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A Roadmap to Green Supply Chain System Through Enterprise Resource Planning (ERP) Implementation

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Abstract

Green supply chain is a supply chain system focusing on environmental impacts and the efficiency of energy used. A green supply chain will be achieved if a system is able to track down all information regarding the environmental influence. However, a green supply chain will not be possible without enterprise resource planning (ERP) implementation in organizations. ERP is the integrated information system overlooking manufacturing processes from raw materials to finished products. However, the successful implementation of ERP depends on four critical factors: defining business cases, prepare system and users, stabilizing to obtain normal operations and maintaining and upgrading. Moreover, learning organization (learning from own experience and learning from others) is another key ingredient for the successful implementation. Last but not least, process mapping from "As-Is" to "To-Be" models is also a powerful technique which facilitates the implementation by identifying the process models of current and future ones. Moreover, the featured functions of ERP for a green supply chain should include the capability to keep and track the environmental data of raw materials from suppliers, to prepare an environmental report for each product from raw materials to finished products, to keep the environmental data regarding logistics and transportation and to comply with the ERP software used by third-party manufacturers.

Keywords: enterprise resource planning (ERP); environmental impact; green supply chain

1. Introduction

Enterprise resource planning (ERP) is an integrated system, which is designed to automate and integrate business processes and operations together. This is a desired function which paves the way for the organizations to have the

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operation, especially the supply chain, which is environmental friendly. However, the implementation of ERP requires a lot of organizational efforts and many enterprises end up with failures or do not achieve the benefit as expected before the implementation. For this reason, there are a lot of research works conducted in order to identify potential factors and approaches, which have helped to guide the enterprise through the implementation successfully. In this research, the roadmap to a green supply chain with the assistance from ERP is clearly illustrated. Critical success factors, which are significant to the success of the implementation, are addressed and described while its relationship with ERP is also clarified by following the chronological order of the implementation. Moreover, the role of process mapping as well as the organizational characteristic of how to learn from failures was presented and discussed on how they influenced the success of the implementation. Finally, the desired characteristics of the ERP system leading to green supply chain are listed and explained while the integrated model for implementing ERP is also proposed.

2. Literature review

Al-Mashari and Zairi [1] pointed out that a supply chain system can be re-engineered within and beyond the organizational scope by applying the ERP scheme to the existing system. Hervani, Helms and Sarkis [2] created a framework for studying, designing and evaluating a green supply chain. Their studies were based on experiences, case studies and literature reviews. The integration of supply chain management and ERP was shown in the research work of Koh, Saad and Arunachalam [3] since these two approaches were known to fulfill each other. Their study indicated that the close relationship with suppliers and the centralized system would lead to a successful integration. For a model-oriented study, the moderated hierarchical regression analysis was utilized by Zhu and Sarkis [4] to explore the relationship among the green supply chain implementation, the environmental and economic performance in Chinese firms which now face high pressure from lawmakers to adopt a green supply chain system. The critical factor to achieve a green supply chain system is studied by Zhu, Sarkis, Cordeiro and Lai [5]. The correlation between the organization learning and the management support and its influence on the green supply chain were also investigated.

3. Green supply chain and ERP

There is a lot of effort trying to combat pollution issues, especially from the European Union (EU). Among these initiatives are the restrictions of hazardous substances directive (RoHS) (adopted in 2003) and European Union emission trading scheme (EU ETS) (launched in 2005). Under RoHS, six hazardous materials (Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls and Polybrominated diphenyl ether) are restricted in the manufacturing processes of electronic and electrical equipment. On the other hand, EU ETS focuses on the reduction of greenhouse gas emission based on the cap and trade scheme. Cap is the limited amount of emission from each country and it can be traded in the form of emission permits (carbon credits). Installations are able to hold credits but it will not be allowed to exceed the cap. However, if the installations would like to emit more gas, they have to pay in order to obtain credits. Therefore, not only carbon footprint or hazardous substances but also environmental footprint has to be closely monitored by manufacturers. The supply chain system of each installation has to comply with the above constraints and this can be considered as the responsibility to the environment and customers. As a result, manufacturers have to establish their green supply chain systems which have the capability to document all the environmental information in every stage of supply chain. In order to fulfill this objective, an integrated information system is required to track every detail due to the environmental impacts of supply chain system. The answer to this question is the implementation of ERP system since ERP has integrated every aspect of the production system together and overlooks the transactions of data throughout the system by following the master production schedule (MPS). Basically, ERP focuses on the following categories (Table 1):

However, there are many factors affecting the successful implementation of ERP system. Therefore, the in-depth understanding of these factors will pave the road to the green supply chain system.