Sustainable Performance Measures for Malaysian Automotive Industry

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Abstracts: The purpose of this study is to examine the sustainable performance measures for Malaysian automotive industry using confirmatory factor analysis. In this study, sustainable performance measures focused on environmental sustainability, economic sustainability and corporate social responsibility sustainability. Confirmatory factor analysis was employed to test the model on a sample of 227 respondents in Malaysian automotive industry. The results of confirmatory factor analysis show that three factors for sustainable performance measures for Malaysian automotive industry were valid and reliable. This research provides fundamental knowledge and direction for researchers in further research as well as practitioners to constantly improve organizational performance through the implementation of sustainable performance in Malaysian automotive industry.

Key words: Sustainable performance • Environmental sustainability • Economic sustainability • Corporate social responsibility • Confirmatory factor analysis • Automotive industry

INTRODUCTION

Early in 1979, the idea of establishing an automotive assembling and manufacturing industry in Malaysia was suggested by the fourth Deputy Minister of Malaysia, Tun Dr. Mahathir Mohamad. To achieve the status of a developed nation for Malaysia, he created various strategic plans to accelerate Malaysia’s industrialisation capabilities such as PROTON, which was officially incorporated on May 1983.

Under this policy, two national car projects, namely Perusahaan Otomobil Nasional Berhad (PROTON) (founded in 1983) and Perusahaan Otomobil Kedua (PERODUA) (founded in 1994) have conquered the automotive industry, commanding 29% of the local market share for the year ending March 2011. For the long-term mission, Malaysian automotive industry is hoping to boost the industrialisation process to reach the status of a developed nation by the year 2020.

Recent development in the global economic situation has created the requirement for organisations to reconstruct and restructure their business strategy in order to sustain their performance and effectiveness while remaining competitive in the market positions. In addition, the role of quality improvement within an organisation has become a crucial issue in world-class performance [1, 2] such as productivity, quality, safety and environment. A particular evidence from PROTON Annual Report (2011) for the year ending 2010 stated that it had been a landmark year in terms of strengthening PROTON’s operational sustainability practices.

The sustainability initiative program is one of the business strategies in an effort to improve organisational performance [3]. Moving beyond its comfort zone into a more challenging zone, the organisation should be willing to take higher risks and be innovative as a golden opportunity to accomplish better achievement. Malaysian automotive itself should be prepared in several aspects...
such as reducing cost, improving quality and ensuring timely delivery in an attempt to achieve an excellent level in world class performance [4].

According to PROTON Annual Report [5], three risk factors were highlighted by PROTON which should be effectively managed because the existential risks might affect the sustainable performance (SP) of Malaysian automotive industry. Longenecker and Ariiss [6] pointed out that many organisations fail to accomplish desired performance result when implementing quality initiative programmes because of ineffective planning practices and failure to remove performance barriers. Thus, it is requires a strategic quality improvement practice [7, 8] such as SP in the attempt to jump to a higher level of the global competition.

Therefore, it is necessary for organisations to understand and measure their performance improvement in SP perspectives which aim to address the social, environmental and economic performance aspects [9-12]. Moreover, it assists the organisation to achieve its goals, understand its current situation and current issues and alternative solutions [13]. Effective performance measurement can be considered a significant factor in way of doing something, customers’ satisfaction, continuous improvements and work under control [14].

**Literature Review**

**Malaysian Automotive Industry**: Among the Southeast Asia region, PROTON has transformed itself from a humble car assembler to Malaysia’s largest auto manufacturer and indigenous original equipment manufacturer [5] until the establishment of the secondary national car marker, PERODUA in 1993. Both PROTON and PERODUA dominated the local automotive industry to bring Malaysia into a journey which is best summed up as one of pride, passion and progress.

Strategically located in the centre of Association of Southeast Asian Nations (ASEAN), Malaysia offers vast opportunities for global automotive and component manufacturers in order to set up manufacturing and distribution operations. Evidence show that Malaysia has been attracted global automotive companies (e.g. Toyota, Honda, Nissan, BMW and Peugeot) and international component manufacturers (e.g. Delphi, Continental, Denso and Bosch) in order to launch their product in this country and meet the highest consumer demands [15].

However, Malaysian government should also regulate the entry of foreign products in order to ensure the local automotive performance can survive in the local and global market. Thus, a regulatory structure practice was gazetted to protect and control the automotive manufacturing activity. South Africa, for example, could sustain their economic performance by adopting an import substituting policies [16].

The Brazilian automotive industry could create a fairly competitive automotive industry, based on a range of import substituting policies [17]. Current study by Wad and Govindaraju [18], the Malaysian automotive industry expanded in terms of sales, production, employment and local content, but failed in industrial upgrading and international competitiveness.

For this reason, the ASEAN Free Trade Area (AFTA) and the National Automotive Policy (NAP) were announced as industry protections to support the local automotive industry. Both AFTA and NAP have set up the main goal on the well-being of the Malaysian automotive industry in terms of competitiveness and industry expansion. For example, according to the AFTA policy, there are three main objectives namely: (i) to create a single market and an international production base; (ii) to attract foreign direct investments; and (iii) to expand intra-ASEAN trade and investments [19].

Thus, to face many challenges in the automotive environment, these policies could bring many advantages for the local automotive industry. Various efforts have been made by the Malaysian government in an attempt to establish the Malaysian automotive industry, directly and sub industry, indirectly.

**Sustainable Performance (SP)**: The successful implementation of sustainable development could improve more than one dimension of SP namely environmental sustainability, economic sustainability and social responsibility sustainability [20, 21].

In addition, existing performance measurement is used to improve organisational performance such as helping the organisation measure progress towards its goals, understand its current situation, address the key issues and the options available [13]. According to Ghosh [22], effective performance measurement can let us know about a way of doing something, achieve the goals, customers’ satisfaction, work under control and improvements are necessary.

Gadenne *et al.* [23] found that customer value, new product development and information capital performance are linked with a single sustainability performance management practices, whereas the other four performances such as environmental, employee value and
Table 1: SP Measures and Their Measurements Items

<table>
<thead>
<tr>
<th>SP Measures</th>
<th>Item</th>
<th>Literature/ Authors</th>
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<tbody>
<tr>
<td>EN</td>
<td>1. Reduction of air emissions.</td>
<td>[40, 41, 42, 43]</td>
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<tr>
<td></td>
<td>2. Reduction of effluent waste.</td>
<td></td>
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<tr>
<td></td>
<td>3. Reduction of solid wastes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Reduced in consumption for hazardous/harmful/toxic materials.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Reduced in frequency for environmental accidents.</td>
<td></td>
</tr>
<tr>
<td>EC</td>
<td>1. Reduced in cost of materials purchasing.</td>
<td>[44, 45, 46, 47, 48]</td>
</tr>
<tr>
<td></td>
<td>2. Reduced in cost for energy consumption.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Reduced in fee for waste treatment.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Reduced in fine for environmental accidents.</td>
<td></td>
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<tr>
<td>CSR Performance</td>
<td>1. Improved responsibility towards human right.</td>
<td>[49, 50, 51]</td>
</tr>
<tr>
<td></td>
<td>2. Improved responsibility towards safety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Improved personal desires of employees to do what is right.</td>
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Financial performance are linked with multiple sustainability performance management practices. To summarise, SP measurement is the process to identify how successful organisations or individuals have been in attaining their objectives and strategies.

**Sustainable Performance (SP) Measures:** Performance measures are critical for successful implementation of sustainability programs and actions both for the short and long term performance. The proposed SP consists of the three performance measures in 14 measurement items, for environmental and social responsibility which are measured by five items respectively, while economic item uses four items as shown in Table 1.

**Environmental Performance (EN):** The other research fields for industrial sustainability are developing and rapidly growing in order to reduce environmental impact in the most efficient way [24, 25]. Beyond environmental efficiency in manufacturing [26, 27, 28] have identified that minimising manufactured products is attracting more attention as energy cost is increasing as well as decreasing the environmental impact.

Environmental initiatives considered include ISO 14000 certification, pollution prevention, recycling of materials and waste reduction [29]; plant performance is assessed with the dimensions of the four competitive capabilities of quality, delivery, flexibility and cost. Hoppe and Coenen [30] suggest that prior lean manufacturing experiences are positively related to EN practices. In doing so, environmental sustainability requires improved resources use-productivity [31] in order to reduce natural resource material as well as consequent waste and pollutant outputs.

**Economic Performance (EC)**

Economic sustainability is the criteria by how a pound of profit is made are a building block in the creation of a just capitalism; progressive profitability must replace simple financial profitability as the sole yardstick of business success [32].

Rennings et al. [33] investigated the effects of different characteristics of EU Environmental Management and Auditing Scheme (EMAS) on technical environmental innovations and economic performance. They found that there is an increase in the number of employees, turnover and export. In short, a careful design of EMAS is important for both the environmental and economic performance of a facility.

Similarly, by using the Material Flow and Economic Exchange (MFEE) model, Kumar and Sutherland [34] have focused on certain profit-enhancement strategies which may be employed to ensure the economic sustainability in the US automotive industry.

**CSR Performance:** Over the decades, future business assessments should view CSR in the global market perspective. Hutchins and Sutherland [35] who evaluated social sustainability for supply chains have identified the positive impact of social change and the need to establish a comprehensive social footprint.

According to Parast and Adams [36] and Habidin et al. [37], CSR and benchmarking can effectively improve the organisational performance. The findings showed that top management support for quality is the main driver of practices associated with CSR. CSR appears to have a significant impact on internal quality results but it does not have a significant effect on external quality results. Flack and Heblieh [38] and Fuzi et al. [39] concluded that CSR is a way of promoting social trends in order to
enhance society's basic order, which is defined as consisting of obligations which cover both the legal structure and social conventions.

**Methodology:** All the data in this research was collected through a survey design with online and offline questionnaire. The questionnaire was administered simultaneously in each PROTON and PERODUA vendor by researcher. The questionnaire was mailed to the General Manager Level/Quality Control Manager or the person with the equivalent position in the company. These persons are best suited to self-report the decisions made regarding the manufacturing practices and the results of the quality program implementation. During the data collection, 227 questionnaires were answered completely by General Manager Level/Quality Control Manager in the Malaysian automotive industry.

**Reliability Analysis:** Reliability issues in current accounting literature have generally focused on the quantitative approach [52, 53]. According to Cronbach [54], Allen and Yen [55], Anastasi and Urbina [56] and Aiken [57], the first important thing for the researcher is to achieve an acceptable level of reliability. The recommended Cronbach’s Alpha value and internal consistency used in this study is in line with Cronbach [54] and the summary as shown in Table 2.

**Validity Analysis:** In quantitative research, validity is one of the most essential manifestations of research method. Validity refers to the extent to which the number obtained truly reflects what the user intended to measure. Particularly in quantitative accounting research, Ryan et al. [58] raise the ultimate question on whether the researcher can draw valid conclusions from the research design. Buckley et al. [59] seem to suggest they already believe that validity is not a belonging of the measure, but instead refers to the reliability of the conclusions which are drawn from the measure.

**RESULTS AND DISCUSSION**

**Exploratory Factor Analysis (EFA):** EFA with varimax rotation by 14 items from SP was done on random sample (n=227) of Malaysian automotive industry to produce basic details of each SP namely: EN, EC and CSR performance. KMO measurement showed the sampling adequacy as 0.92 which was greater than 0.70, signifying that the current data was suitable for principal component analysis. Similarly, Bartlett’s test of sphericity was significant at (p <0.001), indicating sufficient correlation among items to proceed for analysis as described in Table 3.
Fig. 1: Modified SP model: the output path diagram with three factors

Table 3: KMO and Bartlett’s Test for SP Measures

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | 0.916 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 2283.385 |
| df | 91 |
| Sig. | .000 |

Table 4: Results of Total Variance Explained for SP Items

<table>
<thead>
<tr>
<th>Factors</th>
<th>Number of items</th>
<th>First Eigen value</th>
<th>Percentage of variance explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP</td>
<td>1.357</td>
<td>75.033</td>
<td></td>
</tr>
<tr>
<td>EN</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSR</td>
<td>5</td>
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As shown in Table 4, these factors in initial solution had larger Eigen values from unity. The three factors taken into account were accounted as 75.03% of the total variance. This shows that three latent influences are associated. The last column of cumulative percentage indicated that the variance explained by extraction solution was also 75.03%.

Relating to the building of SP, 14 items were fitted in three factors as recommended. A varimax rotation was also done. The EN, EC and CSR items were incorporated into the expected structuring as originally designed. The load factor was higher than 0.40 to the factors and no item were suggested to be removed.

Confirmatory Factor Analysis (CFA): Measurement model test is the test whereby SP measures are tested using the first order confirmatory model and confirmed for evaluating construct validity by using the maximum likelihood method with multiple factors.

SP Measures with Three Factors: The first order confirmatory with multiple factors tested was SP with three steps consisting of EN, EC and CSR performance. The diagram is presented in Figure 1.

The CFA result demonstrated a good fit. Statistics of $\chi^2$ was 134.88 (degree of freedom = 74, $p < 0.001$); with a ratio of $\chi^2/df$, the value was 1.82 which was less than 3.0 thus exhibiting a good fit. GFI was 0.92 and AGFI was 0.89. CFI was 0.97, TLI was 0.97. The score was very close to 1.0, signifying perfect fit. RMSEA was 0.06 and less than 0.08 and reflected good fit. RC indicated a value of less 1.00, implying that discriminant validity was acceptable. Therefore, it confirms the ability of the three factors to measure the SP.

Through the measurement model of SP measures, three factors of model analysis as measurement model for SP measures demonstrated good fit and proved that this model is valid and reliable for Malaysian automotive industry. Finally, SP is represented by three variables namely, environmental, economic and CSR.
CONCLUSIONS

In this study, by using the SEM technique, three success factors for SP measures were developed and verified. The significant items were maintained to create an instrument of latent constructs and measurement items after conducting the validity and reliability tests. For this purpose, it helps academicians and practitioners in order to increase their knowledge and comprehension of SP implementation which can assist the automotive supplier to improve SP. Agenda for future research, the authors are interested to study the structural relationship between sustainable manufacturing practices, sustaining lean improvement and sustainable performance in Malaysian automotive industry.

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REFERENCES


