systems; System quality; Information quality; System configuration.

USER
The major component CSFs issues in user are User training & education; Project team & best people; Acceptance user and user involvement; New mindset & new business opportunity; Feedback user resistance.

TECHNOLOGY
The major component CSFs issues in tehnology are Integrating; Technological(adequate infrastructure); Technical knowledge.

The summarize CSFs issue of ERP systems is shown in Figure 2.

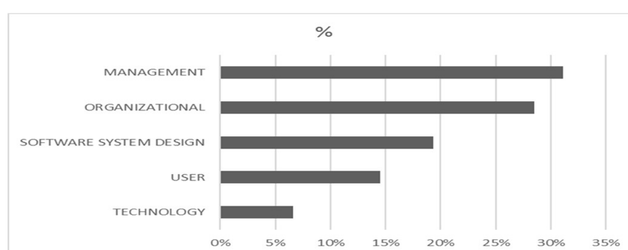

Figure 2. CSFs issue of ERP systems

Based on the frequency of appearance in analyzing literature, the researcher have analyzed for the highest rank of each CSFs issue of ERP systems as follows: The highest rank of Management issue is Management support and commitment (7%); the highest rank of Organizational issue is Business Process Reengineering (7%); the highest rank of Software system issue is ERP performance (7%); the highest rank of Users issue is User training and education (4%); and the highest rank of Technology issue is Integrating (4%). The conclusion that these issues are the CSFs in implementation of ERP systems, and these issues have impact on the fundamental for achieving success in the implementation of ERP systems. The summary CSFs rank order based on the frequency of appearance in analyzing literature is shown in table 7.

Table 7. CSFs in rank order based on frequency of appearance in analyzed literature

CSFs Issue	COMPONENTS	%	Frefluency
Management	Management support & commitment	7%	15
Organizational	Business Process Reengineering	7%	16
Software System	ERP performance	7%	15
Users	User training and education	4%	10
Technology	Integrating	4%	8

V. DISCUSSION

In this section, the researchers show the answers to the research questions.

A. The key success factors for ERP systems

The resulting analysis of studies of literature review shows that many papers have consistently identified the definition for key success factors of ERP system, based on the highest rank of CSFs component such as:

Management support and commitment

Active management support and commitment is important to provide enough resources, decision and support acceptance in the implementation of ERP systems success. Management support and commitment not only investment agreement and involvement in implementation phrase, but also be required involvement in post-implementation. It proves that ERP systems are running well with supporting management to take decision.

Business Process Reengineering (BPR)

BPR is the changing of organizations business process by following business process of ERP systems. But the fact is the changing of ERP systems business process by following organizations business process. To operate BPR, It needs radical process by following business process of ERP systems selected. The ERP systems will change the organization business process by considering the simplicity and adjustments to business process of the ERP systems selected. ERP systems is built on best practices, and to successfully ERP systems, so the business process should conform to the ERP model by BPR. BPR is consistently identified as the most important of CSFs component in implementation of ERP system.

ERP Performance

The user's acceptance of ERP is important to understand. Therefore, ERP Performance is important in the implementation of ERP systems to ensure that the using of ERP systems is suitable as requirement of organizations.

User training and education

For ensure that the users can operate the applications of ERP system well, It needs user training and education. Therefore, be required an active involvement of the users in training and education in the implementation of ERP systems. The user training and education become the key success of the ERP systems.

Integrating

The business value for ERP will able to integrate information. By integrating, the users can have more control and useless time to perform tasks and users can have more and faster access to get the information. Integrating of ERP systems can determine the application is running well with no repetition of work. It prove that increases work efficiency and effectiveness in order enhance performance of organization.

B. The challenge for ERP systems

The resulting analysis of studies of literature review shows that the challenge of ERP system are the planning phase that focuses on building a solid foundation to support and overcome ERP systems success. The perspectives, focuses become the challenges of ERP systems such as:

Technology selection.

Technology selection is a crucial process for a serious investment in management decision.

Change management.

Before implementation of ERP systems, drive to change business process, people and technology must also change. The factors drivers to change management for ERP systems are people, business process, and technology.

Knowledge management.

ERP implementation and knowledge management systems to be a challenge of ERP systems. The goal of ERP systems to increase work efficiency with enhancing performance of information processing of knowledge management goal for the knowledge by organized knowledge repositories as a means for sharing tacit knowledge and focus on increasing flexibility.

Emerging technologies.

The emerging of technologies can enhance the process flexibility, and accelerate the speed of process decision.

C. Implications

The important implication for the organizations is that understanding about CSFs in the implementation of ERP systems, and the challenges on how to implement of ERP systems successful.

D. The limitations

This study only identifies the key success and the challenge for ERP systems based on study literature for general organizations. Therefore, the researcher have understood that this study has the limitation of this current research, such as: the search process was done manual for search journal and conference proceedings; the number of databases has restricted access from journal or conference proceedings publication, no determine and analyze to size of the organizations.

VI. CONCLUSION AND FUTURE RESEARCH

To identify CSFs in the implementation of ERP systems for an organization, research using SLR methodology are the solution. The result of this research has given contribution that the most important key success factors in the implementation of ERP systems are Management support and commitment, Business Process Reengineering, ERP performance, User training and education, Integrating. These factors have a main impact in ERP systems success. Even though, it will be challenging to enhance performance of ERP systems in order to prove the growth of organizations, by focus factors as well as: change management, technology, knowledge management and emerging of technologies. Thus, the researchers have concluded that the challenge of ERP systems in order for enhance performance of ERP systems focus with survey and specific industry is necessary for future research with considering the trend of the key success factors may be helpful.

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