Sustainable Supply Chain Management: Factor Analysis

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***Abstract*— The purpose of this study is to identify the sustainable supply chain management (SSCM) by using factor analysis (exploratory factor analysis and confirmatory factor analysis). Using a survey questionnaire, data were collected 230 respondents from private hospitals in Malaysia. The findings found that the factor analysis for SSCM model was fit and acceptable with four dimensions (environment, information and communications technology, culture change, and risk management). Regarding this, SSCM model provides a useful guide for Malaysian private hospitals to implement supply chain in terms of SSCM dimensions. Thus, SSCM practices implementation can improve the supply chain and performance in Malaysian private hospitals.**

***Keywords*—** *Supply chain management, sustainable, factor analysis, reliability, private hospital*

1. Introduction

Healthcare industry is known as one of the important services in Malaysia due to its role in keeping the citizens healthy at an optimum rate. In addition, the industry plays an important role in developing and extending support to private healthcare in order to enhance the healthcare quality. Nowadays, the industry has become one of the significant contributors towards the Malaysian economy.

Sustainable supply chain management (SSCM) is now becoming a common term in the service sector in Malaysia. SSCM is responsible for the management of all managers for creating quality benefits in the healthcare industry. One set of policies held the supply chain management, actions [1], and contacts that are formed to respond to the anxiety associated with social and environmental issues associated with the design, procurement, distribution, consumption, reuse, and disposal of goods and services of the organizations.

In the healthcare industry itself, there are several studies that have been conducted on the implementation of SSCM. The SSCM had become more challenging and put pressure on the healthcare organization to opportunities to boost operational efficiency and reduce the cost while enhancing the quality of healthcare [2, 3]. SSCM has greater complexity within the healthcare industry because the effects on human health require sufficient and appropriate care according to the needs of patients [4]. Furthermore, SSCM in the healthcare industry comprises of a variety of major issues in the economic, environmental, and social phases. Hence, the healthcare management should emphasize SSCM issues at all stages of their management.

To increase profit and supply chain effectiveness, the management needs to focus on the productivity for controlling the cost [5]. In this research, SSCM would continue to be reviewed within the context of private hospitals in Malaysia.

By improving SSCM practices, hospitals can implement supply chain as the benchmark for strategic management in order to enhance performance measures. This research is essential for providing valuable information regarding the implementation of SSCM among the Malaysian private hospitals. Thus, it is hoped that the implementation of SSCM initiatives can contribute to the healthcare industry in order to increase the performance in the private hospitals in Malaysia.

2. Literature Review

The integration of sustainability with supply chain management is emphasized by both industrial and academic communities [6]. SSCM has become a growing concern for companies of all sizes and in many industries [7]. With SSCM practices, more private hospitals have benefited from trying to continue in their practices. Nevertheless, there are still many challenges associated with SSCM [8]. Many researchers have given consideration to

sustainability or supply chain management [9, 10]. Thus, SSCM practices are an important strategy that can be beneficial to private hospital and improve the quality of the Malaysian private hospitals. Each SSCM allows organizations to identify the main effects of the organization as offering social, environmental, and economic. Hence, SSCM is the most important section in the culture and character of hospital management in Malaysian private hospitals.

2.1 SSCM constructs

This research identifies four constructs in SSCM: Environment, information and communications technology, culture change, and risk management. SSCM practices assist the hospital in improving the reputation [11, 12, 13]. Therefore, SSCM practices must be implemented to make it easier for hospitals to manage their production operations.

Environment is the need to be protected from pollution and waste [14]. Environment is the total effect of environmental and resources use which must come from sources that are renewable. For example, to protect the environment from pollution, reduce the use of natural resources, and environmental pollution. Besides, environment is important to improve the products and operating it [15]. Therefore, the hospital concerning the environment will become more competitive and maximize profits.

Information and communications technology definition is the number of processes to identify, control, and reduce the risks associated with information systems. Information and communications technology includes risk assessment, cost benefits analysis, the selection, implementation, testing, and evaluation of safety protection and technology that is used to support information gathering, processing, distribution, and consumption [16]. This review of the whole security system considers effectiveness and efficiency, including impact on the mission and constraints due to the policies, regulations, and laws. This includes all forms of technology such as computers, internet, website and landlines, mobile phones and other wireless communications devices, networks, broadband and variety of special devices.

Culture change is the most important part of the nature and culture of hospital management in Malaysian private hospitals. Some studies have suggested that culture can be an important factor related to the effectiveness of the various organizations in the healthcare sectors [17]. Thus, culture emphasize that the combined group, co-coordination and co-operation has been associated with greater implementation of continuous quality improvement practices.

Risk management gives the opportunity to reduce the risks of disorders to supply, lack of resources, volatility in energy costs, poor quality of legal action, and also regarding the economic, environmental, and social performance [18]. Risk management consists of SSCM practices to engage in long-term relationships that have been implemented by the sustainability and supply chain development [19]. The issues of risk in the SSCM are becoming important due to various reasons like uncertainties in supply and demand [20]. Hence, risk management is important to private hospitals in Malaysia.

3. Methodology

The aim of this research was to investigate the instruments in SSCM practices. The questionnaire that had been constructed consisted of general information about SSCM. To achieve the study objectives, the selection of the Malaysian healthcare management was selected using data from Malaysian private hospitals. Using a survey questionnaire, data were collected 230 respondents from private hospitals in Malaysia.

The personnel involved in the survey were the senior management and middle management of the private hospitals. The respondents' titles (e.g. senior doctor, junior doctor, manager hospitals, and nurse) were selected so that questionnaires could be mailed to the person who was most likely to have understanding, knowledgeable, practical experience about SSCM practices.

To meet the needs of the measurement model and identify indicators to measure each construct, factor analysis was conducted. First, Exploratory factor analysis (EFA) was used to identify the goods tentative, and also to suggest items for deletion and places where items should be added. Second, confirmatory factor analysis (CFA) is the most comprehensive method to test and to examine how the structure fits the data set of measurements.

Confirmatory Factor Analysis (CFA) through Structural Equation Modelling (SEM) using AMOS (version 22.0) was used to test the measurement model. CFA is the most comprehensive method to

test and examine how the structure fits the data set of measurements.

Chi-square over degrees of freedom (X2/df-between 1.0 to 3.0), Goodness of Fit Index (GFI≥0.8), Adjusted Goodness of Fit Index (AGFI≥0.8), Comparative Fit Indexes (CFI≥0.9), Tucker Lewis Index (TLI≥0.9), and Root Mean Square Error Approximation (RMSEA≤0.08) as recommended [21, 22, 23]. Next, the following section discuss the results and discussion.

4. Results and Discussion

EFA is the dimensionality of a measurement instrument by finding the minimum number of interpretable factors required to explain the correlations among the overall variables [24]. EFA with 22 items of SSCM practices Environment (EV), Information and Communications Technology (ICT), Culture Change (CC), and Risk Management (RM)).

The result of KMO showed 0.832, more than 0.5, indicating that it was suitable for the analysis of main components [25] and Bartlett's is a significant ($p<0.001$). These four factors contributed 61.359% of the total variance and was sufficient to further analysis which required at least 50% [26, 27]. This implies that the latent influence four was related. In this study, ICT6 has been deleted due to factor loading less than 0.4 [28].

The results of EFA and reliability analysis for SSCM constructs as shown in Table 1.

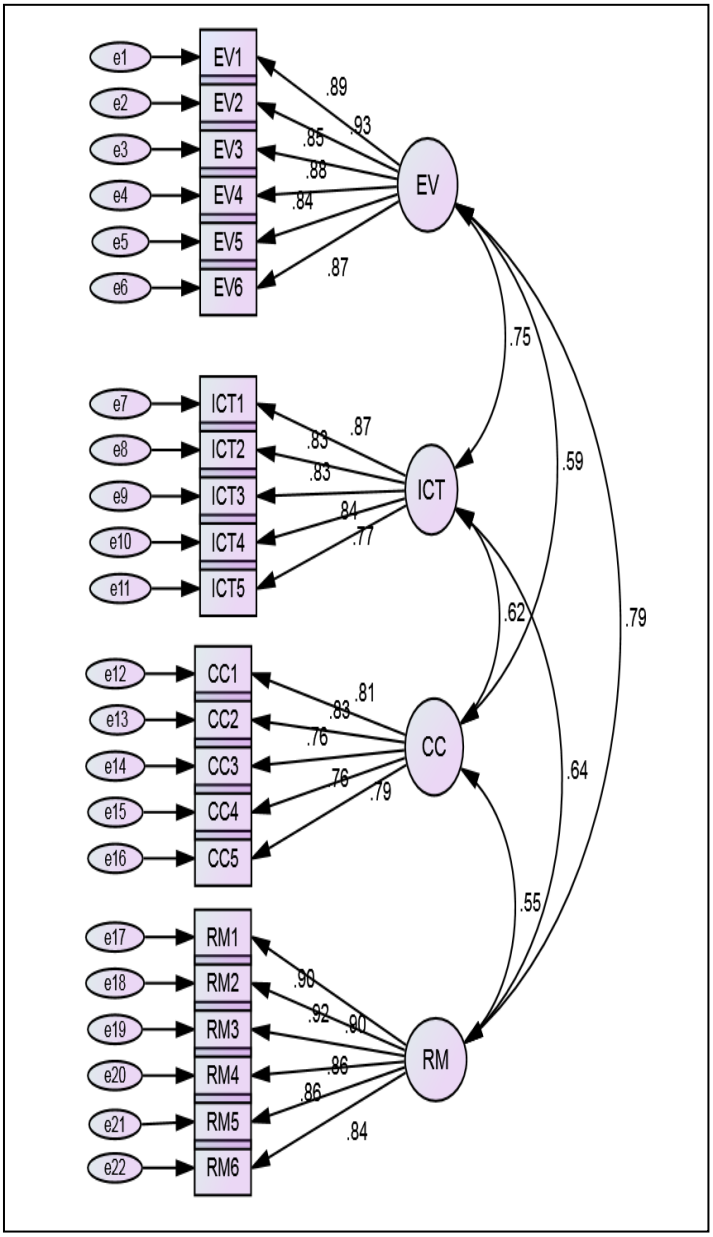
Table 1. Results of EFA and reliability analysis

Measures	KMO	Bartlett's Test	Total Variance Explained
EFA	0.832	p<0.001	61.359% (22 items)
Reliability analysis	EV= 0.948 (6 items) ICT= 0.868 (5 items) CC= 0.890 (5 items) RM=0.951 (6 items)		

The SSCM model with four factors showed sufficient fit result as presented in Figure 1.

Figure 1. CFA for SSCM

$\chi 2$ (545.978) (degree of freedom = 203, $p<0.001$), with $\chi 2$/df (2.690) (less than 3.0), thus displaying a good fit. GFI (0.836), AGFI (0.826), CFI (0.938) TLI (0.929), and RMSEA (0.078) was less than 0.08, thus the model was fit and acceptable for this study.



5. Conclusions

SSCM practices are important for the organization to improve the quality improvement, especially in Malaysian Private Hospitals. In this study, SSCM practices implementation can improve the supply chain and performance in Malaysian private hospitals. The findings found that the factor analysis for SSCM model was fit and acceptable with four dimensions (EV, ICT, CC, and RM). The study contributes to an understanding of the importance of SSCM not only the success of a

business, but the positive effects on the supply chain, particularly in the private hospitals. Hence, this SSCM model provides a useful guide for Malaysian private hospitals to implement supply chain in terms of SSCM dimensions.

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