



Sustainable enterprise resource planning: imperatives and research directions



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ABSTRACT

The world faces to the problem of integration between sustained business functions. The sustainability data is not sufficiently integrated and used for decision making. To solve this problem, organizations need information systems to facilitate their sustainability initiatives. In this study has been proposed Sustainable Enterprise Resource Planning (S-ERP) system as a holistic solution to support sustainability initiatives. The paper highlights the significance of S-ERP system and provides its future research direction to guide the academic researchers. Two research areas are included – the ERP and sustainability, to discover how academicians and practitioners solved the problems of integration and sustainability. The S-ERP systems' life cycle and identified six key areas include: concept, system design, pre-implementation, implementation, post-implementation, and system extension/retirement have been defined. They distinguish number of broad research themes based on key areas. S-ERP system appears as a promising solution to solve integration problems in sustainability; however the academic researchers need to take certain direction for assisting organizations for solving their business issues.

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1. Introduction

By the turn of the 20th century, the growth and evolution of distribution systems were developing apace. It had been characterized by the people who migrate to urban centres, availability of the production and technology, and improvements in transport and storage were combining to change the state of the marketplace dramatically (Wilkie and Moore, 2003). There was a genuine need to increase the products and services to this new market where supplying these demands, the industries have to increase their products and goods. In order to achieve this aim, the industry players are pressed to change the traditional ways of their production.

By these changes, the environmental issues have steadily embedded on business capability to generate value for consumers, stakeholders, and shareholders in organizations. Furthermore, globalized workforces and supply chains have raised

environmental pressures and attendant business responsibilities. The emergence of new world power has increased competition for natural resources and added as a geopolitical dimension to sustainability (Lubin and Esty, 2010). Due to this phenomenon, the quality and future of human existence related to the deterioration of our natural environment are becoming more perilous (Elliot, 2011). These forces are magnified by escalating governmental and public concern about climate change, industrial pollution, food safety, natural resources depletion, among other issues (Lubin and Esty, 2010).

The concept of sustainability pervades the agendas of governments and corporations as well as the mission of educational and research programs worldwide (Bettencourt and Kaur, 2011). Although there are some earlier antecedents, these ideas had their formal beginning in the 1980s with several important policy documents. Primarily the World Conservation Strategy (IUCN, 1980) and the Brundtland report (Brundtland, 1987), issuing a call to arms for new policy. With the publication of the National Research Council's *Our Common Journey* report (1999) for advent of a novel scientific discipline capable of responding to the challenges and opportunities of sustainable development (Bettencourt and Kaur, 2011).

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World Commission on Environment and Development of the United Nations Brundtland defined sustainability development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987). Sustainability scholars often point this commission as a critical junction in the modern development of the integration of sustainability concept into various disciplines e.g. Pitt and Lubben (2009). The definition of sustainability development is related to three interlocking goals: environmental, economic, and social (Elkington, 1994, 2004). This perspective is generally referred to as the triple bottom line (TBL). TBL approach suggests that besides economic performance, organizations need to engage in activities that positively affect the environment and the society. In fact, it is argued that a firm's long-term profitability and existence are best served by balancing them with social and environmental goals (Porter and Kramer, 2006).

Currently consumers are seeking out sustainable products and services, and relying on companies to advance sustainability practices (Nidumolu et al., 2009). The investors consider the external resources, such as carbon dioxide emissions, waste management and water consumption, to a firm's performance, and stakeholders expect companies to share information about them (Lubin and Esty, 2010). Further fuelling this megatrend, thousands of companies are innovating products and services, which consider energy efficiency, renewable power, resource productivity, and pollution control (Lubin and Esty, 2010). This fast changing business strategy and dynamic global business environment requires firms to be more flexible to quickly adapt and respond to market change. Among the forces that drive changes, requirements for corporate responsibility and sustainability are getting more urgent. During such difficult time as economic downturn, companies are faced with hard choices to survive (Porter and Kramer, 2006). Most companies are struggling to define sustainability in a way that is relevant to their businesses. The majority of managers believe that a sustainability strategy is a competitive necessity to deliver sustainability values to stakeholders and gain sustained competitive advantage (Dao et al., 2011). Recent research shows that over 2874 managers and executives from 113 countries, 70% of companies that have placed sustainability on their management agendas since 2006–2011, and 20% of companies have done so between 2010 and 2011 (Kiron et al., 2012).

Based on Kiron et al. (2012), sustainability adoption drivers consist of internal and external factors to an organization. In their research, they interviewed Bill Morrissey, a vice president for environmental sustainability at Clorox, who defines the internal factors of sustainability drivers, which are related to operating costs, revenue growth, brand integrity, employee engagement, and leadership. Along with these internal factors, the external factors include access to new markets, regulation, green score cards, media and nongovernmental organizations, climate change science, resource scarcity, and consumer demand. However, these internal and external drivers are insufficient enough to explain the recent strengthening business focus on sustainability consider to the rapid changes in the business environment (Kiron et al., 2012).

Sustainability enables to create new opportunities through innovation to gain competitive advantage and driving cost reduction programs. Beyond the obvious cost saving derived from using less energy, additional benefits include changing behaviours leading to increase productivity, improve morale, stream line business processes, creative innovations and better use of technology. Organizations that recognize and embrace the key drivers for sustainability will reap the eventual rewards of market opportunities and efficient business operations (Hutchins, 2009). Therefore, many organizations are engaging sustainability initiatives to their corporate strategy. They realize that they have responsibility to participate in solving critical environmental issues and their

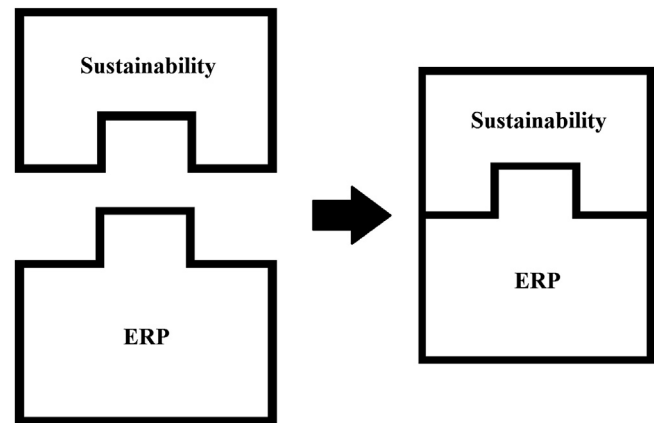


Fig. 1. The concept of S-ERP systems.

customers expect them to provide sustainable products and services. Sustainability requires sustainable business practices. For doing so, information systems play an important role in the organization transition towards sustainability initiatives. Sustainability information system (Sustainability IS) considered as an opportunity for organizations to improve productivity, reduce costs, and increase profitability (Boudreau et al., 2008).

Sustainability IS refers to the design, implementation, and maintain of information systems that contribute to sustainable business processes (Boudreau et al., 2008). Sustainability IS can be seen as a possible solution to solve sustainability issues. For instance, smart home renewable energy management systems (Al-Ali et al., 2011); sustainability reporting (Ahmed and Sundaram, 2012); and smart power grid system to maintain energy efficiency, environmental integration and accessibility (Markovic et al., 2013). In addition to these emerging innovations, organizations also need an integrated sustainability information systems solutions to collect, integrate, automate and monitor sustainability information (Brooks et al., 2012), such as Sustainable Enterprise Resource Planning (S-ERP). To understand and study S-ERP comprehensively, therefore, in this study the authors describe the significance of S-ERP towards sustainability initiatives and propose its specific research directions. In order to do this, the authors review traditional ERP and sustainability research experience then apply it into S-ERP systems research.

This paper is organized as follows: in the next section, the authors describe the importance of S-ERP system and research to achieve sustainability goals. The authors then identify future research direction of S-ERP systems. It can be concluded by summarizing the findings and discussing implications for research and practice.

2. The imperative of S-ERP system and research

Achieving sustainability in a firm requires a holistic, integrative, and complete view spanning not just the product and the manufacturing processes involved in its fabrication, but also the entire supply chains, including the manufacturing systems across multiple product life-cycles. This requires improved models, metrics for sustainability performance evaluation and optimization techniques at the product, process, and system levels (Jayal et al., 2010).

In the transitional period towards sustainability systems, organizations are practising sustainability in their value chain as separate functions (Seuring and Müller, 2008). The firms perform sustainability modelling and implement specific environmental or social management systems without integrating them with the

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