Supply Chain Process of Environmental Information System: Exploratory Factor Analysis

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***Abstract*— The purpose of this study is to identify the supply chain process of environmental information system (EIS) using the exploratory factor analysis (EFA). In this study, EFA was conducted on supply chain process of EIS constructs (technology and processes). 350 valid responses were used for final analysis, representing a response rate of 13.46%. These findings are expected to supports Malaysian manufacturing industry to implement key strategies with supply chain process of EIS. Hence, the supply chain process of EIS implementation may assist Malaysian manufacturing industry to increase the supply chain and information system in the organization.**

***Keywords*—** *Supply chain, environmental information system, exploratory factor analysis, reliability, manufacturing*

1. Introduction

In order to achieve these objectives, the implementation of supply chain process of environmental information system (EIS) in the Malaysian manufacturing industry is essential to improve the performance.

Supply chain process has been considered as the most effective operations process to improve performance [1]. Supply chain process seem to improve in production, but the aims of each element are the same which is to improve performance [2, 3]. Manufacturing industry is emphasized more on production to achieve speed and flexibility in producing goods and services. While, supply chain process is emphasis on all aspects which includes quality, delivery, speed, flexibility, cost, and management. In supply chain process, the integration of suppliers and customers are essential to achieve better performance in the organization [4]. Regarding this, supply chain process of EIS is concerned to daily operation to ensure that manufacturer satisfied by the production way, particularly in the Malaysian manufacturing industry.

Therefore, supply chain process becomes a popular management tool in assisting manufacturing organizations to improve the performance through to achieve the objectives of supply chain process which is reduce waste and enhanced efficiency.

2. Literature review

Supply chain process can be defined as a system in terms of waste reduction, cost reduction, delivery time, monitoring, coordination, and planning [5]. Supply chain process can be consisted into three elements, which are operational, design, and strategic [6]. Hence, the implementation of supply chain process is to enable managers to make strategic decision making with company's objectives in the supply chain management.

Supply chain process of EIS as an application to raw data into information sharing and information management that can improve efficient and effective the business operations [7]. This is due to supply chain process of EIS also refers to

technology developed and implemented specifically for managing elements or components of the supply chain, or an application of technology used to support supply chain process. Therefore, supply chain process of EIS use to coordinating and integrating information throughout the supply chain to improve efficiencies and effectiveness of business processes.

In this study, supply chain processes of EIS focused on technology and processes in the Malaysian manufacturing industry. Technology are the study of hardware and software that usually people and organizations applied to gather, process, create, monitor, control, and distribute data [8, 9]. The contribution is to support management and operation to make the informed decisions based on the technology. Regarding this, technology is used as a dimension of EIS, but it is more focused on the function of communications and the integration of information system by electronic equipment.

Besides, technology to measures technological practices, and the result showed that technology is significantly influences the EIS [10]. This study concludes that the technology applications are crucial to speed up the supply chain process of EIS. Consistent with the literatures, this study measure supply chain process of EIS implementation by the extent of use of the technology.

To understanding supply chain process of EIS based on the processes are the activities that are performed and supported by an information system. While the supply chain process of EIS assumes that the processes are important in the manufacturing activities supported and enabled by information system, it considers the manufacturing activities as primary importance in the Malaysian manufacturing industry. As the processes emphasize the activity aspect of EIS, it leads organizations to look at how activities undertaken by processes can be performed and/or supported the information system [11]. Therefore, the processes should be designed to improve reporting of environmental information.

Furthermore, the need for data management to support processes has created demand for specialized EIS and custom-designed systems for fulfilling supply chain process of EIS needs [12, 13]. As a result, organizations have begun to invest in processes that enhance decision-making capabilities for management, production, and demand forecasting and planning, particularly in the Malaysian manufacturing industry. Thus, supply chain process of EIS is important to Malaysian manufacturing industry in order to improve the supply chain and information system.

3. Methodology

In the present study, the questionnaire was developed in English language. It was structured into two main sections, each encompassing a different theme as follows: Section 1 consists of questions that are related to the respondent's profile (types of ownership, industrial sector, number of employees, current position, and period of current position). In Section 2, this section contains two dimensions which is technology and processes that are relevant to the supply chain process of EIS. This section also comprises 20 questions that measure the supply chain process of EIS.

The data would be collected using an online survey from 2,600 manufacturing companies selected from the Federation of Malaysian Manufacturers Directory 2017. Data collection in the stage of final survey was implemented totally through questionnaire from January 2018 to March 2018. For this research purpose, 2600 manufacturing companies can answer the questionnaires by using online survey (Google Form).

As for exploratory factor analysis (EFA), Kaiser-Meyer-Olkin (KMO) value of 0.6 or above and a Bartlett's test significant at ($p< 0.001$) [14]. Following the descriptive analysis, a measurement scale, Cronbach's alpha provides a measure of the internal consistency of the test ranges between 0 and 1 [15, 16, 17, 18]. In the next section, the empirical results of the data analysis are presented.

4. Results and discussion

Out of the 2600 questionnaires sent to the respondents, 350 were received from manufacturing companies. Thus, 350 valid responses were used for final analysis, representing a response rate of 13.46%. The objectives of EFA are referred to accesses the construct validity of a test or instrument and to analyse the relationship between variables [19, 20, 21]. In this study, EFA was conducted on supply chain process of EIS constructs.

Kaiser-Meyer-Olkin (KMO) measurement test displayed values of more than 0.6 as acceptable values [22]. KMO measure for supply chain

process of EIS was 0.935 and Bartlett's test of sphericity was significant p< 0.001.

All factors contributed 59.248% from the total variance explained for supply chain process of EIS and a total of two components had Eigenvalues > 1. The total variance explained which is greater than 50% was accepted [23, 24, 25]. Thus, total variance explained for supply chain process of EIS were greater than 60% which was acceptable.

Two factors for supply chain process of EIS from TCH including TCH1, TCH2, TCH3, TCH4, TCH5, TCH6, TCH7, TCH8, TCH9, and TCH10. The next factor was classified as PRS with eight items, namely PRS1, PRS2, PRS3, PRS5, PRS6, PRS8, PRS9, and PRS10. Item PRS4 and PRS7 were suggested to be deleted. The result of EFA exhibited two EIS constructs with 18 items for this study.

In this study, reliability analysis was conducted on 18 items for two EIS constructs by using IBM SPSS Statistics software. The results of reliability analysis showed that all the supply chain process of EIS constructs have alpha value more than 0.7 (range from 0.882 to 0.930). Table 1 presents the summary results of EFA and reliability analysis.

Table 1. Summary results of EFA and reliability analysis

Measures	**EFA**	**Reliability Analysis**
KMO	0.935	0.930 (10 items)
Bartlett's test	p<0.001	0.882 (8 items)
Total variance explained	59.248%	

5. Conclusions

This study aims to identify the supply chain process of EIS using the EFA. Consequently, the empirical study has significant contributions to the body of knowledge where supply chain process of EIS, including technology and processes to improve supply chain and information system. These findings are expected to supports Malaysian manufacturing industry to implement key strategies with supply chain process of EIS. Hence, the supply chain process of EIS implementation may assist Malaysian manufacturing industry to increase the supply chain and information system in the organization.

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