

# Assessing Sustainability in Environmental Management: A Case Study in Malaysia Industry

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**Abstract.** The scarcity in measuring the sustainability accomplishment has been restrained most of the companies in Malaysian industry. Currently, there are variety types of the measurement tools of the sustainability assessment that have been implemented. However, there are still not achieving the inclusive elements required by the worldwide claim. In fact, the contribution to the sustainability performance are only highlighted on the nature, financial along with society components. In addition, some of the companies are conducting their sustainability implementation individually. By means, this process approaching type is needed to be integrated into a systematic system approach. This paper is focussing on investigating the present sustainability tools in the environmental management system for Malaysian industry prior to the quantification of the sustainability parameters. Hence, the parameters of the sustainability have been evaluated then in order to accomplish this project. By reviewing on the methodology of this research it comprises of three phases where it starts with the analyzation of the parameters in environmental management system according to the Malaysian context of industry. Moving on to the next step is the quantification of the criterion and finally the normalisation process will be done to determine the results of this research either it is succeeded or vice versa. As a result, this research has come to the conclusion where the level of the sustainability compliance does not achieve the standard level of the targeted objectives though it has already surpassed the average level of the sustainability performance. In future, the understanding towards the sustainability assessment is acquired to be aligned unitedly in order to integrated the process approach into the systematic approach. Apart, this research will be able to help to provide a measurable framework yet finally bestowing the Malaysian industry with a continuous improvement roadmap in achieving excellence in environmental management system.

## 1. Introduction

The idea of sustainability or sustainability development has grown rapidly into many levels of society over the last decade [1-2]. Recently, the growth in demand for the manufacturing products with the sustainability conditions are keep increasing [3-5]. Most of the companies in Malaysia must extremely zealous to compete each other in producing a sustainable product without neglecting their financial side [6]. In addition, our Malaysian industry are experiencing an utterly rapid improvement in the engineering phase of bringing forth a good quality goods [7]. However, the assessment of the



sustainability requirements in the environmental management system in our country are not comprehensively covers the elements needed in the green practices.

Views from the Bursa Malaysia is clearly justified that they are strongly committed to support the sustainability practices in our Malaysia industries. They are really devoted in creating the green environment practices in the industries all over our country. Therefore, all of the registered companies that have been patronage under the Bursa Malaysia must have the elements of the sustainability practices in their working area comprehensively [8].

In order to fulfil this current requirements, the application of the green project management is the most desirable tool that will act as our guideline in encouraging the sustainability assessment in the environmental management system for Malaysian industry. Hence, an exhaustive sustainability report surely can be prepared by the firms itself as required in the Bursa Malaysia [7].

Equally important in this topic is the sustainability assessment in the environmental management system is the utmost important issue since it will be measured the fulfilment of the criterions needed in the integration of the sustainability endeavours. The convergences of this process will then follow by the preparation of the sustainability reports. However, the existed sustainability practices and reports are only concern on the environment, social and financial [7].

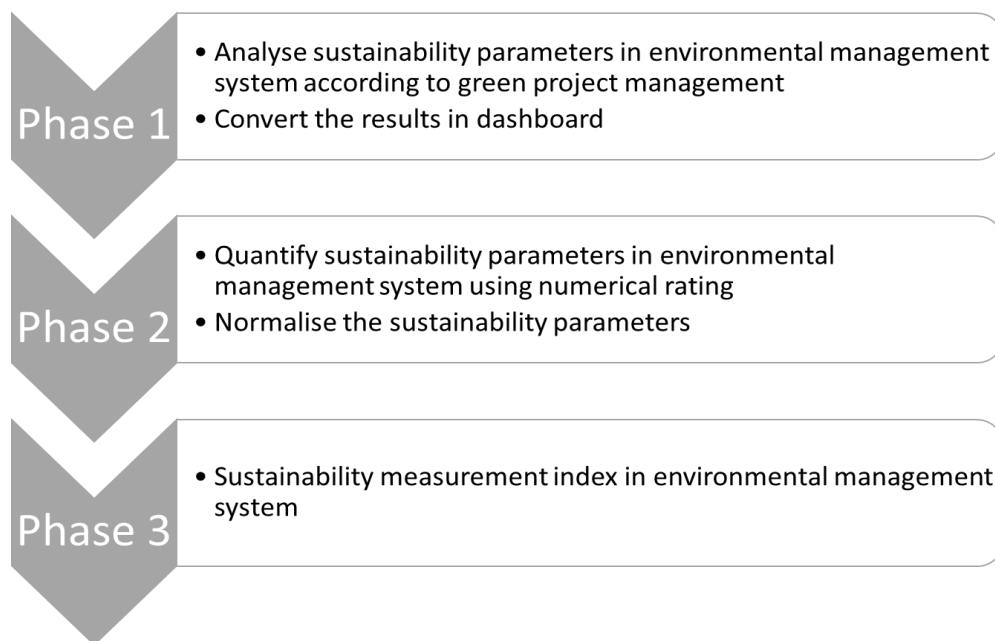
Hence, to overcome the dearth in the reports, the green project management is taken to be as a guideline in order to measure the level of the sustainability practices extensively in the management system in the manufacturing field including the process and the product in the environmental of manufacturing industry itself. This effectual measurement tool will guide the management system on how to gain a sustainability environmental waste management especially in our Malaysia context of manufacturing industry.

The main objective regarding to this proposed project is to appraise the sustainability awareness level in Malaysian manufacturing industry and measuring the level of sustainability practices that have been implemented by the consumers. Referring to the explicit target in our purposed project are as follows:

- (a) To investigate the level of sustainability compliance using green project management.
- (b) To quantify selected sustainability parameters related to the environmental management system for Malaysian industry, i.e. environment, safety and health.
- (c) To contrive a new sustainability assessment tool that will be able to compute the level of the sustainability compliances.

## **2. Methodology**

The depicted Figure 1 below shows how the general framework of the proposed approach.



**Figure 1.** General framework of proposed approach

### 2.1. Phase 1

To go deep through into the real complication that might be faced by the industries, the distinguishing of the root cause of the problems is the predominant step to be taken out before proceeding to the next level. Thus, five companies from the manufacturing sector that covers in Nilai, Shah Alam, Pekan, Kuantan and Port Klang.

By reviewing to the targeted companies, the problem that have been encountered by them is the limitation that occurs during the implementation of the sustainability assessment where most of the existence measurement tools are only emphasize on the environmental, economy and governance aspects. Some of the companies also implementing different of sustainability indicators to evaluate the performance of economy, social and environmental separately.

Moving on to the next step is where the collection of data is being carried out by some of the research questions. The scale between -3 to +3 was developed to ease the respondents' group for rating the evaluation criteria as depicted in Table 1. Equally important in this method is where the questions are generated by using the green project management that serves as a reference. The green project management concept integration matrix is describing below:

- Product impacts – objectives and efforts, lifespan and servicing
- Process impacts – maturity and efficiency
- Society (People) – labor practices and decent work, society and customers, human rights, ethical behaviour
- Environment (Planet) – transport, energy, water, waste
- Financial (Profit) – return on investment, business agility, economic simulation

Table 1 shows the example of voice of customers and each relevant design criteria.

**Table 1.** Scale of “Weighting criteria” from -3 to +3

<b>Numerical Rating</b>	<b>Descriptions</b>
<b>3</b>	Negative Impact High
<b>2</b>	Negative Impact Medium
<b>1</b>	Negative Impact Low
<b>0</b>	Neutral
<b>-1</b>	Positive Impact Low
<b>-2</b>	Positive Impact Medium
<b>-3</b>	Positive Impact High

### 2.2. Phase 2

Subsequently at this phase, the research study continues to the point of quantifying and normalizing the data gathered according to the “Functional Based” and “Criteria Based”. For the “Functional Based”, the data is being summarized according to the 3P’s elements which are People, Planet and Profit that is correlated to the Product and Process factors. In addition, the normalization of the results is illustrated using the pie chart.

Moving on to the next is the “Criteria Based” where the statistics of data is being interpreted according to each of the criterions. The minimum, maximum and average values of each criteria part is computed in order to discover the deviation gap of the sustainability compliance level in the companies. As a result, the degree of sustainability assessment can be measured either it is comprehensively implemented or not by referring back to the five elements of the society, nature and financial correspond with the product and process parts in the environmental management system.

### 2.3. Phase 3

Result of sustainability compliance ratio of each sustainability parameters are proposed to be ranked as shown in Table 2. The outcomes of the project of study is returned back to the companies to get their feedback according to the measured statistics data.

**Table 2.** Proposed ranking of sustainability compliance [7]

<b>Ranking</b>	<b>Description</b>
<b>80 – 100%</b>	Complied (Accepted)
<b>50 – 79%</b>	Partially complied (Conditionally accepted)
<b>0 – 49%</b>	Not complied (Not accepted)

According to above ranking, engineer and project manager can do their self-assessment on the critical element of sustainability compliance and take necessary actions to improve the practice.

## 3. Results and Discussion

The process of gathering the data has been conducted in several departments of the companies using the same research questions. The research questionnaire has been distributed at the listed departments where the results is the transmitted into the scoring board that has used the green project management as the guideline. The correspondents are chosen from several departments that is related to the manufacturing sector in the Malaysian industry.

The “Weighting scale” is used during the distribution of the research questionnaire where the -3 value alluding to the highly positive impact meanwhile the + 3 rating scale will shows the highly negative impact of the sustainability compliance level in those companies. The departments involved in this field of study are:

- (a) Department of Production (Parts)

- (b) Department of Production (Assembly)
- (c) Department of Engineering
- (d) Department of Environmental Quality
- (e) Department of Quality Control

### 3.1. Criteria Based

Result of sustainability compliance ratio of each sustainability parameters are proposed to be ranked as shown in Table 2. The outcomes of the project of study is returned back to the companies to get their feedback according to the measured statistics data.

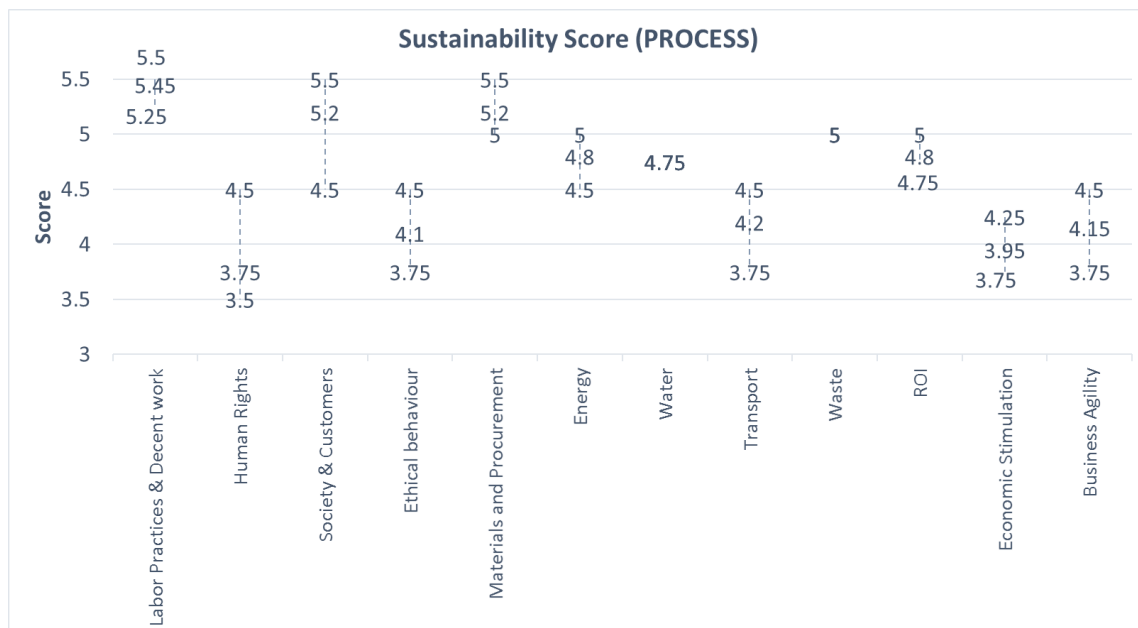
Here, at this section the data discussion will emphasis on the criterion based towards the sustainability compliance in the environmental management system for Malaysian context industry. By referring back to the formulated data that has been normalised earlier, the gap difference of the human's perception can be integrated to the sustainability assessment level of compliance by finding the value of the standard deviation from the raw data collected.

The data result has been sorted according to the each of the criteria that will interconnected to the Product and Process elements. It will demonstrate on how the data being normalised to get the spreading tendency of the data. This outcome is the utmost important peak point that will help to understand more about the relation of the sustainability assessment in the environmental management system.

#### (a) Process

The value of the data that covers from the five departments that have been mentioned earlier are being sorted according to the twelve criterions. The maximum and minimum value of the data can be determined directly from the categorised element meanwhile the average number at each of the criteria are being computed too. This calculated value indicates that the lower the value of the difference between the maximum and minimum value, the better the result is and vice versa.

Referring to the Figure 2 below, it shows that the gap difference of the maximum rating value of the Society and Customers that is from the People group is on the uppermost rank amongst all of the criterion which marks on 1.0 value. It shows that, this part of element is essentially needed the enhancement of improving the understanding of the sustainability concept in the environmental management system. Meanwhile, the zero value of the disparity between the maximum and minimum number of the rating values are from the Planet element which are (Water) and (Waste). It demonstrates that these parts are having no gap difference of understanding among the twelve-criterion listed.

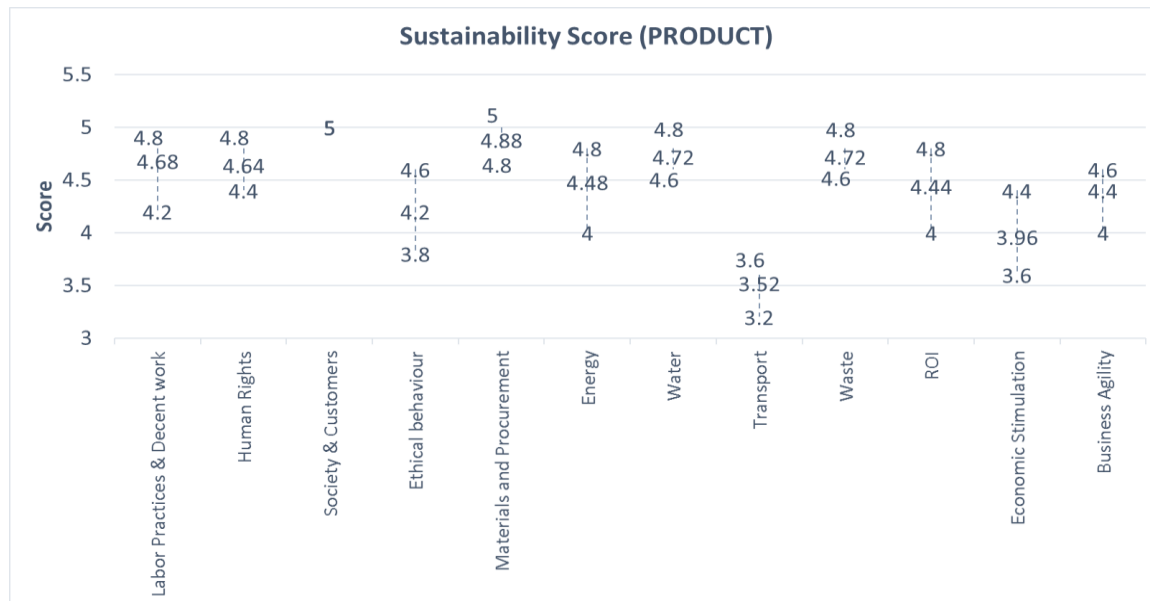


**Figure 2.** Criteria based score for Process

**(b) Product**

Graphically, the result in Figure 3 shows that there are several criteria having the same value of the gap difference of the understanding about the sustainability assessment in their company scope of the environmental management system. The value of the Ethical & Behaviour from the People portion, Energy from the Planet division and Return of Investment (ROI) along with the Economic Stimulation from the Profit part is 0.8 which is similar to each other.

In contrast from the Process line graph, the gap distinction of understanding in the terms of Product is the superlative one which is zero value by means there is no variance of ideas in the sustainability concept in the Malaysian context industry. Thus, this situation will make the process of reaching the main goals of this research study to be easier where the lower the gap difference of understanding variation, the better the results of the project study will be achieved.

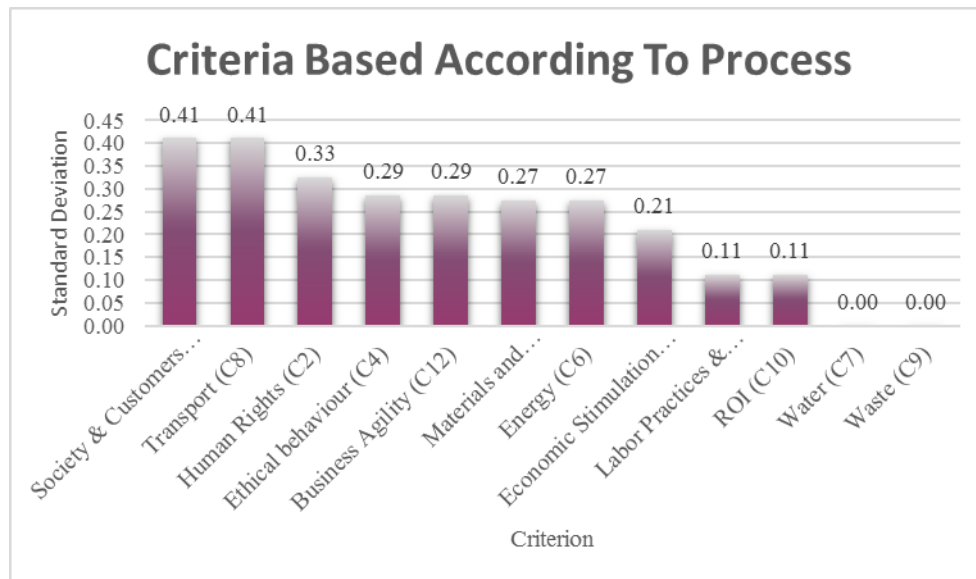


**Figure 3.** Criteria based score for Product

Moving on to the next part of this topic is the significant value of the standard deviation. The standard deviation can be defined as a numerical value in the units of the observed values that measures the spreading tendency of the data. Hence, the greater the value of the standard deviation at each of the criterion, it will indicate the challenging task in aligning them to the targeted objectives of this study will become harder and vice versa.

Concerning to Process bar graph in the Figure 4 below, it represents the standard deviation value according to each criterion from those elements in the sustainability assessment in the declining order. The highest value of the spreading tendency goes to the Society and Customer from the People group by 0.41 which is the highest rate among others. In addition, there are two types of the criteria from the Planet element which are Water and Waste that are having similar value of the dispersion of the data which indicates zero value. This situation shows that the outcomes from this part are showing such a good quality of sustainability measurement.

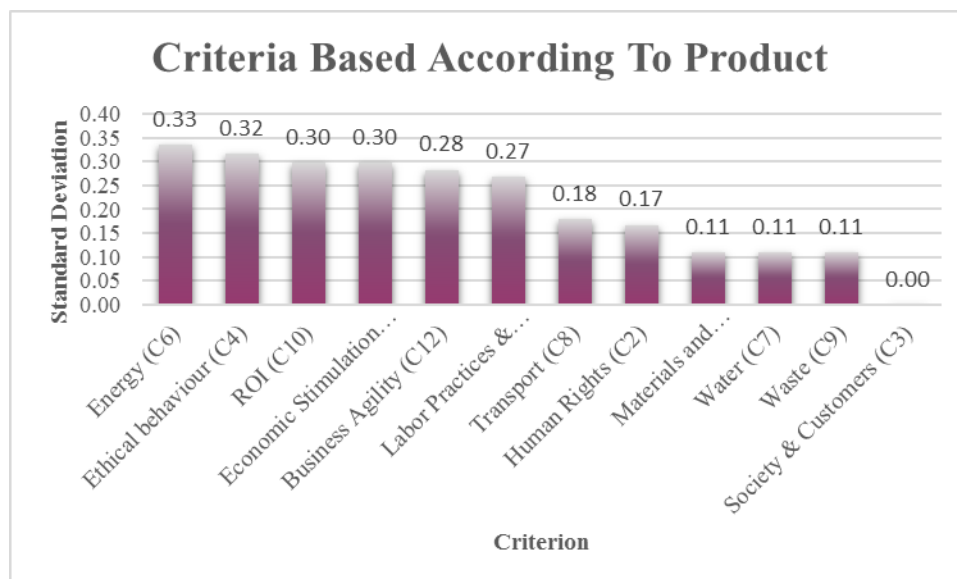
In contrast, the overall dispersion of the cumulative data is showing quite an enormous divergence in their understanding level of the sustainability compliance. It can be clearly seen when the disparity between the first highest value of the criteria which are Society and Customer along with the Transport part in the Planet group with the last two criteria which are previously stated is quite a huge difference value. 0.41 value marks that this restraint is compulsory to be reduced or even removed in the future.



**Figure 4.** Process bar graph illustrating the rank value of the standard deviation

Continuing to the Product bar graph in Figure 5 below, the Energy part which comes from the Planet criteria is laying on the topmost of the ranking. The value of the spreading tendency from this criterion is 0.33 only. Consequently, the overall overview of the criteria based graph in terms of the Product is portraying a slightly minimal value of the standard deviation obtained from the formulated data.

In contrast, there is only one criteria in this data that is having zero value of the dispersion data which is Society and Customers that comes from the group of People. It indicates that most of the interpretation from the respondents seems unbalance even though its having lower value of the spreading. Hence force, the overall observation portraying that there is quite a challenging mission of this research study in order to succeed the goals.



**Figure 5.** Product bar graph illustrating the rank value of the standard deviation



### 3.2. Process Capability

Here, at this point 25 subgroups of data have been extracted out from the raw data and the value of the Cp and Cpk is being computed according to its formula. The value of the Upper Specification Limit (USL) obtained is 5.36, Lower Specification Limit (LSL) marks on 3.80 along with the mean of the data which is 4.58 and its standard deviation is 0.26. Those important values in constructing the process capability is being mapped in to the line graph in Figure 5 and the normal distribution graph in Figure 6 below.

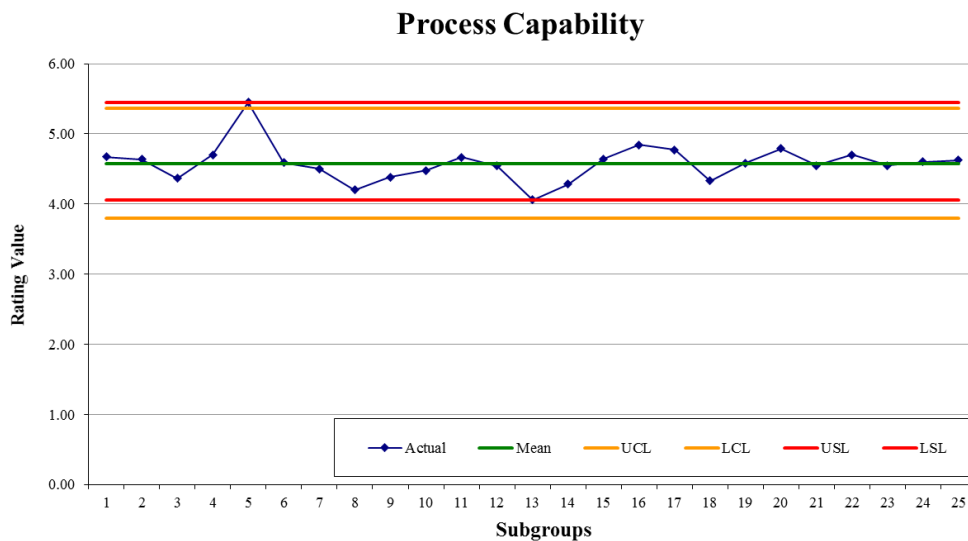


Figure 6. Process Capability line graph

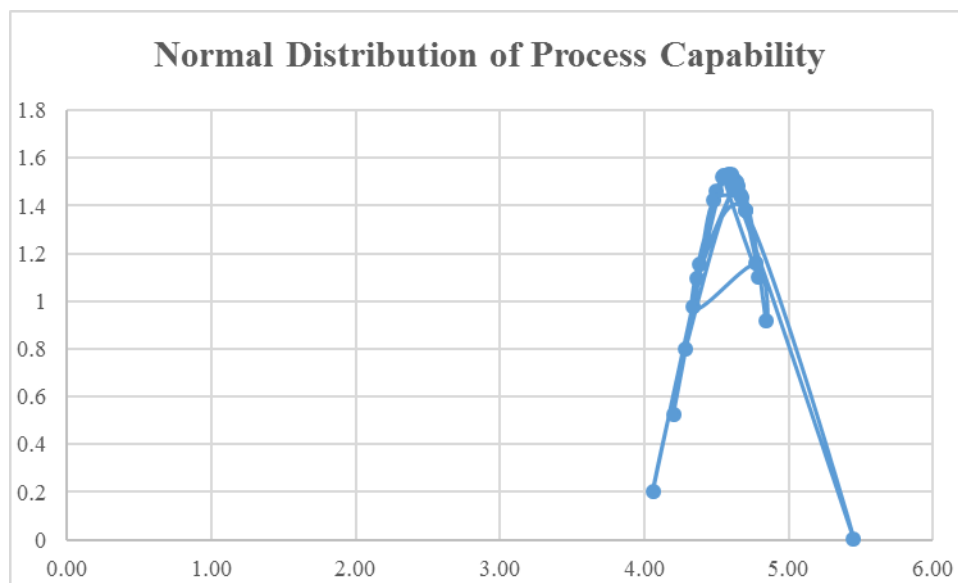


Figure 7. Process Capability "bell curve" graph

Aside from that, the calculated Cp and Cpk is 0.89 and 0.67 respectively where it indicates that the value of Cpk lower than the value of Cp. When the value of the Cpk is less than 1.00, it shows that the process study is producing the results that does not conform to the specifications. Next, the value of the Cp which also less than 1.00 exhibits that the process of the research is still does not capable to achieve the aim of this project study.

The illustration of this graph will depict on the variation of the respondents' level of knowledge in the sustainability assessment. They did have the ideas of this "green" practices yet still they are not able to interconnecting the new integrated ideas of combining the five elements of the sustainability into one concept of assessment. Here at this point, it shows on how diverse the data obtained from the research questions and it requires a vast improvement strategy to get their ideology toward this sustainability issue to be aligned into the united understanding.

#### 4. Conclusion

Conclusively, this research work is focusing on the sustainability assessment in the environmental management system for Malaysian context of industry. By means, it represents on how to integrate the current assessment for the sustainability concept for the environmental management system especially in the manufacturing field of industry. The existed approaching systems are not still in the deficiency level hence, it acquires a new solution to overcome this recent problem.

In the final analysis, the result performance is already expressed that the sustainability measure in the Malaysian industry are still under the satisfactory level. Attaching the previously stated graph result, the outcomes illustrating that the process capability does not equivalent to the field of research's objectives where the ranking value of the standard deviation that being arrayed in descending order is still showing a high value. The higher the value, the degraded the performance of the results.

Moving on to the process capability "bell curve" graph, the value of the Process Capability, Cp and the value of the Process Capability Index, Cpk is below 1.00. Therefore, it emphasizes that the sustainability practices in the environmental management system is still not obeying the comprehensively elements according to the GPM P5 Standard.

Most of the respondents that involve in this project research are having diverge of understanding about the sustainability compliance. Furthermore, their ideas towards this assessment are only restricted on the existed sustainability tool of measure which it does not comprises of the product and the process elements. Since the new integrated sustainability system approach is introducing the five components into the assessment, the outcomes will surely across-the-board of the current assessment in the sustainability practices.

In addition, it will help to fill the knowledge gap towards the sustainability compliance concept and provides new opportunities for further studies. Hopefully, the findings of this study will become a benchmarking purpose and as a point of references for the identifications in Malaysian industry especially in the environmental management system.

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