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AN INSIGHT INTO ENTERPRISE RESOURCE PLANNING SYSTEM (ERP-S) RESEARCH TREND

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ABSTRACT

The purpose of this paper is to provide a comprehensive review on the research trend of enterprise resource planning system (ERP-S) for the recent five years period (2011 until 2016). A set of criteria is set to explore relevant research articles of ERP-S through the academic search engine and academic database. Information from the articles were gathered and categorized based on their research focus. This paper presents two significant findings in enterprise resource planning system literature study. First, the research trend of ERP-S in the five recent years shows that the most discussed research focus is the factors that influenced ERP-S implementation. Within this research focus, a study on ERP-S critical success failure factors gained many interest from researchers around the world. It is then followed by a research on ERP-S implementation and the least discussed research focus is on the ERP-S general review. Second, sustainable ERP-S has been found as the latest type of the system which is still new. This finding indicates another new field such as the sustainable ERP-S to be explore for the future research. The findings from this paper can also serve as an insight into the current trend of ERP-S research for both academician and industrial practitioners.

Keywords: *Enterprise resource planning, ERP system, ERP-S, research trend, ERP review*

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TINJAUAN TERHADAP TREN KAJIAN KE ATAS SISTEM PERANCANGAN SUMBER PERUSAHAAN (ERP-S)

ABSTRAK

Penulisan artikel ini bertujuan untuk membincangkan kajian menyeluruh mengenai trend dalam sistem perancangan sumber perusahaan (ERP-S) untuk tempoh lima tahun kebelakangan (2011 hingga 2016). Satu set kriteria yang telah ditetapkan adalah berdasarkan kajian-kajian lepas yang telah diperolehi melalui artikel-artikel penyelidikan berkaitan ERP-S melalui enjin carian akademik dan pangkalan data akademik. Maklumat dari artikel dikumpulkan dan dikategorikan berdasarkan fokus penyelidikan mereka. Kajian ini mendapati dua penemuan penting iaitu yang pertama; trend kajian ERP-S dalam lima tahun kebelakangan ini menunjukkan bahawa fokus penyelidikan yang sering dibincangkan adalah faktor-faktor yang mempengaruhi pelaksanaan ERP-S. Melalui fokus kajian ini, kajian terhadap faktor kegagalan kritikal ERP-S telah banyak menarik minat para penyelidik di seluruh dunia. Ia kemudiannya diikuti dengan penyelidikan mengenai pelaksanaan ERP-S. Manakala kajian yang paling kurang dibincangkan adalah kajian umum terhadap ERP-S. Penemuan yang kedua melalui kajian ini mendapati bahawa pengukuhan ERP-S yang mampan merupakan satu bentuk sistem yang terkini dan masih baru. Hasil dapatan kajian ini memberi ruang bidang kajian baru seperti pengukuhan ERP-S yang perlu dikaji masa hadapan. Dapatan kajian ini juga memberi maklumat tentang trend kajian semasa ERP-S kepada para akademik mahupun mengamal dari industri.

Kata kunci: *Perancangan Sumber Perusahaan, sistem ERP, ERP-S, trend penyelidikan , ERP kajian literatur*

INTRODUCTION

Enterprise resource planning system (ERP-S) integrates all data and information from different departments under one centralized database system. Through this system, information flow in the organization are improved and their process become more simplified and standardized and it can be accessed by each users based on their allowed level of access on the system. ERP-S allows organization not only to improve their information flow, but also helps to optimize their business process and also improves their communication internally and externally, with their suppliers and customers (Moon, 2007). Current ERP-S was originally came from the material resource planning (MRP) system back in 1970s and material resource planning II (MRP II) system from the 1980s (Al-Mashari, 2003). Since then, as the most widespread information technology (IT)

solution, ERP-S has been widely used by many companies around the world, and not only been implemented by manufacturing industry, but also to various sector such as finance, health care, hotel chains, education, insurance, retail and telecommunication sectors (Shehab et al., 2004).

The number of research articles related with ERP-S has increased in parallel with the increasing number of ERP-S implementation in industry. Up to this date, the studies on ERP-S had been done in various types such as ERP-S success and failure, ERP-S implementation either in big enterprise or small and medium enterprise, investigation on its benefit or motivation upon its adoption, and many more. In term of types of research articles, there are lots of empirical studies, case study, and review were done regarding to the ERP systems. However, despite numerous review done on ERP system, compare to the dedicated review which focus on specific theme, an overall review which cover the whole field of an ERP system is still lacking (Huang and Yasuda, 2016). Thus, the objective of this paper is to provide a comprehensive and overall review about ERP system research trend from 2011 to 2016 which focus on their research focus. The following sub-titles explain research method, general explanation about ERP system, ERP system research trend for the recent five years period (2011 until 2016) and a conclusion with suggestion for future research.

RESEARCH METHOD

In this paper, literature study on enterprise resource planning system (ERP-S) was carried out in two stages. Figure 1 show the research method used in this review. At the first stage, the collection of relevant research articles on enterprise resource planning system was done based on following criteria: (i) selection for research articles has been limited to Scopus indexed journal, (ii) ERP implementation that focus on general industry, (iii) time frame has been set from 2011 to 2016, and (iv) keywords such as "enterprise resource planning", "ERP", and "industry" have been used to search relevant articles. These scope was set as it is important to give an overview of the research's extent and boundary (Oguduvwe, 2013). Total of 82 articles were carefully identified and then selected as it is important to ensure the discovered knowledge and information are accurate and rigorous (Cronin et al., 2008). At the second stage, all of the selected articles from the first stage were reviewed and analyzed. In this regard, the information gathered have been categorized into several categories (i) general details of articles, and (ii) the articles main focus. The trend of ERP-related research articles have been analyzed and reviewed.

Finally, a conclusion was drawn comprehensively along with the suggestion for the future research on ERP system.

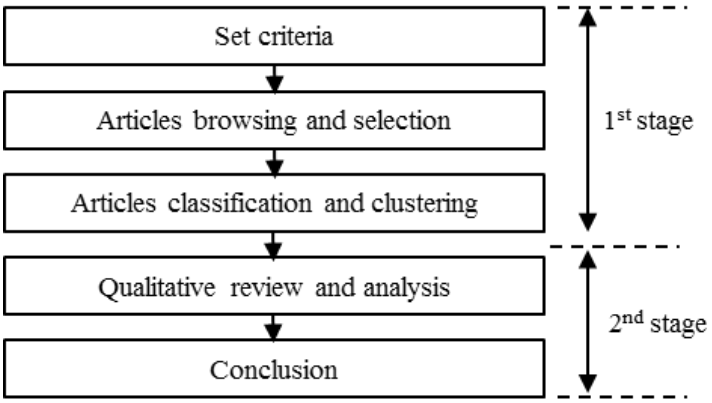

Figure 1: Research Method

ENTERPRISE RESOURCE PLANNING SYSTEM (ERP-S)

ERP-S Definition and Components

Enterprise resource planning system is developed to integrate all data from each department in an organization in order to ease information sharing and communication process, either internally or externally. There are no standard definitions for ERP-S as there are various definitions were suggested as shown in Table 1.

Table 1: ERP-S Definitions

Research articles	ERP definition
(Aldammas and Al-Mudimigh, 2011)	A single computer system that aims to ease the data exchange while facilitates communication among the departments by integrating all departments and functions across an organization.
(Anderson et al., 2011)	A software and database which integrates and computerizes information processing over a big number of processes and functions in an organization in the real time.

(Ifinedo, 2011)	An engineered information system packages which institutionalize data resources sharing in an organization.
(Li, 2011)	A multi-module application software that supports organizations to streamline their business process.
(Sternad et al., 2011)	A designated integrated, all-encompassing, and complex packages to support organization's key functions.

Even though, there are many definitions available for enterprise resource planning system, those definitions shares few key points which define enterprise resource planning system as a system, which integrates all data in organization, in order to ease or improves the information flows. ERP integrates data from each department under one centralized system contains a number of modules, that designated based on department's needs. Each module was designed to avoid overlapping task within the departments involved in the ERP system. There are no specific modules for ERP-S as it is a customizable system. Different ERP-S offers different packages.

Figure 2 shows single ERP-S with depicted modules by Aldammas and Al-Mudimigh (2011). Here, ERP-S is divided into four modules; (i) sales and marketing, (ii) finance and accounting, (iii) human resources, and (iv) manufacturing and production. All of these modules have been integrated by one centralized database system.

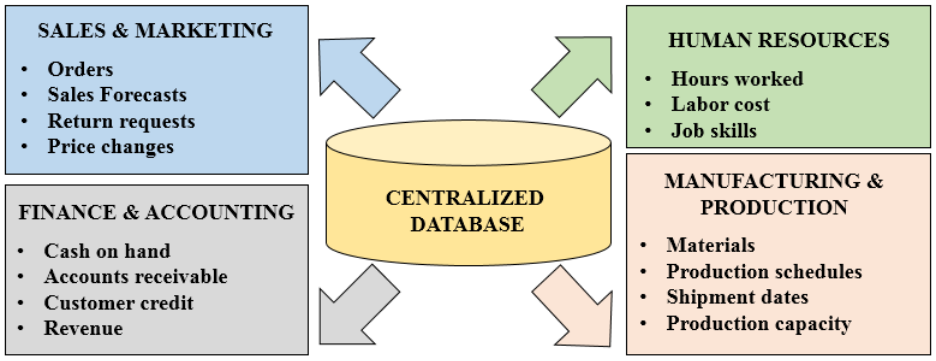

Figure 2: ERP System (Aldammas and Al-Mudimigh, 2011)

Lin *et al.* (2011) introduced another form of ERP system as shown in Figure 3. ERP-S is depicted as an integrated system which contains five modules that served by five different departments; (i) finance, (ii) purchase, (iii) production, (iv) human resource, and (v) sales and marketing.

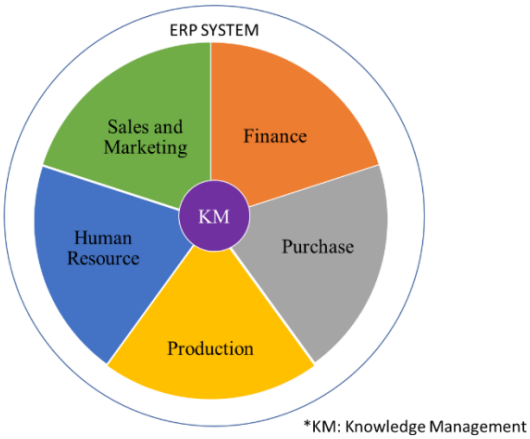

Figure 3: ERP System (Lin et al., 2011)

ERP-S Benefits

As a system that integrates data from all departments in an organization, ERP-S can benefit their user in many ways. Wu (2011) stated that ERP-S can help company to improve their productivity and also support the company operation to be more efficiently. In addition, Aldammas and Al-Mudimigh, (2011), Chang et al. (2011) and Goni et al. (2012) stated that ERP-S also contributes to inventory improvement. The ERP-S support company to view and manage extended enterprise of suppliers. On the other hand, Chang et al. (2011) added that another ERP-S benefits are increase the operation output and increase the company profit. ERP-S implementation also contributes to improvement in order management, increase the response time either to customers or suppliers, and improve visibility and accuracy of the information shared (Li, 2011; Goni et al., 2012). Implementing ERP also contributes to improvement in process and operation flow. Then again (Lin et al., 2011) stated another ERP implementation benefits are improvement in supply chain, customer services and product quality.

Motivation on ERP Implementation

Other than attracted by benefits offered by the ERP implementation, there are motivations behind the implementation of ERP-S into an organization. Hasan et al. (2011) listed some motivations which are to simplify and standardized systems used in an organization, to improve communication to both supplier and customers, to gain the strategic advantage, due to pressure to keep up with competitors, and to restructure organization in company. In addition, Huang and Chiu (2011) stated that another motivation to implement ERP system is to improve the competitiveness.

In other findings, Kosalge and Ritz (2015) added another motivations which are ERP systems secures the data audit trail, bigger scales for more users, the needs of a system that able to configure the unique and complex needs in business process, and the needs of such system that allow the users to organize data across all departments and functions which ease them to generate reports with higher degree of details and accuracy.

RESEARCH TREND IN RECENT FIVE YEARS

In this paper, a review on ERP-S research articles has been carried out in order to identify the research trends of ERP-S in the recent 5 years (2011 until 2016). The review has focused on two aspect; (i) general details of the research articles and (ii) the research focus of the research articles. Figure 4 shows research trend on articles general details, consists of publication year and types of research articles from 2011 to 2016.

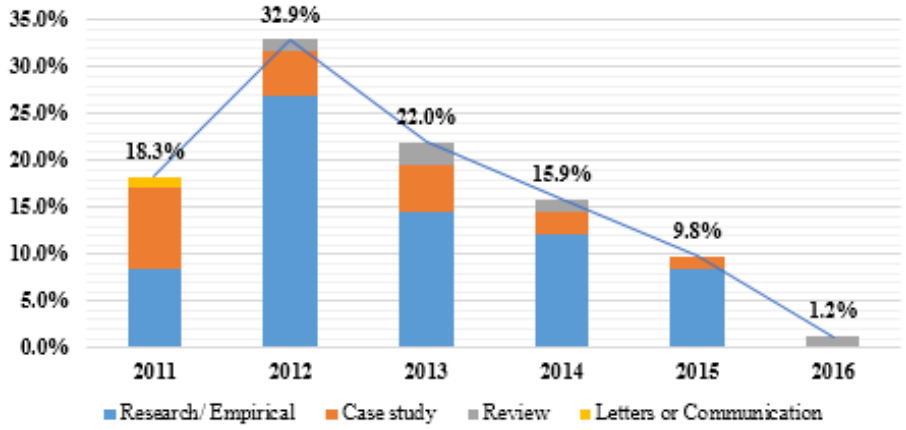

Figure 4: ERP-S Article General Details (2011-2016)

From year 2011 to year 2016, a total of 82 articles were selected based on the set condition. Year 2012 shows the highest published ERP-S related article which makes 32.9 % from overall articles, followed by year 2013 with total of 22 %, year 2011 with 18.3 %, year 2014 with 15.8 % and 2015 with 9.8 %. In addition, by clustering the articles based on its type, it is found that empirical study contributes to the highest percentage that is 71.1 % of the total articles whereas case study is the second highest (21.7 %). 6 % of the articles presented as review papers and 1.2 % letter or communication type of articles. The study found that the reviews on ERP-S were very few compared to another types of research articles.

In this paper, the selected ERP-S related articles were categorized based on their focused topics. There are six types of focus topics introduced in this paper; (i) ERP-S influence factors, (ii) ERP-S implementation, (iii) ERP-S evaluation, (iv) ERP-S impact, (v) ERP-S extended application, and (vi) ERP-S review. Figure 5 depicted the ERP-S research trend from 2011 to 2016 based on the aforementioned six categories.

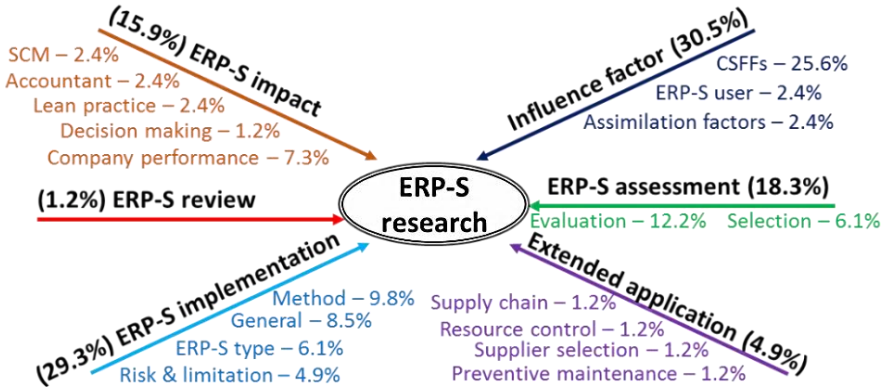

Figure 5: ERP System Research Trend With Respect to its Focus Topic

The most discussed category is on factors that influence ERP-S implementation with a total of 30.5% from the total articles. Within this category, 25.6 % were focused more on ERP-S critical success and failure factors (CSFF). 29.3 % of total articles were focused on ERP implementation that covers issues in ERP implementation such as how to implement the system, types of ERP systems, and ERP systems advantages and limitations. Authors has found that, under ERP type sub-category, a new concept of ERP-S which integrates sustainable concept with ERP-S was introduced by Chofreh et al. (2014). With a total of 18.3 %, the third most discussed ERP-S research focus category is assessment on ERP-S. From 18.3 %, 12.2 % was focused on evaluation on ERP-S, while another 6.1 % has study on ERP-S selection. On the fourth rank, 15.9 % from total selected articles are from ERP-S impact category. Most of articles under this category have discussed on ERP-S impact on company performance which contributes 7.3 %. The study on ERP-S impact are still relevant and there are still many researches can be carried out to discuss more details on this category such as study on the ERP-S impact on different groups of people in the organization, or ERP-S impact on different types of manufacturing, and many more. The extended application of ERP-S contributes 4.9 % from total selected articles, and the least focused topic of ERP is system review as only 1.2 % of total articles.

Table 2 shows more details on ERP-S research categories and sub-categories with the related research articles found in this study.

Focus topic	Sub-categories	Research articles
ERP's extended application	Resource control	(Shkurskii and Sabel'nikova, 2011)
	Supplier selection	(Lin et al., 2011)
	Preventive maintenance	(Fouad et al., 2012)
	Managing supply chain	(Goud Sandhil and Vishal Gupta, 2013)
ERP-S impact	Impact on accountant	(Chen et al., 2012), (Malinić and Todorović, 2012)
	Impact on company performance	(André et al., 2012), (Zhang et al., 2012), (de Vries and Boonstra, 2012), (Supramaniam and Ponnan, 2013), (Hart and Snaddon, 2014), (Katerattanakul et al., 2014)
	Impact on Lean practice	(Powell et al., 2013), (Kong and Daud, 2013)
	Impact on decision making process	(Chaabouni and Ben Yahia, 2014)
	Impact on SCM	(Saleh Shatat and Mohamed Udin, 2012), (Hwang and Min, 2013)
ERP-S assessment	Evaluating ERP	(Chang et al., 2011), (Jahanyan et al., 2012), (Ruivo et al., 2012), (Sarfaraz et al., 2012), (You et al., 2012), (Chou and Hong, 2013), (Moalagh and Ravasan, 2013), (Gajic et al., 2014), (Parveen and Maimani, 2014), (B. Chang et al., 2015)
	Selecting ERP	(Gürbüz et al., 2012), (Méxas et al., 2012), (Tsai et al., 2012), (Kazancoglu and Burmaoglu, 2013), (Kilic et al., 2014)
ERP-S implementation	Method	(Anderson et al., 2011), (Rouhani and Zare Ravasan, 2012), (Handayani et al., 2013), (Hidayanto et al., 2013), (Kanchymalay et al., 2013), (Khaleel and Sulaiman, 2013), (Poba-Nzaou and Raymond, 2013), (T.-S. Chang et al., 2015)
	ERP Type	(Olson and Staley, 2012), (Alex Peng and Gala, 2014), (Chofreh et al., 2014), (Gelogo and Kim, 2014), (Grubisic, 2014)
	Risk and limitation	(Poba-Nzaou and Raymond, 2011), (Aloini et al., 2012), (Hou, 2013), (Gandhi et al., 2015)
	General	(Hasan et al., 2011), (Wu, 2011), (Aslan et al., 2012), (Choi et al., 2013), (Chen and Liu, 2013), (Zach et al., 2014), (Kosalge and Ritz, 2015)

ERP-S influence factors	Critical Success and Failure factors (CSFF)	(Aldammas and Al-Mudimigh, 2011), (Čelar et al., 2011), (Ifinedo, 2011), (Li, 2011), (Huang and Chiu, 2011), (Tsai et al., 2011), (Aarabi et al., 2012), (Alhakbani and Alnuem, 2012), (Amid et al., 2012), (Basu et al., 2012), (Bourrie et al., 2012), (Goni et al., 2012), (Shaul and Tauber, 2012), (Soltanzadeh and Khoshsirat, 2012), (Ahmad and Pinedo Cuenca, 2013), (Rouhani et al., 2013), (Garg and Agarwal, 2014), (M. Beheshti et al., 2014), (Hwang and Min, 2015), (Ozorhon and Cinar, 2015), (Saravanan and Sundar, 2015)
	ERP system assimilation factor	(Liu et al., 2011), (Cereola et al., 2012)
	Factor affecting ERP system user	(Sternad et al., 2011), (Al-Jabri, 2015)
ERP review	General review	(Huang and Yasuda, 2016)

Table 2: ERP-S Research Focus with Related Research Articles

CONCLUSION

As a summary, the main objective of this paper is to review the recent five years (2011-2016) of research done on ERP-S. Authors found that the study on factors influencing ERP-S was the most discussed category compared to other categories such as ERP-S implementation, assessment, impact, extended application, and review. In addition, a new type of ERP-S was found in the study which is the sustainable ERP-S. Since the sustainable ERP-S is still in introduction stage, it indicates a new dimension to be explored as the future research on ERP-S. In addition, between 2011 to 2016, the reviews on ERP-S were very less compared to another types or research articles, and perhaps more review on this system can be carried out in the future. The findings in this article can provide more in depth understandings on ERP-S research trend for both academicians and industrial practitioners.

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