



## **SUSTAINABILITY COMPETENCY PROFILING (SCP) FOR MALAYSIA SME MARINE INDUSTRY USING DELPHI AND FUZZY AHP-TOPSIS APPROACH**

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### **ABSTRACT**

*Since the increasing of companies addressing the sustainability principles in companies' operation, developing countries especially in Malaysia are start utilizing sustainability management plan in order to create green workplace behaviour. But, only 5% of manager aware plans of United Nations Sustainable Development Goals (UN SDG) and 32% of CEOs were familiar. In needs to comply with current sustainable development goals as a bridging gap between the governor and the practitioner, will the attitudinal parameter affecting the sustainability performances? Consequently, this research will deals with a development of Sustainability Profiling Competency (SCP) of sustainability performances in order to examine the attitudinal parameter that affecting decision making process in the context SMEs Marine Industry in Malaysia by using the integration of Delphi and Fuzzy AHP-TOPSIS approach. As a guideline, this approach will quantify the sustainability compliances of the industry which help the industry especially the decision maker to measure the critical element of sustainability compliance in decision making process.*

**Keywords :** *Sustainability, Deiphi, Fuzzy AHP, Fuzzy TOPSIS, SMEs*

### **1.0 INTRODUCTION**

In a big perspective of industries, top management of an organization shows their commitment to the implementation of environmental practices through direct involvement in the environmental issues of the firm by appointing senior managers to oversee the environmental issues of the firm [1]. Top management must understand the implementation of the environmental initiatives and make provision for the necessary resources for the successful implementation of environmental practices. Knowledge of industrial organization, governance structures and coordination mechanisms can guide policy towards the most efficient use of scarce resources where the policies directed at SMEs will be ineffective if the cluster has lead firms or core firms that are not interested in the programs [2]. The significant of SMEs going forward are bound to be even bigger and more essential if the SMEs performance constrained by both internal and external factors [3]. SMEs sector has attracted increasing and significant attention from policy makers which focused on development, business birth rates and entrepreneurship for provision of increased employment, economic development and innovation [4].

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In Malaysia, the barriers of adopting sustainable are related to law and regulation, the government of Malaysia fails to regulate and enforce due to the lack of a legislative framework [5]. In order to change the conventional 3E's (Economic, Environment and Equity) and 3 P's (people, profit and planet) concept to make a more actionable framework, it is a must to add the ethical and educational elements along with environmental and economic [6]. It is also important to set goals to create an effective management plan that can account for biological diversity, ecosystem stability and human well-being [7]. Thus, green workplace behaviour of person-environment interaction, job performance, and motivational in organization level positively influenced the sustainability practices and performances [8]. Indeed, many companies already start to integrating the sustainability principle into their decision-making [9] and addressing the sustainability issues of the companies' operation as consuming resources to meet demands of the companies' issues [10]. Small and medium enterprises (SMEs) in Malaysia account for a large proportion of the total business in various sectors and contribute a considerable share in terms of GDP [11] and make up 99.2% of the businesses in Malaysia [3]. SMEs in Malaysia are on track to contribute 41% to the country's GDP by 2020 compared to 32% in 2012, and the local SMEs are now suppliers for multi-national companies (MNCs) [12]. Meanwhile in Malaysian, only a notable number of companies are publicly initiated towards United Nations Sustainable Development Goals (UN SDG) since the launched in 2015. According to surveyed from the Global Opportunity Report 2016, 23% of CEOs planning to response to the goals with 32% were familiar but only 5% of manager aware with the plans on SDG [13].

## **2.0 LITERATURE REVIEW**

Regardless of the pressure for environmental issues incorporation and the consequent growing demand for information, most companies still know very little about the potential environmental and social impacts of their production networks [14]. And because of the financial and recourse limitations [15], the large firms have an advantage for adopting sustainable practices and SMEs adoption is necessary in the long run [16]. Hence, SMEs still regard integrating environmental practices into sustainable management as something new and pointed out that small- and medium-sized manufacturers were less active in sustainable management than their larger counterparts [17]. The information in regards to sustainable practices among SMEs still remains scarce, embarkation on environmental management was still less promising than larger firms [18]. While in marine perspective, data availability, knowledge gaps and uncertainty are the main controlling factors for the appropriate management decisions in order to guide proper sustainable management [19]. In order to achieving better sustainability performance will require systematic schemed by moving from a business-as-usual approach which dramatically affect organization's performance [20].

In contrast, this research typically study on the subject of the sustainability activities in Malaysia SMEs Marine industry where involve a lot of systematic review to delimitate and structure the current sustainability management performance and discipline. The conceptual framework is develop as a guideline of this research to conduct sustainability assessments by providing elements of sustainability management performance of current leverage. It is because the sustainable frameworks is a key business that will offers a systematic way to the companies to develop competitive benefits and responsible for understanding the concept of decision support system [21]. The framework will allow the companies to organize, evaluate, and observe their own sustainability performance over specific time [22]. Afterward, the framework in Figure 1 is construct as adopted from [23] with customizations, where combining the factor that influencing decision making process with 3 aspects of performance principles (economic, environment and social). Generally, the Sustainability Competency Profiling (SCP) will develop from the

conventional management plan cycle after decided the indicators in monitoring stage. Then the evaluation of SCP will translate to decision stage for decision maker to select the most appropriate decision.

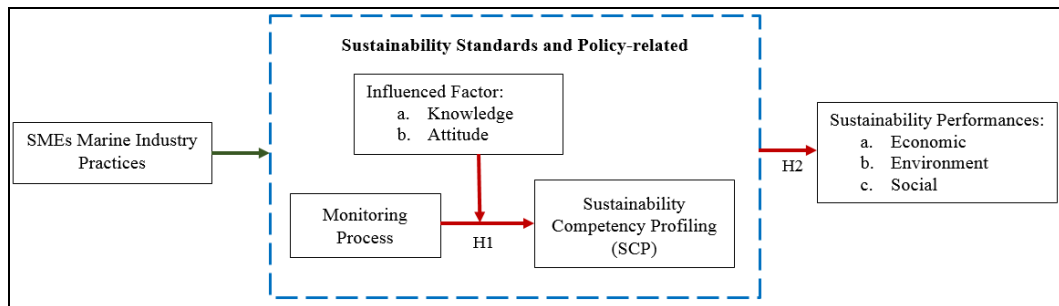


Figure 1: The proposed framework

## 2.1 The Influenced Factor of Decision Making

Accordingly, the framework considers the pressure imposed by sustainability activities on some aspects of the system, the state of that aspect and the actual or desired societal response. Malaysian manufacturers suggested that sustainable practices perspectives were significantly improves the sustainability performances [24]. Though, to develop a long-term sustainability practice, the organization needs to assume the liability of indorse activities on sustainability and start with understanding the need that drive sustainability practices [25]. It may be desirable to define indicators of pressures or driving forces since such forces are often the subjects of management intervention [26]. Significantly, [27] proofed with attitudinal parameter into risk management aspect that the impact of persons' attitude affected the decision making regarding sustainability practices. This subject also support by [28] that the expert opinion may be biased, inconsistent, or poor altruistic which leads to inadequate decision making. But then, the reliability of an expert's judgments may not corresponded to conventional knowledge that depend on qualifications and experience. It is because of the individuals own an attitude that surrounded by behavioural control and consciousness, where an intended behaviour is positively correlated of attitudes and actions [8]. On the contrary, will the consciousness on subject field influencing the judgment by knowledgeable decision maker? Based on this issue, this study proposed the following hypothesis:

**H1:** *The sustainability expert decision maker is positively correlated with the sustainability consciousness for sustainability practices in Malaysia SMEs Marine Industry.*

## 2.2 Performances

For the second part of the framework, it will discover on the impact of the sustainability activities that guided by standards and policy-related especially on UN SDG. Based on [23], the 3-level analytical assessment model (as in Figure 2) is developed from the weight of the sustainable performance practices impacts that corresponded to degree of maturity which signifies the degree of sustainability implementation in an organization. The sustainability practices of SMEs Marine Industry will be evaluate through Sustainability Competency Profiling (SCP) in order to generate a tangible result as an indicator of sustainability for decision making and knowledge of whether the objectives established in the sustainability strategies are achieved. The indicators is important in order to heighten the communication, transparency, effectiveness and accountability in natural resource management, while decision making involves reconciling competing objectives and interests [26]. Indeed, it is desirable to undertake the changes serially where the 'improvement cluster' approach to policy implementation is more effective

because it addresses several coordination problems at the same time [29]. Though, the coordination are essential in order to achieve a positive impact, maximize the economic and social growth [30].

**H2(a):** *Sustainability practices that guided by sustainability standards and policy-related are positively related to economic performance.*

**H2(b):** *Sustainability practices that guided by sustainability standards and policy-related are positively related to environment performance.*

**H2(c):** *Sustainability practices that guided by sustainability standards and policy-related are positively related to social performance.*

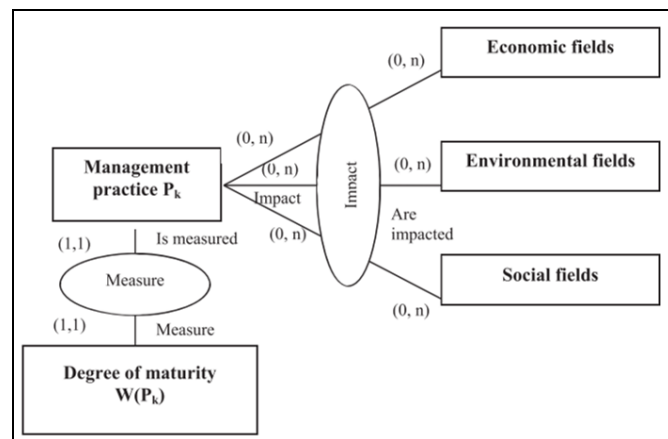


Figure 2: The 3-level analytical assessment model by [23]

Indeed, answering these questions can make several valuable contributions to the literature. Specifically, this research examines the decision making reliability on the sustainability management along with the impacts of sustainability practices that guided by sustainability standard and policy-related in Malaysia SMEs Marine industry's environmental, financial as well as social performances. In contrast, the relationship of sustainability practices, the reliability of decision making management, and the impacts on sustainability performance that guided by standards and policy-related management in SMEs Marine Industry have been largely unexplored. Such an empirical exploration could help in establishing the extent to which various drives contribute to industry's engagement in sustainability.

### 3.0 METHODOLOGY

As a concept of this research, the methodology is developed based on two types of characteristics which are the criteria of sustainability and SMEs. While the Sustainability Competency Profiling (SCP) will evaluate the sustainability practices with the integration of Delphi, Fuzzy AHP and Fuzzy TOPSIS. Delphi method is a systematic process to extract the expert opinions on a specified topic through a series of questionnaires and low cost tool that can be applied for gaining judgments on complex matters in lack of precise information [31]. In 2009 [32], the study concluded that the Delphi-variant used in the study was practical in providing a well-defined and translucent means of discovering the complexities of subject field. Indeed, fuzzy logic is necessary for handling values human judgment in decision making because of the unclear and hard to estimate by exact numerical which characterized by vagueness and imprecision [33]. As the methodology has the potential to transform qualitative data into equivalent quantitative measures for this research, Fuzzy AHP will be used to create weights for main and evaluation criteria, while Fuzzy TOPSIS will be used to aid the ranking of options in terms of their potential

to meet the overall objective based on the evaluations and preferences of policy makers [34]. Generally, the methodology will be start with the step to define the indicator criteria, determine the relative weights of every criteria, and lastly to translate the sustainability performance ranking. The dimensions for the indicators will be evaluated by industry experts, and the uncertainty of human decision-making was taken into account using the fuzzy concept.

### 3.1 Identifying the influenced factor

As a starting point of this research, a pilot study has been done on the influenced factor; attitude and knowledge that affecting sustainability practices in Malaysia. Previous study conveyed that a questionnaire survey is a systematic content analysis of antecedent conceptual framework for sustainable innovation [35]. Accordingly, a pre-coded questionnaire survey was administered using an electronic (online) approach to identify the sights both expert group SMEs industry and management personnel in sustainability practices towards policy-related in Malaysia. The questionnaire survey was conducted online to 5 companies with a total of 20 respondents randomly but only 11 respondents were responded which represents 55% of response rate. Thus, the response rate for this research was over the expected target and Figure 3 shows the result of the survey.

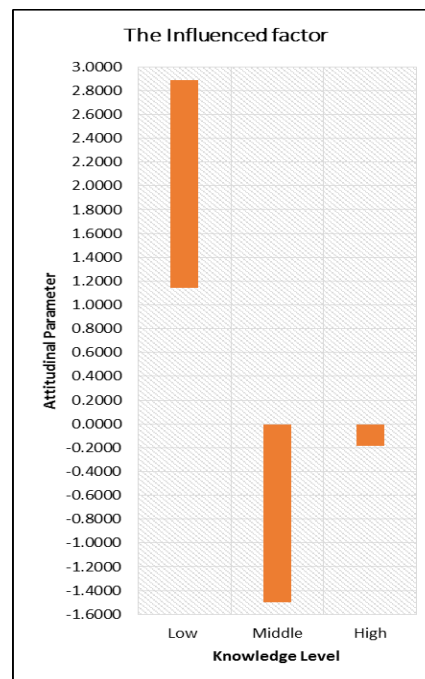


Figure 3: The influenced factor that affecting decision making

### 3.2 Defining indicators criteria for Sustainability Competency Profiling (SCP)

In order to assess the progress towards the objectives, it is needed to define the criteria of sustainability management and its practices performance of current leverage by using modified Delphi method-based decision group which will be use five steps of procedures:

- i. Establish experts group from Marine Industry and Sustainability.
- ii. Conduct the first round of a questionnaire survey.
- iii. Conduct the second round of a focus survey.
- iv. Identify and finalised the criteria for SCP.
- v. Integrate and structure the expert opinions to reach a consensus.

The criteria for SCP is consider the feasibility, data availability, cost and other factors based on the conventional marine system and management plan cycle to determining the practicality of implementing the indicators. However, [26] states that the choice of indicators for a system should be restricted to a limited number of effective indicators, based on the following:

- Policy priorities
- Practicality/feasibility
- Data availability
- Cost-effectiveness
- Understand-ability
- Accuracy and precision
- Robustness to uncertainty
- Scientific validity
- Acceptability to users/stakeholders
- Ability to communicate information
- Timeliness
- Formal (legal) foundation
- Adequate documentation

### **3.3 Determining the relative weights of every criteria**

In order to transform qualitative data into equivalent quantitative measures from Delphi method, Fuzzy AHP will be used to determining the relative weights for each criterion of SCP. Though, [36] suggested the calculation for the weights of each criterion by using five steps of procedures:

- i. Define the value of fuzzy synthetic
- ii. Establish each fuzzy positive reciprocal matrix
- iii. Calculate the eigenvalue and eigenvector
- iv. Perform the consistency test
- v. Compute the weights of the elements

### **3.4 Translating the sustainability performances ranking**

Lastly, the ranking of the performances of sustainability practices of SCP translate into the sustainability competency profiling graph where the relationship of the consciousness practices and performances. By using the Fuzzy TOPSIS method, the ranking will use five steps of procedures:

- i. Calculate the weights calculated by fuzzy-AHP
- ii. Determined positive-ideal and negative-ideal solution
- iii. Calculation of separation measures using the n-dimensional Euclidean distance.
- iv. Computation of relative closeness to the ideal solution.
- v. Rank the preference order.

## **4.0 CONCLUSIONS**

This research in general study on the subject of the sustainability practices in SMEs Marine Industry that assimilate the structure of the current sustainability management performance and discipline. As a guideline of this study, the conceptual framework is developed in order to examine the construction of management concept in decision making during assessment stage. At the first part of this research will evaluate the correlation of the sustainability expert decision maker with the sustainability consciousness for sustainability practices in Malaysia SMEs Marine Industry by using Modified Delphi method. Then, the Sustainability Competency Profiling (SCP) will measures the relationship of the sustainability practices that guided by sustainability standards and policy-related with the sustainability performance of Malaysia SMEs Marine Industry by using Fuzzy AHP-TOPSIS approach. The result of SCP will be materialised in a graphing result where it will profiled the impact of sustainability performances toward the influencing factor of decision making process (sustainability knowledge and consciousness) when assessing the sustainability performances in SMEs Marine Industry of Malaysia. Which can help to guide the decision or policy maker to decide the most appropriate decision especially for any SMEs Marine organisation.

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