A Master Plan for the Implementation of Sustainable Enterprise Resource Planning Systems (Part II): Development of a Roadmap

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Advanced organizations require implementing a Sustainable Enterprise Resource Planning (S-ERP) system in order to integrate all data, information, and processes across their entire extended value chain. A number of vendors such as Systemanalyse und Programmentwicklung (SAP), Microsoft, and Oracle have developed the system as a holistic solution to support sustainability initiatives. However, the organizations still face the problem in implementing the S-ERP system. There is a lack of a master plan, which shows the stages, dimensions, and steps to assist them to implement this system. In order to solve this issue a master plan has been developed for the implementation of S-ERP system that comprised of a roadmap, a framework, and guidelines. This study focuses on the development of the roadmap that shows the stages intended to implement the S-ERP system. To attain the research objective, this study employed a conceptual research method, which relies primarily on the literature for the development of the roadmap. Various research fields including sustainability, Enterprise Resource Planning (ERP) system, and project management were examined. As a result, the roadmap of the S-ERP system implementation master plan was successfully developed by using the conceptual research method.

1. Introduction

Sustainability turns into a business megatrend (Lubin and Esty, 2010). Numerous organizations have incorporated sustainability into their operations and policy (Lam and Lai, 2014), strategy (Küçüksayraç, 2015), finance (Lagoarde-Segot, 2015), product design (Seay, 2015), supplier relations (Leppelt et al., 2013), and supply chain management (Silvestre, 2015). The sustainability strategy needs to be systematized and integrated into daily practices of organizations of all sizes in all sectors (Lubin and Esty, 2010). Sustainability has embedded into extended value chain in an organization (Chofreh et al., 2014a).

An organization needs a holistic vision across the entire extended supply chain for achieving sustainability. This requires improved models, indicators for sustainability performance evaluation, and optimization methods at the product, process, and system levels (Jayal et al., 2010). To accomplish these processes, information systems (IS) represent a potential source of solutions (Elliot, 2011), such as data collection, data analysis and conversion, information evaluation, report and communication, monitoring, and controlling (Scipioni et al., 2008). It has an important role in globalizing world over the past decades (Malhotra et al., 2013).

During the transformation process of the organization from unsustainable into sustainable, two problems emerge: the segregation between business functions (Chofreh et al., 2014a) and lack of holistic plan during implementation. Recently sustainability data, information, and processes are managed by using tools, processes, and procedures that are isolated from an enterprise system. They were only managed with a

collection of spreadsheets of varying and uncontrolled quality. It indicates a misalignment between sustainability and information systems (Goni, et al., 2013b).

The majority of organizations leverage existing tools and manual methods to initially collect environmental, economic, and social metrics. This approach breaks down when the organizations need to repeat this process quarterly, monthly, or more frequent basis and when the data must be audited by a third party. As sustainability became a strategic issue, a new generation of technology solutions emerged delivering significantly improved functionality and reliability. But with sustainability now a material factor in the strategic and operational management of an organization, sustainability process, data management, and reporting must be truly integrated into enterprise systems. For those reasons the role of S-ERP system is vital in solving this problem.

Chofreh et al. (2014a) defined S-ERP systems as "an information system driven by sustainability consideration that covers all aspects of the value chain". It is an integrated information system which enables an integration of sustainable business functions, units, and processes in an organization. This system is designed to capture and manage data of all the sustainability dimensions. As stated by Chofreh et al. (2014a), numerous software vendors, such as SAP, Oracle, and Microsoft, have developed the S-ERP systems in order to assist the organization in tackling the segregation issue. However, the organizations face difficulties to implement this system due to lack of guidance for implementing this complex system. In academic perspective, sustainability has been embedded in various research areas, especially in value chain. However, there is no evidence of any work that outlines a master plan, showing the stages, perspectives and steps to direct practitioners in implementing the S-ERP systems. In order to solve the problem in real business practice and to fill in the knowledge gap the researchers develop a master plan for the implementation of S-ERP system that comprised of a roadmap, a framework, and guidelines. The focus of this paper is on the development of the S-ERP roadmap.

2. Literature review

According to Chofreh et al. (2014a), a research on S-ERP systems is still growing. The implementation of S-ERP systems requires multi-disciplinary skills and studies that involve various disciplines. To perform this study, therefore, literature from various research areas including sustainability, ERP system, and project management should be examined.

2.1 Sustainability implementation roadmap

The road mapping technology is popular and it has been employed at product, technology, company, industry, and policy levels (de Laat and McKibbin, 2003). This approach is flexible, scalable, and can be modified to fit different strategic and innovation contexts (de Laat and McKibbin, 2003). In their research, Phaal et al. (2004) mentioned that road mapping is a flexible technique that was extensively applied in the business to support strategic and long-range planning.

Organizations require a roadmap to transform their business towards sustainability. Ahmed and Sundaram (2012) revealed that a coherent sustainability transformation roadmap is an overview of the sustainable business management plan process, which contains several high level stages, to guide the decision makers to manage a sustainable business lifecycle. Lubin and Esty (2010) mentioned that recently numerous organizations have initiated the sustainability transformation, however, they did not have vision or plan to execute it. Therefore, there is a need of roadmap to guide organizations in facing their sustainability journey.

Chofreh et al. (2015) had examined numerous sustainability implementation roadmaps that have been proposed for facilitating the organizations in practising sustainability. For instance, Nidumolu et al. (2009) developed a roadmap for organizations to becoming sustainable. They claimed that sustainability recently is the key driver of innovation, thus, it is necessary for organizations to transform their business and strategies towards sustainability in order to attain a sustainable competitive advantage. In another work, Ahmed and Sundaram (2012) proposed their sustainable business transformation roadmap, which consists of five phases: (1) discover and learn; (2) strategise; (3) design; (4) transform; and (5) monitor and control. They took the interactions of business strategies, IT strategies, organizational and information systems infrastructures as a philosophical guideline for designing the sustainability roadmap. According to an examination of the literature, there were various stages that need to be considered in implementing sustainability. However, it seems to be no general technique underlying the formation of the roadmaps as different perspectives and concepts that the researchers used in developing the roadmaps.

The majority of studies in the related topic applied a conceptual research method in order to develop the roadmap. This method can be used for answering research questions which are not possible to be responded via empirical analysis (Xin et al., 2013). Furthermore, several studies used a case study and peer review methods to evaluate the applicability of the roadmaps. An application of the peer review method can be seen

in the work of Ahmed and Sundaram (2012) that proposed a roadmap for the implementation of sustainability reporting.

2.2 ERP implementation roadmap

ERP is a system designed to support the integration between business processes (Goni et al., 2011). In their study, Jacobs and Bendoly (2003) stated that ERP concept was subsequently designed to integrate all business functions and processes, hence, the decision makers can manage the concurrent resource accountability in all business functions. This capability facilitates the practitioners in handling the peripheral issues such as the elimination of information conflicts, the reduction of data redundancy, global access, and information security (Goni et al., 2013a).

An ERP system implementation requires a huge commitment from the organization is expensive to implement, and takes several years to complete (Sahran et al., 2010). However, when it is integrated successfully, the benefits can be enormous (Sadrzadehrafiei et al., 2013). According to Chofreh et al. (2014a), ERP research would decline unless new innovation emerges to increase the system extension. In order to amplify the value of ERP systems, technology innovation is required for the long-life of these systems.

A number of ERP implementation roadmaps had been reviewed by Chofreh et al. (2014b) in order to assist organizations in implementing ERP systems. For instance, McGinnis and Huang (2007) proposed four-phase ERP refinement model that incorporates knowledge management into each phase. This continuous improvement model consists of design, construction, deployment, analysis, and support group. In addition, Samaranayake and Abeysinghe (2011) developed an integrated roadmap for ERP pre-implementation and implementation life cycle. The objective of this roadmap is to improve the ERP implementation results. Furthermore, it can be a foundation for a computer-aided tool. The phases in the roadmap include initiation, planning, process analysis, realisation, transition, and operations. In another work, Asher (2009) explained a standard methodology from SAP, namely Accelerated SAP, to implement an ERP system. This methodology aligned with the project management concept and it has been successfully proven by various industries.

Generally, prior researches adopted project management concept in developing the ERP roadmaps. This can be seen in the proposed stages which are aligned with the process groups in project management. However, they did not consider the process groups completely. In addition, the majority of the researchers used a conceptual research method to develop the roadmaps. For evaluating the roadmaps, however, various researchers adopted different methods such as case study and survey.

2.3 Project management

This study examines literature in project management as a relevant study that contributes to the development of the sustainability implementation roadmap. An application of project management methodology and tools is important to improve the organizations' performance, efficiency, and competitive advantage (Golini et al., 2015). Shenhar et al. (2001) argued that projects are strategic and they need to be evaluated according to long-term and short-time project objectives. This concept can be reflected to an S-ERP system implementation. The organizations need to set their strategic goals and objectives before implementing an S-ERP system. It is a complex project and it should be undertaken at all management levels in an organization. Therefore, an organization needs to employ project management as the application of knowledge, skills, tools, and techniques to implement S-ERP systems.

Project management is a methodology for managing the project implementation processes (Chofreh et al., 2011). According to Project Management Institute (2013), the project implementation processes were guided through five process groups and ten knowledge areas. These process groups are initiating, planning, executing, monitoring/controlling, and closing. In addition, there are ten major knowledge areas in project management. They are integration, scope, time, cost, quality, human resource, communications, risk, procurement, and stakeholder. These knowledge areas contain of processes that need to be accomplished in order to achieve effective project management.

Project management concept is widely used in sustainability and ERP system implementation areas. According to Chofreh et al. (2014b), the use of project management concept becomes one of the best practices in sustainability and ERP system implementation. Since an S-ERP system is an extension of ERP system (Chofreh et al., 2014a), hence, the project management concept can also be utilized in the S-ERP system implementation.

3. Research methodology

The nature of this paper presents the need for qualitative studies since this paper seeks to develop a process-oriented description. Given that S-ERP system research is still at the introductory stage and there is a lack of organizations that implement it (Chofreh et al., 2014a), this paper required data that revealed some patterns regarding the theoretical development that can be obtained only through qualitative studies.

This study used the conceptual research method to develop a master plan for the implementation of S-ERP system. The concepts involved in sustainability and ERP system implementation for developing an S-ERP system implementation theory were identified. In this case, the stages and the core categories for implementing sustainability and ERP systems were examined.

S-ERP systems research is still in the introductory stages and there is a lack of literature on the topic (Chofreh et al., 2014a). Therefore, the development of a roadmap began with an extensive review of recent and relevant literature in the field of sustainability and ERP system as these fields are the root S-ERP system. The purpose of this analysis was divided into two points. The first point was to observe how the academicians and practitioners developed roadmaps for sustainability and ERP implementation. An in depth understanding of the pertinent literature contributes to the development of the roadmap. Furthermore, the stages in the roadmap from the pertinent literature were reviewed and classified. This process is a part of conceptual research method, which was used by Mukhtar (2006) in collecting the variables from the previous studies for developing a framework for supply chain management performance analysis. The second point was to expose the gaps and inconsistencies in the literature. In this regard, this study highlighted the missing components in the existing roadmaps and adapted the necessary components in the proposed roadmap. After the literature was reviewed, in the next section this paper explains how to develop the roadmap.

4. Development of the roadmap

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The S-ERP system implementation roadmap is made-up of three phases: pre-implementation, implementation, and post-implementation. Pre-implementation phase consists of initiating and monitoring/controlling stages. Implementation phase consists of planning, executing, monitoring/controlling, and closing stages. Post-implementation phase consists of initiating, planning, executing, monitoring/controlling, and closing stages. The structure of these phases and stages are necessary because they reflect the effective and comprehensive flow of the project throughout its life cycle. This idea is synonymous with the project management concept. Figure 1 shows the specification of the roadmap.
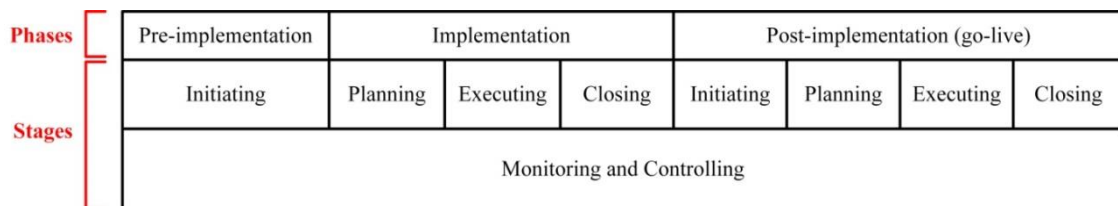

Phases	Pre-implementation	Implementation			Post-implementation (go-live)			
Stages	Initiating	Planning	Executing	Closing	Initiating	Planning	Executing	Closing
	Monitoring and Controlling							

Figure 1: Roadmap for the implementation of S-ERP system (Adapted from Motwani et al., 2005 and PMI, 2008)

Pre-implementation phase consists of initiating stage. This stage encapsulates processes performed to obtain an authorisation to start the S-ERP implementation project. The main objective of this stage is to align stakeholders' expectations with the S-ERP system implementation objective, provide them visibility about the scope and business case, and demonstrate how they contribute to the project.

Implementation phase consists of three stages including planning, executing, and closing. The planning stage refers to the processes undertaken to determine the overall scope of endeavours, define and refine the objectives, and develops the course of action required to achieve the objectives. The main objective of this stage is to define the strategy, tactics, and path to successfully complete the S-ERP system implementation project. In addition, the executing stage encapsulates processes to complete the work defined in the planning stage according to the project specifications. Moreover, the closing stage consists of processes performed to

conclude all activities across all stages to formally complete the S-ERP system implementation project and contractual obligations.

Post-implementation phase consists of four stages including initiating, planning, executing, and closing. The initiating stage includes the processes performed to define strategy and activity for go-live. Furthermore, the planning stage covers the processes to develop a plan for the S-ERP system go-live. Moreover, the executing stage encapsulates the processes to complete the work defined in the previous stage. In addition to this, the closing stage includes the processes to formally conclude all activities in the post-implementation phase.

Finally, the monitoring and controlling stage consists of processes to follow, evaluate, and coordinate the progress and performance of each stage in the pre-implementation, implementation, and post-implementation phases.

5. Conclusions

Organizations need to attain concurrent improvement of the economic, environmental and social performance of the business towards sustainability. In doing so, they need to implement an S-ERP system in order to integrate all sustainability data, information, and processes across entire extended value chain. Nevertheless, there is no evidence of any work that outlines a master plan, showing the stages, perspectives and steps to direct practitioners in implementing the S-ERP systems. Thus, organizations require a comprehensive master plan that comprised of a roadmap, a framework, and guidelines in order to assist them in implementing the S-ERP system.

The objective of this paper was to develop the roadmap for the implementation of S-ERP system. The development of the roadmap had been approached by a variety of ways by various researchers. The use of conceptual research method requires the literature revisited and it was shown that this has resulted in the uncovering of a project management concept for the development of the roadmap. Further study needs to be performed in order to evaluate the usability of the roadmap. In addition, the development and evaluation of a framework and guidelines are required in order to complete the formulation of the master plan for the implementation of S-ERP system.

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