SUPPLIER PERFORMANCE ASSESSMENT TOOL IN AUTOMOTIVE INDUSTRY USING MULTIVARIATE ANALYSIS

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ABSTRACT

The supplier evaluation process is complicated because a variety of criteria must be simultaneously considered. In some approaches to supplier evaluation, only quantitative factors are allowed in the model, or qualitative factors can be used in the model but the data are replaced by the assigned numbers. In practice, different goals, multiple criteria, constraints and parameters that involve conflicting quantitative and qualitative criteria make the decision making complicated. This thesis presents a development of a supplier performance assessment tool to evaluate automotive suppliers based on multivariate analysis. A questionnaire was prepared and sent to 278 companies from automotive sector in Malaysia. 5 forms were provided for each of the company to perform total of 1390 recipients, thus giving 24.3 percent response rate. Attempts were made to find the extent of practices in 5 different factors; quality system, in-process quality, logistics and management, shipping and delivery, and after sales services. The results were analyzed using the SPSS software. Factor Analysis, one of the tools for multivariate analysis was used to design the assessment tool for Supplier Performance Assessment and Evaluation. It can also be used for Supplier Control. The procedure utilizes a proposed assessment tool; constructed from factor analysis to do the evaluation. Since the supplier evaluation is a decision problem combining multiple criteria or attributes into a single measure of supplier performance, the objective is to find a method that can be used to objectively evaluate the best supplier. It was also found that it is advantageous to use the proposed instrument as it requires minimal manual interferences. If the proposed instrument is executed and controlled regularly, the performance level of automotive suppliers may be improved continuously. As a conclusion, this study may be able to assist automotive suppliers to maintain and improve their performance. This will support our Malaysian automotive industry as a whole.

ABSTRAK

Pengukuran prestasi pembekal atau vendor adalah agak sukar dan kompleks kerana ia melibatkan banyak faktor dan ciri-ciri yang perlu dipertimbangkan secara serentak. Di dalam sebahagian kaedah yang digunakan untuk mengukur prestasi vendor, hanya faktor-faktor kuantitatif yang diambil kira dalam model penilaian, ataupun hanya faktor-faktor kualitatif yang diterjemahkan dalam bentuk angka supaya ia dapat digunakan sebagai pengiraan. Dari segi amalan, matlamat yang berbeza, kriteria yang pelbagai, kekangan dan parameter yang melibatkan angka-angka kuantitatif dan kualitatif bertentangan menyebabkan sukar untuk membuat keputusan bagi permasalahan ini. Tesis ini menerangkan prosedur untuk membangunkan alat/kaedah untuk mengukur keupayaan prestasi pembekal/vendor melalui analisis multi-variasi. Borang soal-selidik telah disediakan dan telah diedarkan kepada 278 syarikat pembekal dalam sektor automotif di seluruh negara. Setiap syarikat itu telah diedarkan 5 set borang soal-selidik dan menjadikan sebanyak 1390 penerima borang soal-selidik seluruhnya. Kadar respon adalah 24.3 peratus. Soal-selidik ini adalah untuk mencari keluasan penggunaan 5 faktor yang berbeza iaitu; kualiti sistem, kualiti proses, pengurusan logistik, penghantaran dan juga servis selepas jualan. Keputusan soal-selidik itu kemudiannya di analisa dengan perisian SPSS. Analisa Faktor, salah satu kaedah Analis Multivariasi telah digunakan bagi mengukur prestasi vendor di dalam kajian ini. Di samping itu, kaedah ini juga boleh digunakan sebagai kaedah pengawalan vendor. Prosedur ini menggunakan alat yang dicadangkan hasil daripada analisa tersebut. Oleh kerana pengukuran prestasi vendor merupakan masalah keputusan yang melibatkan pelbagai ciri, maka keputusan tersebut seharusnya berkisar untuk mencari vendor yang terbaik. Didapati juga bahawa kaedah/alat yang dicadangkan mempunyai kelebihan lain iaitu ia hanya memerlukan pengolahan data yang minima. Jika kaedah yang dicadangkan diimplementasi dan dikawal dengan baik, tahap prestasi vendor automotif dijangka dapat ditingkatkan dengan lebih baik. Sebagai rumusan, kajian ini diharapkan dapat membantu untuk meningkatkan prestasi vendor-vendor automotif. Seterusnya ia akan menambah-baik industri automotif Malaysia secara keseluruhannya.

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CHAPTER 1

INTRODUCTION

1.1   Introduction

It is a well established fact that an organization can perform no better than its suppliers. This fact along with greater demands for lower prices and continuous improvement in all aspects of supply management make supplier assessment and performance measurement a critical process in world-class organizations. Yet it is acknowledged that a majority of enterprises are less than satisfied with their ability to consistently select the best suppliers or measure and manage supplier and contractor performance. Nowadays, there are many techniques had been used such as those that focus on accounting techniques, auditing techniques and quality certificates for performance measurement.

However, there is no theoretical or generic approach to studying the practice of ongoing companies' performance measurement, in particular on how companies use performance measurement to manage their relationships and interactions with suppliers and how suppliers respond to the measurement (Schmitz and Platts, 2003).

Supplier Performance Assessment is a technique of measuring a supplier's actual performance against a set of agreed criteria then awarding "marks" according

to the quality of that performance. These criteria are often called "Performance Indicators". The transformation of qualitative data to quantitative data means that it can be measured and evaluated. It is an objective way of assessing a supplier's performance.

1.2   Background of the Problem

The supplier evaluation process is complicated because a variety of criteria must be simultaneously considered. In some approaches to supplier evaluation, only quantitative factors are allowed in the model, or qualitative factors can be used in the model but the data are replaced by the assigned numbers. However, the assigned numbers may not directly reflect the impreciseness of the performance data. In order to obtain an effective evaluation, the impreciseness of data should be accurately reflected.

Three traditional techniques are designed to evaluate suppliers: the categorical method, the weighted-point method, and the cost-ratio method (Muralidharan and Anantharaman, 2001). These traditional evaluation processes have the disadvantage of being either intuitively judged by the evaluator or too expensive to use. Operations-research-oriented approaches may also be available for dealing with the problems of the supplier evaluation process. In general, however, they are not only too complex for practical use but they are used to solve optimization-oriented problems. Since the supplier evaluation is a decision making problem combining multiple criteria or attributes into a single measure of supplier performance, the objective of selecting suppliers is to find a method that can be used to objectively evaluate the best supplier. Unfortunately, the methods listed above do not provide a generally applicable methodology, are too complex for practical use by operating managers, or do not fit to this type of problem.

1.3   Research Problem

1.3.1   Statement of Research Problem

More often than not, a supplier assessment is based on the lowest bid, and in some cases on unsystematic and incomprehensive subjective evaluation and interviews. Therefore, it becomes too late to proactively avoid supplier issues or divest production flow of their symptoms. If causes of the suppliers' issues (i.e quality, delivery, etc) are accounted for early in the supplier assessment process, the associated risk could be minimized.

1.3.2   Research Question

The general question this study attempts to answer is this: is there a more comprehensive and effective supplier performance assessment model that minimizes the risk associated for their end product to automotive manufacturer? The general question subsumes several related questions:

1. Which practices contribute the most to the suppliers' end products to the automotive manufacturer?

2. How are we doing in supplier assessment and performance measurement? It will motivate suppliers with performance measurement and receive feedback from the supplier's point of view.

1.4   Objectives of the Research

The objectives of the study:

- To design an assessment tool that can be used as a generic approach to measure supplier performance in automotive industry.
- Using multivariate analysis as a method for supplier performance assessment development process. This is to prove that multivariate analysis can be used to perform the assessment.
- To give benchmark from which to measure improvement. Suppliers need to know how well they are performing and to have the opportunity to meet the needs of the customer better. In the rare event that supplier performance is so poor that the contract needs to be terminated and/or damages sought, supplier rating provides objective documented evidence of unsatisfactory performance.

1.5   Scope of the research

The scope of this study is to develop supplier performance assessment tools using multivariate analysis approaches. The focus is limited to companies which are suppliers from automotive industry manufacturing sectors in Malaysia. Also, the focal point process in this research is the evaluation of suppliers and benchmark it based on qualitative and quantitative data from the measurement.

1.6   Significance of the research

Manufacturers can attain multiple benefits by measuring supplier performance. Companies that fail to measure most of their suppliers risk large-scale quality mishaps, service deficiencies, and cost overruns that can eat into bottom-line profits and damage competitive positioning in the market. On the other hand, companies that subscribe to such practices can reduce buffer inventory, cut cycle times, and lower the total cost of ownership (TCO) of their supply chains.

There are also several reasons to evaluate suppliers. First, by evaluating results of suppliers, buying firms can identify who fits the requirements best. Buying firms can upgrade and obtain the greatest competitive advantage by cooperating with better performers. Second, supplier evaluation also develops a better negotiating position for the buying firm. Third, supplier's performance directly impacts the buying firm's performance. For example, a better quality product may result from higher quality material, a lower manufacturing cost may result from lower purchasing cost, and a short production schedule results from shorter lead time of orders, etc.

The concept of Supplier Performance Assessment has been developed since 10 to 20 years ago with so many control laws has been introduced but has yet to be evaluated in a real application. In Malaysia, many suppliers and manufacturer lack the expertise to perform such task and with this study, it hopefully will benefit all parties. The study will hopefully be a platform for future research in a similar field.

1.6.1   Why Automotive Industry?

The automotive industry was selected due to the diversity of businesses and because the relationships between suppliers and manufacturers are well developed

and fairly stable. The automobile manufacturer had indicated that the selected suppliers were superior or critical for their business success. When a supplier is critical to the buying firm, the buying firm is more inclined to utilize supplier development of the problem. (Porter, 1997)

1.7   Layout of thesis

This research thesis is organized into six chapters:

1.   Chapter I   : Introduction
2.   Chapter II : Literature Review
3.   Chapter III : Research Methodology
4.   Chapter IV : Multivariate Analysis and Its Application
5.   Chapter V   : Result and Analysis
6.   Chapter VI : Conclusion and Recommendations

Chapter 1, describes the background of research, problem statement, purpose of research, importance of the research, scope of the research and layout of the thesis.

Chapter 2, presents a review of the literature to understand the issues and formulate the research problems. The review describes about Supplier Performance and development issues, supplier assessment categories and methods that have been used to perform the assessment. This chapter also described criteria that check upon during the assessment.

Chapter 3, describes basic definitions of multivariate analysis and the original set of factor analysis theory, as well as the steps of operation. It explains about multivariate analysis, its uses and application. Details of steps for conducting Factor Analysis, the multivariate tool used in this research are explained briefly.

Chapter 4, describes the research methodology employed in conducting the study. Survey methodology is the main approached adopted. The survey method was used to find-out the practices level of performance implemented in supplier's firm. The questionnaire is developed in order to fulfill the objectives of research.

Chapter 5, presents the results and findings from the survey. Using SPSS software, data were processed with factor analysis techniques, mean test and t-test. It explained the results which were relevant to research questions. From the result, an instrument/tool for supplier assessment and performance evaluation was developed. This instrument/tool was used in the case study.

Chapter 6, presents the conclusion of this study. The report culminates with some suggestions and discussions for future research. It also presents the limitation of the study.

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