Identification of Performance Evaluation Indicators for Health, Safety, Environment, and Ergonomics Management Systems

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Health, Safety, Environment and Ergonomics Management Systems (HSEEMS) are an important approach in supply chain management that contributes to the reduction of sustainability issues. The implementation of HSEEMS can improve the efficiency of supply chain management through the advancement of a safe, healthy, and eco-friendly workplace. For ensuring the effectiveness of the HSEEMS implementation, organisations need to evaluate the performance of the system. The purpose of this study is to determine indicators to evaluate the performance of HSEEMS implementation. It initially begins with a review of various studies in HSEE and quality performance evaluation. The literature review reveals that Malcolm Baldrige and European Foundation for Quality Management (EFQM) models are the frequently adopted excellence models. These models are used, analysed, and compared by HSEE experts through in-depth interviews to identify the indicators. In this light, considering the principles and assumptions of the models as well as their structure, efficiency in implementation, and scientific and operational support are selected for benchmarking. As a result, eight criteria including leadership, strategy, risk analysis, personnel, resources, HSEE implementation, stakeholders' effects, and key performance effects are acknowledged. The identification of the HSEEMS performance assessment indicators will be useful for practitioners to enhance the quality and effectiveness of the HSEEMS implementation in organisations and contribute to the implementation of sustainable supply chain management.

1. Introduction

Workforce health and safety, as well as the environmental impacts involved in industrial operations comprising toxic products, toxic packaging, unsafe working environment, greenhouse gas emissions, and waste disposal, have been a major concern of government and society (Porter and Kramer, 2011). Consumer demand for sustainable products, enforcement of sustainable manufacturing regulations, along with improved work environments are increasing (Spangenberg, 2017). Hill and Seabrook (2013) stated that the implementation of the Health, Safety, Environment, and Ergonomics Management Systems (HSEEMS) is essential for organisations to advance organisational performance, especially in addressing sustainability issues. It enables organisations to conduct business in a sustainable way through the protection of human and natural resources and diminish the business's environmental impacts.

The HSEEMS is an approach that can improve the effectiveness and performance of the supply chains within an organisation (Yawar and Seuring, 2017). Increased demand for the embedment of sustainability into business and operations stimulates the organisations to integrate the sustainability into a complex supply

chain comprising all suppliers, contractors, and consumers and business strategy (Chofreh et al., 2017). Implementation of HSEEMS can improve the implementation of sustainability within the organisation by considering aspects of health, safety, environment, and ergonomics. This system involves risk analysis activity, which is crucial to reduce the frequency of incidents in the workplace (Borchiellini et al., 2017). Jilcha and Kitaw (2017) argued that sustainability stewardship with health and safe work environment are imperative for upholding and advancing the environment, society, and economy aspects of sustainability.

Since aspects of health, safety, environment, and ergonomics are important to support the success of sustainability implementation; organisations need to improve the HSEEMS performance (Hill and Seabrook (2013). They need to evaluate the performance of HSEEMS to obtain effective system implementation. This study aims to identify performance evaluation indicators for HSEEMS by comparing various criteria of Malcolm Baldrige and European Foundation for Quality Management (EFQM) models. These models are used to develop the indicators as they are widely used by organisations and easy to follow and understand. These criteria are analysed by a number of HSEE experts from various organisations through in-depth interviews. In addition, the experts identify other important criteria that need to be considered as the HSEE performance evaluation indicators. The results reveal that leadership, strategy, risk analysis, personnel, resources, HSEE implementation, stakeholders' effects, and key performance effects are important. The outcome of the present study is advantageous for manufacturing organisations as they can use the identified indicators to evaluate their HSEEMS implementation. Effective HSEEMS implementation will contribute to the effective implementation of sustainable supply chain within the organisation.

2. Literature review

The present study examines various studies in HSEE and quality performance evaluation. Literature reveals that Malcolm Baldrige and EFQM models are frequently adopted by organisations to evaluate their business performance. These two models are then used to obtain a set of performance evaluation indicators for HSEEMS. The majority of organisations that implement Malcolm Baldrige and EFQM models have successfully improved their performance and achieved valuable results. Table 1 presents the studies that have proven that the application of Malcolm Baldrige and EFQM models can improve organisational performance.

Table 1: Summary of a study on Malcolm Baldrige model and EFQM model

Reference	Research purpose	Malcolm Baldrige model	EFQM model
Beard and Humphrey (2014)	This study proposed an alignment of information technology resources in university with Malcolm Baldrige criteria using balanced scorecard approach.	√	
Doeleman et al. (2014)	This study conducted an empirical study to evaluate the application of EFQM model in European organisations.		√
Calvo-Mora et al. (2015)	This study used EFQM excellence model to advance knowledge management projects in organisations. The experts confirmed that the model can be a valid method to improve the performance of the projects.		√
Peng and Prybutok (2015)	This study examined the effectiveness of Malcolm Baldrige model implementation across various industries.	√	
Thompson and Blazey (2017)	This study provided lessons learned from the Malcolm Baldrige model application from a number of organisations that have reaped progressive results.	√	
Aydın and Kahraman (2018)	This study evaluated the application of Malcolm Baldrige model in various organisations using survey and modified AHP methods.	√	

2.1 Malcolm Baldrige model

Malcolm Baldrige model is a comprehensive strategic method that widely applied by organisations from various industries to improve their organisational performance so that they can survive in the global competition (Oyewobi et al., 2015). American Society for Quality (2018) stated that the model has seven criteria: 1) leadership, 2) strategic planning, 3) customer focus, 4) measurement, analysis, and knowledge management, 5) workforce focus, 6) process management, and 7) results. These criteria are constructed from integrated core values and concepts found in high-performance organisations. They are interconnected and aimed to provide a basis for the organisations to incorporate strategic business requirements into results. The model assists organisations to respond current challenges by aligning strategies and resources to attain targeted goals. Figure 1 provides the criteria for Malcolm Baldrige model and their relationships.
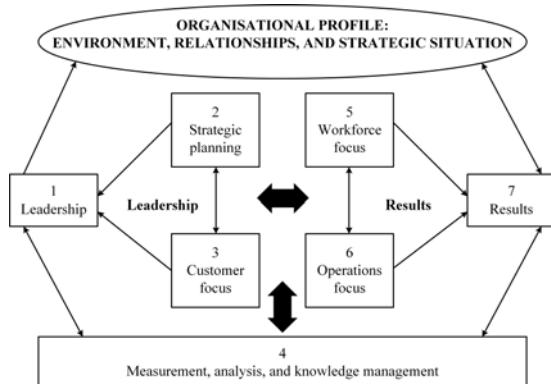

Figure 1: Malcom Baldrige model (ASQ, 2018)

Malcolm Baldrige model envelopes the health, safety, environment, and ergonomics aspects of the workforce in the organisation as they are interconnected in supporting the increased productivity of an organisation (Fabius et al., 2013). The Malcolm Baldrige model can be a standard to assess the performance of HSEEMS in organisations. Having safety and healthy workplaces, high productivity, less harmful environmental impact, and high job satisfaction among workforces will contribute to high corporate sustainability performance.

2.2 European Foundation for Quality Management model

The main idea of EFQM model is to improve collaboration, cooperation, and innovation within the organisation to improve sustainable corporate performance (Zapata-Cantu et al., 2016). It integrates eight important concepts consisting adding value for customers, creating sustainable future, developing organisational capability, harnessing creativity and innovation, leading with vision, inspiration, and integrity, managing with agility, succeeding through the talent of people, and sustaining outstanding results (EFQM, 2013). This model can be applied by organisations from various size and sectors (Mohammadfam et al., 2013). EFQM (2013) observed that the EFQM model enables practitioners to comprehend the relationships between enablers, which refer to the criteria that organisations need to manage, and results, which refer to the achievement according to the business strategy. The EFQM model includes five enablers criteria and four results criteria. Figure 2 illustrates the main criteria of the EFQM model.
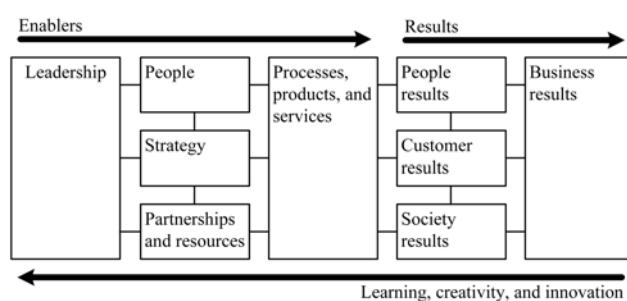

Figure 2: European Foundation for Quality Management (EFQM, 2013)

EFQM can be adopted for developing the performance evaluation of indicators of HSEEMS as it is widely adopted by organisations and easy to interpret. Similar to Malcolm Baldrige model, EFQM model stimulates improvement on the organisational performance (Para-González et al., 2018). However, EFQM model includes self-assessment aspect because it is reflected motivating activities for key decision makers that participate in the implementation of the model.

3. Research methodology

The identification of performance evaluation indicators for HSEEMS initially began with a review of various studies in HSEE and quality performance evaluation. The Malcolm Baldrige and EFQM models are the most suitable models to be adapted for determining the HSEEMS performance evaluation indicators as they consider the health, safety, environment, and ergonomic aspects. To identify the HSEEMS indicators, all criteria of the models are included and evaluated by a number of experts in the field of HSEE interview. In this process, the experts determine which criteria from the models is considered important. The experts also identify other necessary indicators that need to be included in the HSEEMS indicators. Figure 3 summarises the research flow of the present study.
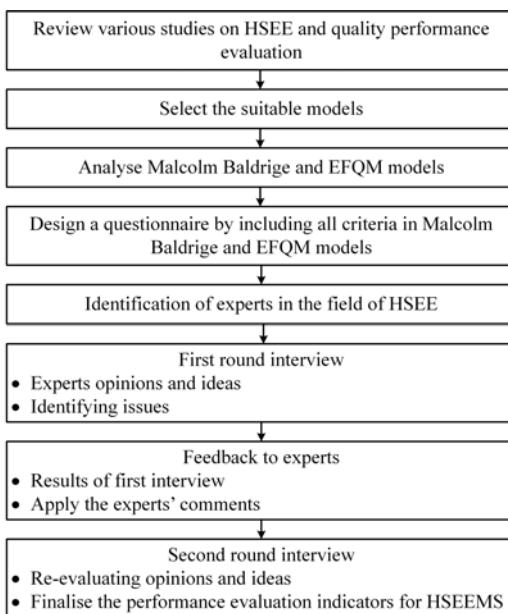

Figure 3: Research flow

4. Performance evaluation indicators for HSEEMS

The interview results reveal that the performance evaluation indicators for HSEEMS include eight criteria consisting of leadership, strategy, risk analysis, personnel, resources, HSEE implementation, stakeholders' effects, and key performance effects. Leadership, strategy, personnel, and resources criteria are adapted from Malcolm Baldrige and EFQM models, whereas risk analysis, HSEE implementation, stakeholders' effects, and key performance effects are identified by experts. Figure 3 presents the considered criteria in the questionnaire and identified criteria for HSEEMS performance evaluation.

The experts stated that there are numbers of criteria that should be specified and added as criteria in HSEEMS performance evaluation. These criteria include risk analysis, personnel, HSEE implementation, stakeholders' effects, and key performance effects. Risk analysis is an assessment to reduce the level of incidents in a workplace. This process intends to protect the workforces and business as well as complying with government laws and regulations. Personnel is related to the workforces in an organisation. Organisations require to assess their workforces and create a positive work culture to achieve mutual benefits between organisation and individual. Excellence organisations develop their personnel capabilities, encourage equality, appreciation, and communication so that the workers devote their skills and knowledge to achieve business goals and objectives. HSEE implementation includes various activities of planning, execution, evaluation, and improvement. Organisations should evaluate their HSEE implementation process to achieve stakeholders' satisfaction. Stakeholders effects are related to the fulfilment of internal and external

stakeholders' requirements. Excellence organisations accomplish and maintain outstanding business results that meet the stakeholders' needs and expectations. Key performance effects refer to quantifiable indicators to enhance the performance of HSEEMS implementation in an organisation. Organisations need to develop a set of key performance indicators to determine the successful implementation of the HSEE strategy based on the needs and expectations of internal and external stakeholders. Figure 4 provides an overview of the performance evaluation indicators of HSEEMS.
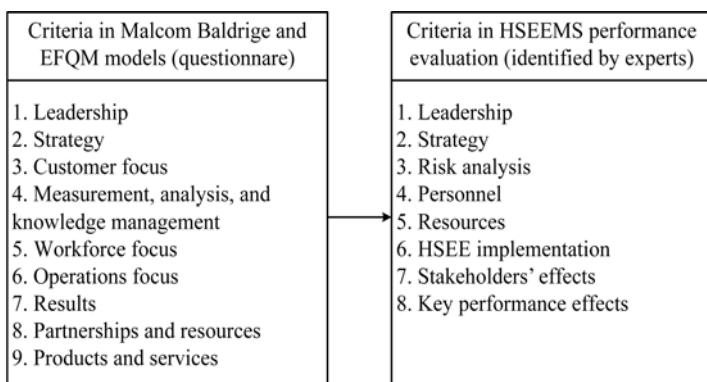

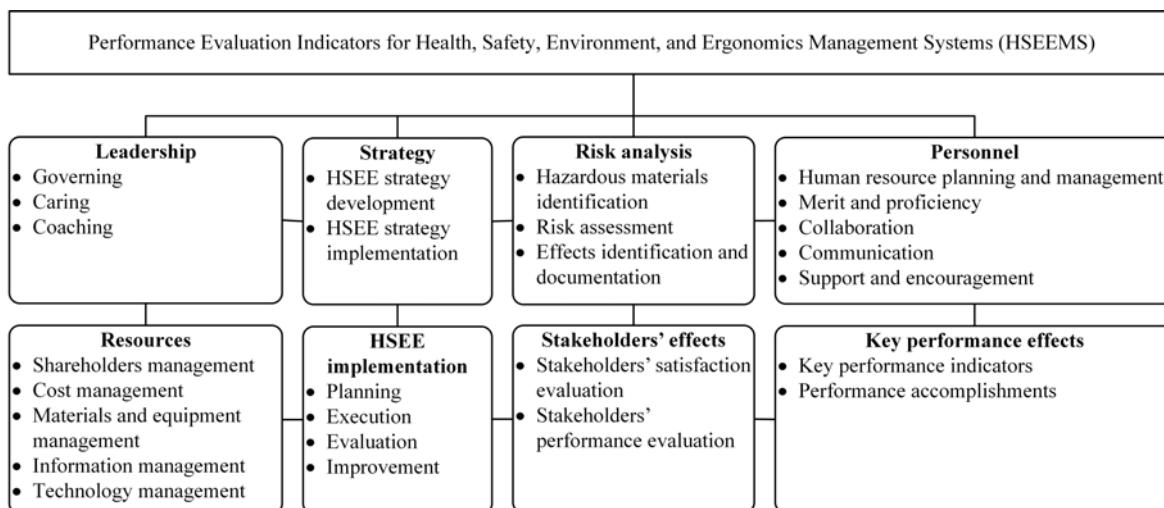*Figure 3: Performance evaluation indicators for HSEEMS*

Figure 4: Performance evaluation indicators for HSEEMS

The HSEEMS performance evaluation indicators include eight main criteria comprising leadership, strategy, risk analysis, personnel, resources, HSEE implementation, stakeholders' effects, and key performance effects and each of them has its sub-criteria, as shown in Figure 4.

The identified HSEEMS performance evaluation indicators can be used to assess the performance of the HSEEMS implementation in organisations. It provides a valid evaluation framework for organisations to follow in their HSEEMS implementation and improve it. The benefits of adopting the HSEEMS performance evaluation indicators that can be reaped by organisations include identification of current business level of organisation, identify the strengths, weaknesses, and possible improvement, stabilise and appraise stakeholders' requirements and expectations, and lead the organisations into an excellent organisation.

5. Conclusions

This study intends to identify performance evaluation indicators for HSEEMS. Various criteria of Malcolm Baldrige and EFQM models are analysed and compared by HSEE experts to determine which criteria are important and suitable as the HSEEMS indicators. It involves two round interviews to identify the final indicators. Experts also determined other criteria that need to be considered in evaluating the performance of

HSEEMS. As a result, eight criteria including leadership, strategy, risk analysis, personnel, resources, HSEE implementation, stakeholders' effects, and key performance effects have been identified. Leadership, strategy, personnel, and resources criteria are adapted from Malcolm Baldrige and EFQM models, whereas risk analysis, HSEE implementation, stakeholders' effects, and key performance effects are identified by experts. The analysis results reveal that the identification of these criteria would contribute to the effective implementation of the health and environmental safety of workplaces. The workplaces that implement HSEEMS can diminish the injury and illness cost by 20 % to 40 %.

Acknowledgements

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