THE RELATIONSHIP BETWEEN SUPPLY CHAIN MANAGEMENT PRACTICES, PERFORMANCE MEASUREMENT PRACTICES AND FIRM PERFORMANCE: AN EMPIRICAL STUDY OF THE PRACTICES IN TANZANIA'S INDUSTRIAL SECTOR

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ABSTRACT

Supply chain management is considered by many firms as the best competitive strategy option in the prevailing turbulent and dynamic business environment that has resulted from effects of globalization. Despite being acknowledged as the best option in overcoming the effects of globalization in business, supply chain management has come with multiple challenges in its implementation that include the development of trust among supply chain members, process alignment and integration, to mention a few. Even with these challenges, a supply chain is expected to function as one entity, thus it has to be monitored in its performance.

The assessment of the success of organizations throughout history has been performed using performance metrics. Performance measurement quantifies effectiveness and efficiency of action using metrics. The proper selection of key performance variables allows for major consideration in improvement, problem identification, and gauging performance against plans, norms, or best practices, and gives directions for improvement plans. Performance measurement and metrics pertaining to supply chain management have not received adequate attention from researchers or practitioners.

This two stage sequential mixed method applied research explores the nature, transformation, and, processes of supply chain management and performance measurement practices in the industrial sector of Tanzania. The primary data is collected using a mail questionnaire from 264 industrial firms in Tanzania; the analysis is performed using the AMOS program for structural equation modeling (SEM) techniques. A performance index, developed from the quantitative analysis results, is used to identify the four firms for the case study.

The results of the analysis (both survey and case study) show that supply chain management is practical in Tanzania and improves the performance of organizations in the supply chains. The practice is observed to be in its infancy in the study firms. Performance measurement practices, pertaining to supply chains, are observed to be less practiced, though they show a positive impact on the performance. Many firms use only financial measures and performance measurement systems. Better performance is observed in firms that embrace supply chain management and appropriate performance measurement practices. Time based performance is found to mediate the impacts of supply chain management and performance measurement practices to overall firm performance.

ABSTRAK

Pengurusan kitaran "Supply Chain" dilihat sebagai pilihan kaedah strategi terbaik bagi pelbagai firma di dalam persekitaran perniagaan yang dinamik akibat globalisasi. Meskipun begitu, pengurusan "Supply Chain" berhadapan dengan pelbagai cabaran untuk diimplementasikan. Antaranya termasuk mendapatkan kepercayaan dari pihak yang terlibat dalam "Supply Chain" dan cabaran dalam proses penggabungjalinannya. Meskipun begitu, "Supply Chain" dilihat sebagai entiti yang prestasinya perlu diukur.

Taksiran tentang kejayaan organisasi lazimnya dilakukan dengan menggunakan pengukur prestasi. Pengukur prestasi menggunakan metrik untuk memberi nilai kuantitatif kepada kecekapan dan keefisyenan sesebuah organisasi. Seterusnya, adalah penting untuk mengenalpasti pembolehubah utama yang mempengaruhi prestasi organisasi bukan sahaja bagi mengenalpasti masalah yang dihadapi oleh sesebuah organisasi tetapi juga untuk mengenalpasti pembaharuan yang perlu dilakukan untuk kebaikan organisasi serta membolehkan prestasi organisasi dibandingkan dengan perancangan yang telah dibuat terlebih dahulu ataupun dibandingkan dengan amalan terbaik oleh organisasi lain. Anehnya, perhatian yang sama tidak diberikan kepada pengurusan "Supply Chain".

Kajian ini menggunakan kaedah dua peringkat berterusan untuk meneliti sifat, transformasi dan prosses pengurusan "suppy chain" serta pengurusan kecekapan dalam sektor industri di Tanzania. Data primer telah dikumpul menggunakan kaedah soal selidik dari 264 sektor industri di Tanzania. Kajian ini dijalankan dengan menggunakan kaedah "structural equation modeling". Perisian AMOS digunakan bagi tujuan ini. Indek kecekapan yang dijana dari analisa kuantitatif seterusnya digunakan bagi mengenalpasti empat firma yang digunakan sebagai elemen yang dicerap dalam kajian kes yang dilakukan.

Keputusan bagi kedua-dua analisa ini menunjukkan bahawa pengurusan "supply chain" adalah praktikal untuk diamalkan di Tanzania kerana ia mampu meningkatkan kecekapan organisasi dalam mengurus kitaran "supply chain" mereka. Prestasi yang lebih baik dilihat dapat dicapai oleh firma yang mengamalkan pengurusan "supply chain" yang beserta dengan pengukur prestasi yang bersesuaian. Namun begitu, kaitan tersebut dicapai apabila pengukur prestasi yang bersesuaian itu adalah berasaskan masa.

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LIST OF ACRONYMS AND SYMBOLS

ABC	Activity Based Costing
AGFI	Adjusted Goodness of Fit Index
AMOS	Analysis of Moment Structures
ANOVA	Analysis of Variance
BRELA	Business Registration and Licensing Agency
BSC	Balanced Score Card
CAMARTEC	Centre for Agricultural Mechanization and Rural Technology
CC	Communication Connectivity
CCT	Cash - to - Cash Cycle Time
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMIN/df	Normed Chi-square
CPFR	Collaborative Planning, Forecasting, and Replenishment
CR	Construct Reliability
CRM	Customer Relationship Management
CTI	Confederation of Tanzania Industries
DDO	Delivery Dependability
df	Degree of Freedom
DI	Danish Industries
EDI	Electronic Data Interchange
EDS	Essentials of PMS design
EFA	Exploratory Factor Analysis
EHS	Environment, Health, and Safety
EPZ	Export Processing Zone
ERP	Enterprise Resource Planning
EV	Eigen Value
EVA	Economic Value Added
F	F - Value
FPO	Firm Performance - Output

FPR	Firm Performance - Resources
GDP	Gross Domestic Product
GFI	Goodness of Fit Index
ID	Identification Number
ILP	Internal Lean Practices
IQ	Information Quality
IS	Information Sharing
IMF	International Monetary Fund
ISO	International Standards Organization
IT	Information Technology
JIT	Just - in - Time
KMO	Keiser - Meyer - Olkin Index
KPI	Key Performance Indicator
LV	Latent Variable
MI	Modification Index
MIT	Ministry of Industry and Trade (Tanzania)
MITM	Ministry of Industry, Trade, and Marketing (Tanzania)
MLE	Maximum Likelihood Estimation
MP	Market Performance
MRP	Material Requirement Program
NBAA	National Board for Accountants and Auditors
NDC	National Development Corporation
NFI	Normed Fit Index
NGO	Non - Governmental Organization
OFP	Overall Firm Performance
P	P - Value
PGFI	Parsimony Goodness of Fit
PI	Performance Indicator
PI	Performance Index
PM	Performance Measurement
PMP	Performance Measurement Practices
PMS	Performance Measurement System

PNFI	Parsimony Normed Fit Index
POA	Performance Of Activity
Psi	Private Sector Initiative (Tanzania)
PST	Postponement
r	Pearson's Product Moment Correlation
RMR	Root Mean Square Residual
RMSEA	Root Mean Square of Approximation
RNI	Relative Non - Centrality Index
SBP	Small Business Project (South Africa)
SC	Supply Chain
SCC	Supply Chain Council
SCM	Supply Chain Management
SCMP	Supply Chain Management Practices
SCOR	Supply Chain Operation Reference
SEM	Structural Equation Modeling
SIDO	Small Industries Development Organization
SMC	Squared Multiple Correlation
SME	Small- and Medium- size Enterprise
SPSS	Statistical Package for the Social Sciences
SRM	Supplier Relationship Management
SSP	Strategic Supplier Partnership
t	t - Value, Critical Ratio
TBP	Time Based Performance
TBS	Tanzania Bureau of Standards
TCCIA	Tanzania Chamber of Commerce, Industry, and Agriculture
TFAS	Tanzania Financial Standards
TIC	Tanzania Investment Promotion Centre
TIRDO	Tanzania Industrial Research and Development Organization
TLI	Tucker Lewis Index
TQM	Total Quality Management
TSRP	Tanzania Statements of Recommended Practices
TTB	Tanzania Tourist Board

TTM	Time to Market
UDF	Up and Down Flexibility
UN	United Nations
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
UPM	Uses of Measures and PMS
URT	United Republic of Tanzania
VE	Variance Extracted
VIF	Variance Inflating Factor
VMI	Vendor Managed Inventory
Z	Z - Score for the Standard Normal Distribution
Δ	Bentler - Bonnett Coefficient
R	R - Squared, Proportion of Variance
α	Alpha
δ	Delta, Error Variance
ΔX^2	Change in Chi - square
λ	Lambda, Regression Weight
φ	Correlation Between Constructs / Latent Variables
X^2	Chi - square

To

my Children

my Siblings

my Father

and

my late Mother

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Organizational competitiveness is a precondition for the survival of any business in the globalized business environment that prevails currently in the world. The business environment has witnessed markets that have a global nature combined with a global kind of competition, with customers demanding more but willing to pay less (Chopra and Meindl, 2003). These environmental conditions have compelled businesses into having multiple competitive performance objectives that include: quality, price, responsiveness, flexibility, and dependability, among many others. The overall impact of the above influencing environmental conditions has resulted in companies rethinking and reevaluating their operations strategies, and tactics targeting at meeting the dynamic requirements of the market (Gunasekaran and Ngai, 2005). Taking advantage of available resources and to be closer to their markets, many companies operating in this new environment have shifted from centralized to decentralized operations.

One such strategy (i.e. supply chain management) requires firms to align conjointly with their suppliers and customers to streamline operations as well as working together to achieve levels of agility beyond individual firms (Lin et al., 2006) resulting in supply chain relationships. The requirement for integrating suppliers and customers with the objective of improving responsiveness and flexibility of organizations has resulted in many firms considering supply chain management as the best competitive strategy option. The significance of supply chain management in improving competitiveness in organizations has been well acknowledged by many firms after realizing that they could no longer compete, as stand alone firms, in the current highly dynamic business environment (Thoben et al., 2003).

Among the key issues for supply chain partners are the opportunities to produce products in a collaborative way. In doing so, the supply chain partners have to effectively coordinate their activities and streamline their operations. In turn, this will increase their profit margins and enhance customer service (Hunt et al., 2005). Despite being seen as a solution to the dynamic market environment, supply chain management comes with challenges in its practices. Many attempts aimed at capturing market advantage in the current dynamic business environment have been undertaken by organizations, consultants, practitioners and academicians (Robinson and Malhotra, 2005). The attempts include activities to properly organize supply chain management concepts and practices and to integrate these into the business processes. These organizations, consultants, practitioners and academicians have realized that supply chain management concepts and practices are not well defined and cannot be implemented easily (Robinson and Malhotra, 2005). The supply chain management concept has many challenges in its implementation that include the development of trust and collaboration among members of the chain, process alignment and integration, implementation of latest collaborative information systems and Internet related technologies for purposes of driving efficiency, performance, and quality throughout the supply chain.

In contrast, the assessment of the success of organizations throughout history has been implemented using performance measures (Kennerley and Neely, 2003). Bond (1999) is of the opinion that management tasks are inherently complex and generally the number of states necessary to describe all possible future events and the corresponding range of decisions that can be taken is limitless. Bond (1999) further reiterates that the managements of organizations are exposed to enormous amounts of data; therefore having proper guidance of the management process selectivity becomes essential. It is at this juncture that the selection or identification of key performance variables becomes important. These variables reflect a major consideration in performance improvement involving the creation and use of performance measures, or performance indicators. The created measures or indicators in turn allow managers to know how their businesses are performing. In addition, this allows for problems in the organization to be identified. Moreover, the indicators enable the management to gauge performance against plans, norms, or best practices, hence giving essential directions for improvement.

1.2 Background of the Study

Literature on the current business trends reflect the demands being placed on businesses by their customers are increasing. These demands include: reduced prices, superior product quality, excellent customer service, increased variety and exceptional value (Chopra and Meindl, 2003). This necessitates multiple companies to perform their business functions with the goal of satisfying a given customer's demand. This has resulted in the development of supply chains with the aim of fulfilling their customers' demands. Businesses in developing economies are facing these same operational challenges and demands from their customers. Such businesses in many developing countries operate under more stringent and difficult conditions compared to the best supply chain management practitioners found in the developed economies that have excellent industrial bases. There is a need to explore operations in the developing economies with the intent to weigh the survival aspect, in view of the current business trends focusing especially on supply chain management practices.

In recent years, supply chain management has received increasing attention from academicians, consultants, and business managers as well (see: Li et al., 2005; Tracey et al., 2004; Chan et al., 2003; Chan and Qi, 2003b; Croom et al., 2000). This is due to the recognition by many organizations that supply chain management is the key to building a sustainable competitive edge in the ever increasing competition and economy globalization (Bovet, 2004; Moberg et al, 2003; Chan and Qi, 2003b). In the past, firms targeted improved competitive positions by aggressively pursuing different methods, such as marketing and financial improvements to survive and to compete (Langabeer and Seifert, 2003).

Owing to competitive pressures, organizations have to re-orient their strategies, operations, processes and procedures to remain competitive. Organizations must be able to measure their different facets of performances to achieve such competitive standing (Gomes et al., 2004b) since organizational performance has always exerted considerable influence on the actions of companies (Folan and Browne, 2005). Chan and Qi (2003b) argue that, when viewed from a supply chain management perspective, performance measurement can facilitate inter understanding and integration among partners in the supply chain. These authors assert that performance measurement is capable of providing insight to reveal the effectiveness of strategies and identify success and potential opportunities. The contribution of performance measurement to supply chain management decision-making is indispensable, especially in terms of business goals and strategies redesigning and reengineering processes.

Besides the challenges of practicing supply chain management, a supply chain is expected to function as one entity, thus it has to be monitored in its performance to be able to constantly evaluate every aspect of its operations to ensure that productivity and cost objectives are realistic and attainable. Managing supply chain operations is critical to any firm's ability to compete effectively, and success in today's market depends on the ability to balance a stream of products and processes to remain competitive (Kuo et al., 1999). As a result of this, Kuo et al highlights that firms are constantly evaluating every area of operations to ensure that productivity and cost objectives are realistic and attainable. Despite this procedure being seen as important, some authors (e.g. Whalen, 2000; Holmberg, 2000) point out problems and difficulties (e.g. determining what to measure, what measures to use) faced by companies in achieving their goals in terms of measurement activities. Deducing from these authors' statements, measurement activities still face a number of problems within and across organizations. This has prompted the current researcher to perform this study for the purpose of ascertaining the situation in Tanzania's industrial sector.

The much publicized supply chains in developed economies (e.g. Dell, Wal-Mart) are further strengthening their market positions globally through this strategy. This makes survival in business to become difficult for their competitors. Some scholars postulate that future competition lies much on performance of supply chains. Therefore, improving supply chain performance will be a pre-requisite for the survival of any supply chain. Nunlee et al. (2000) argues that limited agreement can be seen as to how to monitor and how to assess the performance of a supply chain, despite the fact that most organizations are able to track costs and measure revenues. It is of critical importance to identify suitable measures in cases of continual evolution of supply chains so as to cope with competition and the changing environment. This is another reason that prompted this researcher to study performance measurement of supply chains in Tanzania's industrial sector. Measures that are currently available and being used by supply chains found in developed economies need to be ascertained on their compatibility to supply chains in Tanzania's industrial sector.

Thus, this study aims towards fulfilling the need to study and understand supply chain management and performance measurement practices in firms in supply chains of

Tanzania's industrial sector. Also the study aims at exploring the differences in the way supply chain management concept is being practiced in the developed economies and in Tanzania's industrial sector. Furthermore, it is timely that an empirical study has to be conducted to establish facts about supply chain management practices in developing economies. Currently most of the facts about supply chain management practices relate to what is being performed in developed economies.

1.3 Statement of the Problem

Institution of continuous improvement plans is not an easy task for the managements of organizations due to the changing nature of the environment in which the firms operate as it renders useful measures of today to become obsolete tomorrow. This situation is exacerbated by globalization, which Medori and Steeple (2000) say has changed the world into a global shopping mall in which ideas and products are available everywhere at the same time, allowing customers to make their choices easily. The idea of collaboration between different companies through supply chains that continue to replace individual firms as economic engines for creating value during the twenty-first century (Lockamy III and McCormack, 2004) also complicates the process of measuring performance, as it now spans several organizations (each with its own management and culture) since processes extend through the collaborating entities.

In their study on supply chain constructs and measurement, Chen and Paulraj (2004) highlight the fact that lack of clearly defined constructs and conceptual frameworks necessary in advancing the field of supply chain management has led to many supply chains not managing to maximize their potential. This makes it difficult for one to gain insight into how supply chain management can increase competitiveness without the assessment tools that can capture overall supply chain performance and identify opportunities for improvement (Tracey et al., 2004). It may be surmised here that there is a lack of clearly defined constructs and conceptual frameworks to advance the field of supply chain management, supply chain performance measurement, and their related practices.

On the other hand, the purpose of evaluating organizational performance, among other aspects, is for control purposes, where evaluation and control of performance of resources can be accomplished; for communication purposes, whereby performance can be communicated internally and externally for other uses; and, improvement purposes, where gaps can be identified (observed versus expected) and corrective actions taken (Melnyk et al., 2004). Many firms have difficulty in identifying what to measure and how to measure in the best way although the need for measuring is clear (Whalen (2002). This fact is reiterated by Holmberg (2000) stating that both practitioners and scientists have noted a number of problems regarding measurement activities during the past few decades. The problems reported suggest that measurement activities are fragmented, both within and across organizations, implicitly; supply chains also face the same problems. The firms noted above make alliances to serve their customers through supply chains, so the identified problem is seen to be inherent, even to these supply chains.

Extending from the above paragraph, it is seen that there is a lack of guidance on the use of a multitude of existing measures for supply chain performance measurement, and lack of a single all-encompassing performance measurement system for firms in supply chains and their supply chains. Furthermore, there is no consolidation of findings and contributions from various works that exist in isolation for successful management of supply chains that is found to exist. Accordingly, literature on supply chain management practices and performance measurement practices from developing economies such as Tanzanian is noted to be lacking, probably due to failures in studying the subject in these countries.

1.4 Scope of the Study

The purpose of this sequential mixed methods study is to explore supply chain management practices, explore performance measurement practices and performance in organizations belonging to supply chains in Tanzania. The study examines relationships among supply chain management practices; performance measurement practices; time based performance; and overall firm performance. Supply chain management practices include all practices undertaken in an organization to promote effective management of its supply chain, while performance measurement practices are all activities undertaken in an organization to promote effective performance measurement. Time based performance is the performance of the firm that is measured to see how it performs in terms of time to market, cash to cash cycle time, up and down flexibility, and delivery dependability, among other things. The overall firm performance is the traditional performance of the firm measured to see how the firm is performing financially as well as in the market.

In this study, supply chain management practices, as a construct, is conceptualized as an organizational level construct. By this conceptualization, the study does not deny the fact that; these practices need to span the entire supply chain. Thus the study takes a general perspective in studying supply chain management practices in individual firms. The understanding is that the study firms reflect what takes place in supply chains to which they belong. Performance measurement practices, as a construct, is also conceived at an organizational level and studied in the perspective of supply chain management. In this case the understanding is that performance measurement practices in supply chains differ from the traditional practices in stand alone firms that have been studied in the past.

Furthermore, performance in study firms is viewed in two perspectives: the time based performance, measured by variables such as: time to market, delivery dependability, up and down flexibility; and, the overall firm performance which is measured by: financial performance-output, financial performance-resources, market performance. This approach is employed with an understanding that the intermediate performance focuses on the non – financial aspects of performance that are time based, and can influence the overall performance that is normally looked in terms of financial and market performance of the firm.

Finally, the study looks at the supply chains in developing countries, Tanzania being the targeted case, because limited studies on the subject are available relating to the developing economies. This may be due to the fact that the field of supply chain management is relatively new (Nunlee, 2000) and it is growing fast in the developed world. This study analyzes the practices prevailing in the management and performance measurement of the organizations in the chains in Tanzania, with the aim of understanding the factors that make successful performance measurement systems in these supply chains possible.

1.5 Research Questions

The problems enumerated above invite several questions needing answers through empirical investigation. Thus this study aims at investigating some of such questions. To accomplish this study, the following are the main research questions: (1) How is supply chain management practiced and how is performance measured in supply chains of

Tanzania; (2) Why are performance measures used the way they are, in supply chains of Tanzania; and (3) What is the impact of supply chain management practices and performance measurement practices on time based performance and overall firm performance. To be able to appropriately study these questions, more specific research questions have been developed. These include:

RQ1 What are the supply chain management practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector?

RQ2 What are the performance measurement practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector?

RQ3 How is time based performance related to overall firm performance of firms belonging to the chains in the industrial sector of Tanzania?

RQ4 How are supply chain management practices and performance measurement practices linked in firms belonging to supply chains in the industrial sector of Tanzania?

RQ5 Why is supply chain management and performance measurement being practiced in the way that it is, for the firms in the industrial sector of Tanzania?

RQ6 Are there any similarities, or differences in practices on supply chain management and performance measurement between the industrial sector of Tanzania and the good performers in developed countries' supply chains?

1.6 Research Objectives

The main objectives of this research include: (1) to study and understand the way supply chain management is being practiced and the way performance is measured in the supply chains of the industrial sector of Tanzania; (2) to study and understand the reasons leading to the way measures are used in supply chains of the industrial sector of Tanzania; and (3) to study and understand the impact of supply chain management practices and performance measurement practices on the time based performance and overall firm performance in the industrial sector of Tanzania. The above objectives are achieved by first by identifying the practices in supply chain management and performance measurement in the industrial sector of Tanzania. This is followed by examining the consequences of these practices to time based performance and overall fir performance. In line with the above, the specific objectives for this study are as articulated below:

RO1 To identify and study supply chain management practices being used by firms in supply chains of the industrial sector of Tanzania and determine their relationship to time based performance and overall firm performance of these firms;

RO2 To identify and study performance measurement practices being used by firms in supply chains of the industrial sector of Tanzania and determine their relationship to time based performance and overall firm performance of these firms;

RO3 To study the nature of the relationship between time based performance and overall firm performance in firms belonging to supply chains in the industrial sector of Tanzania;

RO4 To understand the relationship between supply chain management practices and performance measurement practices in firms belonging to supply chains in the industrial sector of Tanzania;

RO5 To understand the causes for implementing supply chain management practices and performance measurement practices, in firms belonging to supply chains in Tanzania's industrial sector.

RO6 To understand the difference, if it exists, between practices in supply chain management and performance measurement, in firms belonging to supply chains in Tanzania's industrial sector and the ones in developed economies.

1.7 Theoretical Perspective

The strategy of supply chain management, and its practices, can be viewed through various theories. For example: firstly, the contingency theory points to the need for managers to recognize the implications of a changing environment and to use firm resources (in this case resources in the supply chain) to respond effectively in countering the negative effects of the environmental changes or in taking advantage of these changes for the benefit of the firm (Stonebraker and Afifi, 2004; Fawcett et al., 2007). Supply chains are formed, in part, because of the uncertainty and dynamism of the business environment, managers, therefore, are responsible for devising and implementing strategies to deal with the difficulties faced due to these environmental changes.

Secondly, the industrial organization theory claims that decision making in business firms is driven by market forces (Fawcett et al., 2007; Ketchen Jr. and Hult, 2007). Considering the core questions of: "Where does market power exist?" and "What are the sources of this power?" and a proper analysis of the five forces that include: suppliers, buyers, existing rivals, potential rivals, and providers of substitute products, managers are able to comprehend the environment in which their firms (as well as their chains) are operating, thereby leveraging their competitiveness in the market (Fawcett et al., 2007). Thirdly, the resource-based theory of the firm emphasizes on the management of internal resources to establish a hard to imitate advantage (Barratt and Oke, 2007). In this respect chains build organizational skills and processes (core competence) that enables the delivery of distinctive products and services.

Similarly, performance measurement practices can be viewed through the resource-based theory of the firm where skills in performance measurement contribute to the hard to imitate advantage, especially in the area of design and development of measures and performance measurement systems. This is important due to the nature of supply chains that makes useful measures of yesterday be obsolete today, thus requiring fast action to rectify the situation. Also through the knowledge management perspective, knowledge sharing not only in innovation, but in other areas like measurements and their related practices can find application in firms in supply chains.

Performance measurement practices play an important role in the strategic choice theory for supply chains. The strategic choice theory asserts the importance of the role of played by managers in the success or failure of an organization (in this case the supply chain), through their decisions (Ketchen and Hult, 2007; Miles and Snow, 2007). The authors' opinion is that, strategic renewal and repositioning form the central issue in the strategic choice theory. It is in the support for decision making that performance measurement practices make an important contribution to this theory. Thus, decisions taken in a supply chain are based on analyses of performance that are implemented in the perspective of the supply chain performance measurement practices with a focus on the chain as the primary driver.

1.8 Contribution of the Study

The research has been able to come up with some results and findings that lead to useful conclusions. These are seen to be of significant importance to academicians and researchers, as well as practitioners in the areas of supply chain management and performance measurement. The following are some of these identified useful results, presented as contributions to the theory and practice.

1.8.1 Contribution of the Study to Theory

- The study was able to develop and validate a measurement instrument for measuring performance measurement practices in the perspective of supply chains. After validation of its constructs, this instrument has shown suitability for use in the study and may be used in similar environments, for instance in industrial sectors of other developing economies around Tanzania. In its use, the instrument will advance studies in supply chain performance measurement practices.

- Using the field data, the study was able to perform revalidation of the adapted instruments for measuring supply chain management practices, time based performance, and overall firm performance. Initially these instruments were used to study the variables in developed countries where the operating environment is different from the one in developing economies. The successful revalidation of these instruments lends a hand into studying the variables in developing economies, hence playing a positive role in advancing the knowledge through the studying of these variables.

- The study was able to verify the mediating role of time based performance in the relationship between supply chain management practices and overall firm performance (full mediation effect), and, in the relationship between performance measurement practices and overall firm performance (partial mediation). This knowledge lends an important hand in the study and advancement of theories related to relationships between supply chain management practices, performance measurement practices, and overall firm performance. Also it will be helpful in studying or in the search for best practices in terms of the study variables for varying business environmental conditions.

- The study adds to the body of knowledge and literature on supply chain management practices and performance measurement practices in the perspective of supply chains, as practiced in developing economies.

- The study was able to identify gaps in supply chain management and performance measurement theory and practice. These include: the failure of researchers to study the supply side (up-stream side) of supply chain relationships; lack of research linking supply chain management practices to performance of supply chains; and, the scarcity of studies administered in less developed economies. This will enable academicians and practitioners make valuable improvements on the existing systems after understanding the nature of the gaps. Theoretical gaps will lend guidance to future research areas.

1.8.2 Contribution of the Study to Practice

- The developed instrument measurement instrument for performance measurement practices construct can be used by managers practicing supply chain management in evaluating the how comprehensive their practices are, in terms of performance measurement practices.

- The identified best practices in terms of the study variables will enable firms to focus on their objectives by using specific practices to achieve specific goals through appropriate allocation of resources. Also the identified best practices can be used by firms needing to start implementing supply chain management practices and performance measurement practices in the bid to improve their performances.

- The confirmation of the mediation role of time based performance is important as it enables managers to know that for firms practicing supply chain management in environments such as that found in Tanzania, it is only through improvements in time based performance that better overall firm performance can be achieved as supply chain management practices has no direct impact on the overall firm performance. Similarly, managers will be able to know that the performance measurement practices have a direct and an indirect impact on overall firm performance, necessitating proper attention to practitioners when planning to excel in their firm performances.

- The confirmed association between supply chain management practices and performance measurement practices will help managers needing to practice the two sets of practices to understand the need to proceed practicing these practices simultaneously rather than sequentially as their association brings a bi-directional impact on both sets of practices, as well as improving the impact on time based performance and overall firm performance.

1.9 Organization of the Thesis

The thesis is organized into seven chapters, starting with the introduction chapter, second the chapter on the review of literature, then a chapter on the industrial sector of Tanzania. Next, research design and methodology, afterwards the chapter on data analysis, followed by a chapter on discussion of the research results. Finally, the conclusion, recommendations, and suggested future research.

Chapter One presents the introduction to this thesis, giving the background and the scope of the research conducted, as well as the contribution of the research to the academia and practitioners. This chapter also provides the research questions, the research objectives, and the research theoretical underpinning. Lastly the chapter provides the outline of each chapter in this study.

Chapter Two, deals with the review of literature. The chapter details most aspects related to supply chains and supply chain management, and the development of supply chains. The aspects of performance measurement, metrics and performance measurement systems in the general perspective are covered. Also, the chapter presents discussion on performance measures, metrics, and performance measurement systems used in supply chains. The chapter further presents the discussion on the study constructs and the framework proposed for this research, as well as the proposed hypotheses.

Chapter Three discusses the industrial sector of Tanzania. The historical background of the sector is provided with a focusing on its evolution, along with description of the kind of industries, products, and raw materials used. The chapter also looks into supply chain management practices and performance measurement practices in this sector, including the kind of metrics in use in the Tanzanian industrial sector.

Chapter Four deals with the research design and methodology, whereby all details related to the two procedures used in data collection are presented. All procedures in the research design (e.g. sampling procedure, identification of target population; sample size, procedures for development of measurement items etc.) are discussed. Also, data analysis techniques are proposed in this chapter.

Chapter Five concerns data analysis for the survey and case study. The chapter presents results from the survey conducted during fieldwork in Tanzania, outlining the respondents' profiles and tests for similarities, or differences in responses. Results of the quantitative analysis performed using the Structural Equation Modeling (SEM) are presented, including relevant tests for the data. The results from the qualitative part of the survey and the development of a Performance Index, which is used in the selection of firms participating in the case study, are also presented. Furthermore, this chapter deals with the case study analysis. The four firms in the case study are analyzed to observe their similarities and differences, the results are presented in this chapter. The analysis presented covers the within the case analyses and across cases analyses, including the discussion on the implications of the results.

Chapter Six discusses the results of the analysis of data from both stages of the research (survey and case study). Details of the results obtained from data analysis are outlined and their implications on the practical and theoretical aspects are presented. The chapter revisits the research questions, hypotheses, objectives, and links them to research findings (results of the survey and the results of the case study) by giving answers to the questions posed earlier on in the research.

Chapter Seven closes the research report by pointing out the limitations encountered in the course of doing this research. The chapter also presents suggestions on areas for future research in this subject of study, and provides the concluding remark on the research. Lastly, but not least, the chapter closes the report with a presentation of recommendations to various stake holders in the area of supply chain management and performance measurement, in particular the Tanzanian industrial sector and those vested with the task of promoting the sector in the country.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction

This chapter provides an overview of the literature in the field of supply chain management and performance measurement in supply chains. A schematic view of issues discussed in this study is given in this chapter. The review of literature is divided into two main components, namely: one, issues pertaining to supply chain management; and, two, issues related to performance measurement in general and specifically in supply chains.

In the first component, the review examines the nature of supply chains; covering the fundamentals of supply chains, essentials of supply chain management, activities in supply chain management, and the evolution of supply chains. The review for the second component covers: issues regarding measuring organizational performance, the process of evaluating organizational performance, metrics for performance evaluation, and, the building blocks of performance measurement systems. The second component of the review covers the dynamic performance measurement systems as well as design, selection, and implementation of measures.

Furthermore, the review extends to performance measurement in supply chains including supply chain performance metrics, supply chain performance measurement systems, and application of some measurement systems. Study variables are also discussed in this chapter. Lastly, a discussion of the gaps identified in this study is presented. Gaps are identified in this study to highlight areas that are not well researched in the field.

2.2 The Supply Chain and its Management

The two terms i.e. supply chain and supply chain management are still new in the field of operations management when compared to other terms such as TQM and JIT. So, it is important to have a common understanding of these two key concepts used in this study. Since they are still new, authors use varying definitions for each. This necessitates a this study to conduct taxonomical analyses of definitions of supply chain is as presented in Table 2.1, and supply chain management as presented in Table 2.2. Different authors provide various definitions of supply chain that indicate different areas of focus or coverage. According to Ellram (2004), the chains exist in both service and manufacturing organizations, although the complexity of the chain might vary greatly from an industry to another.

Table 2.1
The Taxonomy of Supply Chain Definitions

Key: I – Set of three or more entities (firms or individuals); II – Stages/set of processes/ relationships/ functions involved in satisfying customer request; III- Information/material/ products/ funds flows IV- Value creation/ efforts of producing and delivering products/ services; V – Spans from supplier's supplier to customer's customer; VI – Strategic alliances/ cooperation/ shared objectives

AUTHOR		Coverage of the Definition					
		I	II	III	IV	V	VI
1	Stevens, 1989		√	√		√	
2	La Londe and Masters, 1994	√		√		√	
3	Beamon and Ware, 1998		√			√	
4	Lambert et al., 1998	√		√		√	
5	Moore, 1998	√			√		
6	Holmberg, 2000	√					√
7	Supply Chain Council (SCC), 2000				√	√	
8	Mentzer et al., 2001	√		√		√	
9	Chopra and Meindl, 2003; 2001		√				
10	Agrawal and Shankar, 2002		√				√
11	Chan et al., 2003b		√		√		√
12	Moberg et al., 2003		√			√	
13	Bacheldor, 2004		√			√	
14	Ellram, 2004		√		√		

Source: Compiled from relevant articles.

Definitions in Table 2.1 have a common aspect that is important to all supply chains, the existence of a linkage (chain) between those who are involved in fulfilling the customer's request. The definition, which will be used in this study, is a blend of the definitions pointed out in Table 2.1, defining a supply chain as a set of three or more entities with systems that are directly or indirectly involved in fulfilling a customer's request.

In defining a supply chain, one common aspect that is important to all supply chains is the existence of the linkage (chain) between parties involved in fulfilling the customer's request. Figure 2.1 presents a basic supply chain configuration. The complexity of the chain increases as more participants and stakeholders are involved in fulfilling customer requests. This is imperative as one production unit may have several suppliers (who may have several suppliers of their own and several production units to supply) as well as customers (who also may have their own customers).

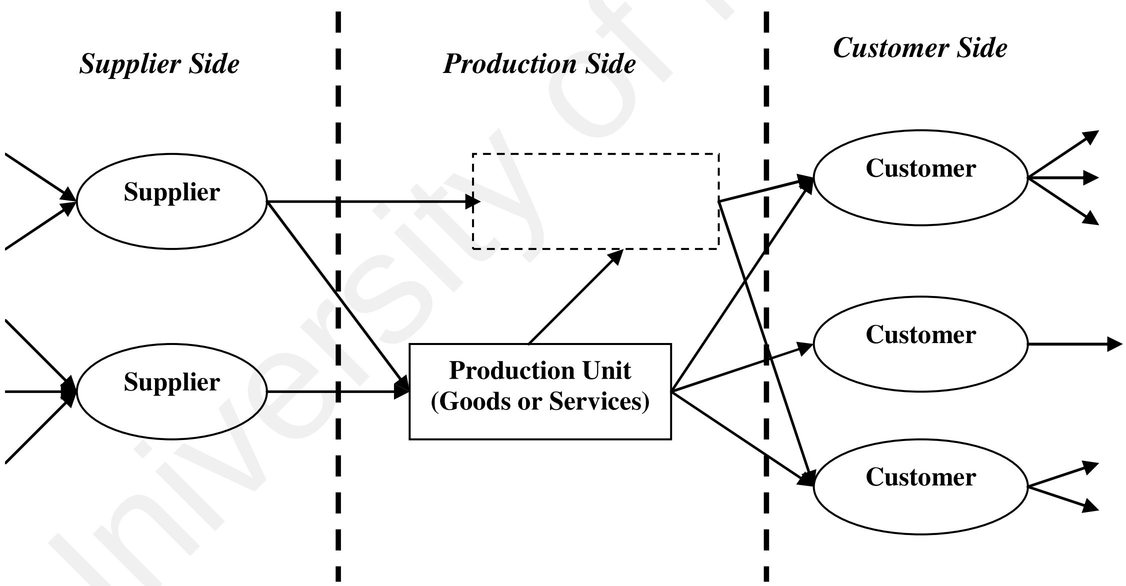


Figure 2.1
A Basic Supply Chain Configuration

In observing the supply chain configuration and the definition of supply chain, it can be seen that an important aspect of integrating the business processes from the consumer (who has the demand and is the source of funding), through original supplier (where the process of satisfying the customer's request begins) is included. Wherefore it becomes important to understand how these integrated processes and the linkages in the supply chain are managed. This is basically an initiative that focuses on managing the entire process of raw materials being transformed into finished goods (products or services) delivered to the customer.

According to Nunlee (2000), a common definition for supply chain management does not exist, although several underlying themes appear in most of its conceptualizations. These include: the coverage of all movements from raw materials to the end customer and returns, as well as the concern of the flows of information, materials, funds, products and knowledge. Furthermore, the conceptualizations include being customer focused and systems thinking orientation. Some studies conceptualize supply chain management from the perspective of purchasing and supply functions, while others focus from the perspective of logistics and transportation. This results in supply chain management being seen as of interdisciplinary origin (Li et al, 2006).

The literature shows that most of the studies listed in Table 2.2 take a broader view of supply chain management, emphasizing management and integration of major linkages between a firm and its upstream and down stream trading partners. As noted from these studies, the primary concern of supply chain management lies in the product and service flow (from supplier through to customer), information flow (from customer through to supplier and vice versa) and the financial flow (from customer through to supplier). By having multiple companies that perform business functions with one common goal of satisfying a customer's demand, it shows how vast supply chain management can be.

The taxonomy of supply chain management definitions includes various categories of coverage or focus of individual definitions, is presented in Table 2.2. Foremost, to the definition to be used in this study, is to incorporate most of the relevant aspects of supply chain management. The definition coined by the Institute for Supply Management as presented by Fawcett et al. (2007) and the one from the Global Supply Chain Forum (GSCF) as presented by Ho et al. (2002), reflect most of the important elements of supply chain management.

Table 2.2
The Taxonomy of Supply Chain Management Definitions

Key: I – Management philosophy/ managing processes, flows and activities in the supply chain
II- Integration of key processes; III-Coverage is from end-user to initial supplier
IV-Provision of products and/ or services; V- Value addition/ creation/ delivery; VI- Collaboration

	AUTHOR	**Coverage of the Definition**					
		I	**II**	**III**	**IV**	**V**	**VI**
1	Morgan, 1996		√		√	√	
2	Christopher, 1998	√		√		√	√
3	Lambert et al., 1998	√	√			√	
4	Monczka et al., 1998		√				√
5	Van Hoek, 1998		√				√
6	Tan et al., 1999		√	√	√		
7	Council of Logistics Management (CLM), 2000	√					√
8	Global Supply Chain Forum (GSCF), 2000		√	√	√	√	√
9	Nunlee et al., 2000	√		√		√	
10	Mentzer et al., 2001						√
11	Spekman et al, 2002					√	
12	Stadtler and Kilger, 2002	√	√				√
13	Larson and Halldorsson, 2002	√		√			
14	Chan et al., 2003						√
15	Chopra and Meindl, 2003	√					√
16	Wisner, 2003	√	√	√			√
17	Trent, 2004	√		√			√
18	Heredia et al., 2004		√	√			√
19	Ellram, 2004	√		√			
20	Ohdar and Ray, 2004		√	√	√		√
21	Fawcett et al., 2007	√	√	√	√	√	√

Source: Compiled from relevant articles.

So, for this study, supply chain management is defined as the design and management of seamless, value added processes across organizational boundaries to meet the real needs of the end customer. In this definition three core elements are explicit i.e., value creation (value addition), the integration of key business processes (across organizational boundaries), and collaboration (seamless), which is also seen in Table 2.2 by the authors focusing on these aspects.

In the definition of supply chain and supply chain management, it is noted that the terms can be used to describe a series of interconnected entities incorporating the satisfaction of customer demand and the management of the flow of materials, funds and information through these entities to and from the end customer respectively, not excluding after sales services and returns, or recycling. Van Hoek et al. (2001) claim that one of the lessons from business experience that has been communicated accurately by literature in the past decade is the fact that producers have to align with suppliers, supplier's suppliers, customers and customer's customers to streamline operations, thus, resulting into supply chains becoming the dominant vehicle for competition.

The main objective of every supply chain, as Chopra and Meindl (2003) state, is to maximize the overall value generated. They assert that, this value is strongly correlated to the supply chain profitability, which is the total profit to be shared across all supply chain stages. The only source of revenue for any supply chain is the customer. The flows that take place in the supply chain generate costs. It is important to manage these flows appropriately, as this is the key to supply chain success, which is measured, in terms of profitability. The building blocks of supply chain are discussed in the next section, while the building blocks of supply chain management, and its current practices are discussed in the section after next.

2.2.1 The Fundamentals of Supply Chains

The processes performed in a supply chain can be viewed in several ways. Chopra and Meindl (2003) put their views of supply chain processes into two categories: First, the cycle view, which clearly defines the processes and the owners of each process. This proves to be useful in operational decisions, as it specifies the roles, responsibilities of each member and the desired outcome for each process; second, the push/pull view, which categorizes processes depending on the response to a customer's order (pull) or the anticipated customer's order (push), which is useful when considering strategic decisions related to supply chain design. The importance of understanding the sequence of processes and flows in a supply chain cannot be overemphasized, as these combine to fulfill the customer's needs. Table 2.3 gives a summary of the cycle view of supply chain processes and Table 2.4 presents the properties of the pull/push view of supply chain processes.

Table 2.3
Cycle View of Supply Chain Processes

Cycle	Process	Owner
Customer	• Customer arrival * • Order entry • Order fulfillment • Order receiving	• Customer • Retailer • Retailer • Customer
Replenishment	• Order trigger • Order entry • Order fulfillment • Order receiving	• Retailer • Distributor • Distributor • Retailer
Production/ Manufacturing	• Order arrival • Production scheduling • Production/ Manufacturing and shipping • Order receiving	• Distributor/Retailer or customer • Producer/Manufacturer • Producer/Manufacturer • Distributor/Retailer or customer
Sourcing/ Procurement	• Order arrival • Order entry/ Production scheduling • Order fulfillment/ Production and shipping • Order receiving	• Manufacturer/ Producer • Supplier • Supplier • Manufacturer/ Producer

Source: Adopted from Chopra and Meindl, 2003.
* Arrival in supermarket, call a mail order or use web or electronic link to a mail order firm etc.

The two tables provide a general depiction of what takes place in a supply chain. A chain reaction from the customer to the supplier always exists. This reaction is generated by the reaction cycles, as depicted in the cycle view of the supply chain processes. The end of one cycle triggers the beginning of the next cycle. Conversely, these reactions set towards fulfilling a customer's demand may be seen as pulling and pushing reactions. A supply chain does not have to contain all processes described in the cycle view of the supply chain processes, however, in terms of the pull/push view; both can exist in one supply chain. An example of this is noted in the supply chain of the DELL computer manufacturer (Chopra and Meindl, 2003) whereby, the chain bypasses the distributors and deals directly with the end customers. Essentially, this confers the supply chain an advantage of shorter cycle times, as well as low inventory (due to the procedure of manufacturing only according to orders placed).

Table 2.4
Pull and Push View of Supply Chain Processes

View	Properties/ Characteristics
Pull	• Initiated in response to a customer order • Demand is known with certainty at order execution time • It is a reactive process
Push	• Executed in anticipation of customer orders • Demand is not known for certain at order execution time • Demand must be forecasted • It is a speculative process

Source: Adopted from Chopra and Meindl, 2003.

The meeting point between the pull view and the push view is what many in supply chain management call decoupling point (Christopher, 2000). The pull process is what allows the visibility of real demand. The visibility of real demand is important, as it reflects the ongoing requirement in the final marketplace being as close to real-time as possible. When a supply chain has a longer pull process, the chain is driven by demand, if the push process is longer, the chain is forecast driven. Therefore, these are crucial roles in the design of supply chains (Chopra and Meindl, 2003).

In the past decade, several researchers have attempted to categorize supply chains according to different properties. Chopra and Meindl (2003) categorize supply chains as two types, the efficient and the responsive. Cigolini et al. (2004) improves on this categorization by adding another type of supply chain that lies between these two types, i.e., the lean type of supply chain. Efficient supply chains primarily target supplying the market demand at the lowest possible cost. According to Cigolini et al. (2004), efficient supply chains focus actions on the continuous replenishment techniques, in order to improve physical distribution efficiency and effectiveness. This gives the chain an effective source of competitive advantage that significantly improves the inventory turns.

The agile SCs (some authors term this as ‘quick’ (Cigolini et al., 2004), others term it as ‘responsive’ (Fisher, 1997), while others view it as more than speed as it entails more than speed (Youssef, 1992)) are characterized by high levels of maneuverability that arise from the flexibility of the chain. Flexibility is defined as the ability of a SC to respond rapidly to changes in demand, both in terms of volume and variety. Agile SCs work, as partners, with a limited number of strategic suppliers through linked systems and processes (Christopher, 2000). For operations of the agile SCs to function successfully, high levels of information sharing and the need of high levels of connectivity between SC members is a pre-requisite. Christopher further construes that, it requires multiple collaborative working relationships of members at all levels of the SC. Agility is needed in less predictable environments where demand is volatile and the requirement for variety is high.

Christopher (2000) describes, lean, as doing more with less, and it is a term often used in connection with lean manufacturing to imply zero inventory - the JIT approach. In this kind of supply chains implementation of powerful information systems linked across SC partners and efforts to reduce SC costs usually lead to smaller inventories and in general to leaner SCs (Kleindorfer and Van Wassenhove, 2004). Lean works best in high volume, low variety and predictable environments.

A summary of characteristics of the three types of supply chains described above and some examples of products that can go through such supply chains are given in Table 2.5.

These properties give a direction towards the kind of functional strategy expected to be used by each supply chain. For example, an efficient supply chain is expected to try and minimize inventory to lower the cost, while the quick supply chain will maintain buffer stock to meet unexpected demand as an inventory strategy (Fisher, 1997). According to Chopra and Meindl (2003), a lack of strategic fit between the competitive strategy and supply chain strategy may result in the supply chain actions not being consistent with customer needs, which may result in reduction in supply chain surplus, resulting in a decline in the chain's profitability. Strategic fit forces the totality of functions and stages in the chain to target the same goal of fulfilling customer needs.

Table 2.5
Supply Chain Types

SC Type	Properties	Product example
Efficient	- Easy to forecast demand - Brings to the market commodities sold in high volumes - Supply demand at the lowest cost through high utilization of facilities - Chains invest in capital-intensive facilities - Improvement initiatives are focused on operations to maximize performance at a minimum product cost - Lower margins because price is a prime customer driver - Compete on price	- Grocery - Pharmaceuticals - Basic apparel - Classical books
Lean	- Have intermediate characteristics of efficient and quick supply chains - Compete simultaneously on price, novelty, time, quality and customer service - Put internally complex products on the market	- Automobiles - White goods - Computers
Quick/ Responsive/ Agile	- Difficult to forecast demand so maintains capacity flexibility to meet unexpected demand - Responds to a wide range of quantities demanded - Meets short lead times - Handles a large variety of products - Build highly innovative products - Meet a high service level - Compete on time and innovation rather than on price	- Fashion apparel - Technology driven product innovation - Book publishing - Best selling Books

Source: Compiled from Chopra and Meindl, 2003; Cigolini, 2004.

In a similar endeavor towards categorizing supply chains, Lejeune and Yakova (2005) recently conceived a typology of supply chain configurations, which distinguishes among communicative (characterized by slight dependence among supply chain members, cross-function integration), coordinated (characterized by prominent dependence, lead organization), collaborative (slight interdependence, common supply chain goals) and co-opetitive (prominent interdependence, cooperation) supply chains. These basically depict the development or evolutionary stages of supply chains. For example, Mentzer et al. (2001) describe the communicative supply chain as a supply chain that exists, but is not managed. This is a reflection of early stages of supply chain development, as it involves short-term (as needed) relationships and the chain can change into any of the three initially discussed supply chain types. With realization of benefits, the chain will definitely develop into higher stages. Further discussion of these stages is in the supply chain levels section.

The approach to manage the supply chain is an additional area that needs to be explored. The following sub-section discusses the building blocks and current practices of supply chain management.

2.2.2 The Essentials of Supply Chain Management

Lee (2000) observed that for many firms to improve their competitiveness, currently they are embracing supply chain management to increase their effectiveness and achieve goals, such as improved customer value, better resource utilization, and the increase profitability. Lambert and Cooper (2000) claim that supply chain management represents one of the most significant paradigm shifts of modern business management by recognizing that individual businesses no longer compete as sole autonomous entities, but rather as supply chains. Tan et al. (1999) shows empirically that supply chain management impacts the performance of supply chains in a positive way, causing the interest in managing supply chains to grow rapidly among companies in the world (Li et al., 2005).

The major forces behind this development stem from the increasing pressure of customers requirements in product customization, quality improvement, demand responsiveness and lower pricing; as well as the increasing competitive pressure being faced by businesses nowadays, more than ever before (Chan and Qi, 2003b; Holmberg, 2000). In order to survive under these pressures many companies, in their efforts to improve efficiency and product quality, now look beyond their own operating boundaries and consider the overall design of their supply chains (Baiman et al., 2001). The current changing industry dynamics has influenced the design, the operation and the objectives of supply chain systems by increasing the emphasis on: customer service levels improvements, production cost reduction, improvement of quality of products and services, shorter lead times, reduction of cycle times and lower inventory levels, the integration of information technology and process flows, planning and managing movements, and the flexibility of product customization to meet customer requirements to ensure profitability (Chan and Qi, 2003b; Cahill and Gophal, 1992).

Kleindorfer and Van Wassenhove (2004) consider a supply chain as a set of entities consisting of suppliers, manufacturers, distributors, retailers and customers as an outcome of a broader view of the chain resulting from the emergence of supply chain management. They view these entities as interconnected and the linkages support three types of flows that require careful design and close coordination. The flows, include material flows (products, servicing, recycling), information flows (order transmission and tracking, and, coordination of physical flows), and financial flows (credit terms, payment schedules, and, consignment arrangements). In turn, the supply chain is supported by three pillars: First, processes, or value adding activities that embody logistics, new product development, and knowledge management; Secondly, organizational structures incorporating a range of relationships from total vertical integration to network supply chain members, performance management and reward schemes; Finally, enabling technologies encompassing process technologies and information technology.

Lambert and Cooper (2000) provide a more detailed view of supply chain management. They assert that in managing the supply chain three interrelated elements are involved. These elements include: the supply chain network structure, which comprises supply chain member firms and their interconnective links; the supply chain business processes, comprising the activities that produce a specific output of value to the customer; and, the management components that are managerial variables allowing for integrated business processes, managed across the supply chain. Table 2.6 illustrates further details of each element in managing the supply chain. The authors point out that a prerequisite for successful supply chain management lies in coordination of activities within the firm and the supply chain as a whole, which can be carried out by identifying the key business processes and using cross-functional teams in managing the identified key processes.

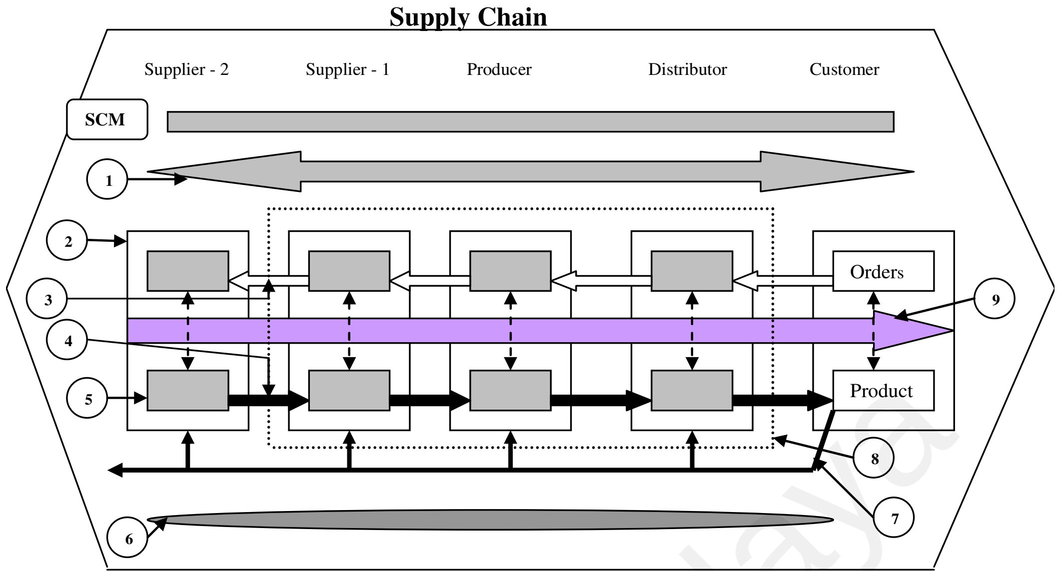
Lambert and Cooper (2000) believe the identification of chain members, critical to link with, and the processes needing linkage, are part of the implementation of supply chain management, aiming at creating the most value for the entire supply chain network. As seen by Chandra and Kumar (2000), supply chain management, turns out to be a way of improving competitiveness through the reduction of uncertainty and the enhancement of customer service.

To elaborate further on supply chain management, Figure 2.2 presents a model reflecting a simplified supply chain network structure consisting of the information system (indicating the flow to all chain members), transactions /finance flows, key supply chain business processes penetrating functional boundaries within the company and the various company borders across the supply chain, material and product flows, return logistics, and third party logistics providers. The business processes become supply chain business processes linked across intra-and intercompany boundaries.

Table 2.6
Elements Involved in Managing the Supply Chain

Element	Components and their Characteristics
Network Structure	• Identifying SC members – sort out some basis for determining members who are critical to the success of the SC so that they be allocated managerial attention and resources (primary or secondary). • The structural dimension of the network – essential when describing, analyzing, and managing the SC; includes: horizontal structure (number of tiers across the chain), vertical structure (number of suppliers/customers represented within each tier), and horizontal position (near the source, near the end customer or in between). • Business process links – four types: managed process links (important to the focal company); monitored process links (not as critical to the focal firm); not-managed process links (focal company not actively involved in, nor are they critical); and non-member process links (other connected SCs that influences the focal SC).
Business Processes	• Customer relationship management – identifies key customers or customer groups (critical to business mission), establish product and service agreements specifying level of performance. • Customer service management process – provides single source of customer information; key point administering product/service agreement. • Demand management process – balances customer requirements with firm's capabilities. • Customer order fulfillment process – integrates the firm's production, distribution, and transport plans to meet customer need dates. • Production flow management process – pulls product through production unit based on customer needs. • Procurement process – strategically develops plans with suppliers to support the production flow process and development of new products. • Product development and commercialization – integrates customers and suppliers into product development to reduce time to market. • Return process – enables identification of productivity improvement opportunities and breakthrough projects.
Management Components	• Planning and control – key to moving an organization in a desired direction. • Work structure – indicates how the firm performs its tasks and activities. • Organizational structure – can refer to the individual firm and the SC; the cross-functional teams would suggest more of a process approach. • Product flow facility structure – sourcing, production and distributing across the SC. • Information flow facility structure – the kind passed among members and frequency of updating has strong influence on efficiency of the SC. • Management methods – include the corporate philosophy and management techniques. • Power and leadership structure – affects the SC form; one strong channel leader will drive the direction of the chain. • Risks and rewards sharing – affects long-term commitments of chain members. • Culture and attitude – compatibility of corporate culture across the chain is important; includes how employees are valued and how they are incorporated in the management of the firm.

Source: Compiled from Lambert and Cooper, 2000.



Key: **1** – Information System; **2** – Organization (Management, Functional Activities); **3** – Transaction / Financial Flows; **4** - Material/Product Flows; **5** – Departments within an organization; **6** – Reverse Logistics); **7** - Third Party Logistics Providers (3PLP); **8** – Collaboration; **9** – Supply Chain Business Processes.

Source: Compiled from Ellram et al., 2004; Mouritsen et al., 2003; Korpela et al., 2001; and, Lambert and Cooper, 2000.

Figure 2.2
A Supply Chain Management Model

In their view of supply chain management, Eric Johnson and Pyke (2000) believe that supply chain management typically involves coordination of information and materials among multiple firms. The authors divide supply chain management into twelve areas: location, transportation and logistics, inventory and forecasting, marketing and channel restructuring, sourcing and supplier management, information and electronic mediated environments, product design and new product introduction, service and after sales support, reverse logistics and green issues, outsourcing and strategic alliances, metrics and incentives, and global issues. Most of the elements are similar to what has been presented by Lambert and Cooper (2000) except, for the added stakeholder of environment protection group (environmentalists). These elements and processes are clearly depicted in the supply chain management model presented in Figure 2.2. In the model the supply chain begins with the end customer, or the second tier customer and moves through first tier customer, production, first tier suppliers, second tier suppliers, or basic input source, covering virtually all those involved in fulfilling customer requests including, the end customer.

The organizations are presented in the model of rectangles that contain the internal structure of different functions (production, research and development, finance, human resource, marketing and sales, logistics, and purchasing, etc.). It is important to note that these rectangles are opening up due to collaboration and cooperation efforts in the chains, being now seen as administrative boundaries only. Management decisions also play a role in the path, determining the choice of structure, partners and processes that flow towards the customer, as does materials and products. The supply chain business processes, includes customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement, product development and commercialization, and returns (Lambert and Cooper, 2000). In principal, all information is availed to all participants in the supply chain (Mouritsen et al, 2003) as operating an integrated supply chain requires continuous information flows that assist in creating the optimum product flow (Lambert and Cooper, 2000). Supply chain management coordinates all these processes and activities to fulfill customer requests.

Mentzer et al. (2001) see supply chain management to be having three characteristics: One, systematically views the supply chain as a whole, and manages the total flow of goods and inventory from the supplier to the ultimate customer. Two, is strategically oriented toward cooperative efforts aimed at synchronizing and converging internal operations of individual firms and operations across firms and strategic capabilities into one unified whole. Three, is customer focused with the intention of creating unique and individualized sources of customer value, leading to customer satisfaction. Successfully implementing the supply chain management, Mentzer et al. (2001) suggest the following necessary activities: integrated behavior, the integration of processes, mutually sharing of information, cooperation, goal congruence, the same focus in serving customers, and, building (by partners) and maintaining long term relationships. This is in line with what has been proposed by Lambert and Cooper (2000). Although, in terms of integration and coordination, the later suggests that the most appropriate relationships befitting specific sets of circumstances are the only ones closely linked. It is worthwhile to investigate each of these activities to ascertain how each impacts the management of supply chains.

2.2.2.1 Supply Chain Management Activities

In the following paragraphs, key supply chain management activities outlined in the preceding paragraphs are discussed. The discussion covers the impact of each activity on the management of supply chains.

Integration

Combining something in such a way that it becomes a full part of something else is what is known as integration. The integration behaviour is seen to be important in supply chain management as the entire process must be viewed as one system (Lummus and Vokurka, 1999) since supply chain management coordinates (i.e., ascertains that decisions of all supply chain members are geared towards one goal of maximizing total chain profits) and integrates all activities involved in fulfilling the customer request (Vokurka et al., 2002).

Lee (2000) outlines three dimensions of supply chain integration: One, information; Two, coordination and resource sharing; and three, organizational linkages. The aspect of information involves supply chain members sharing information and knowledge including: transactional, production, and process-related data. According to Mouritsen et al. (2003) this integration makes customer demands, inventory and production visible throughout the supply chain. Shapiro (2001) views supply chain integration in four dimensions: functional integration – planning, supply, production and distribution activities; spatial integration – through the location of suppliers, facilities and markets; temporal integration – of activities with regard to strategic, tactical and operational time horizons; integration of the supply chain with other systems in the firm.

Coordination

Co-ordination makes different parts to function together efficiently. Coordinating activities in a supply chain, however, is difficult, partly due to the complexity induced by the large number of related and interdependent activities in the supply chain (Holmberg, 2000). The author elaborates that understanding what happens in a supply chain and why it happens can be difficult for firms with limited information about what is occurring within other parts of the supply chain. In supply chain management co-ordination and resource sharing covers the realignment of decisions and responsibilities by supply chain members.

Organizational relationship linkages take in the communication channels amongst chain members, performance measurement, sharing visions, and sharing objectives (for goal congruence). The need for process integration is imperative in implementing supply chain management, and this covers all processes in the supply chain, accomplished through cross-functional teams, in-plant supplier personnel, and third party service providers (Cooper et al., 1997; Ellram and Cooper, 1990). The integration process starts with internal function integration and ultimately reaches to the full supply chain integration whereby the scope of integration extends throughout the supply chain (Poirier and Quinn, 2003).

Information Sharing

According to Mentzer et al. (2001) information sharing is the willingness to avail strategic and tactical data to other members of the supply chain. Thus performance is enhanced as uncertainty between supply chain members is reduced as a result of the open sharing of information, such as inventory levels, forecasts, sales promotion strategies, and marketing strategies. Facing less uncertainty, supply chain members can reduce inventory buffers by postponing costly value adding operations. Also, they can provide better customer service with more flexible responses to customer demands. Through this, significant productivity gains are attainable by the supply chain members (Mouritsen et al, 2003). So the importance of mutually sharing information cannot be overemphasized, as it is required for the planning and the monitoring processes (Cooper et al., 1997). As such, this result in reduced cycle times, increased visibility of transactions, better tracing and tracking, reduced transaction costs, and enhanced customer service giving the supply chain a greater competitive advantage (Christopher, 1998).

Within supply chain management literature, information exchange is viewed as an absolutely necessary and indisputable component in any successful supply chain, having a tremendous impact on a firms' operation. This fact drives supply chain management to have new perspectives on systems, as it makes individual firms contemplate the supply chain as a whole. In supply chain management, the network of organizations is structured through upstream and downstream linkages among the processes and activities that add value along the value chain (Christopher, 1992). The process-based model of a supply chain blurs organizational and departmental borders between the connected processes and activities, thus diluting the structural barriers and encourages cross - organizational optimization (Chan and Qi, 2003a).

Risk Sharing

The aspect of mutually sharing risks and rewards is also required in an effective supply chain management. According to Cooper et al. (1997) it should happen for a long time, and also it is important for long term focus and co-operation among supply chain members. Working together for a common purpose is known as co-operation. This is necessary among supply chain members for an effective supply chain management (Ellram and Cooper, 1990) cutting across all levels in the supply chain, while involving cross-functional coordination of activities in the entire chain (Cooper et al., 1997). According to the authors, the process of cooperation begins with joint planning in the supply chain and progresses through to joint control activities that evaluates performances of members, as well as the chain as a whole.

Goal Congruence

Mentzer et al., 2001 support the argument that a supply chain succeeds if all its members have the same goal and the same focus on serving customers. Basically, it is what many authors term as goal congruence. Goal congruence can be described as the extent to which chain members perceive the possibility of common goal accomplishment, enabling the estimation of the degree of alignment among supply chain members to be determined (Lejeune and Yakova, 2005). In the case of true goal congruence, supply chain members feel that their objectives fully coincide with those of the chain (Lejeune and Yakova, 2005). According to Jap (2001), goal congruence has the benefit of reducing incentives for opportunism and it may be considered as a key component of the relationship between supply chain members. As Mentzer et al. (2001) affirm, establishing the same goal and same focus among supply chain members is a form of policy integration, the possibility exist if there are compatible cultures and management techniques among the chain members.

Strategic Alliance

Supply chain partners building and maintaining long term relationships cannot be excluded, as supply chain management constitutes of a series of relationships. The relationship time horizon is believed to extend beyond the life of the contract, also at the same time, the number of members being small to facilitate increased cooperation (Cooper et al., 1997). Mentzer et al. (2001), state that forming strategic alliances with supply chain partners provides a competitive advantage by creating customer value.

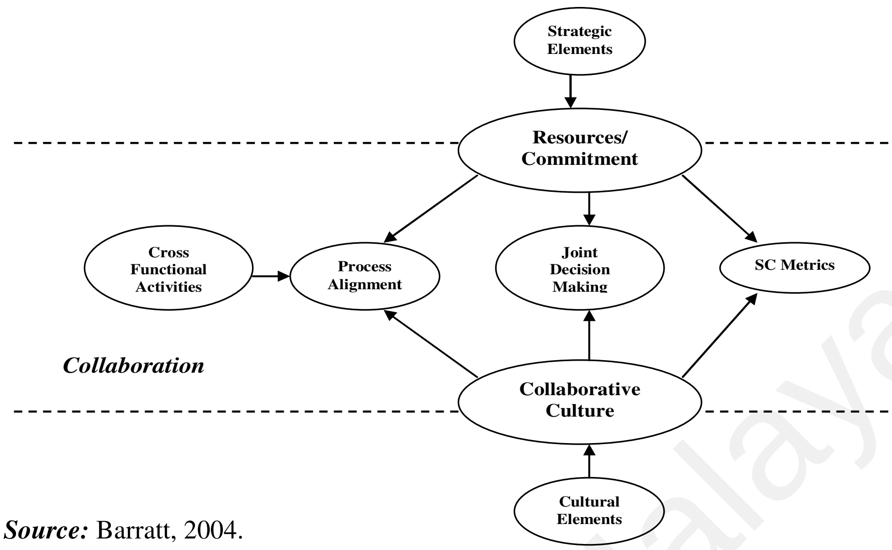
2.2.2.2 Supply Chain Collaboration

According to Bititci et al. (2005), partnering with supply chain members (suppliers, customers, designers, research institutes, etc.) is collaboration. The process integrates individual competencies of chain members to create a level of competency that is unmatched and difficult to copy and develop. Simatupang and Sridharan (2002) define supply chain collaboration, as two, or more chain members working together to create a competitive advantage through the sharing of information, making joint decisions, and sharing benefits which result in the greater profitability from jointly satisfying end customer needs, than acting alone. Barratt (2004) states, collaboration can be vertical (with customers and suppliers, or internally i.e., across functions) or can be horizontal (with competitors, with non-competitors, or internally e.g. sharing production capacity).

Furthermore, Angerhofer and Angelides (2005) say collaboration can take on many different forms, including strategic alliances, joint ventures, third party logistics, short and long term contracts, partnership sourcing, and retailer – supplier partnership. The authors point out that collaboration can be at three management levels. One, at the strategic level, concerns with decisions that influence the future direction of the supply chain; Two, at the tactical level, concerns about the optimization of the flow of goods, forecasting, planning, and resource control; and three, at the operational level, dealing with routine and repetitive tasks, such as production, transportation scheduling, or stock control.

Despite possessing an impressive track record, supply chain collaboration has been slow to catch on. Overall, the most significant barriers to collaboration are not technical, but obstacles from within the firms (Cooke, 2003). Importantly, internal collaboration must be aligned with the external collaboration for fruitful results. Barratt (2004) identifies several elements of collaboration: cross-functional activities, process alignment, joint decision making, and supply chain metrics. Resource commitment and the existence of a collaborative culture are important for a successful collaboration. Strategic elements that contribute to resources and commitment are: corporate focus; business case; and, technology, which culminate to the intra-organizational support. The cultural elements that contribute to collaborative culture compose: trust; mutuality; information exchange; and, openness and communication (Barratt, 2004). The schematic relationships of the strategic elements are presented in Figure 2.3.

According to Sahay (2003) collaborative relationships require trust and commitment for long term cooperation, along with the willingness to share risks. Bowersox et al. (2000) are of the opinion that the shortcomings of supply chain members' internal collaborative practices can be identified with the aid of a measurement instrument, allowing for remedial initiatives to be instituted by the chain members and to pave a way for possible benchmarking of their practice levels to the best–in–class performers.



Source: Barratt, 2004.

Figure 2.3
Elements of Supply Chain Collaboration

While developing an instrument to measure the extent of collaboration in supply chains, Simatupang and Sridharan (2005) categorize the concept of collaboration into three interrelated dimensions: information sharing – which refers to the act of capturing and disseminating timely and relevant information for decision makers to plan and control supply chain operations; decision synchronization – which refers to planning context, whereby decisions about long term planning and measures of such facets as selecting target markets, product assortments, customer service levels, promotions, as well as forecasting are integrated, and the operations context, whereby order generation and delivery processes in form of shipping schedules and the replenishment of the products are integrated; and, incentive alignment – which refers to the degree to which chain members share costs, risks, and benefits. The authors argue that these three dimensions are important to enable the supply chain members to improve the rapid flow of products to end customers. The authors manage to show that there is a significant correlation between the index developed (collaboration index) and the operational performance. Chain members can build collaborative efforts to seek opportunities to improve overall supply chain performance.

According to Barratt (2004), the collaborative culture is important, but most organizational cultures cannot support collaboration, is it internally, or externally, due to most organizations are functionally oriented. Trust (external and internal) can contribute to the long term stability of an organization and acts as a foundation in building cooperation in the supply chain. Mutuality comes with mutual risk sharing and respect for partners. Information exchange in the supply chain is a fundamental need to improve the performance of the chain and is achieved through process integration, as the chain moves to a seamless supply chain in which all players think and act as one. Openness and honesty build trust, respect and commitment, as a result of certainty and reliability improvements. Communication fosters information sharing and provides assistance in creating a shared understanding among supply chain partners.

However, to develop a collaborative relationship a massive change has to take place internally, as well as externally to the organization (Barratt, 2004). Subsequently, managing change, by deploying programs to support the collaborative initiatives, is important to avoid internal resistances. Other key elements in terms of what has to happen if collaboration is to succeed are: cross-functional activities, process alignment, joint decision making, and true supply chain metrics. According to Barratt (2004), for sustainable collaboration, a number of strategic elements must be present: One, resources and commitment, where collaborating partners must be prepared to commit resources; Two, intra-organizational support in which senior management support is required at the initial and ongoing process, as well as gaining the support of other parts of the organization; Three, the corporate focus on supply chain;

Four, demonstrating the business case to build support from senior management; and five, the role of technology where the key is to have a clear understanding of what supply chain partners are collaborating upon, clearly defined processes, and a clear understanding of information required to populate the processes so as to avoid unnecessary investment on technology.

2.2.3 Supply Chain Management Implementation Tools

The discussed activities extend through all tiers of the supply chain and involve the use of supply chain management techniques in realizing their intended outcome. Cigolini et al. (2004) identify a number of management techniques (family of operations management methods) that operate at the interface between supply chain members. These include: design for supply chain management; redesign of warehouses network, retailing system, transport fleet, and facility network (as supply chain configuration techniques); just in time, logistic category management, group purchasing organizations, distribution requirements planning, transportation optimization, continuous replenishment and vendor managed inventory (VMI), reserving upstream capacity/ stock, reorder policies and business process redesign (as supply chain management). To support the implementation of these techniques, Cigolini et al. (2004) proposes three broad categories of supply chain tools covering information tools, co-ordination and control tools, and organization tools.

As put forth by Cigolini et al. (2004), information tools (online connections and automated identification systems) are utilized to gather, transmit and share data. The co-ordination and control tools (performance metrics, vendor rating systems, total quality certifications, cross firm incentive system, supply chain cost accounting system) are utilized to monitor and influence the decision making process, by measuring performances and setting rewards based on achievement of certain results. The organizational tools (supply chain interface managers) are functional to support cross company communication and coordination. The resulting outcome of these efforts is what one may term as collaboration, which is seen by many as the backbone to the success of supply chain management. Bowersox (1990) advocates that supply chain collaboration facilitates the cooperation of supply chain members to improve performance. On the other hand Fisher (1997) and Lee et al. (1997) identify the benefits of collaboration, to include revenue enhancements, cost reductions, and operational flexibility enabling the chain to cope with high demand uncertainties.

2.2.4 Scope of Supply Chain Management

Even though, some authors believe that the scope of supply chain management is made unclear by the flurry of activity across multiple business disciplines (Larson and Halldorsson, 2002). The authors point out, for example, in the purchasing field alone, there are four different conceptual perspectives on its relationship to supply chain management. These perspectives are: Traditionalists who conceive supply chain management as a strategic aspect of purchasing, emphasizing supplier development and partnership up to the second tier suppliers; Relabelers who merely change the name of purchasing to supply chain management; Unionists who perceive purchasing completely subsumed by supply chain management; and, the Intersectionalists who view supply chain management as elements from various disciplines, including purchasing, and supply chain management coordinated cross-functional efforts across multiple firms. This research has adopted the view of Intersectionalists, as it reflects what has been discussed in previous paragraphs.

2.2.5 The Supply Chain Evolution

Supply chains do not achieve the highest results of supply chain management overnight, as it takes time and effort to engineer an effective supply chain management. Poirier and Quinn (2003) identify five stages that supply chains go through in achieving supply chain excellence. The first stage pertains to enterprise integration where the focus will be on functional and process improvement. The second stage is about corporate excellence, where the focus will be on intra-enterprise, or corporate-wide excellence in supply chain processing. In the third stage, which is dominated by partner collaboration, the focus will be on firms working together with business allies (inter - enterprise). For the fourth stage pertaining to value chain collaboration (external), the focus will be on establishing a position of dominance in an industry for a particular network. The last stage concerns full network connectivity. In this stage, communication will be fully electronically enabled. Appendix 1 presents summarized processes, activities and characteristics of members of the chain that are very prominent in each stage of evolution.

Found in level one is the basis of how each department in the organization tries to organize its operations to realize savings from properly managed functions with their supply chain management efforts entirely focused inward. Reliance concerns internally generated process improvements aimed at reducing costs in specific functional areas. No links, other than the traditional business relationships exists for the firm.

In level two, the organization endeavors to optimize the value chain internally. The functions perform their activities as a type of internal supply chain (operations, distribution and service), which determines the nature of the procurement of raw materials, the transportation of materials to and from the firm, and the production of the goods / services. New product development specifies a portfolio of new products the company will attempt to develop, either internally or through outsourcing, while marketing and sales explores how the market will be segmented, products positioned, priced and promoted. Also, the configuration of how to support the functions by support units (finance, accounting, information technology, and human resources) is implemented (Chopra and Meindl, 2003). The structure of this level of evolution emphasizes the close relationship of all functions (including their strategies) within the organization.

In level three of the supply chain evolution, business allies co-operate using a variety of techniques with the intentions of discovering savings through mutually beneficial initiatives that reduces cycle time, achieves a faster time to market, and has effective utilization of asserts. Likewise, at this level, sales and marketing are a part of the supply chain management picture and key customers are empowered to do self configuration of their requirements (products or services). This is done in many cases through the use of an interactive on-line portal.

In level four of the supply chain evolution, supplier and customer collaboration blossoms. The organization moves forward with its position in the supply chain network. The grouping of the chains becomes pronounced, due to collaborative initiatives. The firm, under this advanced environment, starts to work earnestly with a small group of upstream suppliers and downstream customers, and the chain focuses on establishing a position of dominance in an industry.

Furthermore, level five of supply chain evolution sees the highest, or the most advanced stage of evolution. The communication connectivity across the total supply chain network is the main characteristic of this level. In this level, there is full network collaboration and full usage of technology to gain positions of market dominance. The chains in this level achieve unprecedented levels of order accuracy and cycle time reductions across the end-to-end networks that are completely electronically enabled. Figure 2.4 presents a schematic form of a supply chain management model appropriate to this level of evolution. The model is similar to the one presented in Figure 2.2 showing a supply chain management model.

This paves way to the discussion on supply chain management practices construct.

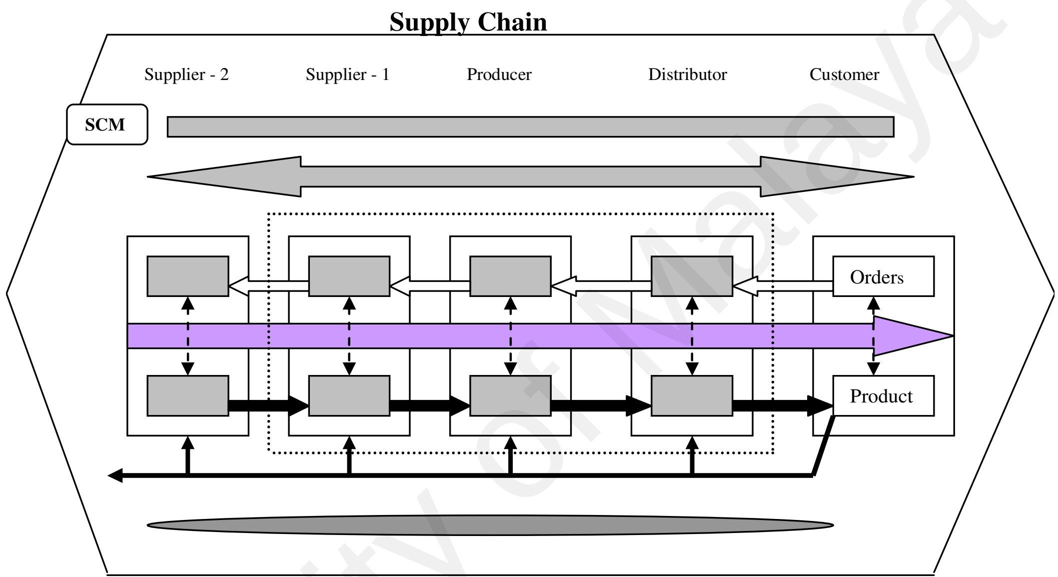


Figure 2.4
Schematic Presentation of Supply Chain Level Five

2.2.6 Supply Chain Management Practices Construct

The discussion in the preceding paragraphs highlights the stage by stage development of a supply chain that can be observed in any chain across time, beginning with an un-managed supply chain and improving to reach the highest level of supply chain management. It should be noted that each of the levels of evolution reflect dominant practices performed by a firm belonging to a supply chain. This makes it relevant for one to study these practices in terms of how they are measured and their impact on the well being of the firm and its chain. It was earlier generalized that the activities being performed by firms in supply chains are aimed at improving the performance of the individual firms and that of the chains to which they belong. Supply chain management practices are defined as a set of activities undertaken in an organization to promote effective management of its supply chain (Li et al., 2005; 2006).

There has been a multitude of studies in the recent past that have dwelt in the area of supply chain management practices in very broad terms. Some studies focused on practices that lead to inventory reduction from within and across organizations in supply chains (Alvarado and Kotzab, 2001; Romano and Vinelli, 2001). Others looked only at activities related to the functions of purchasing (Banfield, 1999; Lamming, 1996). According to Li et al. (2005), much of the current researches choose to focus either on only practices related to internal supply chain, those related to the upstream or downstream side of the supply chain. Within these categories or areas of focus, some researches have looked into few aspects of say internal supply chain such as total quality management practices (Tan et al., 2002), internal integration practices (Pagell, 2004; Braganza, 2002), agile manufacturing practices (McIvor, 2001), and postponement (Van Hoek et al., 1999).

The supplier side has received some attention as seen from Choi and Hartley (1996), Stuart (1997), Monczeka et al. (1998a), Narasimhan and Jayaram (1998), Vonderembse and Tracey (1999) and Shin et al. (2000), among many others. The downstream side has also received attention as seen from studies by Clark and Lee (2000) and Alvarado and Kotzab (2001) among others. Some studies have dwelt simultaneously on supply chain management practices in both the upstream and downstream side of supply chains. These studies include that by Li et al. (2005; 2006), Tan et al. (1998) and that by Frohlin and Wesbrook (2001). Other studies with their areas of focus in brackets are: Min and Mentzer (2004) (measurement instrument for supply chain orientation) and Cigolin et al (2004) (tools to examine supply chain management strategies).

These studies represent efforts performed with the aim of addressing supply chain management issues that happen to be so diverse, but still interesting to study due to the importance of supply chain management practices to business entities. The absence of a unifying conceptual framework covering the upstream side, the internal part, and the downstream side of the supply chain waters down the usefulness of the results of the above studies.

In their bids to study supply chain management practices, authors have identified different practices to represent the constructs or variables for studying supply chain management in firms belonging to supply chains. Some of these authors with the identified practices are presented in Table 2.7. As seen from the table, literature portrays supply chain management from a variety of perspectives with a common goal of improving organizational performance.

Table 2.7
Identified Supply Chain Management Practices

Author	Identified SCMP
Donlon (1996)	Supplier partnership, outsourcing, cycle time compression, continuous process flow, information technology sharing
Tan et al. (1998)	Purchasing, quality, customer relations
Alvarado and Kotazb (2001)	Core competencies, use of EDI (and other IT technologies), postponement
Tan (2001)	Coordination of flow (material and information), postponement, mass customization
Gunasekaran et al. (2001)	Strategic supplier partnership, number of knowledge workers, investment in IT, Use of internet and intranet, communication
Tan et al. (2002)	Information sharing, supply chain characteristics, supply chain integration, customer service management, geographical proximity, Just in time (JIT) capabilities
Wisner (2003)	Supplier management strategy, customer management strategy, supply chain management strategy
Chen and Paulraj (2004)	Supplier base reduction, long term relationship, communication, cross-functional teams, supplier involvement
Min and Mentzer (2004)	Agreed vision and goals, information sharing, risk and award sharing, cooperation, process integration, long term relationships, agreed supply chain leadership
Li et al. (2005)	Strategic supplier partnership, customer relationship management, information sharing, internal lean practices, information quality, postponement
Li et al. (2006)	Strategic supplier partnership, customer relationship, level of information sharing, quality of information sharing, postponement

As noted in supply chain levels literature, there are five levels in supply chain development, level one being the lowest. Each level has some supply chain management practices that are dominant and these practices distinguish one level from another level. Since a firm in a supply chain may be practicing at differing extents, different practices at different levels, and in differing chains, it may prove to be a difficult task to gauge the supply chain levels to performance. In this respect, after a thorough literature review, this research identifies seven practices that are to be used in this research. The practices reflect the levels and they include items to measure: internal lean practices; strategic supplier partnership; information sharing; customer relationship management; information quality; postponement; and, communication connectivity. Table 2.8 gives the description of each factor, with some of the posited impacts on the chains. The identified practices represent the first order factors that are to be used in the study. The measurements to be used for each factor are enumerated in Appendix 2. It should be noted that the factors cover the upstream side (SSP) of a supply chain, the downstream side (CRM) of the chain, the internal part (ILP, PST) of a chain, as well as information flow across a chain (IS, IQ, CC). Although these factors of supply chain management practices capture the entire array of a supply chain, they not complete. Other factors are identified in literature as seen in Table 2.7. The seven factors are defined in Table 2.8 and in Appendix 2. Some posited impacts from these factors to the wellbeing of the chain are also presented in Table 2.8, with the relevant references. From this, it may be posited that supply chain management practices impacts both time based performance and overall firm performance.

To conclude, supply chain management is important in a successful supply chain, since the practice leads to better performance of the firms in the chain and ultimately the entire supply chain. This fact leads to one important aspect of how a supply chain can be evaluated to ascertain the success, performance and to exercise control on its processes i.e., performance measurement, which in business is not a new phenomenon. Accordingly, businesses have been measuring costs, quantity, efficiency, as well as productivity of

Table 2.8
Description of Supply Chain Management Practices First Order Factors

S/No	Factor Description	Impact	Reference
1.	Strategic Supplier Partnership - Long term relationship between the organization and its suppliers	Promotes shared benefits, enables organization to work more effectively through cost-effective design choices, best components and technologies, help design assessment, eliminates wasteful time and effort, reduces time to market, increases level of customer responsiveness and satisfaction, improved flexibility.	Gunasekaran et al., 2001; Monczeka et al., 1998a; Balsmeir and Voisin, 1996; Yoshino and Rangan, 1995.
2.	Customer Relationship Management - Practices employed in managing customer complaints, building long term relationships with customers and improving customer satisfaction	Improves customer satisfaction through personalized services / products (mass customization), differentiates product from competitors, sustain customer loyalty, extends the value provided to customers, improves flexibility resulting into reduction in backorders, number of lost sales, number of late orders, and hence improved sales/revenue.	Claycomb et al., 1999; Magretta, 1998; Tan et al., 1998; Aggarwal, 1997; Noble, 1997;
3.	Information Sharing - Extent to which critical and proprietary information is communicated to one's SC partner	Enables firms to work as a single entity, understands end customer needs better, enables quicker responses to market changes, negative impact of bullwhip effect reduced or eliminated, faster cycle times, reduced inventory, improved forecasts, higher quality products at lower cost and dependable delivery, quicker time to market.	Yu et al., 2001; Mentzer et al., 2000; Lalonde, 1998; Monczka et al., 1998a.
4.	Information Quality - Accuracy, timeliness, adequacy, and credibility of information exchanged	Accurate and timely information creates SC flexibility leading to higher customer satisfaction levels.	Holmberg, 2000; McAdam and McCormack, 2001; Jarrell, 1998.
5.	Internal Lean Practices - Practices of eliminating waste (cost, time etc.)	Enhances delivery of high quality, best value products in a timely manner, dominant drivers of highly integrated and down-sized SC, promising cost saving, and productive collaboration.	McIvor, 2001; Handfield and Nichols, 1999; Taylor, 1999.
6.	Postponement - Practice of moving forward one or more operations or activities to a much latter point in the SC	Enhances flexibility in product development to meet changing customer needs, differentiate products, modification of demand function, balances global efficiency and customer responsiveness.	Waller et al., 2000; Van Hoek et al., 1999; Naylor et al., 1999;
7.	Communication Connectivity – Completely electronically enabled full network collaboration and use of technology to gain positions of market dominance	Enables unprecedented order accuracy and cycle-time to be attained, high customer satisfaction and retention, high resource/ asset utilization etc.	Poirier and Quinn, 2003; Gunasekaran et al., 2001.

products, services and processes, as long as ways to measure these have existed. This has been due to the fact that the evaluation of performance is central to control of operations. In the following sections a review of what has been taking place in the area of performance measurement in organizations is presented.

2.3 Measuring Organizational Performance

The preceding sections presented a thorough discussion on supply chains and their management, highlighting that individual firms unite to make a supply chain. Before the advent of supply chains, firms operated as stand alones in serving their customers. It was important for the firms to monitor their operations and performances and to make appropriate adjustments for them to remain in business. Before discussing the approaches used in measuring supply chain performance, it is useful to understand how individual organizations measure performance in the individual perspective.

Various authors are of the opinion that despite organizational performance being the most widely used dependent variable in many studies, yet it remains to be one of the most vague and loosely defined construct (Katz and Kahn, 1966; Scott, 1977; Rogers and Wright, 1998). In some fields, performance as a construct focuses almost entirely on financial measures, while others view it as a comparison between the value created by the organization and the value expected by its owners (Venkatraman and Ramanujam, 1986). Salem (2003) sees performance as something referring to doing work, and the results achieved. The author defines performance as the outcomes of work. In other words, it may be seen as the end result of an activity. The basis for this definition is its linkage to the organization's strategic goals, customer satisfaction and economic contribution.

Performance may be viewed as the capacity to achieve a set of desired results. In viewing organizations, one may say organizational performance comprises the output, or the results of an organization measured against intended outputs (goals and objectives). Li et al (2006) says organizational performance refers to how sufficient the organization achieves targeted market oriented goals and targeted financial goals. If one links this to the definition of performance, given in the preceding paragraph, organizational performance may be seen as the accumulated end results of all work processes and activities taking place in the organization. This extends to supply chains since they behave as one entity. It is about effectiveness (achievement of objectives) and efficiency (rates of resource usage in achieving objectives). Good and Carin (2004) state that performance is a relative concept. This is the reason that made it frequently measured against some baseline or standard. In this research, performance is defined as the effectiveness and rate of resource usage in achieving set objectives.

The process of measuring performance requires the tools and procedures to perform the task. Measurement is the determination of the size or magnitude of something. An important fact in measurement is the existence of various quantities (e.g. weight, height, profit, and cost) that should be measured with different levels of measurements. Mentzer and Konrad, (1991) define performance measurement as effectiveness and efficiency in accomplishing a given task in relation to how well a goal is met. Neely et al., (1995) defines performance measurement as the process of quantifying effectiveness and efficiency of action. Lebas (1995) says measuring performance means transferring the complex reality of performance into a sequence of limited symbols that can be communicated and reproduced under similar circumstances. One can say this is the activity of measuring performance using performance metrics.

According to Kuwaiti (2004), performance measurement process is a collection of related activities designed to identify and collect data and transform the data into relevant, understandable and actionable performance information with accurate assessment of the achievement of strategic, tactical and operational objectives, which forms the basis of reward and appraisal systems. This study utilizes the definition provided by Neely et al. (1995) as it summarizes the aspects of other given definitions of performance measurement, and it defines performance measurement as the process of quantifying effectiveness and efficiency of action. The next sub-section, presents how performance in an organization is evaluated.

2.3.1 The Process of Evaluating Organizational Performance

Measuring performance, seen by some circles as managing for results, can be described in many different ways depending on the way it is performed and the purpose of measuring the performance. Thus, it may mean setting performance expectations, comparing actual performance with benchmarking data and continuously improving the processes. The process is much reflected, or pronounced in the basic principles of total quality management where one can pinpoint management by facts, continuous improvement, and customer satisfaction, focus on tangible results, not just in controlling costs as the key to success.

Performance measurement enables organizations to focus on what is important in achieving the set objectives. By comparing actual results with expected results, it enables the firms to evaluate progress towards goals and objectives. By comparing actual results with expected results, it enables the firms to evaluate progress towards goals and objectives (University of Arizona Library, 2004). Verweire and Van den Berghe (2003) state that effective performance measurement and performance management provides a systematic link between organizational strategy, resources, and, processes.

Measuring performance has long been recognized as vital in the efficient and effective management of organizations (Kennerley and Neely, 2002), and it entails the use of a performance measuring system, which basically is made up of a number of performance measures, or performance indicators. Moullin (2004) advocates eight essentials of performance measurement: One, the use of a balanced set of measures; Two, to make sure what is measured matters to all stake holders; Three, to make sure that employees are involved in determining the measures; Four, to include both perception measures and performance indicators; Five, to use a combination of outcome and process measures; Six, to take account of the cost of measuring performance; Seven, to have clear systems for translating feedback from measures into a strategy for action; and eight, measurement systems need to focus on continuous improvement. In the following paragraphs each of these essentials of performance measurement is related to its relevance in an organization.

The use of a balanced set of measures is required since a high standard of performance on a wide range of factors is necessary in delivering excellent products and services. It is therefore vital that performance is assessed on a balanced framework reflecting all the relevant areas. According to Bourne et al. (2000), the design of a performance measurement system translates the views of customers and other stake holder's needs into business objectives and appropriate performance measures. Therefore, making sure what is measured matters to the product or service users and other stakeholders as they are the ones who experience satisfaction from the use of the product and the service. Therefore, it becomes necessary to research and establish what really matters to these groups, as it is vital, both for measuring what matters to them, and also for developing action plans to make sure that the products and services meet their needs.

The involvement of workers in determining the measures helps in avoiding feelings of being misguided, prevents the likelihood of workers responding to measures differently than what is intended by management. According to De Haas and Kleingeld (1999), one expects increased information, knowledge and creativity resulting from the participation of employees through better communication and utilization of knowledge. This also helps in better solving organizational problems, causes less resistance to change because of the increase of trust on the part of employees, and / or an enormous feeling of control and the reduction of anxiety. According to Waggoner et al. (1999), performance measurement can provide feedback information on progress; it can improve motivation, communication and can diagnose problems. The authors are of the opinion that performance measurement is a crucial part of effective planning, control and decision making, being widely used by senior managers to monitor business performance, check progress and investigate areas for improvement (Gunasekaran et al., 2001). Thus, performance measurement is part of how an organization is managed, so it is important for the process to be cost effective and deliver value as it is vital for one to take account of the cost of measuring performance (Moullin 2004). This stems from the fact that reflects performance measurement as evaluating how well an organization is managed and the value it delivers to customers and other stakeholders.

Moreover, it is important to avoid having a vast amount of information being collected by an organization just to find that an effective system for translating this feedback into a strategy for action does not exist. To avoid such a problem, the firm needs to have clear systems for translating feedback from measures into a strategy for action. The need for measurement systems to be focused on continuous improvement cannot be over emphasized here, as it is seen to be important for a firm to ensure improved products and / or services provided to customers. The emphasis has to be on establishing what is in error and how the issue can be addressed in the future, whenever a performance on a particular measure is below the set level.

The above discussion outlines what has to be undertaken in the evaluation of performance in an organization. The metrics for evaluation of performance are as presented in the following sub-section.

2.3.2 The Metrics for Performance Evaluation

A performance metric (also called performance indicator (PI) or performance measure) is seen as a variable that expresses quantitatively the effectiveness, efficiency or both, of a part, or a whole process, or a system, against a given norm, or given target (Lohman et al., 2004). Melnyk et al. (2004) defines a performance metric as a verifiable measure, stated in either quantitative or qualitative terms, defined with respect to a reference point. The definition identifies three critical elements: how metrics are measures (they capture characteristics, or outcomes, in a numerical, or nominal form); should be verifiable (should be based on an agreed set of data, well understood and well documented process for converting the data into measurement); and should be value based (linked to how the operation delivers value to its targeted customers). These critical elements reflect most of the properties of measures mentioned by many authors (e.g. Keebler et al, 1999), showing a concurrence in the properties of acceptable performance measures.

De Haas and Kleingeld (1999) describe a performance indicator as a formula or rule that enables the quantification of performance. The two authors further state that quantification is the essence of measurement, which in fact is the addition of symbols, or figures to the phenomena of performance through a set of prescribed rules. Therefore, for the purpose of this study, the definition given by Melnyk et al. (2004) is employed, due to its comprehensiveness. Therefore, a performance measure is defined as a verifiable measure, in either quantitative or qualitative terms, defined with respect to a reference point.

In performance measurement, having a balance between perception measures (obtained directly from product or service users and other stakeholders), and performance indicators (recorded directly by the organization), is important as the satisfaction of the customer is captured as well as changing expectations can be pinpointed. The use of a combination of outcome and process measures helps in avoiding the matters of products or services conforming to the process measures used, having little or no relationship to customer satisfaction. Measuring outcomes is important because of their vital importance to product and service users. Process measures are seen to be important because they measure the way products and services are delivered to customers (Moullin 2004).

Neely et al. (1997) reviewed several publications and concluded that performance measures should: be derived from strategy; be simple to understand; provide timely and accurate feedback; be based on quantities that could be influenced, or controlled, by the user alone, or in co-operation with others; reflects the business process; relates to specific targets, or goals; be relevant; be part of a closed management loop; be clearly defined; have visual impact; focuses on improvement; be consistent (their significance is maintained with the passage of time); provide quick feedback; has an explicit purpose; be based on an explicitly defined formula and source of data; employs ratios, rather than absolute numbers; uses data automatically collected as part of a process whenever possible; be reported in a simple consistent format; be based on trends, rather than snapshots; provides information; be precise (i.e., exact about what is being measured); and, be objective (i.e., not based on opinion).

Besides what has been suggested by Neely et al. (1997) on how measures should be, there are eight attributes that according to Malina and Selto (2004) have been identified through management control and strategy theories. The authors state that measures should be: diverse and complementary; objective and accurate; informative; more beneficial than costly; causally related; be strategic communication devices; be incentives for improvement; and, supportive of improved decisions. These attributes are in line with what has been noted by Neely et al. (1997) the authors conclude how measures should be.

According to Bond (1999), an organization's performance is regulated by managers monitoring outputs, whereby inputs are adjusted to achieve the targeted levels of output. It is seen here that the managers do this rather than controlling tasks by considering each data element necessary to describe the status of the system. The product, or process improvement policies, developed by senior management are related to actions taken at lower organizational levels by a mechanism provided by performance measures, or performance indicators with the aim of encouraging workers at the operational level to take responsibility for their own activities that performance monitoring does, also, in a manner that supports the strategic aims of the organization (Bond 1999). To underscore this point, Neely et al. (1995) argue that measurement may be the process of quantification, but its effect is to stimulate action, only through the consistency of action are strategies realized. The consistency of action may further be extended to the consistency of decision making and action, since a strategy can only be realized as decisions are made and courses of action are pursued. The design of the measurement system is a major factor in aligning both employees and management to improve the capability of the operating system (Robson, 2005).

Conversely, Kennerley and Neely (2002) observe the tendency of measures to lose their relevance and the ability to discriminate between superior and inferior performances over time. This occurs when performance objectives are achieved, or when the behaviour no longer reflects the performance objectives underpinning the measures. The authors caution that failure to effectively manage this change causes the introduction of new measures that have weak correlation to those currently in place. They further point out that an organization may end up having a diverse set of measures that do not measure what is intended. This concurs as observed by Bourne et al. (2000) that performance measures change over time, due to budgetary revision processes, chance, the intervention of researchers, and design. Measurements can be useful and help management if it is ensured that performance measures continue to reflect the issues that are important to the organization (Kennerley and Neely, 2002) as targets and measures can evolve naturally during the use of the measures leading to performance measures diverging from strategy. It is important for the strategy and measures to remain in alignment. For this to be achieved a regular performance measurement review process that focuses on key aspects of targets, measure definitions and the set of measures is required (Bourne et al. 2000).

Furthermore, Neely et al. (1995) advocate that performance measures can influence behaviour. In line with this Robson (2005) argues that the design of performance measurement systems can encourage a culture of high performance in an organization, if it is designed with psychological consequences in mind. In order to support this kind of culture, the performance measurement system has to encourage the whole organization to think smatter rather than simply work harder. Robson continues by stating that most traditional performance measurement systems are not constructed with these psychological principles in mind, resulting in many organizations utilizing extrinsic reward systems to motivate employees to improve performance. However, due to the fact that often these reward systems are based on a single measure of performance, they end up creating more problems than they can solve (Kohn 1993 cf. Robson 2005). Besides, firms can effectively describe and implement strategy, guide employee behavior, and assess managerial effectiveness, using valid performance measurement, which also provide the basis for rewards (Malina and Selto, 2004).

Moreover, the traditional performance measures are basically accounting based, due to their historical nature, provide delayed information as to performance. In other words, they lack the capacity to anticipate future performance because they are a result of past actions and not the cause of those actions (Azofra et al. 2003). The authors further claim that the shortcomings of information derived from the use of only financial indicators was brought to light when firms tried to achieve rationalization of productive processes as well as continuous improvement with respect to generic parameters of quality, cost, and time using Total Quality Management (TQM) and Just In Time (JIT) production techniques.

Gomes et al. (2004a) list a score of criticisms on these traditional performance measures. For instance, the authors says the measures: encourage local optimization; focus on the past; are an impediment to implementation of JIT manufacturing strategies, or to the attainment of their potential benefits; do not provide adequate information for productivity measurement and improvement programs; are lagged performance indicators being historical in nature, by definition reporting on activities that have occurred already; are the results of management action and organizational performance, and not the cause of it; fail to measure and integrate all the factors critical to the success of a business; are not externally focused; and, are inappropriate in modern manufacturing settings.

Furthermore, traditional measures have been criticized by more authors (e.g. Banks and Wheelwright, 1979; Fry and Cox, 1989; Hall, 1983; Hayes and Garvin, 1982; Johnson and Kaplan, 1987; Lynch and Cross, 1991; Kaplan and Norton, 1992; Skinner, 1974), as seen in Yee (2005). Table 2.9 presents a summary of limitations and problems of using traditional accounting, or financial performance measures as identified by various authors cited from Tangen (2004). Looking at the number of authors who criticize the use of accounting, or financial measures, it is obvious that the shortfalls of these measures have come to light and are seen to be critical.

Table 2.9
Limitations and Problems of Traditional Performance Measures

Limitation / Problem	Author(s)
They focus on cost elements, so they try to quantify performance in financial terms only while many enhancements (e.g. quality improvements, lead-time reduction, customer service) can not easily be monetarily quantified	Maskell, 1991; Ghalayini et al., 1997; Jagdev et al., 1997.
Financial reports are usually produced monthly and they are result of decisions that were made one or two months previously	
They have predetermined formats that happen to be inflexible, but used across all departments regardless of characteristics of the department as well as its priorities	
They are not directly related to firm's strategy: distortion of strategy building as well as a possible conflict with strategic objectives may occur when there is excessive use of return on investment	Crawford and Cox, 1990; Maskell, 1991; Bititci, 1994; Hill, 1995; Ghalayini et al., 1997; Jagdev et al., 1997; Kaplan and Cooper, 1998.
Pressures for short term results may come from the traditional criteria such as cost efficiency and utilization leading to discouragement of improvement initiatives	
No accurate cost of processes, products or customers are reported, also focus is on controlling processes in isolation not as a system	
Not applicable to new management techniques that give shop floor operators responsibility and autonomy	
Do not penalize overproduction, also can not adequately identify the cost of quality	

Source: Tangen, 2004.

Bourne et al. (2000) term the sets of these accounting, or financial measures, as backward looking, that they led to dissatisfaction, which in turn, led to the development of balanced or multi-dimensional performance measurement frameworks. Azofra et al. (2003) are proponents of the need to use non-financial measures (quantitative and qualitative) to complement the financial indicators to overcome the limitations of financial indicators. The authors are of the opinion that the non-financial measures appear to provide real time information, thus allowing for timely revisions and corrections. Many of the frameworks developed so far have put more emphasis on non-financial, external and future looking performance measures (Bourne et al. 2000).

However, Brewer and Speh (2000) share a different view on the financial measures when they say that ultimately firms must succeed in their financial performances, recognizing that the financial measures can be conceptualized as a system of checks and balances. They put forward an argument that success in non-financial measures does not guarantee financial success and non-financial performance without financial success is a signal of a flawed strategy. Accordingly, top-level managers need to take note of such understanding.

This discussion of metrics leads to a point where one has to look at how they can be coordinated to perform what they are intended to do. In the definition of a performance measurement system, it is stated that a performance measurement system is a system comprising o software, databases, and or, procedures for coordinating metrics across functions, aligning the metrics from strategic to the operational level for the purpose of quantifying efficiency and effectiveness of the actions, It is the link with metrics that makes it necessary to understand the basis of performance measurement systems. This is presented in the following sub-section.

2.3.3 The Building Blocks of Performance Measurement Systems

Simons (1999) describes a performance measurement system as the formal, informational based routines, the procedures that managers implement to maintain, or alter patterns in organizational activities. Neely et al. (1995) define a performance measurement system as the set of metrics used to quantify both the efficiency and effectiveness of actions. Melnyk et al. (2004) describes a performance measurement system, as a system that is responsible for coordinating metrics across the various functions and for aligning the metrics from the strategic (top management) to the operational levels. Lohman et al. (2004) defines performance measurement system, as a system comprising of software, databases, and procedures to execute performance measurement in a consistent and complete way. Unlike other definitions, the last definition delineates some of the tools for the implementation of performance measurement process.

For the purpose of this study, the definition of a performance measurement system to be used is a blend of the above definitions. Performance measurement system is defined as a system comprising of software, databases, and or procedures for coordinating metrics across functions, aligning the metrics from the strategic to the operational level for the purpose of quantifying efficiency and effectiveness of actions.

According to Neely et al (1995), a performance measurement system can be examined at three different levels. In the first level i.e., the individual performance measures, (to understand the kind of performance measures used, why the usage, their costs, and the inherent benefits); the second level of examination is that which covers the set of performance measures i.e., the performance measurement system as an entity (coverage of appropriate elements i.e., internal, external, financial, non-financial; if measures that relate to the rate of improvement, long and short term business objectives have been introduced; if the measures are integrated; and if they conflict with one another); in the third and highest level, the analysis looks at relationship between the performance measurement system and the environment within which it operates. The examination also looks on whether the measures reinforce the firm's strategies; if they match the organization's culture; if they are consistent with existing recognition; and if they focus on customer satisfaction and on what the competition is doing.

In addition, the kind of analysis as discussed above, results in a wide range of criteria that have been developed. The criteria indicates the attributes of effective performance measures and performance measurement systems, which include the need for measures to relate directly to an organization's mission and objectives, to reflect the company's external competitive environment, customer requirements and internal objectives (Kennerley and Neely 2002), and must reflect the context in which they are applied (Neely 1999). Benchmarking is another method of analyzing the performance measurement systems, besides the previous analysis, which bases on effectiveness. Figure 2.5 presents a framework (i.e., a particular set of recommendations) for performance measurement system design developed by Neely et al. (1995).

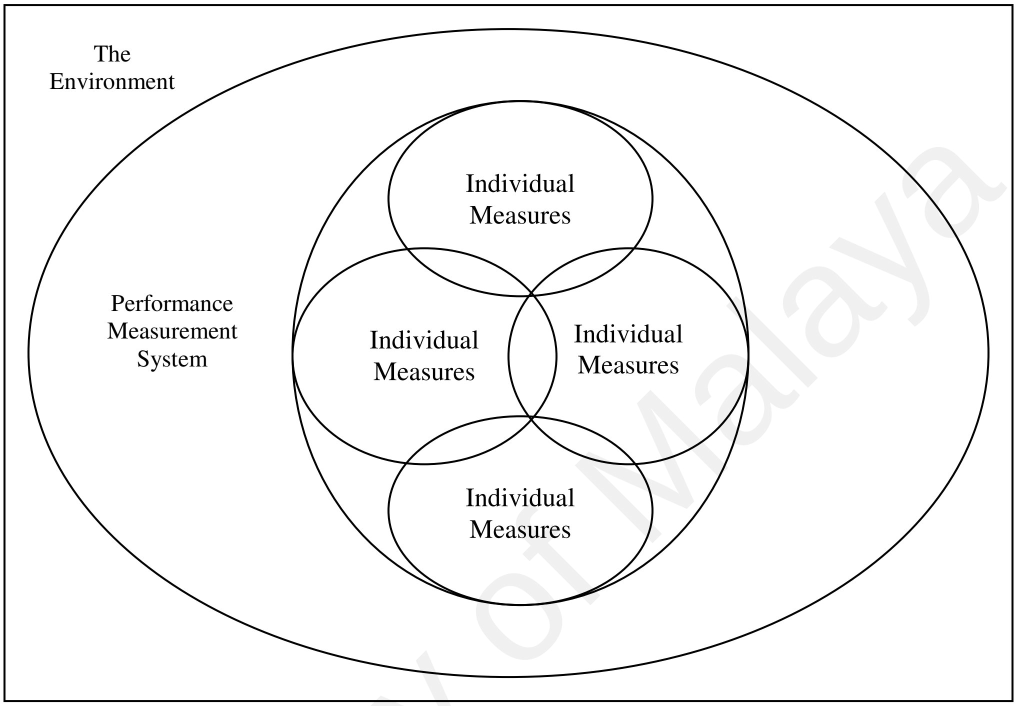
Furthermore, Robson elaborates on the performance measurement system as follows:

> "…the measurement system has to be constructed specifically to encourage everyone in the organization to be in the psychological state of "in-control" of the performance of the relevant systems within the organization. Such measurement systems have to present information that is within the control of people involved in the system, but which is not about performance of individuals. The measurement systems have to provide performance information that assists everyone to improve the overall performance of the system. The information has to ideally remove the natural variance of performance, so that the people involved can see how their actions affect the capability of the system," (Robson, 2005:144).

Kennerley and Neely, (2003) find that performance measurement systems are composed of three interrelated elements, namely: individual measures that quantify the efficiency and effectiveness of actions; a set of measures that combine to asses the performance of an organization as a whole; and, a supporting infrastructure that enables data to be acquired, collated, sorted, analyzed, interpreted and disseminated. The authors advocate that:

> "A well designed measurement system will be accompanied by an explicitly designed evolutionary cycle with clear triggers and: Process – existence of a process for reviewing, modifying and deploying measures; People – the availability of the required skills to use, reflect on, modify and deploy measures; Systems – the

availability of flexible systems that can enable the collection, analysis and reporting of appropriate data; and, culture – the existence of a measurement culture within the organization that can ensure that the value of measurement, and importance of maintaining relevant and appropriate measures, are appreciated," (Kennerley and Neely, 2003:217).



Source: Adopted from Neely et al., 1995.

Figure 2.5
A Framework for Performance Measurement System Design

Moreover, Folan and Browne (2005) are of the opinion that for a performance measurement system to be successful it has to have two types of frameworks – one, structural and the other procedural - as a basic requirement. The frameworks have to be complemented by other tools, such as lists of measures. The authors indicate that the two types of frameworks are usually developed in isolation, which can be combined only when a performance measurement system is being developed. Accordingly, the structural frameworks specify the typology for performance measure management, while the procedural frameworks give a step-by-step process for developing performance measures from the strategy. Table 2.10 gives summarized attributes that a performance measurement system should posses, as identified by various authors.

Table 2.10
Attributes of a Performance Measurement System

Attribute	Author(s)
Be balanced - include requirements of various stake holders	Tangen, 2004; Neely and Adams, 2001; Bititci and Carrier, 1998; Kaplan and Norton, 1996a; Dixon et al., 1990.
Be integrated - relationships between various measures need to be understood	Suwignjo et al., 2000; Neely et al., 1996; Dixon et al., 1990.
Inform strategy - provide an input to strategy, not be driven by strategy	Neely and Adams, 2001; Bititci, 2000; Bititci and Carrier, 1998.
Deploy strategy - propagate and translate strategic objectives to critical parts of the organization	Tangen, 2004; Bititci, 2000; Kaplan and Norton, 2000; Bititci et al., 1997; Neely et al., 1996.
Guard against sub-optimization	Tangen, 2004; Fry, 1995.
Focus on business processes that deliver value	Neely and Adams, 2001; Bititci et al., 1997
Have a limited number of performance measures and be easily accessible	Tangen, 2004; Jackson, 2000.
Be specific to business units	Kaplan and Norton, 2000; Bititci et al., 1997; Neely et al., 1996.
Consist of performance measures that have comprehensible specifications	Tangen, 2004
Include competencies – capabilities and competencies that determine how value is created	Neely and Adams, 2001; Kaplan and Norton, 2000.
Include stakeholder contribution – the role of stakeholders and the contribution they can make to the success or failure of the a business	Neely and Adams, 2001

Source: Bititci et al., 2005; Tangen, 2004.

Medori and Steepe (2000) note the existence of a common approach to performance measurement system design i.e., the utilization of non-financial performance measures, and they concede that it is due to problems that result from using only financial measures in production, as well as the effects of global competition and world class manufacturing. The authors further reveal the advantages of using non-financial measures that include the measures being: timelier than financial ones; measurable and precise; meaningful to the workforce to aid in continual improvement; consistent with company goals and strategies. Furthermore, the authors assert the flexibility of non-financial measures, changing and varying over time as market needs change. Table 2.11 presents a summarized review of some of these multi-dimensional performance measurement frameworks and models with their corresponding areas of focus.

Table 2.11
Multi-dimensional Performance Measurement Frameworks

Framework	Source	Focus/ Characteristics
The Malcolm Baldrige Quality Award	National Institute of Standards and Technology (NIST) NIST, 1987	• Founded in measurement, analysis and knowledge management • Leadership focus on strategy and customers • Business results steered by employees and key processes
Strategic Measurement Analysis and Reporting Technique (SMART)	Cross and Lynch, 1988-1989	• Differentiates between control and improvement measures • Facilitates strategy development and deploys strategic objectives
Performance Measurement Matrix	Keegan et al., 1989	• Matrix examines external/internal and cost/non-cost performance measures
Performance Measurement Questionnaire (PMQ)	Dixon et al., 1990	• Structured methodology for auditing whether a firm's PMS encourages continuous improvement or not • Identify strengths and weaknesses of current measures and propose remedies
Results and Determinant Framework	Fitzgerald et al., 1991	• Distinction between measures of results and measures of determinant of results
Measures for Time-based Competition	Azzone et al., 1991	• Identification of suitable measures based on internal/external division • Model to suit specific competitive priorities (time, cost etc)
Performance Pyramid Framework	Lynch and Cross 1991	• Pyramid highlights hierarchical view of business performance measurement • Ten step procedure model to describe what is to be done in performance measurement • Differentiates clearly measures of interest externally and internally
Detailed Performance Measurement Framework	ICAS* 1993	• Based on ways business use performance measures for planning and monitoring operations • Master list of all financial and non-financial measures mapped to two tree diagrams
Cambridge Performance Measurement Design Process	Neely et al., 1995; 1996	• Business analysis using specific tools to identify stakeholder needs and develop measures • Deploys strategic objectives and focuses on critical areas of the business
Business Process Model	Brown 1996	• Distinction between inputs, process, output and outcome measures
Balanced Scorecard	Kaplan and Norton 1996a	• Balanced set of measures – financial against non-financial • Four perspectives – financial, internal, customer, and innovation and learning
Integrated Performance Measurement System Reference Model	Bititci and Carrier, 1998; Bititci et al., 1998	• A reference model based on a viable business structure from a viable systems theory • Audit method for the framework; differentiates between control and improvement measures
Business Excellence Model	EFQM** , 1999	• Segment enablers and results
The Dynamic Performance Measurement System Model	Bititci et al., 2000	• Sensitivity to organizational environment changes-use monitoring system • All time alignment of PMS with internal objectives –deployment • Maintenance of gains from improvement programmes
The Performance Prism	Neely et al., 2002	• Five facets: stakeholder satisfaction, strategies, processes, capabilities and stakeholder contribution
Framework for Multinational Companies	Yeniyurt, 2003	• Cross-process and cross-border approach • Five levels of performance measurement: financial, consumer, internal processes, innovation and corporate culture/climate
Integrated Framework for Performance Measurement	Rouse and Putteri, 2003	• Integration of a number of frameworks • Set of principles for consideration alongside the framework.

Source: Neely et al., 2000; Medori and Steepe, 2000; Bititci et al., 2000; Bourne et al., 2000; 2002; Folan and Browne, 2003; and Azofra et al., 2003.
* Institute of Chartered Accountants of Scotland; ** European Foundation for Quality Management.

Bititci et al. (2000) demonstrate that these frameworks and models for performance measurement have been developed in recognition of the need for more relevant, better structured, and integrated performance measurement systems. According to Neely (1996) the development of a balanced performance measurement system in an organization has an important role to play in the formulation and clarification of plans and strategies as well as in setting targets for employees, project teams and business units. Accordingly, it is imperative that a balanced performance measurement system has to ensure that only a limited and manageable number of key performance measures are used. De Toni and Tonchia (2000) identify five main types of performance measurement systems: strictly hierarchical; balanced scorecards; frustum; distinguishing between internal and external performances; and those related to the value chain.

Neely et al. (2000) categorize most of the frameworks in Table 2.11 as hierarchical in orientation, though the authors agree that there are several frameworks that call attention to the business processes. These are notably the Business Process Model by Brown (1996) and the Performance Pyramid by Lynch and Cross (1991). The Business Excellence Model and the Performance Pyramid Framework are difficult to be operationalized, due to usage of terms which are so open they can be interpreted in many ways (Neely et al. 2000). Ghalayini et al. (1997) observe that the performance pyramid does not provide any mechanism to identify key performance measures, and does not explicitly integrate the concept of continuous improvement.

Also, Folan and Browne (2005) categorize most of these frameworks as structural, since they lack the procedural aspect that is necessary in an effective performance measurement system. Neely and Adams (2001) argue that the seemingly conflicting measurement frameworks and methodologies exist because they all add value, each providing a unique perspective on performance, through which managers can asses their organization's performance. The need for performance measurement systems to achieve alignment with strategic priorities, and the recognition that the external and internal environment of an organization keep changing over time, make it necessary for a performance measurement system to be dynamic (Bititci et al. 2000).

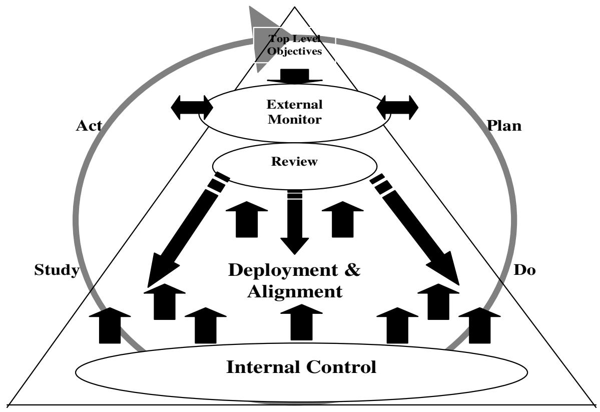
In the preceding paragraphs requirements of a performance measurement system have been discussed. Noteworthy is the importance of a performance measurement system being dynamic and balanced, in terms of the measurements, and incorporate the procedural and structural aspects. In the following sub-sections, properties and examples of dynamic performance measurement systems are outlined and discussed using the existing frameworks. As for the balanced performance measurement systems, two frameworks i.e., the Balanced Scorecard and the Performance Prism are discussed in Appendix B1.

2.3.4 Dynamic Performance Measurement Systems

For a performance measurement system to be dynamic, it should possess properties that match the dynamic environment. Bititci et al. (2000) identifies such properties as: to be sensitive to changes in the external and internal environment of an organization; to be able to review and reprioritize internal objectives when the changes in the external and internal environment are significant; be able to deploy the changes to internal objectives and priorities to critical parts of the organization, thus ensuring alignment at all times; and making sure that gains achieved through improvement programs are maintained. The authors show that the existence of monitoring systems, internally and externally, for the purpose of continuously monitoring developments and changes in the respective environments are necessary for a dynamic performance measurement system. Furthermore, monitoring changes, the internal monitor should be capable of raising warning and action signals when certain performance limits and thresholds are attained.

Additionally, to complement what has been previously discussed, a review system should be in place that will use the information provided by the two monitors (internal and external) and the objectives and priorities set by higher level systems, to decide internal objectives and priorities. The revised objectives and priorities have to be deployed to the critical parts of the system using an internal deployment system. Figure 2.6 presents such a performance measurement system model. The model defines how an organization uses various systems to manage its performance, as pointed out by Bititci et al. (1997). The model also incorporates all relevant aspects necessary in managing an organization's performance in line with its corporate and functional strategies and objectives (performance management process) providing a closed loop control system, where the corporate and functional strategies are deployed to all business processes, activities, tasks and personnel, and feedback is obtained through the performance measurement system to make appropriate management decisions (Bititci et al., 1997).

Bititci et al. (2000) argue that an infrequent event (organizational-wise) or changes within the immediate environment of a business unit, or business process may affect contribution towards the organization's objective, hence necessitating a review of its corporate level objectives and priorities. This in turn, brings about the need for restructuring the whole performance measurement system. This applies, not to the entire business only, it has to be extended to each business unit, or business process within a business entity as shown by Bititci et al. (2000). The structure depicted in Figure 2.6 applies to each business unit or business process as well.



Source: Adopted from Bititci et al., 2000.

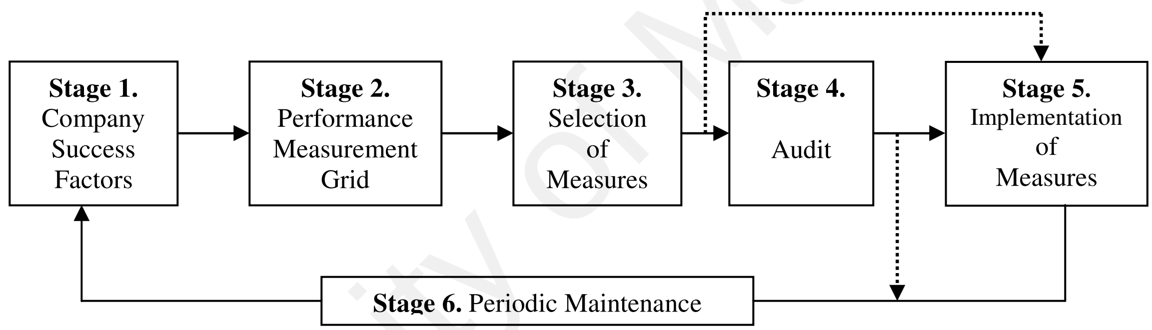
Figure 2.6
The Dynamic Performance Measurement Systems Model

To address some of the shortfalls of different performance measurement systems highlighted in different subsections in this study, it is noteworthy to look into other frameworks that are useful in developing performance measurement systems. The next subsection gives an overview of how one can design, select and implement measures.

2.3.5 The Design, Selection and Implementation of Measures

Despite the praise given by many authors on the use of non-financial performance measures, Medori and Steeple (2000) note a disadvantage that comes with the use of these measures. They say the existence of a huge range, in terms of the number of non-financial measures that companies can use, brings about a problem of knowing which ones a company should use. They acknowledge the efforts of many authors in devising frameworks to aid firms in selecting and implementing measures. In the same spirit, they have developed a framework for auditing and enhancing performance measurement systems, the design of which takes into account the following design requirements for a framework: procedures for selection and implementation of measures; audit capability; congruency to a company's strategy, bearing strong relation to the six competitive priorities (i.e. quality, cost, flexibility, manufacturing lead-time, delivery, and future growth); databank of measures; and workbook approach to avoid the need for external consultant in its implementation.

Some authors (e.g. Folan and Browne, 2005) categorize this framework as a performance measurement system. Figure 2.7 gives the illustration of the framework structure, which revolves around a six-stage plan that incorporates the basic framework design requirements mentioned. The authors claim that the framework has been proven to be a useful method, as it allows companies to asses and determine whether their existing measurement systems are totally complete and up–to–date; measuring issues appropriate to the relevant company, without any external consultation.



Source: Medori and Steeple, 2000.

Figure 2.7
Illustration of Framework Structure

Furthermore, the framework is in six stages. Stage 1, is the starting point, begins by defining a company's production strategy. Stage 2 serves as a matching element in the framework combining the competitive priorities and matches them to any strategic requirements identified in the previous stage; and identifies the general areas which need to be measured. In stage 3, the performance measurement grid (stage 2) in combination with the spectrum, or check list, allows for the selection of the most suitable measures, Stage 4, audits the company's existing performance measurement system by comparing the existing set of measures with the new one (from stage 3) whereby: the existing ones that tie (match) with new ones are kept and continually used; the existing ones that do not tie with new ones are discarded, as false alarms; and the new ones, not in the existing ones' list, are implemented. In stage 5, measures identified as critical in stage 4 are implemented. Lastly, stage 6, revolves around periodically reviewing a company's performance measurement system, since the relevance of measures changes over time. For more details refer to Medori and Steeple (2000).

Folan and Browne (2005) and Tangen (2004) depicts that the Medori and Steeple framework suffers from a lack of surrounding performance management aids, except for the static list of performance measures and the auditing steps. This is coupled with difficulties found in relating a firm's strategy to the performance measurement grid's competitive priorities, as well as the problems that arise from the fact that the separate pre-defined list of performance measures becoming out dated. This renders the framework to be non-dynamic in nature. Therefore, it needs to be used with other structural performance frameworks that can identify the changes in environment and lead to upgrading of the measures list to accommodate the dynamic environmental changes.

Moreover, it should be understood that the evolution of measures and performance measurement systems is a result of the dynamic nature of the business environment and other factors (internal or external) as discussed in the earlier paragraphs. An effective evaluation of measures and performance measurement systems is necessary to keep up with the said changes. Kennerley and Neely (2003) identify three phases of evaluation, namely: Reflection – whereby it is done on the existing performance measurement system to identify areas that are no longer appropriate and where enhancements are needed; Modification – of the performance measurement system to ensure alignment to the organization's new circumstances; and, Deployment – of the modified performance measurement system, so that it can be used to manage the performance of the organization (for more details refer to Kennerley and Neely, 2003). The framework for auditing and enhancing performance measurement systems developed by Medori and Steeple (2000) is compatible to the framework developed by Kennerley and Neely (2003). A combinational use of the two frameworks can definitely bring about a preferable outcome and smoother operations. In other words the two frameworks, combined, will be better placed to create a performance measurement process that will continually maintain relevance.

Consequently, the discussions on performance measurement in the preceding subsections endeavor to provide an understanding of how measurement systems can be designed and managed over time. The reason for this is to make sure that the dynamic and relevant sets of performance measures can be maintained by organizations, while reflecting the changing requirements of the corresponding organization. The factors that affect the changes in measures have been identified and defined, despite the complexity embedded in them. The outcome has been the presentation of useful frameworks that provide an understanding on how organizations can design measures that are dynamic and manage these accordingly. This will enable the organizations to cope with the changing environment in which they operate, and are able to modify their performance measurement systems accordingly (Kennerley et al., 2003).

Accordingly, it should be noted that implementing a supply chain performance measurement system is not an easy task, or a quick solution as it requires a change in the system and attitudes of the top management. Also, full support from supply chain members is needed e.g., top management support, a sustained management time and effort, less resistance from members, etc. (Yee, 2005). The next section presents the discussion on performance, performance measurement systems, performance metrics and performance measurement in supply chains.

2.4 Performance Measurement in Supply Chains

In the preceding section discussions on performance measurement, measures and performance measurement systems, in general terms are presented. These apply to individual firms. In the discussion of supply chains and supply chain management it is pointed out that, supply chains are made up of several firms working together as one entity in their bid to fulfill their customers' requirements. This working together has an implication that even supply chains need monitoring mechanisms for their performance, the same way as individual firms. This section explores this issue in the following sub-sections.

2.4.1 Measuring Supply Chain Performance

Beamon (1999), Gunasekaran et al. (2001) as well as Chan and Qi (2003b) observe that the area of performance measurement of supply chains has not received adequate attention even though supply chain management is now a common practice across all industries, in spite of the importance of performance measurement. Being an indispensable management tool, performance measurement provides the necessary assistance for performance improvement in pursuit of supply chain excellence.

Chan and Qi (2003b) also observe that supply chain management has brought about a revolutionary philosophy and approach to manage businesses with sustainable competitiveness, but the existing performance measurement theory fails to provide necessary support in strategy development, decision-making, and performance improvement. Chan et al. (2003) reiterate this point by saying that the integration between the existing performance measurement methods and practical requirements for the supply chain management are currently lacking. Tracey et al. (2004) argues that performance measures for supply chain management must be capable of enabling users to identify the most critical attributes of the chains that lead to obtaining a competitive advantage.

The basic configuration of a supply chain given in Figure 2.1 is an indication of how complex a supply chain can be, depending on the number of echelons in the chain and the number of facilities in each echelon. Given this complexity and the fact that it extends to issues of context, scope, whether to include many organizations, or many product lines, besides the difficulty in developing appropriate measures, subsequently, makes the process of supply chain performance measurement particularly critical (Beamon, 1999). The effective performance monitoring helps firms to ensure that they are on the path to financial stability and service excellence (Whalen, 2002). As Milliken (2001) points out, an effective performance measurement process is critical to ensure continuous improvement in the supply chain processes. The author argues, what gets measured, gets done is only true if a manageable number of metrics, which focuses on business success, are used.

An appropriate performance measurement process should include both cross-functional and up/down alignment. According to Cooke (2003), what gets measured gets managed. So, the author continues that most supply chain management experts agree that collaboration calls for a drastic change in corporate culture, including the creation of an entirely new reward structure that fosters teamwork. Companies must change their measurement systems, so that performance is driven by accountability and compensation, says Cooke (2003). The author reiterates further that, performance measurement should be on what is best for the company rather than what is best for the individual.

As pointed out in earlier paragraphs, in many supply chains measurement activities are not managed as one system. According to Tompkins and Ang (1999), the greatest challenge related to supply chain performance measurement has to do with having the people administering the measurement to focus, not on their individual link in the chain, but on the real performance of the entire supply chain. The authors further claim that the second greatest challenge has to do with inducing people to focus, not on internal measures, but on the only true measure of the chain's success – the satisfaction of the ultimate consumer in the chain. So adopting a systems thinking to performance measurement is a necessity for a supply chain to be successful as the measurement system should span the entire supply chain. The lack of systems thinking becomes, especially, disturbing when measurement systems are applied to supply chains, elaborates Holmberg (2000). Khadem and Lorber (1986), give the general performance measurement framework as one having the following fundamental system requirements: Accountability, Data system, Feedback, Recognition, and Training.

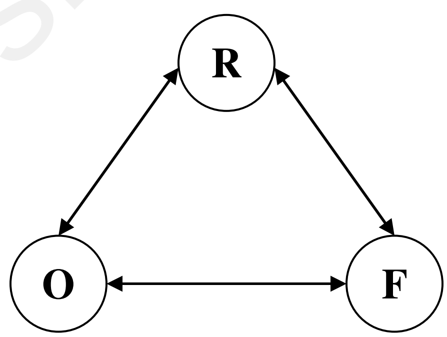
Furthermore, Chan and Qi (2003a) argue that performance measurement should take a holistic system perspective beyond the organizational boundaries. All the participants of supply chains are intended to share mutual customer-focused goals and cooperatively provide products and services that satisfy customers' requirements. Subsequently, the performance of supply chains needs to be assessed across the organizations, so as to encourage global optimization along the supply chain channel. This is possible when process-based performance measurement is used, as it does not only fit with the nature of supply chain management, also contributes much more to the continuous improvement of supply chain management. Assessing process performance provides an opportunity for examining the effectiveness of process management.

Beamon (1999) states that strategic goals involve key elements that include the measurement of resources (generally cost), output (generally customer responsiveness) and flexibility (how well the system reacts to uncertainty), hence a supply chain measurement system must place emphasis on three types of measures (i.e., resource measures – R; output measures – O; and, flexibility measures – F). The goals of each of these measures are as presented in Table 2.12, showing each to be different, making it necessary for a supply chain performance measurement system to measure each type, due to each one's importance to the successful performance of the whole supply chain.

Table 2.12
The Goals of Supply Chain Performance Measure Types

Performance Measure Type	Goal	Purpose
Resources (R)	High level of efficiency	[Maintain] efficient resource management [as it] is critical to profitability
Output (O)	High level of customer service	Without acceptable output, customers will turn to other supply chains
Flexibility (F)	Ability to respond to a changing environment	In an uncertain environment, supply chains must be able to respond to change

Source: Adopted from Beamon, 1999.



Source: Adopted from Beamon, 1999.

Figure 2.8
The Interrelationship of Measure Types in a Supply Chain Measurement System

The other aspect found in these types of measures is that each has important characteristics and the measure of each affects the other. Figure 2.8 presents the illustration of the interrelationship among the three types of measures. As Beamon (1999) suggests, a supply chain performance measurement system must contain at least one individual measure from each of the above-identified types. The idea of measuring performance from various perspectives is also put forward by De Toni and Tonchia (2001) when they conceptually divide the performances of operations into two; one, the cost performance (production costs and productivity); and two, non-cost performance (time, flexibility, and quality).

According to Holmberg (2000), the concept of performance measurement varies between different levels in an organization, due to the need and use of different kinds of measures. It is due to this fact that Gunasekaran et al. (2004) says that supply chain performance measures influence decisions in organizations depending on the level in which they are used in the management hierarchy of the organization. The result is different sets of measures being in use in the three management levels, thus causing difficulties in integrating measures across these management levels. Table 2.13 shows the summarized areas of influence for measures corresponding to each management level.

Table 2.13
The Influence of Different Management Level Measures

Level	Area of Influence of Measures
Strategic Level	Top level management decisions, reflecting investigation of broad based policies, corporate financial plans, competitiveness and level of adherence to organizational goals.
Tactic Level	Mid level management decisions, dealing with resource allocation and measuring performance against targets to be met in order to achieve results specified at strategic level.
Operational Level	Low level managers, set operational objectives that lead to achievement of tactical objectives, measurements and metrics require accurate data.

Source: Compiled from Gunasekaran et al., 2004.

Some problems in measuring performance of supply chains come to light from the few studies done so far in the area. Holmberg (2000) explains common measurement problems from a systems perspective, and shows how these problems are a result of insufficient systems thinking in which a supply chain has to be viewed as one whole entity and the measurement system has to span the entire supply chain. Among the problems that are described in this study, include the weak link between strategy and actions, a heavy reliance on financial measures that causes reactive behaviour, and a confusing multitude of isolated measures. Performance measurement systems, without a systems thinking perspective, encourages local optimization as they lack supply chain context.

Gunasekaran et al. (2001) also notes these problems and points out the lack of a balanced approach to integrating financial and non-financial measures as a problem in implementing supply chain performance measurement. It is important that performance measurement has to take a holistic system perspective beyond the organizational boundaries. The reason for this is that supply chain members are to share mutual customer-focused goals and cooperatively meet customer requests (Chan and Qi, 2003a), as performance measurement facilitates inter-understanding and integration among supply chain members (Chan et al., 2003).

Moreover, Gunasekaran et al. (2004) insist on the importance of measurements to be understood by all supply chain members as this offers minimum opportunity for manipulation, since incomplete performance measures that exist in many organizations fail to asses the entire supply chain. Chan and Qi (2003a) support this point by stating that supply chain performance has to be assessed across the organizations, because this will encourage global optimization along the supply chain. Although, many organizations look to continuous improvement as a tool to enhance their core competitiveness using supply chain management, they fail to maximize their supply chain's potential, due to failures in developing measurement systems that are needed to fully integrate the supply chain to maximize efficiency and effectiveness (Gunasekaran et al., 2004). Chan and Qi (2003a) propose for supply chain management to be introduced in enterprises, an urgent need for a fit between the performance measurement system and the supply chain context to support decision-making and performance improvement should exist. One approach to achieving this is by treating the supply chain in a process-based model as this blurs all kinds of borders (departmental and organizational) since processes span through the whole supply chain. The result is a dilution of structural barriers and encouragement of cross-organizational optimization.

To conclude, performance measurement that is process-based fits with the nature of supply chain management and contributes much more towards continuous improvement of supply chain management. With process-based measurements, problems in operations can easily be recognized and corrected before they escalate. It makes possible in linking with operational strategies, identifying success, testing the effect of strategies, as well as supporting in monitoring the progress. Also, it helps in directing management attention and resource allocation as well as in enhancing communication of process objectives, resulting in improved trust and common understanding. Chan and Qi (2003a) believe strong assistance is provided by process-based measurements. Their timely information in enhances integration and improvement of the cross-organizational processes. The measurement tasks can be simplified when all processes (even beyond the organization's boundaries) are viewed in a systems perspective. The perspective also supports global optimization among all interrelated processes. As pointed out in earlier sections, performance measurement systems are made up of performance measures, among other things. A review of the supply chain performance measures is presented in the next section.

2.4.2 Supply Chain Performance Metrics

Many of those studying the implications of integrated strategic supply chain management are beginning to work toward the development of metrics that have a direct linkage to the business strategy (Monczka and Morgan, 2000). Since strategies change – often drastically, it becomes important to put in place strategic metrics. As Cooke (2003) put it, companies need to tie collaborative goals to process and strategic metrics rather than the results measures typically found in today's businesses. The author elaborates that process metrics span boundaries, they are customer focused, and they take into account how one company's activities affect another's. Beyond process metrics are strategic measures, metrics designed to assess whether multiple partners acting in concert meet overall supply chain goals. So it is recommended that firms establish balanced metrics that include process or strategic measures to measure collaborative objectives.

The core business processes are of essential importance to business objectives and strategies, so they are identified and confined as the framework of performance measurement. Performance metrics, each of which represents one of the dimensions of activity performance, covers inputs and outcomes, and both tangible items and intangible ones. Process based measurements provide strong assistance with timely information in enhancing integration and improvement of cross-organizational processes. From the system perspective, assessing all the processes involved beyond organization boundaries can simplify the measurement tasks and did support global optimization among all the interrelated processes (Chan and Qi, 2003a).

Cooke (2003) states that the key to optimizing the supply chain is implementing performance measures that reflects the entire process, not just the individual components that make up the process. This is elaborated further in Keebler et al., (1999) by their work, which identifies ten specific criteria to be met by firms for meaningful performance measurements. These criteria offer a useful framework for any firm that creates an effective performance-measurement program. The criteria are as presented in Table 2.14.

Table 2.14
Criteria for a Useful Performance Measurement Framework

S/No	A Good Performance Measure	Description
1.	Quantitative	The measure can be expressed as an objective value.
2.	Easy to understand	The measure conveys at a glance what it is measuring and how it is derived.
3.	Encourages appropriate behavior	The measure is balanced to reward productive behavior and discourages “game playing”.
4.	Visible	The effects of the measure are readily apparent to all involved in the process being measured.
5.	Defined and mutually understood	The measure has been defined by and/or agreed to by all key process participants (internally and externally).
6.	Encompasses both outputs and inputs	The measure integrates factors from all aspects of the process measured.
7.	Measures only what is important	The measure focuses on a key performance indicator that is of real value to managing the process.
8.	Multidimensional	The measure is properly balanced between utilization, productivity and performance, and shows the trade-offs.
9.	Uses economies of effort	The benefits of the measure outweigh the costs of data collection and analysis.
10.	Facilitates trust	The measure validates the participation among the various parties.

Source: Keebler et al. (1999).

Several studies have been conducted in the area of supply chain performance metrics as the role of these measures in the success of an organization is seen to be important since they affected strategic, tactical and operational planning and control, besides having an important role to play in setting objectives, evaluating performance, and determining future courses of action (Gunasekaran et al., 2004). In their study, Chen and Paulraj (2004) come up with a set of reliable, valid, and unidimensional measurements that can be subsequently used in different contexts to refine or extend conceptualization and measurements or to test various theoretical models, paving way for theory building in supply chain management. Bhatnagar and Sohal (2004) propose a framework that includes qualitative factors concerning plant location decisions, supply chain uncertainty, and manufacturing practices. The authors believe that a joint consideration of such factors helps in explaining supply chain competitiveness.

In a case study done by Lohman et al. (2004), the authors came up with a prototype system that basically is a balanced scorecard tailored to the needs of a company in Europe. They relate their empirical findings to the role of parallel initiatives for performance measurement, the role of standardized metrics, the continuous improvement of performance measurement systems, and the normalization and aggregation of measures. Their findings suggest that developing performance measurement systems should to a large extent be understood as a co-ordination effort rather than a design effort. Beamon (1999) presents an overview and evaluation of the performance measures used in supply chain models and also presents a framework for the selection of performance measurement system for supply chains. The author identifies three types of performance measures (resource, output, and flexibility) as necessary components in any supply chain performance measurement system, and develop new flexibility measures for supply chains. Further to this, the author is of the opinion that a supply chain performance measurement system having a single performance measure is inadequate as it is not inclusive as well as it ignores the interactions among important supply chain characteristics. Also the single measure ignores critical aspects of organizational strategic goals.

In 2003, Chan and Qi introduced a process based approach to mapping and analyizing the practically complex supply chain network. Via the approach they propose a process based performance measurement system, in which a method called performance of activity (POA) is used to identify the performance measures and metrics. Another study by Melnyk et al., (2004) addresses the functions of metrics; their focus and tense; their operational and strategic contexts; as well as discusses the distinction between metrics, metric sets and metric systems. Gunasekaran et al., (2005) describes a framework for measuring costs and performance in new forms of business organization that are evolving to meet the competitive challenges of the 21st century. The framework emphasizes measurement of costs and performance in the virtual enterprise and along the supply chain to enhance competitiveness in the global markets. Baiman et al., (2001) highlights the interaction between the performance metrics used for contracting within the supply chain, the architecture of the product produced by the supply chain, and the incentive efficiency in the chain.

Patel et al., (2004) developed a framework to promote a better understanding of the importance of supply chain management, performance measurement and metrics. The importance of using process based measures is insisted here due to the fact that this kind of measures promotes global optimization by considering the totality of the process. They enable effective metric selection process by addressing process specific performance. Chan and Qi (2003a) are of the opinion that when there is lack of process based measures in a supply chain, high chances exist that might lead to loss of focus and diverging into metrics that are not completely related to the chain processes and strategy. Hofman (2004) observes that many managers find it difficult to measure performance in their supply chains due to the existence of many metrics and a lack of guidance on how best to use them. To counter this problem, the authors come up with a three-tiered hierarchy approach that enables managers to assess the overall supply chain health at the top-tier, diagnose problems at the mid-tier, and identify corrective actions at the ground level.

Ahmed (2002) insists on taking into consideration business life cycle and phase requirements in developing performance measures as these will create different kinds of challenges and requires different actions and measures that monitor them appropriately. This fact is supported by Verweire and Van den Berghe (2003) when they insist in taking into consideration the maturity of organizations when designing performance measures.

In the preceding section, problems pertaining to measuring performance of supply chains are identified. In developing supply chain performance measures, it is important to consider the mentioned shortfalls of existing measurements for an effective management in a supply chain. According to Gunasekaran et al. (2001) the measurement goals must consider the overall supply chain goals and the metrics to be used should represent a balanced approach.

Gunasekaran et al. (2001) developed a framework for respectively measuring performance from strategic, tactical and operational levels while including a combination of financial and non-financial metrics in supply chains. The authors also identified and discussed measures and metrics along four links (as seen in Stewart, 1995 and defined in the Supply Chain Operations Reference model – SCOR to be among the major processes of an integrated supply chain i.e. plan; source; make/assemble; and, delivery/customer).

Figure 2.9 present metrics discussed in the above paragraphs and some from different authors identified in other parts of this study presented in a tabular form that categorizes them according to the management level in which they are used, whether they are used to measure performance in resources, output or flexibility of the supply chain for each of the identified links for an integrated supply chain. This list may prove useful in the development of supply chain performance measurement systems in particular the selection of appropriate measures.

2.4.3 Supply Chain Performance Measurement Systems

According to Heredia et al. (2005), a performance measurement system for the supply chain is a process integration tool that fosters communication between the process people while at the same time helping them to improve their performance. The composition

1	2	Supply Chain Measures / Metrics				
STRATEGIC	RM	- Total (resources used) cost (F) - Total cash flow time (N) - Rate of return on investment (F) - Variations against budget (N)	- Supplier pricing against market (N)			- Budget for training in customer relationship management (F) - Customer relationship management system (N)
	OM	- Range of products and services (N) - Order lead time (N) - Net Profit vs. productivity ratio (F) - Total supply chain cycle time (N) - Total revenue (F)	- Supplier lead time against industry norm (N) - Mutual assistance in solving problems (N) - Mutual ability to respond to quality problems (N)		- Delivery lead time (N) - Level of supplier's defect free deliveries (N) - Delivery performance (N) - Customer response time (N)	- Customer query time (N) - Level of customer perceived value (N)
	FM		- Buyer supplier partnership level (N) - Supplier interest in developing partnership (N)	- Ability to change the output level of Products produced (N)		- Flexibility to meet particular customer needs (N)
TACTICAL	RM	- Number of IT trained managers (N)	- Supplier assistance in solving technical problems (N) - Supplier cost saving initiatives (F)		- Total Distribution/ transportation costs (F)	
	OM	- Product development cycle time (N) - Order entry methods (N) - Accuracy of forecasting techniques (N) - Planned process cycle time (N)	- Purchase order cycle time (N) - Supplier's ability to respond to quality problems (N) - Supplier's booking in procedures (N)	- Effectiveness of master production schedule (N) - Production / manufacturing lead time (N)	- Effectiveness of delivery invoice methods (N) - Effectiveness of distribution planning schedule (N) - Delivery reliability (N) - Fill rate (N)	
	FM			- Ability to change the variety of products produced (N) - Ability to introduce and produce new products (N)	- Responsiveness to urgent deliveries (N)	
OPERATIONAL	RM	- Information carrying cost (F) - Number knowledge workers (N)		- Total production/ manufacturing costs (F) - Cost per operation hour (F) - Capacity utilization (N) - Total inventory (N) - Inventory carrying cost (F)		- Number of meetings, workshops (N) - Incentives (F/N)
	OM		- Supplier rejection rate (N) - Suppliers delivery performance (N) - Achievement of defect free deliveries (N)		- On-time deliveries (N) - Quality of delivery documentation (N) - Frequency of delivery (N) - Quality of delivered goods(N) - Achievement of defect free deliveries (N) - Information richness in carrying out delivery (N)	- Efficiency of purchase order cycle time (N) - Backorder / stockout (N) - Number of customer complaints (N)
	FM		- Number of partners/ suppliers (N)	- Types of skills and number of skilled workers (N)	- Ability to change planed delivery dates (N)	- Level of understanding the products (N)
SC Link		**Plan Performance**	**Source Performance**	**Production Performance**	**Delivery Performance**	**Customer Service and Satisfaction**

Source: Compiled from Beamon, 1999; Gunasekaran et al., 2001, 2003; Morgan, 2004.
Key: 1 – Management level; 2 – Performance measure/metric type; RM – Measures/metrics for Resources, OM – Measures/metrics for Output, FM – Measures/metrics for Flexibility; F – Financial measure; N – Non-Financial measure.

Figure 2.9
Measurements and Metrics According to Management Levels and Types at the Basic Supply Chain Links

of a performance measurement system includes databases used in data storage. The data, after analysis and understanding the trends in them, are seen to be useful in improvement of activities of the supply chain. Through the data-based communication and discussion, the performance measurement system integrates different actors of the measurement process. Since performance measurement is one of the important elements of managerial activities, it makes the choice of performance measurement system to be central to achieving an organization's strategic targets (Morgan, 2004). The author states that it is immaterial for the kind of performance measurement system used in an organization as long as the system supports the organization in its current activities in a consistent and reliable manner. Further to this, the system should retain its validity with the passage of time, and provide to the management balanced information relevant to the organization's activities and strategies. The author produced a framework of issues that have to be resolved in designing a performance measurement system. The framework shows relationships that define every organization. These "relationships are between the strategy, the supply chain, the value adding processes, the distribution chain and the customer" (Morgan, 2004).

Morgan (2004) insists in considering the performance measurement system as having five elements despite its being a single composite system. The elements include: balance of the system – derived from the application of the balanced scorecard or similar measures e.g. performance prism; structure – driven through knowledge of issues that give the firm competitive advantage, influenced by operational input to be in touch with operational issues and capability; design of performance measures – driven by strategy (define good corporate direction), managers and operators (make the measures work in an active and practical sense), and feedback on wider organizational effects of the performance measurement system; focus – relate to importance of measurements taken, it was set by strategy though input from operational measurement were equally important; and targets – seen in the necessity brought by reflecting the operational system's actual capability which allowed for refinement of competitive targets in real time, provided a critical driver for improving the organization's capabilities.

In his study, Morgan (2004) finds two major requirements in considering the future for supply chain performance measurement system. The requirements advocate that performance measures must be linked with the strategy of an organization, be part of an integrated control system, should have internal validity and enable proactive management; and, the performance measurement system must be dynamic, intra-connectable, focused and usable. This is much in line with what has been discussed earlier in this study. A performance measurement system's importance to an organization or a supply chain need to be underscored here as it clearly drives organizational actions in a way that visibility of measures get high in the organization leading to employees striving to achieve high performance with respect to these measures, as well as identifying areas of improvement. Also as pointed out in earlier parts of this study, measures provide a basis to evaluate alternatives and identify decision criteria which results in the performance measurement system creating a framework for decision making, while decisions and actions at different management levels are being driven by its structure. It is a fact that an effective performance measurement system allows for proper monitoring of business processes through its closed loop feed back, facilitates the benchmarking process and identifies improvement opportunities (Chan and Qi, 2003a).

To summarize on supply chain performance measurement systems, one may say that the end objective of implementing a performance measurement system in any supply chain is to improve its performance. This is achieved when a measurement system provides feedback, relative to the chain's goals, that increases its chances of achieving the goals efficiently and effectively. A good performance measurement system is expected to benefit the entire supply chain by letting all chain members know exactly what is needed and expected, by providing a way for them to monitor their own performance and create their own feedback, and by identifying areas for improvement. So the system should enable managers to precisely communicate performance expectations to subordinates, to know how the supply chain is really performing, to identify performance gaps, and to effectively make and support decisions regarding resources, plans, policies, schedules and business process redesign.

In the following paragraphs performance measurement practices as a study construct is discussed.

2.4.4 The Performance Measurement Practices Construct

Performance measurement practices include all activities undertaken in an organization to promote effective performance measurement i.e., the process of quantifying effectiveness and efficiency of action. Performance measurement practices facilitate the provision of information needed to assess the extent to which a firm in a supply chain delivers value and achieves outstanding practice in managing the firm and delivering value for customers and other stakeholders (Moullin, 2002). The importance of measuring performance in effective and efficient management of organizations, has been in recognition for a lengthy period of time (Kennerley and Neely, 2002). The whole process involves the use of performance measurement systems, which are made of performance measures, or performance indicators. So the selection of appropriate measure to make up an appropriate performance measurement system is vital to all organizations, as this determines the way performance is viewed in an organization.

Furthermore, in the review of literature, some essentials of performance measurement are identified (Moulin, 2004) and these are: the use of a balanced set of measures; to make sure what is measured matters to all stake holders; make sure that employees are involved in determining the measures; include both perception measures and performance indicators; use a combination of outcome and process measures; take account of the cost of measuring performance; have clear systems for translating feedback from measures into a strategy for action; and, measurement systems need to focus on continuous improvement. The study found no apparent literature that explicitly discusses these essential facts on performance measurement practices. The discussion below is intended to clarify the necessity of each of these facts, which then will be used to arrive at the performance measurement practices dimensions that are to be used in this study. These essentials are to be studied in the relevant organizations to understand the performance measurement practices of these organizations.

The use of a balanced set of measures is a necessity for a supply chain aiming at delivering excellence to its customers and other stakeholders. This emanates from the fact that supply chain performance has a myriad of dimensions that range in focus from financial to non financial measures. It is therefore vital that performance of a firm in a supply chain has to be assessed on a balanced framework reflecting all the different facets of performance in the chain. The kind of a system to be used in measuring the performance of a chain is very much reflected here, as it portrays the truth on how the organization considers the stakeholders.

Measuring what matters to customers and other stakeholders makes another important component of performance measurement practices. The main focus from this aspect is that those who experience the product or service provided by the firm deserve to have the best in terms of their needs / wants. It is only through their feedback that the firm can tell or understand their actual needs / wants. On the other hand, those providing the service or the ones who are physically involved in making the product, also need to be consulted to establish what really matters to them. This understanding helps in making service provision run smoother, serving time and cost, improving customer service and customer satisfaction, and ultimately improving performance of the firm and the chain.

The involvement of employees in the determination of measures encourages employees to implement the measures earnestly as they have a sense of belonging to the firm so they take responsibility of the process of implementing the measures. Non involvement of employees in this exercise leads to many negative consequences. For instance, measures that are seen by employees as irrelevant, unrealistic, inappropriate or unfair will be counter productive. According to Moullin (2004), “If [employees] are not involved in determining the measures and feel they are misguided, then they are likely to respond to measures in a very different way leading to a poorer service all round” (Moullin, 2004 pp 111).

Having a balance between perception measures and performance indicators is another important aspect of performance measurement practices. Perception measures are measures obtained directly from service or product users and other stakeholders (give the perception of the product), while performance indicators are measures recorded directly by the organization (ascertain conformance to specifications). A carefully designed feedback mechanism, questionnaire or a focus group to examine perceptions of customers, would give an indication of how satisfied are the customers, and therefore both types of measure are needed. Another advantage of perception measures is that they can pinpoint changing expectations. Having knowledge of the anticipated changes gives an advantage of lead time reduction, improved customer satisfaction, and other time related aspects of delivery, which in turn leads to improved financial and market performance as well as time based performance.

The use of both outcome and process measures in measuring performance of a firm in a supply chain is another performance measurement practice of importance. Measuring outcomes is important because they are of vital importance to customers. Similarly, process measures are important because they measure the way service is delivered, which also matters to customers. Customers are a key to the success of any business firm, so satisfying their needs has positive implications to performance of the firm. Thus it is vital to monitor a combination of outcome and process measures. One problem with outcome measures is that they are lagging in time. They also cannot be used to detect near misses. However, there is also a danger in using process measures if these are not clearly linked to outcome measures or to customer satisfaction. A service may then conform to process measures used, but bear little relation to outcomes or satisfaction.

The number of performance measures proposed so far to be used in measuring the performance of a supply chain is big and seems to be growing. However, performance measures are only useful if their benefits outweigh the costs of obtaining them. In an organization, performance measurement is itself part of how an organization is managed, so it needs to be cost-effective and to deliver value. It is recommended that firms strive to have a smaller number of key measures that can be monitored, for better results in performance.

Translation of the collected data into useful information for decision making is an aspect of performance measurement practices too. Many organizations collect a vast amount of information, but do not have an effective system for translating this feedback into a strategy for action. A simple approach would be to analyze measures by comparing current with previous and desired performance. The next is to identify the approaches needed to improve performance and to deploy the approaches throughout the organization. Then lastly, to assess and review the new approaches and the measures used, before starting the cycle again.

Among the practices of performance measurement, the main focus is to ensure that the measurement system is focused on continuous improvement – ensuring improved services / goods for customers. If performance on a particular measure is below the set target, the emphasis needs to be on establishing what went wrong and how this issue can be addressed in the future. Blames to process owners are not productive.

Table 2.15
Description of Performance Measurement Practices First Order Factors

S/No	Factor Description	Impact	Reference
1.	Performance Measurement System - a set of software, databases and or procedures for coordinating and aligning the metrics for the purpose of quantifying efficiency and effectiveness of actions.	Enables efficient management of resources, attaining high levels of customer service, enables adoption to changing environment (flexibility), leads to higher profitability	Moullin, 2004.
2.	Essentials of performance measurement system Design – guidelines to selection, design and development of appropriate measures and performance measurement system	Design, selection and development of measures and performance measurement system suitable to the firm resulting into the above benefits.	Moullin, 2004.
3.	Uses of measures and performance measurement system – guidelines on the appropriate use of measures and performance measurement system	Culminates to better functioning of the performance measurement system, leading to better resource management and ultimately better firm performance.	Moullin, 2004.

These performance measurement practices have been translated into constructs related to performance measurement systems, uses of measures and performance measurement systems, and, essentials in the design and development of measures and performance measurement systems. Table 2.15 presents the description of the three first-order latent variables with some of their posited effects. In the current research performance measurement practices latent variable has three first order latent variables that use various measurement items to measure the use of measures, essentials of designing measures and performance measurement systems, and the nature of the existing performance measurement systems. Details regarding the measurement items to be used are presented in Appendix 2.

In the next section a discussion on the SCOR Model is presented. It should be borne in mind that this model is one of the supply chain performance measurement systems that has proved to be widely used in the developed chains.

2.5 Application of the Supply-Chain Operations Reference (SCOR) Model To Supply Chain Performance Measurement

According to Huang et al. (2004) the SCOR model is the most promising model for supply chain strategic decision-making as it deals with the entire supply chain as a whole. The Supply Chain Council (SCC), an independent not-for-profit corporation, developed and endorsed the model in 1996. The model has evolved and now it is in its Version 7.0, which SCC says represents reassessment of metrics and best practices. In the overview for SCOR model of this version, the SCC (2005) states that this process reference model integrates the well-known concepts of business process re-engineering, benchmarking, and process measurement into a cross-functional framework which contains: standard descriptions of management processes; a framework of relationships among the standard processes; standard metrics to measure process performance; management practices that produce best-in-class performance; and, standard alignment to features and functionality. The SCC points out that once a complex process is captured in standard process reference model form, it can be: implemented purposefully to achieve competitive advantage; described unambiguously and communicated; measured, managed, and controlled; and, tuned and re-tuned to a specific purpose.

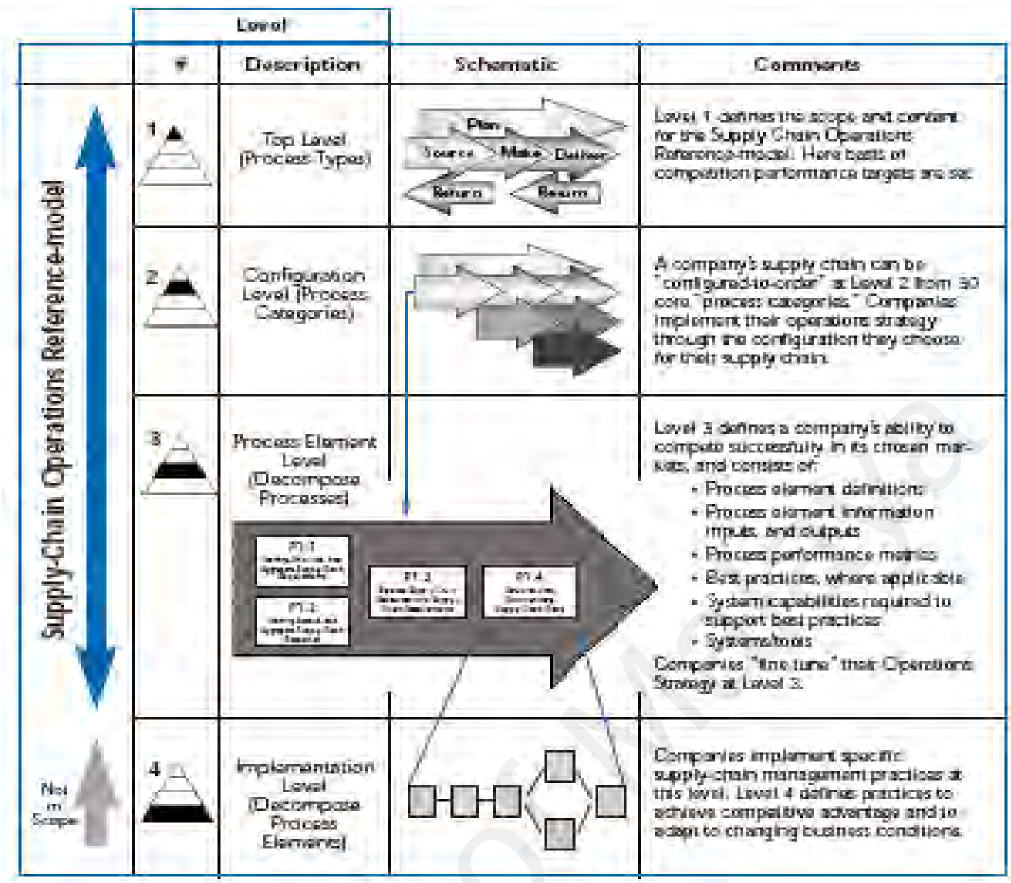
Huang et al. (2004) identify one major objective of the SCOR model as to be improving the alignment between marketplace and the strategic response of a supply chain. This is so on the premise that the better the alignment, the better the bottom-line performance. The SCOR model has its strength in its provision of a standard format to facilitate communication, making it a useful tool for the upper management of a firm in designing and reconfiguration of its supply chain to achieve desired performance. The model is based on five distinct management processes that include: plan; source; make; deliver; and, return. It should be noted here that the return process involves the return of defective products, maintenance and operation products, excess products (from source as well as deliver), and all post sale activities (e.g. after sales service, warranties).

These management processes are defined in increasing levels of details starting with a description of the overall process, and then processes are further divided into process elements, tasks and activities. The model does span: all customer interaction, from order entry trough paid invoice; all product (physical material and service) transactions, from supplier's supplier to customer's customer, including equipment, supplies, spare parts, bulk product, software, etc.; and, all market interactions, from the understanding of aggregate demand to the fulfillment of each order (SCC, 2005).

As seen in Figure 2.10, the SCOR model has, in each decision area, three levels of process details: level 1 is the top level that deals with process types, it contains processes and their corresponding process elements, and it provides a balanced horizontal (cross- process) and vertical (hierarchical) view; level 2 is the configuration level and it deals with process categories, it contains the process elements and their corresponding tasks defining the relationship between core management process and process type, it is designed to be (re)configurable; and, level 3 is process element level and is the lowest level in the scope of the SCOR model, it contains the tasks and their corresponding activities detailing process element information for each level 2 process category, and it is used to represent many different configurations of a similar process (SCC, 2005; Huang et al., 2004).

According to Lockamy III and McCormack (2004), the SCOR model acknowledges the need for an implementation level 4 for an effective supply chain management, though it lies outside of its current scope. The level contains the activities, and it aggregates a series of hierarchical process models. This exclusion is a result of the design of the SCOR model which makes it as a tool to describe, measure, and evaluate any supply chain configuration, leading to the fact that firms must implement specific supply chain management practices based upon their unique set of competitive priorities and business conditions to achieve desired level of performance. In the SCC (2005), the metrics in the SCOR model are seen to be hierarchical as the process elements are.

The SCOR level 1 metrics are primary, high level measures that might cross multiple SCOR processes and are associated with performance attributes of reliability, responsiveness, flexibility, cost, and assets. These metrics are created from lower level calculations and do not necessarily relate to a SCOR level 1 process (i.e. plan, source, make, deliver, return). Lower metrics are expected to roll up to level 1 so level 2 and 3metrics are determined before level 1 can be finalized. Implementation of supply chain management practices within the firm occurs at level 4 and below. Table 2.16 presents the list of level 1 metrics for SCOR model Version 7.0 and the attributes to which they are associated with. Practitioners selected appropriate process categories from the SCOR configuration toolkit to represent their supply chain configurations. Table 2.17 presents the SCOR model configuration toolkit.



Source: Adapted from SCOR – Model, Overview Version 7.0, SCC, 2005.

Figure 2.10
Supply-Chain Operations Reference Model: Levels of Process Detail

Table 2.16
Level 1 Metrics for SCOR Model Version 7.0 and Associated Performance Attributes

Level 1 Metrics	**Performance Attributes**				
	Customer – Facing			**Internal - Facing**	
	Reliability	**Responsiveness**	**Flexibility**	**Cost**	**Assets**
Perfect Order Fulfillment	√				
Order Fulfillment Cycle Time		√			
Upside Supply Chain Flexibility			√		
Upside Supply Chain Adaptability			√		
Downside Supply Chain Adaptability			√		
Supply Chain Management Cost				√	
Cost of Goods Sold				√	
Cash-to Cash Cycle Time					√
Return on Supply Chain Fixed Assets					√

Source: Adapted from SCOR – model Overview Version 7.0 (SCC, 2005).

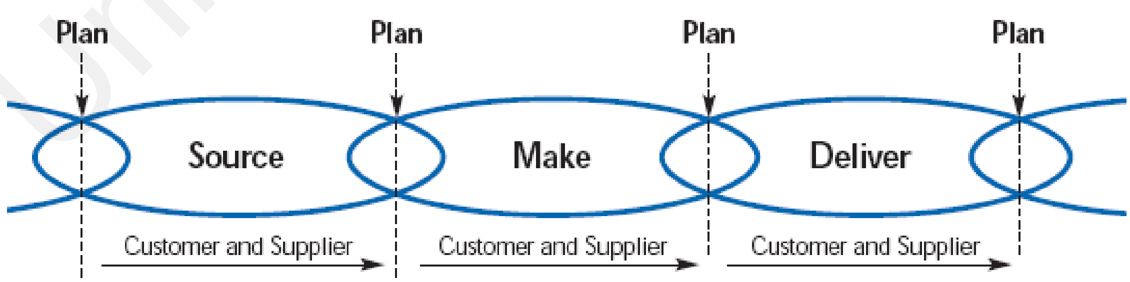
Table 2.17
SCOR Configuration Toolkit

Notes: P1 – plan Supply Chain; P2 – Plan Source; P3 – Plan Make; P4 – Plan Deliver; P5 – Plan Return; S1 – Source Stocked Product; S2 – Source Make-to-Order Product; S3 – Source Engineer-to-Order Product; M1 – Make-to-Stock; M2 – Make-to-Order; M3 – Engineer-to-Order; D1 – Deliver Stocked Product; D2 – Deliver Made-to-Order Product; D3 – Deliver Engineered –to-Order Product; R1 – Return Defective Product; R2 – Return Maintenance/Repair/Operation Product; R3 – Return Excess Product.

			SCOR Process					
			Plan	**Source**	**Make**	**Deliver**	**Return**	
Process Type	**Planning**		**P1**	**P2**	**P3**	**P4**	**P5**	**Process Category**
	Execution			**S1-S3**	**M1-M3**	**D1-D3**	**R1-R3**	
	Enable		**EP**	**ES**	**EM**	**ED**	**ER**	

Source: Adapted from Supply-Chain Operations Reference – model, Overview Version 7.0, (SCC, 2005).

The SCC (2005) states that a supply chain configuration is driven by: *plan* levels of aggregation and information sources; *source* locations and products; *make* production sites and methods; *deliver* channels, inventory deployment and products; and, *return* locations and methods. So the SCOR must accurately reflect the way a supply chain's configuration impacts management processes and practices. The council points out that each basic supply chain is a chain of source, make, and deliver execution processes. Figure 2.11 presents the configurability of the processes whereby each intersection of two execution processes (source-make-deliver) is a link in the supply chain.

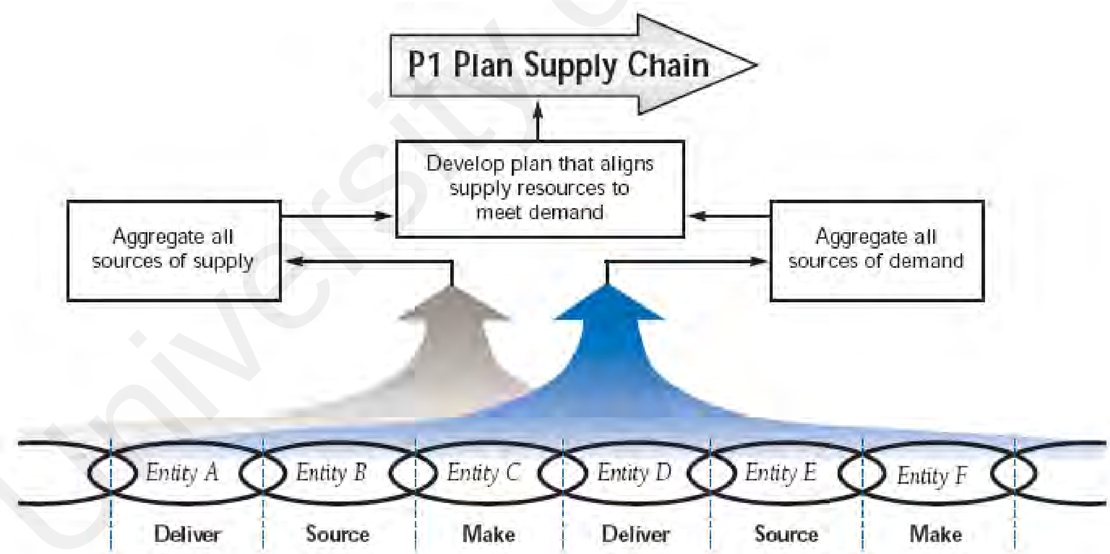


Source: Adapted from SCC, 2005.

Figure 2.11
Configurability of Source-Make-Order Processes

The execution process transforms or transports materials and/or products while each process is a customer of the previous process and a supplier of the next. Planning process manages these customer-supplier links thus balancing the supply chain. Basically every link requires an occurrence of a plan process category. The council is of the opinion that effective supply chain management requires balancing multiple links concurrently. Figure 2.12 displays such a process.

The study by Lockamy III and McCormack (2004) in which seven key supply chain management planning decision categories are identified and mapped to the SCOR model, shows how decision categories can relate to the model. The decision categories identified include: operation strategy planning; demand management; production planning and scheduling; procurement; promise delivery; balancing change; and, distribution management.

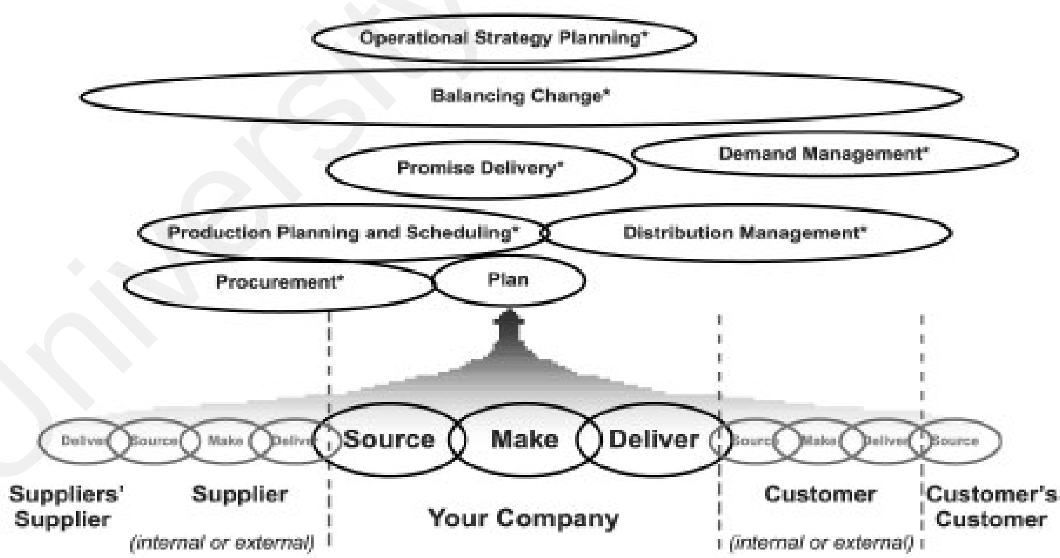


Source: Adapted from SCC, 2005.

Figure 2.12
Balancing Concurrently Multiple Links in a Supply Chain

Figure 2.13 shows how the decision categories are mapped to the SCOR model. As seen in the figure, the mapping suggests that operations strategy planning and promise delivery decisions tends to be aligned with a firm's internal SCOR decision area. On the other hand, decisions on balancing change tend to span internal and external SCOR decisions areas across the entire supply chain. Furthermore, procurement along with production planning and scheduling decisions tends to span across both internal and supplier SCOR decision areas, while demand and distribution management decisions span across both internal and customer decision areas (Lockamy III and McCormack, 2004).

Up to this point it may be noted that the SCOR model provides a detailed view of supply chain processes, technology and stakeholders' involvement. According to Angerhofer and Angelides (2005) the model falls short in clearly depicting the business strategy and thus results into its inability to provide an explanation of the impact of the business strategy on the setup and the success of the supply chain in the marketplace though it is able to capture the operational and managerial aspects of the supply chain.



Source: Adapted from Lockamy III and McCormack (2004).

Figure 2.13
Supply Chain Decision Categories Mapped to the SCOR Model

To sum up on the SCOR model as a management tool, it is seen that the standard language helps managements to focus on management issues while SCOR as an industry standard helps managements to focus across inter-company supply chains. SCOR is used to describe, measure, and evaluate supply chain configurations whereby the standard SCOR process definitions allow virtually any supply chain to be configured, while the standard SCOR metrics enable measurement and benchmarking of supply chain performance, and, the supply chain configurations may be evaluated to support continuous improvement and strategic planning. By describing supply chains using process building blocks, SCOR can be used to describe simple as well as very complex supply chains using a common set of definitions resulting into disparate industries being linked to describe the depth and breadth of virtually any supply chain.

In the next section, a discussion on organizational performance is presented. In this presentation, the performance constructs used in the study are discussed. These constructs include overall firm performance and time based performance.

2.6 Organizational Performance as a Variable

Various authors are of the belief that despite organizational performance being the most widely used dependent variable in many research works, yet it remains to be one of the most vague and loosely defined construct (Katz and Kahn, 1966; Scott, 1977; Rogers and Wright, 1998). In some fields, performance as a construct has received its focus almost entirely in the financial measures, while others view it as a comparison between the value created by the organization and the value expected by its owners (Venkatraman and Ramanujam, 1986). Salem (2003) views performance as something referring to doing work, as well as being about the results achieved. The author defines performance as the outcomes of work. In other words, it may be termed as the end result of an activity. The basis for this definition is its linkage to the organization's strategic goals, customer satisfaction and economic contribution.

Also, performance may be viewed as capacity to achieve a set of desired results. Looking at the organization as an entity, its performance can comprise of the output or results of an organization as measured against intended outputs (or goals and objectives). In one quotation Li et al (2006) says organizational performance refers to how well the organization achieves its market oriented goals as well as its financial goals. If one links this to the definition of performance given in the preceding paragraph, organizational performance may be seen as the accumulated end results of all work processes and activities that take place in the organization. This may be extended to supply chains as they behave as one entity.

Performance has something to do with effectiveness (achievement of objectives) and efficiency (rates of resource usage in achieving objectives). As Good and Carin (2004) put it, performance is a relative concept. This is the reason that makes it to be often measured against some baseline or standard. The end goal of measuring performance is to have better assert management and increased ability to provide customer value. In the recent past, a large number of methods of performance measurement systems have been reported in literature (Chan et al., 2006; Sharma et al., 2005; Chan and Qi 2003a, 2003b; Bititici and Nudurupati, 2002).

The discussion in the preceding paragraphs notes how performance goals vary depending on a firm's objectives. In terms of supply chain management, it can be categorized into two (sometimes more) types of performance. In this study two types will be studied i.e., time based performance and overall firm performance. In the time-based performance, the study intends to see how firms perform in terms of time to market, cash to cash cycle time, up and down flexibility, and delivery dependability. The overall firm performance is to be studied in terms of financial performance and market performance. In the next two subsections, discussion of the two variables is presented.

2.6.1 The Overall Firm Performance Construct

A number of authors (e.g., Benton and Maloni, 2005; Carr and Pearson, 2002; Dong et al., 2000; and De Toni and Nassimbeni, 1999) consider overall firm performance as the traditional performance of the firm, that has over time, been measured to see how a firm is performing financially and in the market. Overall firm performance has been studied by many, among others, Min and Mentzer, 2004; Zhu and Sarkis, 2004; Droge et al., 2004; Bolstorff, 2003; Rosenzweig et al., 2003; and, Wisner, 2003, using and incorporating differing elements of overall firm performance. In many of the studies the measurement of performance is subjective assessment using scales such as Likert scale, with varying ranges. This use of subjective assessments for performance is justified (Ketokivi and Shroeder, 2004; Narasimhan and Das, 2001), as long as rigorous examination of the validity are performed.

In other studies, performance is assessed by relating it to past performance or top performance of competitors. For instance, in Chen et al. (2004) overall firm performance is operationalized using items that indicate the extent of change in return on investment, profit as a percentage of sales, and net income before tax over the past 3 years. A number of researches including Chen et al. (2004), Droge et al. (2004) and Vickery et al. (2003) examine both direct and indirect relationships between practices of supply chain and overall firm performance. Customer service has been used as a mediator variable. Other researches have only examined the direct relationships and use factors that include financial as well as customer service e.g., Kannan and Tan, 2005). Stanley and Wisner (2001); Narasimhan and Kim (2002) have restricted performance to customer service/ financial performance.

Overall firm performance has been widely studied with a number of other variables such as those related to supply chain management practices, performance measurement practices and time based performance. For instance, a number of authors including Benton and Maloni (2005), Narasimhan and Nair (2005), Duffy and Fearne (2004), Johnston et al. (2004), and Dong et al (2001), conducted researches examining relationships using overall firm performance measures, and/or operational costs measures, and/or customer service measures. The commonly used measures for overall firm performance have included overall sales growth, overall market share, return on investments, return on asserts, and overall profitability. These measures are presented in Table 2.18 showing also their intended objectives or areas of effectiveness.

Table 2.18
Factors of Overall Firm Performance

Financial / Market Performance	Objective / Effectiveness
Overall Sales Growth	Achievement of Strategic Objectives
Overall Market Share	Achievement of Overall Financial Objectives
Return on Investment (ROI)	Achievement of Overall Customer Satisfaction
Return on Asserts (ROA)	Achievement relative to Competitors
The Overall Profitability of the Firm	Expanding Strategically into Different Markets
Overall Financial Performance	Achievement of Sales Volume Growth

After a thorough analysis of the literature, in this research, overall firm performance as a second order latent variable that is posited to have several first order latent variables (LVs) embedded in it due to the broad range of perspectives that it takes. The variables to be used in the study for this construct include financial and market performance latent variables. The latent variables are posited according to the explanation offered by Beamon (1999) on how to measure performance in supply chains. The financial performance first order latent variable focuses on measuring resources in terms of costs, assert growth, and return on asserts; while the other financial performance first order latent variable focuses on measuring output in terms of liquidity and revenue generation. The remaining first-order latent variable for overall firm performance focuses on measuring: market performance, with regard to market share, customer service level, and competitive position. Appendix 2 provides the details of the measurement items identified to be used in the study.

2.6.2 The Time Based Performance Construct

Time based performance is a reflection of time based competition. "Time based competition focuses on reducing response time by squeezing time from every facet of value delivery system from research and development, to product development, to manufacturing, marketing and delivery" (Koufteros et al., 1998 pp 21). Few studies have examined time-based performance (strategies or its antecedent practices). In literature, several studies have examined parts of the time based strategies in supply chain management practices and performance, combining both time based and overall firm performance as one variable (Droge et al., 2004). Some studies examined only part of relationships (Min and Mentzer, 2004; Droge et al., 2004; Bolstorff, 2003; Wisner, 2003; Narasmhan and Jayaram, 1998; and Vickery et al., 1997).

Reports on firms achieving higher productivity, increase market share, charging premium prices, reduced risks, and improved customer service are acknowledged by authors such as Koufteros et al. (1998) to be among the outcomes of time based performance. This indicates the existence of a link between time based performance and overall firm performance. The author points to the firms being able to achieve substantial and sustainable competitive advantage as a prize for attaining speed in all facets of the value delivery system. For instance, cycle time compression translates into faster asserts turnover, increased output and flexibility, and satisfied customers. In short, time based performance focuses on the customers.

Different authors have used differing sets of variables to study time based performance. For example, Vickery et al. (2003) measure customer service (a component of time based performance) relative to major competitors using product support, pre-sale customer service, responsiveness to customers, delivery speed and delivery dependability/ reliability. Perceptual measures (service level and quality) also are noted to have been used by some authors including Johnston et al. (2004), Stanley and Wisner (2001), and Ramdas and Spekman (2000). Another set of studies include objective measures such as percentage of on-time deliveries (Humphreys et al., 2004).

In this research, the second order latent variable time based performance is posited to have several first order latent variables, which include items measuring flexibility, time to market, cash to cash cycle time and delivery dependability. The construct is posited to be a mediator variable. Time to market is the extent to which a firm is capable of introducing new products more rapidly compared to major competitors, while delivery dependability is the extent to which a firm is capable of providing on time, the type and volume of the product required by customers (Li et al., 2005). Flexibility refers to making available the products / services to meet the individual demand of customers (Gunasekaran et al., 2001). These authors state that, by evaluating flexibility firms are able to achieve rapid response in delivering individual customer requirements, as their sentiment is to regard flexibility as a metric for winning and retaining customers, as it has a positive influence on customers' decisions to place orders.

The cash to cash cycle time is found to be an important measure bridging activities across the supply chain (Theodore Farris II and Hutchison, 2002). As cited from these authors, many descriptions of this metric are put forward by various authors: Lancaster et al.

(1998), Gallinger (1997), Schilling (1996), Stewart (1995), Moss and Stine (1993), and Soenen (1993); all are of the conviction of the duration required to turn a unit of money invested on raw materials to monies collected from a customer, or the way of calculation (i.e., inventory days of supply added by accounts receivable then reduce accounts payable). The smaller the value, the better, negative values are preferred.

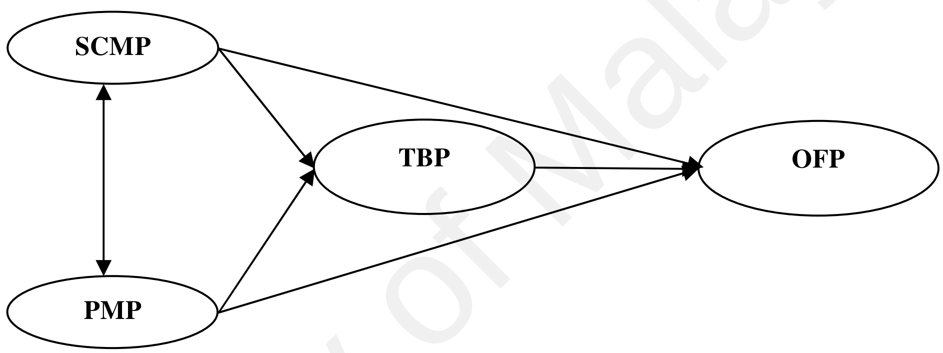
After the discussion of constructs, the next section presents the research framework, followed by the research propositions that are accompanied by research hypotheses.

2.7 Research Framework

The framework for this research results from relationships deduced from the review of literature, observing that different authors use varying approaches to study similar sets of variables, and vice versa. The framework for this research proposes that supply chain management practices (SCMP) will have an impact on the overall firm performance (OFP) of the organization, implicitly on the supply chain to which it belongs. Then again, the framework also proposes that performance measurement practices (PMP) will have an impact on the overall firm performance (OFP) of the organization.

In the literatures some authors posit the existence of the direct relationships among supply chain management practices and overall firm performance, as well as among performance measurement practices and overall firm performance (e.g. Wisner, 2003). The framework also proposes that supply chain management practices and performance measurement practices are associated. The framework further proposes that there will be an indirect impact on overall firm performance by both supply chain management practices and performance measurement practices through time based performance (TBP). Figure 2.14 presents the proposed framework.

The current research proposes that all four constructs in the study be conceptualized as second order factors that are higher in abstraction and have several first order factors imbedded within the second order factor. The fact that each of the study variables are of multifaceted in nature further necessitates the proposed use of the second order level. Table 2.18 lists the first order variables for each of the study constructs. One needs to take note of the wide range of aspects that contribute to each of the study variables. It may prove difficult or worthless if the study ignores this fact.



Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance

Figure 2.14
Research Framework

A number of authors including Anderson et al. (1987), Gerbing and Anderson (1988), and Min and Mentzer (2004) acknowledge this view on variables. In this research, the first and second order factors represent reflexive latent variables. A latent variable (LV) corresponds to some hypothetical construct, cannot be observed directly, hence cannot be measured directly (Hair et al., 2006; Byrne, 2001; 1998; Kline, 1998; Schumacker and Lomax, 1996). Therefore, it is defined, in terms believed represented its behavior. These behaviors are the measurement items to be used in the research.

Moreover, three of the four constructs have been operationalised in various existing literatures (Tan et al., 1999; Wisner, 2003; Min and Mentzer, 2004; and Li et al., 2006;

2005; among others). Therefore, the measurements to be used in this study for SCMP, TBP, OFP, are adopted from the identified studies. Table 2.19 identifies these item sources accordingly and Appendix 2 gives details of source / reference for individual measurement items used in this study.

Table 2.19
Sources of Measurement Items

2nd order Variable	1st order Variable	Source of Measurement Items
Supply Chain Management Practices (SCMP)	- Internal lean practices - Strategic supplier partnership - Information sharing - Customer relationship management - Information quality - Postponement - communication connectivity	Li et al., 2005; 2006; Min and Mentzer, 2004; Wisner, 2003; Tan et al., 1999.
Performance Measurement Practices (PMP)	- Performance measurement and PMS - Uses of performance measurement and PMS - Essentials in the development of PMS	Newly developed.
Time Based Performance (TBP)	- Delivery dependability - Time to market - Up and down flexibility	Supply Chain Council, 2005; Min and Mentzer, 2004; Bolstorff, 2003; Wisner, 2003.
Overall Firm Performance (OFP)	- Financial performance - output - Financial output – resources - Market performance	Supply Chain Council, 2005; Min and Mentzer, 2004; Bolstorff, 2003; Wisner, 2003.

Accordingly, the latent variable performance measurement practices, measurement items are arrived at through literature review with a focus on supply chains. None has been operationalized in any of the studies reviewed in this research. For the purpose of this research, the instrument for studying performance measurement practices (in the perspective of supply chain management) is developed by the research. Further elaboration on the development process is presented in other parts of this chapter. Some of the sources for measurement items were unable to re-validate the measurement items developed due to various reasons (e.g., sample size limitation); this study is re-validating and using the measurement items, together with the newly developed instrument. The definitions of the study variables are provided in the chapter for the review of literature.

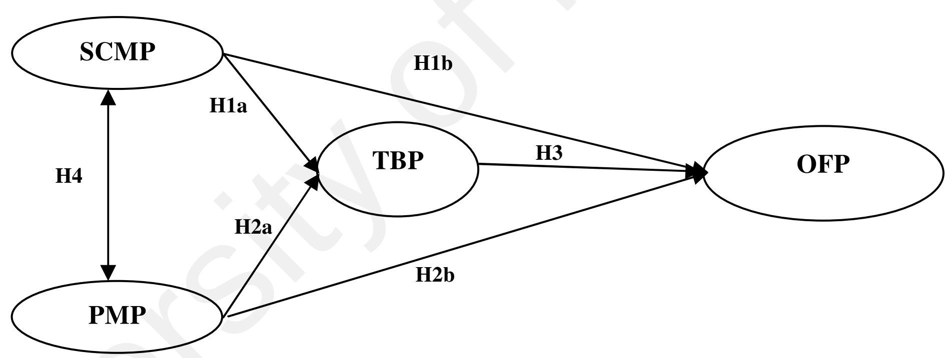
This framework explicitly shows that time based performance plays the role of a mediator in the relationships between supply chain management practices and overall firm performance, and, between performance measurement practices and overall firm performance. A mediator is a mechanism through which a predictor influences an outcome variable (Baron and Kenny, 1986). The main purpose of meditational analyses is to examine why an association between a predictor and outcome exists (Frazier et al., 2004). The authors take note of the assumption that the mediator is caused by the predictor variable and it causes the outcome variable. The authors elaborate that a variable is said to cause another when the two are associated in a non-spurious relationship (isolation) and the cause precedes the effects in time (direction).

In studying variables that impact firm performance, researchers have used different mediator variables, depending on the predictor variables included in the respective studies. For instance, Wisner (2003) has SCM strategy as a mediator in the relationship between supplier management strategy and firm performance, and between customer relationship strategy and firm performance. Also Prajogo and Sohal (2006) have TQM as a mediator in the relationship between organizational strategy and organizational performance. Thus having time based performance as a mediating variable in this study presents an opportunity to improve the understanding of firm performance in SCM.

2.8 Formulation of Hypotheses

The framework presented in the preceding section shows clearly how the links for variables were posited. It is noted in literature review that each variable, SCMP and PMP, has a positive impact on performance. Also it is noted that the two independent variables are correlated. According to Wisner (2003), "The short-term objective of SCM is primarily to increase quality and productivity while reducing inventory and cycle time. Its long-term strategic goals are to increase: customer satisfaction, market share, and profits for all members of the supply chain network" (Wisner, 2003 pp 5). These objectives are components of firm performance.

On the other hand, it is known through literature that one of the determinants of successful firms is performance measurement since a well designed and properly applied PMS is the strongest management tool available for controlling operations and fostering change (Ibrahim, 2002). The ultimate result in controlling operations and fostering change was better management and utilization of resources leading to better firm performance. The proposed relationships for the study variables are presented in Figure 2.15 Further discussions on these relationships are presented in the paragraphs below.



Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance.

Figure 2.15
The Hypotheses as Depicted in the Research Framework

2.8.1 Relationship between SCMP and TBP

Several studies reported that lower total costs, higher-order fulfillment rates, sorter-order cycle times, making dependable deliveries, and introduction of products to market quickly result from high level of information sharing (Lin et al., 2002; Jarrell, 1998); while increased customer responsiveness and satisfaction (Powel et al., 2001), and reduced time to market (Ragatz et al., 1997) are being linked too strategic supplier partnership; and flexibility being reported to result from postponement (Van Hoek et al., 1999). As Li et al. (2004) pointed out that "the bottom – line impacts of SCMP have been confirmed by real world examples", when they cited Sheridan (1998) who reported a survey that found that organizations that were best at SCM held a forty to sixty five percent advantage in their cash-to-cash cycle time over average organizations, and the top organizations carried fifty to eighty five percent less inventory that their competitors. In view of the discussion above, a proposition stating that SCMP influences TBP is put forward. The hypothesis formulated in line with this proposition is:

H1a: There is a direct positive impact of supply chain management practices (SCMP) on time based performance (TBP).

2.8.2 Relationship between SCMP and OFP

A number of authors reported SCMP have a direct impact on the overall financial and marketing performance of an organization. Increased market share, improved return on investment, improved financial performance, as well as improved overall competitive position, among other things, were reported to result from SCMP (Stanley and Wisner, 2001; Shin et al., 2000; Prasad and Tata, 2000; Carr and Person, 1999; Lamming, 1996; Stuart, 1993). Better organizational performance had also been reported to be linked to supplier relationship and customer relation practices (De Toni and Nassimbeni, 2000). This leads to a proposition that SCMP influences OFP. The corresponding hypothesis is:

H1b: There is a direct positive impact of supply chain management practices (SCMP) on overall firm performance (OFP).

2.8.3 Relationship between PMP and TBP

Goals of SC performance measure types provided in the literature include achieving high levels of efficiency (resource), high levels of customer service (output), and ability to respond to a changing environment (flexibility) (Beamon, 1999). The importance of the knowledge on how to design and develop own measures and PMS in a firm, need to be underscored as it allows for timely reviews of the PMS and hence allowing for appropriate corrective to be taken on time. Developing PMSs being understood as a coordination effort was better than a design effort (Lohman et al., 2004). At this point a proposition stating that PMP influences TBP is put forward. The corresponding hypothesis is:

H2a: There is a direct positive impact of performance measurement practices (PMP) on time based performance (TBP).

2.8.4 Relationship between PMP and OFP

Efficient resource management is critical to profitability, while without acceptable output, customers would turn to other Supply chains. In uncertain environment, Supply chains must be able to respond to change. All these aspects are made possible by using appropriate measures which allow for positive improvements in all categories of performance. Measures need to be aligned to firm strategy Monczka and Morgan, 2000). Balanced measures (perception and objective) were important as they provided lagging as well as current information necessary in the management of operations. The role of performance metrics was seen to be important as they affected strategic, tactical, and operational planning and control, as well as their role in setting objectives, evaluating performance, and determining future courses of action (Gunasekaran et al., 2004). Appropriate PMS lead to better margins (Morgan, 2004). It may be summed up that all efforts discussed above lead to improving firm performance. In line with this, a proposition stating that PMP influences OFP is proposed. This proposition leads to this hypothesis:

H2b There is a direct positive impact of performance measurement practices (PMP) on overall firm performance (OFP).

2.8.5 Relationship between TBP and OFP

TBP allows firms to identify and eliminate non-value adding activities and subsequently strengthening product quality and delivery, thereby providing a foundation for sales growth (Rosenzweig, 2003). On the other hand, TBP through flexibility enhances the ability of the firm to accommodate seasonal demands, poor supplier performance, poor production performance, poor delivery performance, new products, new markets and new competitors (Beamon, 1999). The result of this are reduced number of backorders, lost sales, number of late orders, and increased customer satisfaction. This in turn, with appropriate costs, improves on revenue as well as resource utilization. This lead to one surmising a proposition that TBP influences OFP. The corresponding hypothesis is:

H3: There is a direct positive impact of time based performance (TBP) on overall firm performance (OFP).

2.8.6 Relationship between SCMP and PMP

In the perspective of SC and SCM, Chan and Qi (2003a) and Holmberg (2000) stated that PM takes a holistic system perspective beyond company boundaries. This is made possible by the use of process based measures, which in turn lead to a continuous improvement in the SC. SC members need to have congruence in their goals and share metrics so as to achieve highest levels of customer service. So it may be summed up that some metrics encouraged the practice of SCM (e.g. measures spanning several organizations), and also some SCMP encouraged improved PMP (e.g. measures have to be aligned to strategy, in SCM a common strategy is encouraged for SC members, this results into the use of common measures, improving PMP). The phenomenon described here leads to a proposition that there exists a relationship associating SCMP and PMP. This proposition leads to hypothesis H4:

H4: There is an association between supply chain management practices (SCMP) and performance measurement practices (PMP).

Next after the discussion of the hypotheses is the extension of the theoretical perspective. The discussion of the relevant theories is presented in following section.

2.9 Extension of the Theoretical Perspective

Earlier on it was suggested that SCMP may be looked from three theoretical perspectives namely: one, the contingency theory - that requires managers to scan the environment and use firm resources to counter the negative effects of the changes in business environment. Two, the use of industrial organization theory – where managers are required to perform proper analysis of the five forces that include: suppliers, buyers, existing rivals, potential rivals, and providers of substitute products, and be able to comprehend the environment in which their firms (as well as their chains) are operating, thereby leveraging their competitiveness in the market. Three, the resource-based theory - the management of internal resources to establish a hard to imitate advantage, building organizational skills and processes (core competence) that enables the delivery of distinctive products and services.

On the other hand, it was suggested that PMP could be viewed from three theoretical perspectives that include: one, the resource based theory; second, the strategic choice theory – that asserts the importance of the role of played by managers in the success or failure of an organization (in this case the supply chain), through their decisions. Third, the knowledge management theory – where knowledge sharing not only in innovation, but also in other areas such as measurements and their related practices, can be exercised. In the following paragraphs, these theories are discussed in relation to the study constructs SCMP and PMP. The way the understanding of these theories can be used to explain the relationships between study variables is also discussed.

The contingency theory of supply chains as proposed by Stonebracker and Afifi (2004) equates four development phases of supply chains to those of processes, facilities, businesses, and industries which in essence have been studied in the past under this theory. The authors believe that a successful integration in a supply chain is dependent on long-, mid-, and short term strategies and tactics that balance the differentiation of a serial supply chain activities and integrative effort applied. The authors identified four phases of supply chain technology corresponding to four stages of supply chain development. The development phases include the traditional manufacturing/ distribution models, integrated JIT models, Flexible and concurrent JIT models, and, Agile supply chain management models. Each of these phases is characterized by different approaches into supply chain relationships. For instance, the traditional models are largely adversarial in terms of relationships, while the integrated JIT models are more on partnerships. The agile supply chain management models have extended partnerships.

What is apparent from these categorizations is that firms needing to integrate have to make clear of their level of technology and the differentiation (decentralization or specialization) that they intend to achieve. A mismatch of the two leads to a waste of effort, resources and time. It merely increases the supply chain costs, and in the long run, suggesting potential failure. Using this theory, it is possible to structure the contingencies of supply chain management and its practices. It is clear that the more evolved the technology, the greater the differentiation, and consequently the greater the amount of integration effort required. This understanding offers practitioners specific conceptual guidance on how and where to fine tune or fit the activities in the area of responsibility.

The industrial organization theory has a focus in market forces as the influencing factors in decision making in any business (Fawcett et al., 2007; Ketchen Jr. and Hult, 2007). There are core questions that need to be considered when the firms are making business decisions. The questions ask about the market power as to where it exists; and, the sources of this market power. These questions, in conjunction with a proper analysis of the five forces that include: suppliers, buyers, existing rivals, potential rivals, and providers of substitute products, allow managers to comprehend the environment in which their firms (as well as their chains) are operating, thereby leveraging their competitiveness in the market (Fawcett et al., 2007). This theory helps supply chains in understanding their position in the market and hence allowing for proper decisions to be made in making the firm perform accordingly.

The resource based view of the firm examines how certain assets and capabilities lay a foundation for competitive advantage and superior performance (Ketchen and Hult, 2007). The firm is viewed as a bundle of resources and heterogeneity in terms of resources that exist among firms. According to Rungtusanatham et al. (2003), the characteristics of resources that would allow firms to attain sustainable competitive advantage include:

- The resource must be valuable in that it improves firm efficiency and/or effectiveness;
- The resource must be rare so that by exercising control over it, the firm can exploit it to the disadvantage of competitors;

- The resource must be imperfectly imitable to prevent competitors from being able to easily develop the resource in-house;
- The resource must be imperfectly mobile to discourage the ex-post competition for the resource that would offset the advantages of maintaining control of the resource;
- The resource must not be substitutable; otherwise competitors would be able to identify different, but strategically equivalent, resources to be used for the same purpose.

The major tenets of the resource based view of the firm (as per Rungtusanatham et al., 2003) are as follows:

- To compete, each firm seeks to acquire, control, and bundle resources with capabilities;
- Resources are tangible or intangible assets that are key inputs into production and delivery of goods or services;
- Capabilities are organizational routines or mechanisms that enable a firm to acquire and deploy resources to facilitate the production and delivery of goods or services;
- Resources and capabilities that are valuable to the firm, rare to come by, imperfectly mobile; not imitable by competitors, and not substitutable (VRINN) provide the firm with a sustainable competitive advantage.

After establishing the relationship between SCMP and performance, it may be argued that supply chain links are resources that provide performance benefits to the firm. Also the chain links can be posited as a capability to acquire a resource that yields benefits to the internal operations of the firm. When a firm engages in SCMP among other things, it creates linkages with suppliers and with customers, to the extent that these links exclude competitors from forming the same connections with the same supplier and /or customers for the same purpose. This provides the competitive benefit to the firm as the connections facilitate the management of the flow and/ or quality of materials in and out of the firm, with direct benefits to the performance.

In terms of resource acquisition, SCMP as a resource takes the form of explicit as well as that of tacit knowledge and that this knowledge allows a firm to better manage the flow and/or quality of incoming and outgoing materials. Similarly for PMP as a resource, it receives treatments that SCMP has received. The relationships among firms (including sharing of measures!) generate and share knowledge that ultimately benefits the firm and the chain. It is important to note that when a firm interacts with other players in the chain (suppliers, customers), they seek to acquire and maintain access to critical knowledge that otherwise would not be efficiently available.

On the other hand knowledge management perspective links the aspect of information sharing to improving of processes such as innovation. Basically it centers on how wisdom can be used as a resource. With improved abilities to capture not only planned, but unplanned outputs of knowledge firms are poised to benefit from understanding the links they have among themselves. "Cooperative efforts [also closely linked to PMP] – sharing based on clear objectives and agreed-on contributions and returns – are clearly valuable in improving overall performance, but collaborative efforts based on trust, knowledge, and norms of information sharing and equitable treatment result in highly entrepreneurial, cross – industry network organizations" (Miles and Snow, 2007). It is clear from this observation that firms may understand the importance of knowledge in PMP and link it to the implementation of SCMP.

The strategic choice theory stresses on the importance of the role of manager's decision in organizational outcomes. In supply chains, the theory can help in explaining how strategic decisions about supply chains activities do directly and indirectly shape the profits for the firm. The process of making the strategic choices is closely linked to the practices in performance measurement as these guide decision makers on which direction to take. There are many more areas that knowledge management is of much help, such as in bridging cultural differences among supply chain partners.

The completion of the discussion on the theoretical perspectives provides a room to discuss the gaps that have been identified in this literature review. These gaps are presented in the next section, after which the summary for this chapter is presented.

2.10 Gaps in the Area of Performance Measurement in Supply Chains

In view of the reviewed literature, several gaps can be identified in the area of performance measurement in supply chains and in supply chain management in general. The most obvious one is the lack of studies in the supply chains of developing economies. The majority of the reviewed studies focus on manufacturing entities and general business found in developed economies.

The existence of firms as well as supply chains relies on how they serve their customers and make profit. Due to the fact that the customer is the main source of real income to these firms and chains, most of the studies look into the down stream side of the chains, and in doing so the studies have looked more into measures related to fulfilling customer requests and wants. Authors including Schmitz and Platts (2003) observed such a phenomenon and they claim that relationships between producers and suppliers define various intermediary forms of interaction between markets and supply chains, but no management control mechanisms have been so far developed for such relationships. The authors could not find studies on how companies use performance measurement to manage their relationships and interactions with suppliers and how suppliers respond to the measurement.

Lack of research linking supply chain practices to supply chain performance is another area that authors (e.g. Lockamy III and McCormack, 2004) see as a gap in supply chain performance measurement research. They point out the absence of empirical research linking specific supply chain planning practices to supply chain performance. These authors claim further that only a small number of studies that have attempted to empirically link supply chain management practices to supply chain performance are so far in existence. In the literature reviewed, studies do not dispute the prevalence of the shortfall pointed by these authors.

Most of the studies reviewed in the area of performance measurement points out the relevance of measuring performance as the practice is important in the management and control of the processes in organizations. According to Hofman (2004), despite of measurements being a cornerstone of operational success, for many managers the process of measuring performance in supply chains proves to be a difficult and an elusive exercise. Hofman links this difficulty to the existence of many metrics that can be used to measure performance in supply chains while little guidance is available on how best to use them. Patel et al. (2004) adds to this point when they claim that performance measurement and performance metrics pertaining to supply chain management has not received adequate attention from researchers. The lack of guidance pointed out presents another gap in the studies in the area of supply chain performance measurement.

Rouse and Putterill, (2003) points out the failure of researchers and practitioners to come up with a single all-encompassing performance measurement system as the tradition of measuring performance used to be in the past. They blame this to "the complexity of contemporary business, with global ramifications and wide ranging interdependencies promoted by computer facilitated connectivity," as this is "beyond the scope of a traditional single all-encompassing performance measurement systems". The needs of supply chains being different for each of them, has made it difficult for the realization of a single all encompassing performance measurement system. More research is needed in this aspect so as to cover this gap.

2.11 Summary

Many firms have realized that they can no longer compete on their own after understanding that supply chain management is the key to building a sustainable competitive advantage in the highly dynamic business environment of the globalized customers. Supply chains go through several stages of evolution to achieve excellence, collaboration being the key to their success. The whole process is done through supply chain management. On the other hand, evaluation of performance is seen as central to control of operations in any business. So performance measurement is seen as an essential element of effective planning, control, and decision making as it can provide necessary feedback information to reveal progress, enhance motivation and communication, and diagnose problems in an organization.

To achieve the quantification of effectiveness and efficiency of action of supply chains, metrics (balanced) and performance measurement systems (dynamic) need to be used. For a supply to be successful it is important to adopt a systems thinking to performance measurement as the measurement system has to span the entire supply chain, using process based performance measures suitable or compatible to the nature of supply chain management and also contribute much more to the continuous improvement of supply chain management. Among several performance measurement systems, the SCOR model stand out to be more suitable for measuring supply chain performance. The proposed study constructs have been discussed and a clear definition for each is provided. The framework for the research shows the relationship among the study constructs. Further to this, the hypotheses are discussed.

Several gaps are identified in the area of performance measurement in supply chains which include: the lack of studies in the supply chains of developing economies; much focus on the downstream side of supply chains letting the upstream side (supplier) less studied; lack of research linking supply chain practices to supply chain performance; availability of little guidance on how best one can use the vast available non-financial measures; and, the failure of supply chain as well as supply chain management researchers and practitioners to come up with a single all encompassing performance measurement system. In the next chapter, what transpires in the industrial sector of Tanzania is presented.

CHAPTER THREE

THE INDUSTRIAL SECTOR OF TANZANIA

3.1 Introduction

This chapter provides details on how the supply chains in Tanzania have been developing as the basis for understanding how the relevant processes that are undertaken, as well as presenting a picture of how the firms in the chains measure their performances. The description begins with the historical background of the sector, followed by a discussion of the building blocks of the industry sector in Tanzania outlining the types and levels of development of the sector. Next is the description of the existing supply chains, actions and programs that have been in use to shape these chains. This is followed by how firms in these chains perform the process of measuring their performance, describing the types of measures that are in use.

During the collection of secondary data, no documented evidence was found on the actual supply chain management practices and performance measurement practices in the industrial sector of Tanzania. The unstructured interviews (face to face, on individual basis) conducted with several officials from various key organizations of the industry sector shed some light on what was taking place in these industries regarding supply chain management practices and performance measurement practices. The interviewees were from the following organizations: The Ministry of Industry, Trade and Marketing (MITM), the Confederation of Tanzania Industries (CTI), Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA), Small Industries Development Organization (SIDO), and Tanzania Bureau of Standards (TBS). The results of these interviews are reflected in this chapter.

Tanzania is located in Eastern Africa between longitude 29° and 41° East, Latitude 1° and 12° south. The country is formed out of the union of two sovereign states namely Tanganyika and Zanzibar (Ref. to Figure 3.1). Tanganyika became a sovereign state on the 9th of December 1961 and became a Republic the following year. Zanzibar gained its independence on the 10th of December, 1963 and the People's Republic of Zanzibar was established after the revolution of January 12th, 1964. The two sovereign republics formed the United Republic of Tanzania on the 26th of April, 1964. However, the Government of the United Republic of Tanzania is a unitary republic consisting of the Union Government and the Zanzibar Revolutionary Government (URT, 2005a).

Source: http://www.infoplease.com/atlas/country/tanzania.html accessed on March 17, 2007.

Figure 3.1
The Map of Tanzania

Accordingly, this study covers the Tanzania mainland (Tanganyika), in particular regions that have a high concentration of industrial activities are considered. According to the Ministry of Industry, Trade and Marketing, the top eight Regional headquarters with high industrial activities include (according to descending rank): Dar es Salaam, Arusha, Moshi, Mwanza, Tanga, Morogoro, Mbeya, Iringa, and Musoma (See the map in Figure 3.1 for geographical location). In the next section a discussion on the county's industry sector is done, briefly giving its historical development and the current status.

3.2 The Historical Development of Tanzania's Industry Sector

At the time when many less developed economies in the world (e.g. those of East and South East Asia) were positioning themselves to exploit the opportunities stemming from the quickening pace of globalization, Tanzania remained behind, locked in into a north-south pattern of trade, heavily dependent on exports of raw and semi-processed materials and slow to create competitive advantages, depending instead on traditional comparative advantage derived from raw materials and abundant unskilled labor (Wangwe and Rweyemamu, 2002).

Of late, the country has experienced a steady growth of the manufacturing activities to the level averaging over 4 percent annual growth. Despite this positive trend, manufacturing activities in Tanzania are seen to be relatively small and at the infancy stage. In the past decade, contribution to GDP has averaged 8%, with most activities concentrated on manufacture of simple consumer goods - food, beverages, tobacco, textiles and furniture and wood allied products. The majority of the existing manufacturing firms were established during the implementation of the import substitution strategy. The strategy was geared towards production focusing in substituting previously imported goods in view of saving the country's meagre foreign exchange at that time (URT, 2006).

Nevertheless, the importance of the sector to the county's economy is of no doubt, as the sector is the major provider of employment to urban residents and employs about half of the country's wage earners. Through the sector's contribution, in terms of import duty, corporate and income taxes, it remains to be the most reliable source of government revenue accounting for over half of the government's annual revenue collection. Manufacturing exports have experienced a declining trend in the past several years; however, this has not pushed the sector out of the five most important foreign exchange earners. It should not be forgotten that it is the industrial sector that provides a reliable field to practice invention, innovation and the nurturing of modern technologies for production and service provision.

3.2.1 The Evolution of the Sector

From the early sixties to the late eighties, the industrial dynamics in Tanzania were hampered by policies, which placed emphasis on the development of parastatal (i.e., government owned) firms in a tightly controlled policy environment characterized by highly indebted enterprises. Under-capitalization, out-moded production technologies and uncompetitive environments, substantially contributed to this state of affairs (Wangwe, 1998). The unsatisfactory performance and mounting indebtedness of parastatal enterprises resulted from one or a number of the following factors in combination: adverse foreign exchange movements in respect of foreign-denominated debt obligations; a high inflation rate; fundamental errors in the initial location of the projects; product choices, which put a low ceiling on performance; managerial ineffectiveness in controlling costs, collecting receivables or exploring markets; and changing macro-economics and the policy environment that limited industrial growth (Semboja and Kweka, 1997).

Then again, in the mid 1980s the industrial sector was subjected to several industrial and macro-economic policy measures, as a result of economic reforms undertaken by the government. Many industries have had difficulties in adjusting to new competitive pressures as they have been used to operating under import substitution industrialization supplying goods to the protected local market (Wangwe, 1998). The reforms were aimed at promoting private sector enterprise development, as well as creating a market driven environment. Also, these economic reforms aimed at reducing parastatal dominance, while improving the use of resources in the public sector. Divestiture programs, which were part of the economic reforms, had the objectives of reducing the large number of non-performing parastatal enterprises; to encourage private investment with a view to stimulating economic growth; the encouragement of the efficient allocation of and utilization of resources; the development of broader ownership; the creation of jobs; and provision of government relief from financial burdens.

The sale of public enterprises and privatization, or the liquidation of non-viable enterprises has been the main approach in the restructuring exercise. In some of the recently privatised industries, improvement is observed in their capital structures, production technologies and management and marketing systems, especially after undergoing intensive rehabilitations. Also, a reduction of workers to match the actual requirements is noted. There has been an improvement of product quality and a reduction in production costs in the aftermath of the restructuring exercise.

Low capacity utilization is still a threat to most industries in Tanzania. So far none of the existing firms have reported production at full capacity. The constraints that are identified include domestic supply – constraints that lead to the scarcity of raw materials, for most of industries, poor infrastructure, lack of spare parts, high power (electricity) tariffs, inadequate power supply, unfair competition from imported products and low technological capacity and its poor application.

3.2.2 Ownership Structure and Management

A recent report by Ministry of Industry, Trade and Marketing (MITM) observes that industrial establishments varies from ownership, size, investment, supply of raw materials, capacity utilization, power and water supply, marketing, products produced and employment. The industries reported are found to be owned as single proprietorship or joint ventures. The partnerships are both foreign and local. The top management in large firms is held by foreigners, though a reasonable number of management positions are under Tanzanians (MIT, 2006). These facts are not different from what is observed by CTI and DI (2000). Also, MIT and UNIDO (2006) observe that foreign participation in the sector is still small, due to presence of a small percentage of wholly foreign owned and joint ventures.

In spite of this, a broad based ownership structure that favors private sector across industries has induced an increase in productivity in the firms. In the case of joint ventures, working capital has been injected into the divested companies resulting in access to technology and the rehabilitation of production facilities. Foreign investments make it possible for the transfer of technology through the engagement of expatriates, acquisition of licenses, purchases of, and acquisition of new, modern machinery and equipment to enhance efficient processes, production and industrial engineering capabilities in the firms.

Furthermore, a significant impact resulting from these reforms is evident in the management, operation and performance of the industrial sector. The sector is increasingly liberalized and more open to private sector investment and competition (Wangwe, 1998). As of late, major initiatives are taken by the Government through the Tanzania Investment Promotion Centre (TIC) with a view of creating an environment that will be attractive to business. The climate for industrialization has changed dramatically, in terms of the attitude of government towards the need to develop a modern economy. Also, the interest shown by foreign investors, as well as the assessments on the investment atmosphere by different international bodies (e.g. IMF) supports this observation. However, Tanzania's industrial sector is still one of the least developed and stagnating sectors among developing economies.

3.2.3 Products

Tanzania's industrial sector is dominated by agro-processing activities, as the country still has agriculture as its main economic activity. The small manufacturing sector categorizes its industries using the common industrial classification. The classification categorizes firms into nine categories: food, beverages and tobacco; textiles, clothing, leather and footwear; wood and wooden products (excluding furniture); paper and paper products; chemicals, petroleum, rubber and plastics; non-metallic metal products; basic metal products; fabricated metal products and machinery and equipment; and other manufacturing industries (e.g. furniture, jewelery). Most activities concentrate on the manufacture of simple consumer goods - food, beverages, tobacco, textiles and furniture and wood allied products (URT, 2005b). The following paragraphs provide details of the kinds of activities and products manufactured in Tanzania for each category.

The food manufacturing in Tanzania consists of manufacturing dairy products, canning and preserving fruits and vegetables, canning fish and similar foods, the manufacture of animal and vegetable oils, grain milling, sugar, confectionery, and prepared animal feed. The distilling of ethyl alcohol; distilling, rectifying, and blending of spirits; the manufacture of wines, cider and beer; are products included under beverages, along with the production of soft drinks, carbonated waters and the bottling of natural spring and minerals waters. The tobacco sub-sector comprises the manufacturing of cigarettes, tobacco and other tobacco production.

Activities undertaken in the category of textiles, clothing, leather and footwear are: the spinning, weaving, and finishing of textiles; the manufacture of made-up textile goods;

knitting, the manufacture of carpets, rugs, cordage, rope and twine. For the leather and footwear activities include tanneries; leather finishing and the manufacturing of products from leather, such as luggage, handbags and pouches.

Wood and Wooden Products, excluding Furniture activities, include: sawmills, the planning of wood and other wood mill manufacturing goods. Also, included in this category are the manufacturing of wooden containers, cane products and wooden products. The paper and paper products category comprises the manufacturing of pulp, paper, paperboard, fibreboards, light packaging, heavy packaging, stationery and other paper products.

The chemical sub-sector comprises the manufacture of basic industrial chemicals, fertilizers, pesticides, plastic materials and products, medicinal and pharmaceuticals, soap, detergents, perfumes, cosmetics, paints and other chemical products. While, the petroleum sub-sector comprises of petroleum refineries, fuel oils, lubricating oils and the manufacture of asphalt materials. The rubber products produced in the country include: tyres and tubes, conveyors and fan belts, rubber mats, gloves, pipes and tanks, plastic sheets, kitchenware, furniture and footwear.

The Non-metallic Mineral Products manufacture of pottery, china and earthenware, glass and glassware products, bricks, tiles, cement, concrete, gypsum and plaster products. The Basic Metal Products comprise rolling mills and foundries to produce products, such as slabs, bars, sheets, plates, strips, tubes, pipes and rods. Fabricated Metals, Machinery and Equipment manufacture: cutlery, hand tools and general hardware, furniture and fixtures, doors, metal staircases, and, window frames. Others are electrical motors transformers, electrical control devices and switchboard apparatus, radios, and, transport equipment (mainly bicycles and animal and auto-pulled carts). In the category of Other Manufacturing Industries covered are products such as jewellery and related articles, furniture manufacture, measuring and controlling equipment and optical goods. In light of the presented products, inputs used in the production of these products are discussed in the following sub-section.

3.2.4 Raw Materials and Inputs

Tanzania is one country endowed with abundant natural resources, with deposits of many kinds of minerals, iron ore, coal, phosphate, gold, diamonds, tanzanite, and natural gas, have been found to exist. Besides these mineral deposits, there exists a vast land area covered by natural forests, with rivers that flow to the sea (Indian Ocean) and its three major inland lakes (Victoria, Tanganyika, and Nyasa) throughout the year. Agricultural land is also acknowledged to be abundant and full of livestock (cattle, Sheep, and goats). Also, the country has wild animals (e.g. elephants, buffalos, rhinos, lions, tigers, zebras, etc.) in areas reserved as national parks or game reserves (URT, 2005a).

Despite these natural endowments, Tanzania is hardly using much, as raw material for its small industrial base. Iron ore is yet to be extracted, so the country imports a substantial amount of steel from other countries. A small portion of the requirement is covered by the recycling of scrap metals as input in making billets for the production of iron rods, to a small extent coal is being used as a fuel in the production of cement, and also in electricity generation. The precious stones (diamonds, tanzanite) are used as raw materials for the few industries that process them (e.g. jewelry, polishing and cutting), especially after the introduction of incentives to foreign investors, though the extent of value addition is still very low. Natural gas is also used as fuel in cement production and in the generation of electricity, besides its use as a domestic fuel.

On the part of chemical industries, raw materials are also imported. This applies to pharmaceutical firms as well, as a very small amount of raw materials and inputs is locally processed for use in these industries. This also applies to agricultural inputs, fertilizers and pesticides. One factory that uses solely the locally available material to make phosphate fertilizer is in operation close to the phosphate mines. As mentioned earlier, forest products are abundant in Tanzania, with most of the logs harvested from the natural forests being exported. A very small portion is used by the local furniture manufacturers and the construction industry. There is also a large reserve of human grown forests being used in the production of paper in one paper mill.

As already stated in the preceding sub-sections, most of industries in Tanzania are involved in processing, or manufacturing products from agricultural produce. This is a result of the dominance of agricultural activities in the economy of the country. The main agricultural outputs found in the country, include: coffee beans, cocoa, tea, cotton lint and seeds, tobacco, pyrethrum, sisal, maize, paddy, barley, wheat, sunflower seeds, cashew nuts, peanuts, and various kinds of tropical fruits (oranges, mangoes, pineapples). Companies dealing in the processing of these agro-products enjoy the availability of the raw materials because of natural abundance. There are rare cases of shortages experienced, especially when there are adverse weather conditions, or when dealers of the produce decide to export most of the harvest without considering the local demand.

Also, abundant raw materials are the fish (both fresh water and salt water) as Tanzania is endowed with vast natural waters that allow the growth of many kinds of fish; however, there is overcapacity in the processing of fresh water fish due to the earlier high demand of the produce in the export market. The area of sea fish processing is dominated by large commercial vessels (owned by foreign investors) equipped with processing plants. Still the availability of salt-water (sea) fish is abundant compared to the processing capacity. Meanwhile, the abundance of livestock has not been taped well, as processing is still on the low ebb. Meat, as well as milk is plentiful, as fresh products. Hides and skins are available in their raw form and processing is relatively small, this also applies to poultry and its products.

In terms of energy (electricity), the country depends on hydroelectric power generated from four major water dams constructed along major rivers in the country. Thermal power generators that are located in different parts of the country supplement power from these hydro power plants. The thermal power generators utilize natural gas, coal, or imported petroleum fuels in generating electricity. Also, the country imports some electricity from neighboring countries to supplement internal generation.

To conclude, it is noted that the country has a very small industry sector that is dominated by private kind of ownership, though for large firms, multinational companies hold the majority of shares. The main products are agricultural products processed in these industries. The importation of equipment and machinery is imminent as there are no firms that specialize in the production of industrial machinery, other than simple fabrications. It is also evident that Tanzania is dependent on imports for most of the raw materials needed for the production purposes in the small manufacturing sector, except for agro-processing industries and industries manufacturing products from agricultural produce, despite being endowed with many types of minerals, as well as agro-produce and livestock. The following sub-section deals with another very important input to production for the industrial sector of Tanzania i.e. labor.

3.2.5 Labor

Tanzania, one of the most incredible tribal diversity in Africa, has all of the major ethnic and linguistic groups on the continent (TTB, 2007). The country is home to about 120 major tribal groups comprising of small communities and minority groups fro Europe and Asia (URT, 2005a). Tanzanians prize this diversity by placing a high value on their country’s multicultural heritage and hence the diversity is far from being a source of division. Economic activities have transformed the land use and gradually these communities have been assimilated into the larger population.

Still the majority of the population (more than 80%) comprises of small holder farmers (peasants). The major wage earning employer other than agriculture is the public sector (government), the Industry and Trade sectors, as well as other service sectors (URT, 2005b). According to the Parliament of Tanzania (2004), employment in these sectors is guided by the Labor Law, which has among others, the following principal objectives:

- To promote economic development through economic efficiency, productivity and social justice;
- To provide the legal framework for effective and fair employment relations and minimum standards regarding conditions of work;
- To provide a framework for voluntary collective bargaining;
- To regulate the resort to industrial action as a means to resolve disputes;
- To provide a framework for the resolution of disputes by mediation, arbitration and adjudication;
- To give effect to the provisions of the Constitution of the United Republic of Tanzania of 1977, in so far as they apply to employment and labor relations and conditions of work; and
- Generally to give effect to the core Conventions of the International Labor Organization as well as other ratified conventions.

As education is strongly linked to productivity, the government of Tanzania has taken deliberate steps in ensuring all Tanzanians have access to primary education. Higher education is also promoted whereby the private sector is highly motivated to join hands with the government in the provision of education. This has lead to many private institutions of higher learning being established across the country in the recent past. The government, through the Ministry of Education and Vocational Training; and, the Ministry of Higher Education, Science, and Technology, ascertains the quality of education provided by these institutions. So the country can boast of availability of a fairly educated workforce. The previous sub-sections have discussed the main inputs to production, in the next section; the role of the government and other organizations in the promotion of the industrial sector in Tanzania is discussed.

3.3 Role of the Government in Promoting the Industrial Sector in Tanzania

The government of Tanzania has, in the past decade, engaged in comprehensive economic, political and social reforms focusing on broadening the role of market forces in the economy, strengthening human rights, within the context of a liberal, constitutional order, and promoting democracy, good governance and the protection of the environment. A central feature of these reforms is the creation of an enabling environment for private economic activity and for generally enhancing the role of the private sector. The reforms being undertaken affect all sectors of the economy and encompass: reforms in the foreign exchange regime, the investment policy, trade policy, the agricultural, the financial and public sectors.

Accordingly, each sector of the economy is under a specific ministry that oversees the formulation and implementation of relevant policies that guide the development of the sector. The task to oversee the development of the industrial sector is vested to the Ministry of Industry, Trade and Marketing, MITM (formally the Ministry of Industry and Trade, MIT). In the regions, MITM is assisted by the Regional Industry and Trade offices. The government, through MITM, has established several institutions to assist in facilitating the

Table 3.1
Functions of the Government and its Organizations in Promoting the Industrial Sector of Tanzania

Organization	Mission/Function
A. Government of Tanzania	
1. Ministry of Industry, Trade and Marketing (MITM)	To collaborate with the private sector in formulating and implementing policies for development of industry as a vehicle for modernizing the economy with the objective of building export oriented competitiveness in trade and commodity marketing systems, both of which were key to sustainable economic growth (URT, 2006; MIT, 1996).
2. Regional Industry and Trade Offices	To advice the regional administration on matters pertaining to industry and trade, co-ordination and monitoring of industry, trade and marketing activities and liaise with MITM and other organizations in matters pertaining to industry, trade and marketing in their respective regions.
3. Industrial Support Organizations	
3.1. National Development Corporation (NDC)	To identify and lead the development of projects which have high inherent catalysts to enhance exploration of economic growth potentials in Tanzania, initiating economic projects, by itself or in partnership with private sector both local and foreign, with the aim of facilitating the emergence of world class competitive industries and infrastructure, assisting in the creation of human capital base for improved industrial and economic management for Tanzania (NDC, 2005; URT, 2005b).
3.2. Small Industries Development Organization (SIDO)	To develop, create, promote and sustain, indigenous entrepreneurial base in the small scale industries and micro businesses, to promote the development of small industries, planning and coordination of their activities, provision of technical assistance, and provision of management and consultancy services to small industry enterprises in Tanzania (URT, 2005b).
3.3. Centre for Agricultural Mechanization and Rural Technology (CAMARTEC)	To develop, disseminate and improve technologies suitable for agricultural and rural development with aim to improve rural life through development, adaptation and implementation of appropriate technologies in the field of agricultural mechanization, water supply, building construction and sanitation, rural transportation and energy (URT, 2005b).
3.4. Tanzania Industrial Research and Development Organization (TIRDO)	To carry out technological research and capability building so as to facilitate maximum exploitation of locally available natural resources for industrial development and to become an International Centre of Excellence in conducting Research & Development activities in the sector of Industry and Environment, aiming to promote industrial development in Tanzania through applied research heading to the evolution and development of local materials to be used in industrial process (UNDP, 2005; URT, 2005b).
3.5. Tanzania Bureau Of Standards (TBS)	Developing and promoting Standardization and Quality assurance work in industry and commerce, to undertake measures or quality control of commodities of all description and to promote standardization in industry and commerce; to provide for the testing of locally manufactured and imported commodities with a view to determining whether such commodities comply with the provisions of any law dealing with standards relevant to such commodities (TBS, 2006; URT, 2005b).
3.6. Tanzania Investment Promotion Centre (TIC)	To coordinate, encourage, promote and facilitate investment in Tanzania, advises the Government on all investment related matters, to assist investors in establishment of enterprises e.g. incorporation and registration of enterprises; obtaining necessary licenses, work permits, visas, approvals, facilities or services; and sorting out any administrative barriers confronting both local and foreign investments (TIC, 2005; URT, 2005b).

realization of the goals of the policies formulated. These institutions render support services to the industrial sector. Table 3.1 summarizes the organizations with their functions.

Table 3.2
Functions of Other Organizations in Promoting the Industrial Sector of Tanzania

Organization	Mission/Function
B. Business Associations	
1. Confederation of Tanzania Industries (CTI)	To present the views of members, and co-operate with the Government of the day, local authorities and other bodies essential to industry; to promote a competitive minimally regulated business environment in Tanzania in which sustained development is possible; to act as a prime source of information about manufacturing and associated industries for its members, the Government, potential investors and media (CTI, 2005).
2. Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA)	To strengthen the private sector in Tanzania by promoting and assisting businessmen and businesswomen in their efforts to succeed, to provide effective representation and advocacy by lobbying for a good and ideal business climate in the country (TCCIA, 2005).
C. Non Governmental Organizations	Operate to assist disadvantaged groups like women economic groups, orphans, disabled people, and people who face specific problems in the society, assisting in financing different economic groups (e.g. women groups, youth groups etc.) in achieving their goals, e.g. financing specific kinds of projects (e.g. processing of agro-products). This has encouraged the establishment of small scale agro-processing industries especially in rural areas. It has proved to be one way of promoting rural industrialization in countries like Tanzania (URT, 2005b).
D. United Nations Bodies	
1. United Nations Industrial Development Organization (UNIDO)	To support developing countries and economies in transition in their efforts to accelerate social-economic development while meeting the environmental challenge, UNIDO was assisting the government of Tanzania, and the private sector in the implementation of the country's Sustainable Industrial Development Policy (SIDP), (MIT, UNIDO and UNDP, 2004). Also UNIDO is running projects in building capabilities among women entrepreneurs in Tanzania. This helps in achieving international goals relating to poverty reduction and gender equality (UNIDO, 2006).
2. United Nations Development Programme (UNDP)	Helping countries build and share solutions to the challenges of democratic governance, poverty reduction, energy and environment, crises preventions and recovery, HIV/AIDS and information and communication technology (UNDP, 2006).

In Tanzania there exist business associations and organizations that operate for non profit purposes. Among the business associations, most are specific to the type of industry that they save, or are established to save (e.g. chambers of commerce). Also, there are several Non-Governmental Organizations (NGOs) that advocate, or promote the development of industries in the country. Not left behind in this, are the United Nations bodies. The functions performed by these bodies are summarized in Table 3.2.

3.4 Supply Chain and Supply Chain Management in Tanzania's Industry Sector

Tanzania as other developing economies is characterized by an element of discontinuity, whereby the economy consists of a small number of large (mostly multinational) corporations at one end of the spectrum, and many small (mostly informal) local enterprises at the other. The result is not having the 'linking middle' needed to link the two extremes. This has led to a weak link between the large corporations and the rest of the domestic economy, resulting in a limited impact of investments, in terms of employment, increased domestic capacities, and greater wealth accumulation (Small Business Project - SBP, 2004).

After realizing the existence of the missing link i.e., the linking middle, large corporations in Tanzania, in collaboration with Small Business Project (of South Africa), introduced The Private Sector Initiative (Psi) Tanzania. Sustainable and mutually profitable linkages between large corporations and small and medium enterprises are created by the Psi Tanzania mechanism. The mechanism is designed to gain maximum development advantage from existing capacity. This emanates from the fact that in developing economies, the few large corporations, mostly multinationals, are often the most technologically and organizationally advanced. The extensive use of these capabilities is one of the major focuses of the Psi mechanism. Organizations that have adopted Psi go about their day to day activities in a slightly different manner that has proven to be more efficient and less costly. This results from the lower business costs experienced by these firms in using local suppliers and an increased speed and flexibility and reduction in stocks that they need to carry. The mechanism also enhances the collaboration among the large firms, government, and other agencies for their mutual benefit and the nation. Psi makes it possible for businesses in the informal sector to become serious suppliers, abide to consistent quality standards through registration and obtaining the necessary certification.

The above discussion shows one kind of supply chains that exist in Tanzania, involving a leading, or focal organization that coordinates the activities in the chain. In this case, the leading organization, through Psi, helps in developing the local suppliers for its inputs. Since the relationships are developed for mutual benefit, most have proven to be sustainable. The development of these local suppliers is gradual, and takes a few suppliers at a time depending on the importance of their supplies to the focal organization. The result is having processes that are managed, monitored, and those that are neither managed, nor monitored, or non–member process links. Of late, the Confederation of Tanzania Industries (CTI) has embarked on a program that complements the Psi Tanzania efforts, whereby local companies have been identified and is coordinating with the initiators of Psi Tanzania on how the identified CTI members can be included in the Psi Tanzania program. This seems not to be a problem, as most of the big players of Psi Tanzania are CTI members (CTI, 2006).

On the other hand, the Government has decided to establish Export Processing Zones (EPZs) for the purpose of boosting industrial products export. It is believed that these EPZs provide a unique opportunity for the sector to take advantage of economies of scale in relation to infrastructural development. An increased industrialization is one outcome of the establishment of these EPZs. This is coupled with the development of agriculture–industry linkage, leading to accelerated transformation of rural societies, and a more balanced regional distribution of productive facilities, and balanced economic growth. Also, the EPZs are established with the view to create capacity and the ability to compete within the country and in the sub-regions, as well as to attain a certain degree of international competitive edge, while at the same time transforming the country's supply side in conformity with the changing demand structure in the global economy (MIT and NDC, 2004). Most of the companies that are in the EPZs program deal in textile and hi-tech appliances.

In the EPZs program, it is deduced that the supply chains and supply chain management play a crucial role. The use of local inputs need well established linkages between suppliers, who are mostly farmers, and the producers. For sustainable operations to prevail, firms have established these linkages, which are supply chain linkages that are managed and monitored. For firms that use imported inputs, the situation requires higher levels of stocks, due to the inevitable longer lead times that are inevitable because of the long distances between suppliers and these companies. The issue of consolidating purchases is only valid for requirements available locally. In some cases this is made impossible by the unreliability of local suppliers, in terms of quality, quantity and lead time. Consequently, firms are forced to stock more when purchasing their requirements.

The ISO 9000 certification also plays a great role in the establishment of supply chains in Tanzania. According to the Tanzania Bureau of Standards - TBS (2006), so far only twenty five companies, mostly subsidiaries of multinational companies, are certified under ISO 9000 certification procedures. The set of these ISO 9000 standards provides fundamentals of quality management, specified requirements for a quality management system, and provide guidelines that consider both the effectiveness and the efficiency of quality management system, to audit the system, ISO 19011 is used. The quality management principles are: customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision making, and mutual beneficial supplier relationships.

Customer focus in this standard entails the understanding of customer needs (current and future), meet their requirements and strive to exceed customer expectations. Company leaders are to establish unity and fully involve people (employees) in achieving objectives of the company or organization. In involving people (employees), all levels are considered and involved as involvement enables people's (employees') abilities to be used for the organization's benefit. To achieve desired results more efficiently, activities and resources should be managed as a process (process approach).

The aspect of system approach to management involves identifying, understanding, and managing interrelated processes as a system, as it leads to higher organization's effectiveness and efficiency in achieving objectives. The standard insists on making continual improvement as a permanent objective of the organization. Through factual approach to decision making effective decisions are arrived at, as decisions based on data analyzed and information are effective decisions. Under the mutual beneficial supplier relationships an organization, and its suppliers, are interdependent and have a mutually beneficial relationship to enhance the ability of both to create value.

Moreover, all supply chain management practices (Lean Practices, Supplier Partnership, Information Sharing and Quality, Customer Relationship Management (CRM), Postponement, and Communication Connectivity) are in one way, or another being practiced when an organization is achieving certification. Implicitly, companies that have been certified for the ISO 9001 – 2000 in Tanzania, are practicing supply chain management to a recognized level, and the certification makes companies' products globally acceptable due to recognized practices. The products meet international standard customer requirements. The certification has proven to be useful to exporting companies to help in increasing market share and competitiveness in business. Despite these listed benefits of certification, most of the companies in Tanzania are not certified despite the listed benefits. This is due to the fact that most are still focusing on carrying out business activities within the local market. Globalization is bound to drive them out of business, if they continue to adhere to the same out dated principles without noticing the changes that are taking place around them. In future, global competition will force them to seek and adhere to the certification so as to compete in the international market.

Additionally, the process approach described in ISO 9001, provide details on inputs and outputs with the continual improvement of processes. This improvement is linked to measurements of performance. A description of how performance is measured in firms in the supply chains of Tanzania's industrial sector is presented in the next section.

3.5 Performance Measurement in Supply Chains of Tanzania's Industrial Sector

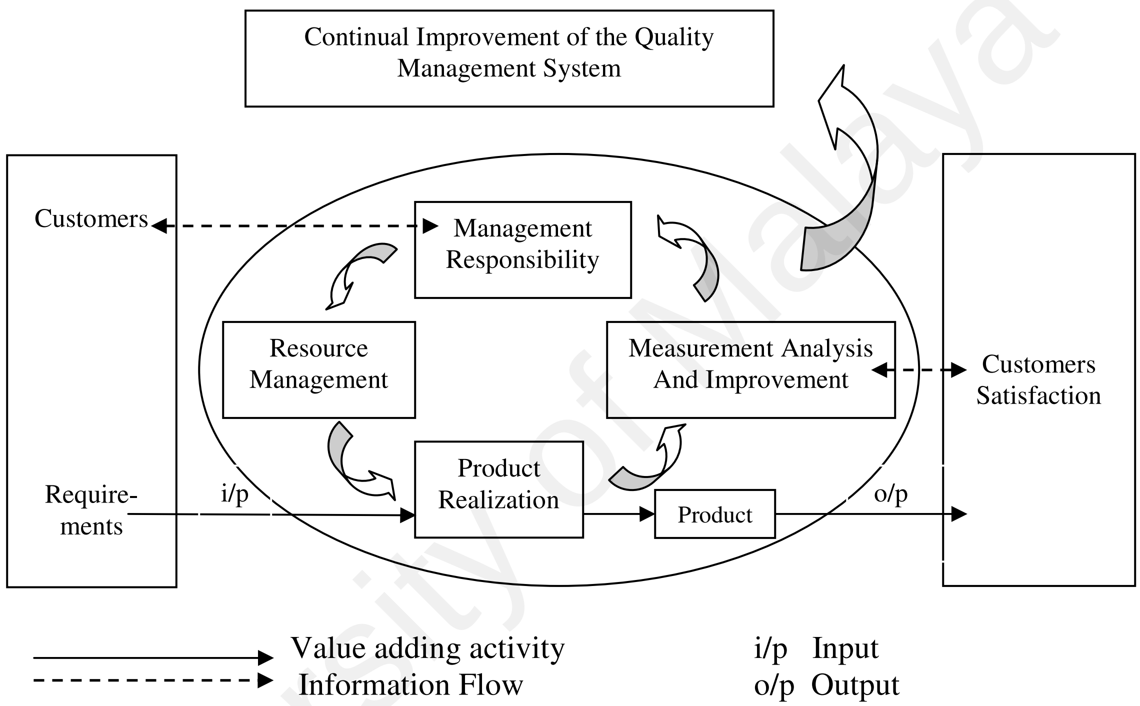
In the preceding subsection, different kinds of supply chain forms in Tanzania have been discussed, including: those developed through the Psi Tanzania initiative, the EPZ approach, and the practices through ISO 9000 quality management system. It should not be forgotten that there are other communicative chains i.e., they exist, but are not managed. In all kinds of supply chains found in Tanzania, there is one original common approach to measuring performance. This involves the use of financial control systems and financial based performance measures. This is apparent in Tanzania, as all companies are required under the incorporation law (limited liability companies) to submit annual returns to the Registrar of Companies (BRELA, 2005), attached with audited accounts for each year of operation.

In the presentation of accounts, companies are obliged to follow the standard set by the National Board for Accountants and Auditors (NBAA) i.e., the Tanzania Financial Standards (TFASs) and the Tanzania Statements of Recommended Practices (TSRPs) (NBAA, 2005). The standards are similar to the International Accounting and Auditing Standards, of which, Tanzania is gradually assimilating (NBAA, 2005). In the NBAA standards, a company is required to present its balance sheet and the income statement in a prescribed way. For instance, in the balance sheet, the company is obliged to present the following: fixed assets, current assets, liabilities (long term and short term), and equity. In the income statement the company is required to present income and expenditure. In order to be able to present these financial reports, a company automatically uses some measures of performance e.g. input and output. Also, the reports make it possible to determine some of the measures used, e.g. ROA, ROI, ROCE, etc. In these financial reports, companies use almost all financial measure, as well as budget comparison to actual performance. So the use of financial measures is a common phenomenon to all companies. The difference is the number of measures that each company uses, besides the ones that are obligatory in presenting accounting reports.

Besides the use of the said financial measures, companies that are involved in supply chain links, managed or monitored, have other measures to use in measuring the performance. It is not clear from the members of these chains as to the kind of measures used, since there are no documented reports on this matter available. All in all, common measures related to supply chain management are in use, including measures of supplier performance as well as customer relationship management.

A more apparent allusion on the use of supply chain performance measures is seen in the implementation of the process approach in the ISO 9001 Quality Management System. This is paged on understanding and meeting requirements, the need to consider processes in terms of added value, obtaining results of process performance and effectiveness, and continual improvement of processes based on objective measurement. The whole system model is as presented in Figure 3.2. This needs the use of a balanced set of measures since the activities spill across several processes and involve objective and perception measures.

As seen in Figure 3.2, the customers initiate the process through their requirements which the management has a responsibility of determining and deciding on the kinds of resources they need to realize what the customers wants. In the process of realizing this, measurements play a role in all steps to determine if the product is what the customer needs, the level of satisfaction in terms of the product as well as the delivery process, etc. The measurements are analyzed to give indications as to what should be improved. The process is a continuous one, and all certified companies are obliged to follow the procedure.



Source: Adopted from ISO 9001, 2000.

Figure 3.2
The Model of a Process-based Quality Management System

3.6 Summary

In this chapter the current status of the industrial sector has been presented as being in its infancy. Most firms are privately owned, with some having multinational companies being the major shareholder. A number of products are locally produced, the majority being products from agro-processing and those using agro-produce as inputs. Other than agricultural produce, most raw materials are imported from various countries (e.g. China, United Kingdom, South Africa, Kenya, etc.). Several organizations, including the government of Tanzania have different roles in promoting the sector. Supply chain management is seen to be practiced in its very early stages, through initiatives, such as Psi Tanzania and receiving a boost from CTI and the introduction of EPZs. ISO 9000 certification plays a dual role in the promotion of supply chain management and performance measurement. It is seen how it can influence the development of supply chains and supply chain management as well as the use of a balanced set of performance measures through its procedures in TQM System. Besides the few ISO 9000 certified firms who use appropriate measures in performance measurement, most of the companies in Tanzania are still using financial based measures. This is a result from conditions set by the incorporation law for firms to submit annual, returns attached with their annual accounting reports, which are prepared in a specifically prescribed format stressing financial based measures.

In Chapter Four, the proposed research design and methodology is described. The methodology used is based on the literature as suggested by researchers in the field of supply chain management and supply chain performance measurement. This chapter describes the way the research had to be conducted and proposes the data analysis techniques relevant for each stage of the research.

CHAPTER FOUR

RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

The main purpose of this dissertation is to examine supply chain management practices and performance measurement practices of firms belonging to certain supply chains in the industrial sector in Tanzania. In designing this research, it is important that appropriate choices of procedures and methods are made to enhance the validity of the study results (Bickman and Rog, 1998). This is mainly achieved through mounting the most rigorous designs in data collection from objective sources, and designing studies that have universal generalizability, whenever possible.

Furthermore, developing converging lines of evidence, as quoted by Yin (1998), assists in improving the validity of the study results. Whether one chooses, the qualitative or quantitative approach, to research design, data collection, analysis, and reporting, it depends on the objectives and questions to be studied. Bickman and Rog (1998) emphasize the importance of finding tools that can best fit the research question, context, and resources available. To research a topic thoroughly, and provide results that can be useful, Bickman and Rog (1998) believe that in many occasions multiple tools are needed, cutting across qualitative and quantitative boundaries.

Thus, in this chapter, the design and methodology of this study is presented. The research stance showing the research bearing is presented first, followed by the presentation on the overall description of the design of the research. This is followed by research questions and the objectives of the study. Next is the detailed design of the research i.e., the methodology, which is followed by data collection methods and analysis techniques to be employed on the data, assumptions, and lastly, the chapter summary.

4.2 Research Bearing

The importance of the mixed methodology, involving quantitative as well as qualitative research, is highly acknowledged in this research, as it is believed that both are important in understanding what is taking place in our environment. Literature review is used to identify relevant information, as this allows for the extraction of information useful in understanding and defining the problem under study (Ibrahim, 2002). In this study, literature covering supply chains, supply chain management, performance measurement, performance measurement systems, and performance measurement systems used in supply chains is reviewed to allow for more flexibility in formulation of the study theories and understanding study variables better.

As the literature on the industrial sector of Tanzania has not been documented, resulting into lack of relevant understanding regarding the practices in supply chain management and performance measurement, it may prove difficult to underscore the rationale of the results that are to be obtained from the survey data analysis. The researcher finds it necessary to pursue a further in-depth study of the firms in the study firms. Wherefore, methodology triangulation is used to create a synergy between the quantitative and qualitative methods.

Thus this two-stage, sequential mixed method study, aims at obtaining statistical, quantitative results from a sample of firms belonging to the industrial sector of Tanzania then follow up with a few firms to probe, or do a more depth study of the statistical results. In the first stage, quantitative research questions and hypotheses address the relationship between supply chain management practices, performance measurement practices and performance (time based and overall firm performances) in firms belonging to supply chains in the said sector in Tanzania. In the second stage, qualitative interviews and observations are used to probe significant results from the survey (quantitative results) by performing in-depth study of aspects of the supply chain management practices, performance measurement practices and firm performance with a few firms (good performing and poor performing) to ascertain the reasons for the results of the survey.

4.3 Research Design

This research was planned to be conducted following steps outlined in Figure 4.1, which presents the research process flow chart for this research. The steps include: literature review, research design, data collection, data analysis, and drawing up of conclusions and report writing. In the following paragraphs and in subsequent sub-sections, discussion on research design, data collection, and data analysis processes are covered. The field research was planned to be conducted sequentially in two stages. The first stage was intended to provide a quick, inexpensive, efficient and accurate means of assessing the firms belonging to supply chains in the industrial sector of Tanzania. This kind of data, or information (primary data), was to be obtained by use of a survey method. The technique, as defined by Zikmund (2003), is a method for gathering primary data based on communication with a representative sample of subjects of the study. The method has the aforesaid advantages and it is a research technique in which information is gathered from a sample by way of a questionnaire, or interview.

Conversely, Fowler (1998) identifies factors that influence the quality of data from a survey: the size and representativeness of the sample from which the data is collected; the techniques used for collecting the data; the quality of the interviewing, if interviewers are used; and, the extent to which the questions are good measures. This entails researchers to consider all sources of error when making survey design decisions. Mangione (1998) points out four major types of errors that can be encountered in a survey: sample selection bias,

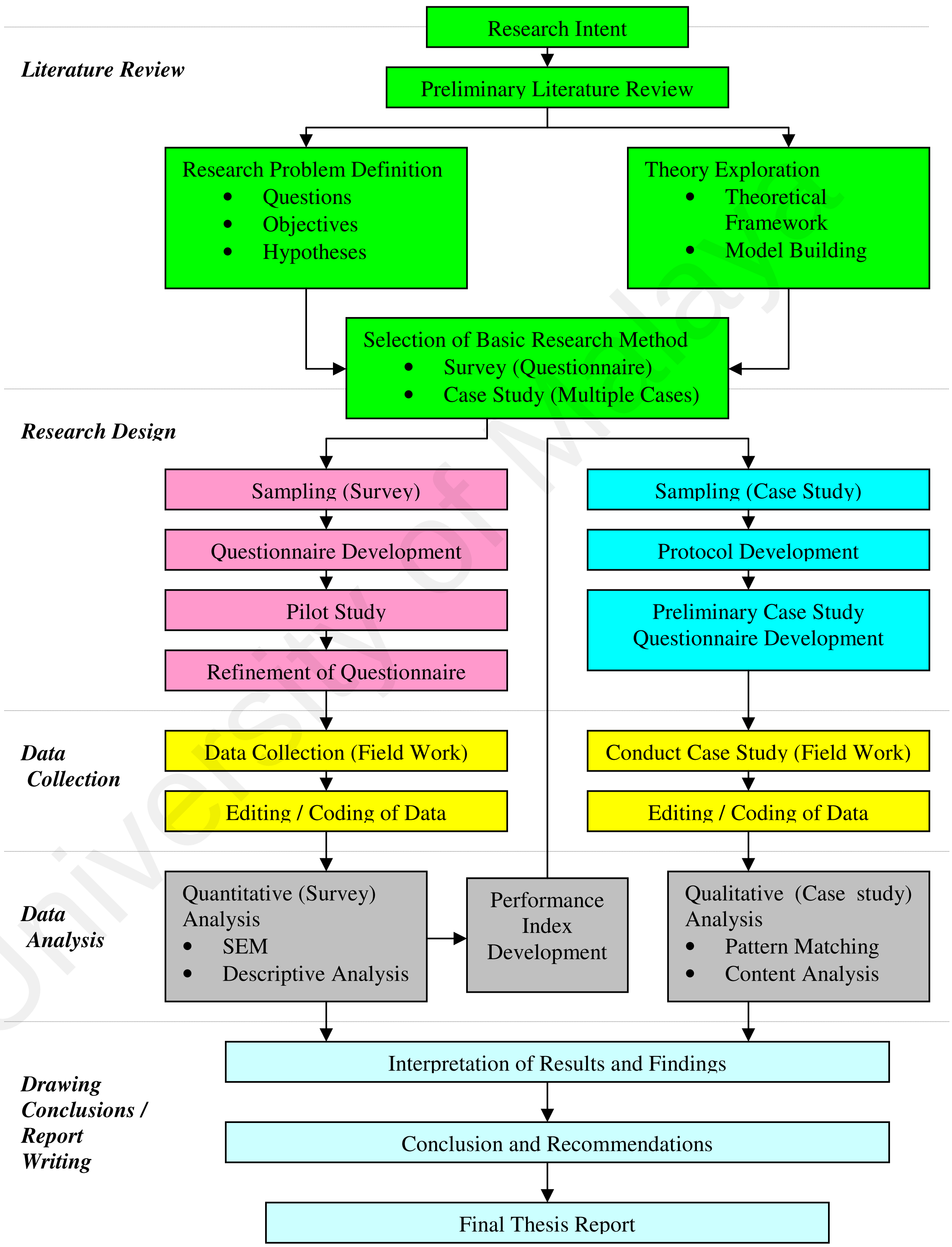


Figure 4.1
The Research Process Flow Chart

non-response error, item non-response errors, and response error. The author stresses the importance of 'designing quality' in all stages of a survey, referring the aspect of optimizing efforts across all areas as "total survey design," as identified by other methodologists, including Groves (1989) and Biemer et al. (1991).

The nature of industries in Tanzania makes them more geographically dispersed as the majority of these industries deal with processing of agricultural produce, or manufacturing of final products from agro-based inputs (MIT, 2006). Agriculture is the dominant economic activity in Tanzania. This fact leads to the conclusion that a mail survey can be a more suitable survey method to be used in this first stage of the study. Mangione (1998) gives the advantages of a mail survey over other methods of data collection. These advantages include:

- the method being relatively inexpensive,
- it allows for large numbers of respondents to be surveyed in a relatively short period even if the respondents are widely distributed geographically,
- it allows respondents to take their time in answering and to look up information if they need to,
- it gives privacy in responding; allows for visual input rather than merely auditory input,
- it allows respondents to answer questions at times that are convenient to them,
- it allows respondents to see the context of a series of questions, and,
- it insulates respondents from expectations of an interviewer.

The suitability of this survey method can be seen to outweigh other approaches.

The research questions, meant to explain supply chain management practices and performance measurement practices in the context of the industrial sector of Tanzania, were to be addressed in this first stage of the field research. It was planned that the analyses of the data from the survey would lead to the development, of a performance index to be used in the identification of four firms (two good performing, and two poor performing – in the perspective of supply chain management) for the case study.

The second stage of the field research was planned to be an in-depth study of the four selected enterprises. For this kind of study, Zikmund (2003) recommends the case study method as it has the advantage that an entire organization, or entity, can be investigated in-depth with meticulous attention to detail. This highly focused attention enables the researchers to carefully study the order of events as they occur, or to concentrate on identifying the relationships among functions, individuals, or entities. Sekaran (2003), and Cooper and Schindler (2003) are also of the opinion that case studies involve in-depth, contextual analyses of similar situations in other organizations, where the nature and definition of the problem happens to be the same as experienced in the study organization. Sekaran asserts further that case studies are useful in understanding certain phenomenon, and generating further theories for empirical testing. The above views are in line with the objective of this research of understanding why supply chain management and performance measurement are being practiced the way they are, in the firms in the industrial sector of Tanzania. This provides the ground for this researcher to opt for the case study approach for the second stage of the research.

According to Stake (2000), regardless of the method chosen to study the case (analytically, holistically, culturally, or by mixed methods), the concentration is on the case, which is a choice of what is to be studied (not a methodological choice). As noted by this author, many case studies are, both qualitative and quantitative. Yin (1994b) says the important point in the case research is the commitment of any research that includes bringing expert knowledge to bear upon the phenomenon studied; rounding up all the relevant data; examination of rival interpretations; and, pondering and probing the degree to which the findings have implications elsewhere.

This second stage of the research was planned to be a collective case study i.e., instrumental study that has to be extended to several cases (Stake, 2000). The author describes an instrumental case study to be a case in which one examines mainly to provide insight into an issue, or to re-draw a generalization. As it is the intention of this research to get an in-depth understanding of supply chain management practices and performance measurement practices in firms belonging to supply chains found in the industrial sector of Tanzania, this approach is the most suitable one. Four organizations are to be studied in this stage of the research.

Since this stage is very detailed, the "why" question, which basically focuses on the content, or process of supply chain management practices and performance measurement practices are to be answered after the completion of the study. This is to help the researcher to understand the reasons that lead to the two sets of practices being performed the way they are in firms in the industrial sector of Tanzania.

4.4 Research Questions Revisited

The research questions for this study have been enumerated in Chapter One. The main focus of the study questions is on trying to understand the way supply chain management and performance measurement are practiced in the supply chains of the industrial sector of Tanzania. This entails finding answers to the questions that have been enumerated earlier, the main questions including: (1) How is supply chain management practiced and how is performance measured in supply chains of Tanzania; (2) Why are performance measures used the way they are, in supply chains of Tanzania; and (3) What is the impact of supply chain management practices and performance measurement practices on time based performance and overall firm performance. For the specific study questions refer to Section 1.5 in the first chapter. The design of this study considered all possible criteria for the purpose of conducting a study to provide for answers to these questions. The answers are to come from both the survey results and the case study results.

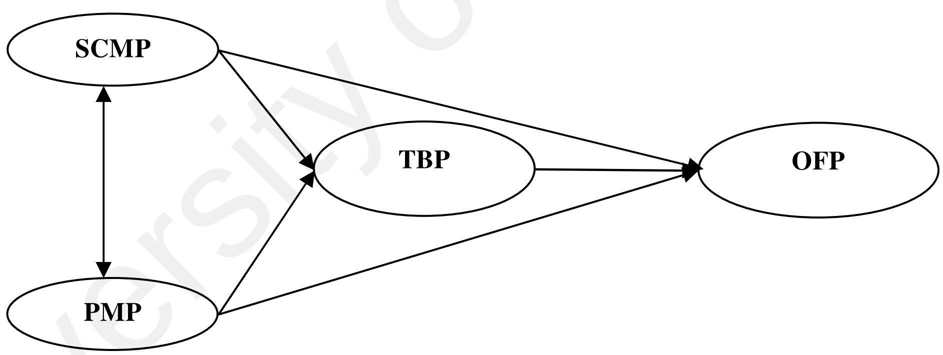
4.5 Research Objectives Revisited

In section 1.6 of the first chapter the objectives of this study have been enumerated. The main objectives of this study include: (A) to study and understand the way supply chain management is being practiced and the way performance is measured in the supply chains of the industrial sector of Tanzania; (B) to study and understand the reasons leading to the way measures are used in supply chains of the industrial sector of Tanzania; and (C) to study and understand the impact of supply chain management practices and performance measurement practices on the time based performance and overall firm performance in the industrial sector of Tanzania. There are six specific objectives (Refer to section 1.6 for details) to assist in achieving these main objectives.

4.6 Research Framework Revisited

As pointed out earlier, the framework for this research resulted from relationships deduced from the review of literature. It was developed by integrating several direct relationships among study variables to come up with the deduced framework. The framework for this research proposed that there is a direct link between supply chain management practices (SCMP) and overall firm performance (OFP) of the organization, implicitly on the supply chain to which it belongs. At the same time, the framework shows a direct link to exist between SCMP and time based performance (TBP).

Then again, the framework also proposed that performance measurement practices (PMP) would have a direct link with overall firm performance (OFP) of the organization. In the same framework, PMP would be seen to have a direct link with TBP. On the other hand, TBP would be seen to have a direct link with OFP. Furthermore, there would be an association that had been proposed to exist between SCMP and PMP. The way these relationships appear in the framework, it makes it obvious that TBP would play a role of intervention between the links from SCMP to OFP and between PMP to OFP. Figure 4.2 presents the study framework. The literature review was used to identify the measurement items as shown in Table 4.1, details of which are found in Appendix 2.



Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance

Figure 4.2
Research Framework

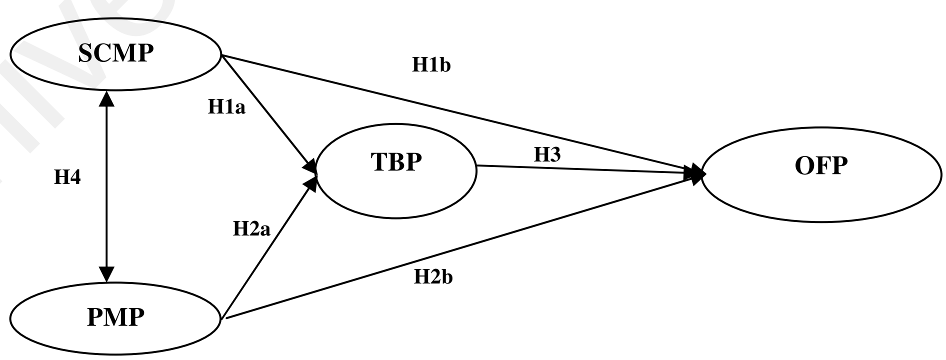
4.7 Hypotheses Revisited

The framework presented in the preceding section shows how the links for variables are posited. It was noted in literature review that each variable, supply chain management practices (SCMP) and performance measurement practices (PMP), have posited impacts on each kind of performance (time based performance, TBP, and overall firm performance, OFP). Also it was noted that the two independent variables are associated. On the other hand TBP is posited an impact on OFP.

Table 4.1
Sources of Measurement Items

Variable	Source of Measurement Items
Supply Chain Management Practices (SCMP)	Li et al., 2005; 2006; Min and Mentzer, 2004; Wisner, 2003; Tan et al., 1999.
Performance Measurement Practices (PMP)	Newly developed.
Time Based Performance (TBP)	Supply Chain Council, 2005; Min and Mentzer, 2004; Bolstorff, 2003; Wisner, 2003.
Overall Firm Performance (OFP)	Supply Chain Council, 2005; Min and Mentzer, 2004; Bolstorff, 2003; Wisner, 2003.

Using propositions arrived through literature review, hypotheses were developed and Figure 4.3 presents the posited relationships and how the hypotheses feature in the proposed framework. Through the framework, time based performance (TBP) was posited to mediate the relationships between supply chain management practices (SCMP) and overall firm performance (OFP), as well as the relationship between performance measurement practices (PMP) and overall firm performance (OFP).



Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance.

Figure 4.3
The Hypotheses as Depicted in the Research Framework

Wherefore, one may surmise the individual propositions for each hypothesized relationship as enumerated in literature review that firms reporting high levels of financial and market performance have some emphasis in the practicing supply chain management and the appropriate performance measurement practices. The practices are the driving forces for time based performance, which in turn drives up overall firm performance. The proposed hypotheses are:

H1a: There is a direct positive impact of supply chain management practices (SCMP) on time based performance (TBP).

H1b: There is a direct positive impact of supply chain management practices (SCMP) on overall firm performance (OFP).

H2a: There is a direct positive impact of performance measurement practices (PMP) on time based performance (TBP).

H2b There is a direct positive impact of performance measurement practices (PMP) on overall firm performance (OFP).

H3: There is a direct positive impact of time based performance (TBP) on overall firm performance (OFP).

H4: There is an association between supply chain management practices (SCMP) and performance measurement practices (PMP).

4.8 Survey Sampling Design

As noted in Chapter Three, the Tanzanian economy has been undergoing reforms for the past decade. Many firms in the industrial sector are affected by these changes in a negative way (Semboja and Kweka, 1997; MITM and UNIDO, 2006). The effects of trade liberalization that are a result of the reforms as well as globalization have worsened the situation for these firms, as they cannot endure the competition. A significant number of these firms have closed their operations (MITM and UNIDO, 2006). Thus, for the purpose of this study, the researcher requested the Ministry of Industry, Trade and Marketing (MITM) of Tanzania, provide information regarding the firms that are still in operation, as this ministry is the main responsible government body vested with the task of promoting the development of the industrial sector in Tanzania.

Thus, the list provided by MITM makes up the target sample (purposive sampling). The study targeted all industries (target population) regardless of the kind of goods they produce or the kind of business they are undertaking. The intention was to have representative sample due to the fact that with small populations, sample size is usually close to the population size, so as to have to have good results (Sullivan, 2001). If individual sub-sectors were to be considered, problems of getting enough respondent for the analysis may have arisen due to the small number of working firms at this material time in Tanzania.

Referring to Sullivan (2001), to calculate a sample size, it needs one to base on the required confidence level, desired sampling error, population heterogeneity, and population size. Table 4.2 presents figures for a population that is relatively varied for the error intervals of 3%, 5% and 10%. The numbers in the table refer to complete, usable questionnaires needed for the indicated levels of sampling error. So, the table is to provide guidance as to what final sample size the study needs to achieve for the desired accuracy, which is 5%error interval in this study. Note that the starting sample should be large enough to allow for ineligibles and nonrespondents.

Table 4.2
Calculating Sample Size

Population Size	**Sample Size for the 95 Percent Confidence Level**		
	$\pm 3\%$ **Sampling Error**	$\pm 5\%$ **Sampling Error**	$\pm 10\%$ **Sampling Error**
100	92	80	49
250	203	152	70
500	341	217	81
750	441	254	85
1,000	516	278	88
2,500	748	333	93
5,000	880	357	94
10,000	964	370	95
25,000	1,023	378	96
50,000	1,045	381	96
100,000	1,056	383	96
1,000,000	1,066	384	96
100,000,000	1,067	384	96

Source: Adapted from Sullivan, 2001.

The relationships that exist among different organizations in trying to reach the goal of satisfying customer needs are core to the existence of any supply chain. One organization can be the focal point in dealing with the customer (the down stream side of the chain), but several other organizations supply inputs (the up stream side of the chain), which may be tangible, or intangible, in reaching the ultimate goal of fulfilling customer request. Much of the theory and constructs may focus and revolve around this focal organization, but ultimately their conceptualization ends in studying the relationship that exists between this focal organization and others. In view of this, the unit of analysis for this research is the firms making up the supply chain with any focal organization, including this focal organization. The assumption is that each firm belongs to a supply chain, which may be managed, monitored, or communicative.

Considering the way firms operate, it could be noted that departments that dealt with sourcing of inputs (e.g. purchasing departments for tangibles, and operations departments for intangibles) were key to the development of the links in supply chains. These departments were the main players in terms of operationalizing relationships among organizations that are linked in a chain. The managements of these firms played their roles in the development of the links at strategic level. In terms of performance measurement the players were from all levels (strategic, tactical and operations, or shop-floor). It was the belief of the researcher that high-ranking professionals, from the mentioned departments as well as the top management make the most appropriate respondents. The questionnaires were to be sent to the Chief Executive Officers of each selected firm. They were to be asked to fill it or direct it To Whom It May Concern in their organizations.

4.9 Case Study Sampling Design

The organizations included in the study were to be selected following a judgmental sampling approach. The approach basically involves selecting elements for the sample that the researcher's judgment and prior knowledge suggest will best serve the purposes of the study and provides the best information (Sullivan, 2001; Eisenhardt, 1989). Even in the multiple cases, still the number of cases to be studied is limited. As Pettigrew (1988) put it, sense is made by choosing cases such as extreme situations and polar types which the process of interest is transparently observable (cf. Eisenhardt, 1989). Hence, the survey results were expected to pave the way to the selection of organizations to be included in the case study: two of the good performing firms and two of the poor performing firms.

It was planned that the judgment was to follow the analysis of performance of organizations in the research to identify the good and poor performing organizations. The identification was to be achieved using the quantitative analysis results of the survey. The survey results were to provide the opportunity to develop an index related to firm performance. The index was to be used to categorize the study firms into groups of good, average and poor performers. The selection was intended to identify two firms from each of the good and poor performance groups. The selection of the four organizations was to be performed to allow for, among other things, a detailed study with the intention of understanding the processes of supply chain management practices and performance measurement practices.

One issue in sample selection is to minimize sample selection bias. This results from the fact that a sample needs to be representative of the population from which it is drawn from. For case studies, it may prove too costly and time constrained to draw and study a sample following the representativeness requirement, since it takes quite a long time to study a single case. For the purpose of generalizability of case study results, Yin (1998) points to the acceptability of generalizing a single case to other cases that represent similar theoretical conditions. The author argues that in case studies, it is not the statistical aspect (generalizing from a sample to a universe) but rather an analytical generalization is what matters (i.e., using single, or multiple cases to illustrate, present, or generalize a theory).

To strengthen, or broaden the analytic generalization, Yin (1998) suggests the use of multiple-case studies. The author stresses the point by arguing that analytic generalizations may be strengthened because the multiple cases are designed to replicate each other – producing corroboratory evidence from two, or more cases (literal replication). This research uses a multiple-case study with four organizations being studied (two from each category of good, and poor performing organizations).

4.10 Data Collection

Two types of data were to be collected in this research and they include primary data (which is undocumented information and statistics) that is obtained from the field work through questionnaires and interviews; and secondary data (which is documented, and or processed / unprocessed information from enterprises' data files). Also other secondary data were to be obtained from different organizations dealing with the promotion of industrial development in Tanzania and other published or unpublished sources. Most of these were to be collected during the fieldwork. In the following sub-sections the discussions on tools and procedures for data collection in the two stages of the field research are presented.

4.10.1 Survey Data Collection

The main tool to be employed in data collection in the first stage of the field research for this study was a detailed structured questionnaire, administered at enterprise level. The study was to employ a mail survey approach. As mentioned earlier, it is important to reduce errors that are prone to the mail survey method of data collection (Mangione, 1998). The errors mentioned, include the sample selection bias, nonresponse error, item nonresponse error, and response error. Discussion on how the study intends to take care of the sample selection bias is given in the sampling sub-section. For the nonresponse error, or biased nature of the responding sample, the study targets to achieve a high response rate by employing various techniques: reminders (whenever seen to be necessary) and incentives such as rewards (not necessarily monetary) as suggested by Cooper and Schindler (2003).

Moreover, ethical matters that encourage respondents to fill questionnaires (e.g. maintaining confidentiality) are also to be used in achieving this goal. The study intended to reduce the failure of respondents to answer individual questions, or items nonresponse error by setting clear instructions as to how the questions were to be answered. Also, the questionnaire was to be made respondent friendly as much as possible (e.g. attractive format, not crowded sentences, not too long). The use of already tested measurement items (whenever possible) was planned to help in the reduction of response error, or respondents misunderstanding the wording of the questions presented.

The questionnaire, as the main instrument for collection of data in the survey consisted of five sections covering the organizational profile, supply chain management practices (SCMP), performance measurement practices (PMP), performance (time based performance, TBP, and overall firm performance, OFP), and a section dealing with aspects of the general management of operations. Items for measurements for the variables were adopted from various authors, as well as newly developed ones as shown in Table 4.1. Section A (company profile) provided the demographic data of the firm, such as: company name, age of the company, type of organization, products, and or services it offers, ownership, number of employees and their categories.

The reason for having the variables sections (Section B – 49 SCMP items; Section C – 25 PMP items; Section D – 26 firm performance items (15 for TBP & 11 for OFP) in the questionnaire was to identify the practices and levels of practice in respective areas (SCMP, PMP) for each participating firm, as well as getting their own assessment on 'how well' they are performing (TBP, OFP). The last section (Section E – general management of operations) provides insight on how a firm views its operations in the perspective of supply chain management, and performance measurement and their practices, covered in 11open-ended questions.

The questionnaire had item statements in the variables sections and it had open-ended questions in the general management section. Items statements in the variables sections are measured as subjective estimates using a five point likert scale (with 1 = disagree and 5 = agree). The open-ended questions in the last section of the questionnaire were planned to allow for a wider opinion from respondents. The facts about the supply chain management practices, performance measurement practices, time based performance, and overall firm performance, were to be found using the items statements relevant to each variable. The facts about operational issues as related to supply chain management and performance measurement found in part with open-ended questions in the questionnaire. The full set of these measurement items and questions are found in Appendix 3, which presents the survey questionnaire (final version). The questionnaire development approach is discussed in the next section, dealing with the survey questionnaire validity.

The cover letter (personalized whenever possible) intended to be sent with the questionnaire was to be addressed to the identified Chief Executive Officers (respondents) of organizations to be studied. The letter contained the objective of the survey, its importance, how the results were to be used, deadline, explanation on how to contact the researcher in case the need arose, and how to deliver the filled questionnaire, as suggested by Mangione (1998). Following recommendations by Dillman (1978; 200), for the purpose of improving the response rate and to reduce non-response bias; the assurance of confidentiality is included in the letter. Also, a return, self-addressed envelope with postage was to be part of the package to be sent to prospective respondents. Depending on the response rate, a follow up letter was to be sent after the expiry of the set deadline. Additionally, follow-ups using phone calls were to be used as need arose. Appendix 4 presents the cover letter.

Survey Questionnaire Validity

The validity of the survey instrument is observed in its content and face validity (the assessment of the correspondence of the variables to be included in a scale and its conceptual definition), and the reliability (the extent to which measures are free from error thus being able to produce consistent results) pertaining to its items. Comprehensive literature review and interviews with practitioners and academicians, as part of the survey instrument development procedure, enhances the content and face validity of the survey instrument (Li et al., 2005).

In this research, the items used in the data collection instrument were generated based on previous supply chain management and performance measurement literature. Some of the studies reviewed are listed in Table 4.1. To further enhance the content validity of the survey instrument, as suggested by Li et al. (2005), before the pilot study is conducted, three independent academicians were to review the questionnaire to determine the appropriateness of the research constructs and correctness of the wording. This is followed by re-valuation of the same items by the same number of practitioners, after which the questionnaire was tested in the pilot study. The main issues in the pilot study are the scrutiny and a thorough check on the appropriateness and language of the research constructs in the Tanzanian environment.

Based on the recommendations of the academicians, practitioners, and the pilot study respondents (n =20), items that were seen to be redundant, and or ambiguous were either modified, or eliminated, and whenever necessary, new items were added. In view of this, one item (type of organization) was added in the company profile section. Another suggestion led to the removal of five items measuring internal lean practices at the departmental level since it was deemed they would lead to multicollinearity problems as the same were in one way, or another represented in the measurement for internal lean practices at the firm level. The high reliability values (α range from 0.681 to 0.881), in Table 4.3 (a)) found from the results of the pilot test suggest that the questions are easy to understand and not ambiguous.

Table 4.3 (a)
Reliability Test Results for the Pilot Study

Second order Latent Variable	First Order Latent Variable	Reliability Cronbach's α
SCMP	ILP	0.681
	SSP	0.812
	IS	0.853
	CRM	0.867
	IQ	0.878
	PST	0.864
	CC	0.759
PMP	PMS	0.800
	UPM	0.881
	EDS	0.856
TBP	DDO	0.797
	TTM	0.865
	CCT	0.796
	UDF	0.728
OFP	FPO	0.812
	FPR	0.823
	MP	0.803

Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance; ILP – internal lean practices; SSP – strategic supplier partnership; IS – information sharing; CRM – customer relationship management; PMS – performance measurement system; UPM – uses of performance measures/ measurement system; EDS – essentials of performance measurement system design; TTM – time to market; DDO – delivery dependability; UDF – up and down flexibility; FPO – financial performance – output; FPR – financial performance – resources; MP – market performance.

4.10.2 Case Study Data Collection

In the earlier parts of this chapter it was stated that to complement the results of the survey by finding out the reasons for the results obtained, an in-depth study of selected firms was to be performed using the case study approach. Yin (1998) points out the fact that, from a positivist perspective, there is greater confidence in case study results, if more emulation occurs in the cases. This leads to a definition of a case study inquiry, which states that it is a technically distinctive situation in which many more variables of interest exist than the data points. This research planned using empirical methods as part of the case. Several approaches were to be employed in collecting the required data in this second stage of the field research. Among the methods used were identified by Yin (1994a) to include the use of documentation, interviews, archival records, direct observations, participant observations, and physical artifacts.

The extent of use of each source of evidence depends on the existing possibilities in the organizations to be studied. Yin (1994a) identifies the strengths and weaknesses of each of these sources as Table 4.3 presents. The researcher has to pay attention to these and take full advantage of the positive aspects of the given strengths and try as much as possible to prevent the negative impact of the pointed weaknesses. This fact of using multiple sources of data is reiterated by Eisenhardt (1989) who acknowledges the combination of data collection methods typically seen in case studies. These methods include: interviews, archi ves, questionnaires, and observations. The listed methods were to be used in this study. As Eisenhardt (1989) explains, the use of a combination of data collection methods makes it possible for triangulation and stronger substantiation of constructs and hypotheses.

The purpose of using multiple sources of evidence in this research is no other than seeking converging lines of evidence. The goal is to apply the concept of triangulation (Yin, 1998), which is generally considered as a process of using multiple perceptions to clarify meaning, verifying the repeatability of an observation, or interpretation. The approach helps in clarifying meaning, especially when different ways of seeing a phenomenon, are identified (Stake, 2000). This approach fits in what Denzin (1989) terms as procedures to reduce the likelihood of misinterpretation, which includes: redundancy of data gathering and procedural challenges to explanations.

Table 4.3
Sources of Evidence in Case Studies

Source	Strengths	Weaknesses
Documentation	- Stable – can be viewed repeatedly - Unobtrusive – not created as a result of the case study - Exact – contains exact names, references, and details of an event - Broad coverage – long span of time, many events, and many settings	- Retrievability - can be low - Access – may be deliberately blocked - Biased selectivity, if collection is incomplete - Reporting bias – reflects (unknown) bias of author
Archival Records	- Same as above for documentation - Precise and quantitative	- Same as above for documentation - Accessibility due to privacy reasons
Interviews	- Targeted – focuses directly on case study topic - Insightful – provides perceived causal inferences	- Biased due to poorly constructed questions - Response bias - Inaccuracies due to poor recall - Reflexivity – interviewee gives what interviewer wants to hear
Direct Observations	- Reality – covers events in real time - Contextual – covers context of event	- Time –consuming - Selectivity – unless broad coverage - Reflexivity – event may proceed differently because it is being observed
Participant Observation	- Same as above for direct observations - Insightful into interpersonal behavior and motives	- Same as above for direct observations - Bias due to investigator's manipulation of events
Physical Artifacts	- Insightful into cultural features - Insightful to technical operations	- Selectivity - Availability

Source: Adapted from Yin, 1994a.

One of the important issues in a case study is maintaining the quality of the study from design step to the final reporting step. Yin (1998) quotes four tests that are commonly used to establish the quality of social research. Table 4.4 presents these tests, including tactics on how to achieve results from the tests. Also, the table indicates the research phase in which the tactic occurs. It is seen from this table that the data collection phase is important in obtaining construct validity and reliability. So, construct validity in this stage of the research is achieved through the already discussed multiple source of evidence and the chain of evidence to be established. Reliability needs to be achieved through the use of case study protocol.

Table 4.4
Design Tests and Case Studies Tactics

Test	Case Study Tactic	Phase of Research in Which Tactic Occurs
Construct Validity	- Use multiple sources of evidence - Establish chain of evidence - Have key informants review draft case study report	- Data collection - Data collection - Composition
Internal Validity	- Do pattern matching - Do explanation building - Do time series analysis - Do logic models	- Data analysis - Data analysis - Data analysis - Data analysis
External Validity	- Use rival theories within single cases - Use replication logic in multiple-case studies	- Research design - Research design
Reliability	- Use case study protocol - Develop case study database	- Data collection - Data collection

Source: Adapted from Yin, 1998.

The case study protocol is one of the most important tactics of upholding the quality of case study research, particularly the reliability (Yin, 1998). Author Yin sees the protocol as more than a study question instrument, but may contain procedures and general rules to be followed in data collection, and it is essential in a multiple case design. Therefore, this research developed a protocol, which is used as the agenda of the case study during the investigation, containing guiding questions, which of course are not rigid. Table 4.5 presents the case study protocol for this research. The interviewing process was planned to take place in the premises of the interviewees, and the interviews were to be conducted on face to face basis with prior arrangements (Boyd, 1985) being made ahead of time (cf Ibrahim, 2002). By using the protocol, each interview was expected to be completed in about one hour.

Besides using the protocol, the study planned to send in advance a questionnaire (list of questions, mixed between closed and open ended) to the organizations to be studied. The research anticipation is that the participants to this research are to answer the questions in writing with the purpose to allow the respondents to take their time in answering the questions, as well as finding the relevant information required in the case study preliminary questionnaire. Follow-up interviews were planned to be undertaken to get a further insight of the answers and get more clarification on issues whenever deemed necessary.

Table 4.5
Case Study Protocol

INTERVIEW GUIDELINE QUESTIONS	
1.	What are the organization's vision, mission and goals? Is it a shared vision among your organization and its trading partners?
2.	Are your organization's goals in line with your supply chain goals? In other words, is there goal congruence with your organization's trading partners?
3.	Is your organization in the forefront of strengthening relationships with its trading partners? Why is it so? What kind of such relationships are considered as important and why?
4.	Do you think that the relationships that you have mentioned in the previous answer (question three) play an important role in your organization's performance? How do you determine their impact on the performance of your organization? Why is the determination of the impact of these relationships done this way in your organization?
5.	In which way is your organization determining what should be measured in terms of performance and why? How is the measuring process done and why is it done in this way?
6.	What role do employees play in the process of determining: what is to be measured, how it should be measured, and why it should be measured that way?
7.	Is customer satisfaction an important factor in your organization? Why do you think so? How does your organization know the level of satisfaction of its customers on the products/services it offers?

The preliminary case study questionnaire consisted of five sections, namely: Section A: covering issues on supply chain and supply chain management, which aims at helping the researcher in understanding the nature of supply chains to which firms belong, as well as the activities related to supply chain management as practiced by the firm; Section B: covering issues on performance measurement system, aiming to assist the researcher in understanding the nature of the performance measurement system in each firm, and the way it is maintained and being used; Section C: covers issues on the purpose of performance measurement, aiming to assist the researcher in understanding the reasons for measuring the performance in each firm, the origins of the process, and how it is being performed in each firm.

Furthermore, Section D: covers the measurement process and metrics, in which the activities related to the measurement processes and metrics are identified for each firm; and, Section E: covers the evaluation of the current practices, in which the prevailing capabilities in terms of the quality of information in the measurements in use, the timeliness of measurements, how relevant, or useful are they (to the firm), and the dimensions of measurement. In total the questionnaire has forty-one main questions distributed in each section as follows: A – 11; B – 12; C – 11; D – 3; and E – 4 main questions. Appendix 5 presents the preliminary case study questionnaire.

4.10.3 Secondary Data and Documentary Evidence

As pointed out earlier, it is important to have multiple sources of data, or information for the purpose of enhancing the validity of the results of the case study research. This entails a collection of secondary data / information from study firms, and other organizations relevant to the area of study. Therefore, the researcher had to collect various documentary materials from the study firms, besides conducting the case study. The documents include: annual reports, company profile documents, reports on specific activities related to supply chain management practices and performance measurement practices, and certification (e.g. ISO) reports.

The government offices (e.g. The Ministry of Industry, Trade and Marketing (MITM) and government affiliates' offices (e.g. Tanzania Bureau of Standards - TBS, Business Registration and Licensing Agency - BRELA, etc.) were to be contacted, to avail information and documents relevant to this research. Also, sector specific bodies (e.g. Tanzania Chamber of Commerce Industry and Agriculture - TCCIA, Confederation of Tanzania Industries - CTI) and UN bodies (e.g. UNIDO) were also to be contacted to request them to avail documents and information relevant to this research. As the need arose, unstructured interviews were to be conducted with officials of these organizations for the purpose of gaining more insight of the area of research.

4.11 Data Analysis Plan

Both qualitative and quantitative data, and other information collected were planned to be analyzed. The analysis has to focus on supply chain management and performance measurement matters as related to firm performance. Due to the nature of markets in the globalized economic regimes, it is therefore recommended that an exploration be performed to determine whether the study firms have the opportunity to improve their performance. Various data analysis techniques and procedures to be used in this research for both stages of field research data are listed in Table 4.6 (a) and discussed in the following sub-sections.

Table 4.6 (a)
Data Analysis Techniques

Research Stage	Technique
Survey (Quantitative)	- Descriptive Statistics - Check on Assumptions: Test for Non-response Bias; Correlations and Linearity; Normality Test. - Factor Analysis + Exploratory Factor Analysis; Confirmatory Factor Analysis (Item Purification & Assessment of Measurement Models). - Construct Validity Assessment + Content (Face) Validity & Substantive Validity; Unidimensionality; Reliability; Convergent Validity; Discriminant Validity; Nomological Validity - Development of a Measurement Instrument - Assessment of the Structural Model - Performance Index Development
Survey (Qualitative)	- Content Analysis
Case Study	- Within the Case Analysis - Cross-Case Analysis

4.11.1 Analysis of Survey Data

The analysis of the survey data was planned to involve a number of techniques and procedures. These techniques and procedures involve descriptive statistics, assumptions for data analysis (e.g. normality, linearity), quantitative data analysis using SEM, and qualitative data analysis. These are described in the following sub-sections.

4.11.1.1 Procedure for Descriptive Statistics Analysis

Descriptive statistical data analysis methods are initially employed to analyze the field data. Computations and analyses of various statistical values are performed. Discussions on respondent profiles (age, number of employees, organization type, ownership, firm size, etc.) are presented. Depending on the type and nature of data that is collected, the use of parametric or non-parametric methods is employed. Using the one-way between groups ANOVA (post-hoc) test, differences in mean scores between the firm categories is to be determined.

4.11.1.2 Procedures for Testing Non-response Bias

Non-response bias is the difference between the answers of respondents and non-respondents (Lambert and Harrington, 1990). Approaches used in assessment, include the first approach that involves comparing responses of the early returned surveys to the late ones. The late ones are considered as surrogates of the non-respondents. The idea is that late respondents, in which considerable stimuli are required, are more likely to answer the questionnaire like non-respondents (Armstrong and Overton, 1977; Swafford et al., 2006).

The second approach involves selecting a number of non-respondents and to collect information on some of their demographic profiles (e.g. workforce size, annual sales etc.). This information is combined with that of respondents to represent the population mean value. The sample (respondents) and population (respondents and the selected non-respondents) means of the selected demographic variables are compared for any statistically significant differences (Chen and Paulraj, 2004; Swafford et al., 2006).

4.11.1.3 Procedures for Checking Correlations and Linearity

Correlation is one of the statistical techniques used to explore the relationship between variables. The technique is used when there is a need to describe the strength and direction of a relationship between two variables (Pallant, 2005). The strength and direction of the relationship is provided by the statistic known as the Pearson's product-moment correlation, r, which can be checked for its statistical significance. Its values range between +1 and -1, where the extreme values indicated perfect relationship in the corresponding direction and 0 indicates no relationship. According to Pallant (2005), different guidelines on the interpretation of the r have been provided by different authors, for example, Cohen (1988) suggests $0.10 \leq r \leq 0.29$ or $-0.10 \geq r \geq -0.29$ to represents small strength, $0.30 \leq r \leq 0.49$ or $-0.30 \geq r \geq -0.49$ represents medium strength, and $0.50 \leq r \leq 1.0$ or $-0.50 \geq r \geq -1.0$ represents large strength.

For checking of linearity (linear relationship of variables), Hair et al. (2006) suggests the use of P-P plots to check the relationship. The plotted points need to be close to the ideal line for linearity to exist. The issue of multicollinearity, i.e., the degree to which a variable's effects can be predicted, or accounted for, by the other variables in the analysis, is checked using the variance inflating factor (VIF) and tolerance. According to Pallant (2005), tolerance is an indicator of how much of the variability of the specified independent is not explained by the other independent variables in the model, (i.e. $1 - R^2$). Small values (< 0.10) suggest high multicollinearity through the indication of high multiple correlation with other variables. For VIF (the inverse of tolerance), values greater than 10 indicate multicollinearity (Pallant, 2005).

4.11.1.4 Procedures for Testing Normality of the Data Set

Normality being the fundamental assumption in data analysis refers to the shape of the data distribution for an individual metric variable and its correspondence to the normal distribution. Hair et al. (2006) terms normality as the benchmark for statistical methods, as it is a requirement for using the *F* and *t* statistics, the variation from the normal distribution needs to be small. For large variations, this renders all statistical tests resulting from the analysis invalid. There are several ways to describe the distribution, if it differs from the normal distribution. Two shape descriptors, skewness and kurtosis, are among the most popular approaches in describing the shapes, or distribution of a data set.

Skewness looks at the distribution balance, whether it is centered (symmetric) or it shifts left or right. It is a measure of symmetry of a distribution and skewness values falling outside the range of -1 to +1 indicate a substantially skewed distribution (Hair et al., 2006). Kurtosis, which is a measure of peakedness, or flatness of a distribution when compared to the normal distribution, has a recommended range from -2.0 to +2.0 (Coakes and Steed, 2003). The higher the positive value the higher the peak and vice versa. A simpler test of conformity to normality is by visually checking the histogram comparing observed data with a distribution approximating the normal distribution (Hair et al., 2006).

Furthermore, statistical tests can be used to assess normality. One method under this approach is the one based on the skewness and kurtosis values. For each item, the *Z*-statistic is calculated for skewness and kurtosis respectively. The calculated *Z*-statistic is compared with a specified critical value from the *Z*-distribution, based on the level of significance. According to Hair et al. (2006), the most commonly used critical values are ±2.58 (at α = 0.01) and ±1.96 (at α = 0.05). The *Z*-statistic is calculated as follows:

$$Z_{skewness} = \frac{Skewness}{\sqrt{\frac{6}{N}}} \quad .... \quad .... \quad .... \quad ..(1)$$

$$Z_{kurtosis} = \frac{Kurtosis}{\sqrt{\frac{24}{N}}} \quad .... \quad .... \quad .... \quad ....(2)$$

where N is the sample size.

4.11.1.5 Procedures for Factor Analysis

Factor analysis refers to a set of multivariate statistical techniques that can be used to explore, or confirm the underlying structure among a set of items/variables to determine those items/variables that tap a factor, or latent construct (Hair et al., 2006; Dyre et al., 2005). The technique allows for one to condense a large set of variables, or scale items down to a smaller, more manageable number of dimensions, or factors (Pallant, 2005). There are two main approaches that are used in factor analysis. These are the exploratory factor analysis (EFA) and the confirmatory factor analysis (CFA). According to Nunnally and Bernstein (1994), in EFA, the objective is to identify the underlying structure, while CFA seeks to validate some a-prior hypothesized structure among items, or variables.

Techniques used in Exploratory Factor Analysis (EFA)

Before the process of EFA starts, data should be checked for assumptions that are necessary in the procedure of EFA. Table 4.6 presents a summary of these assumptions and other conditions included in the preliminary analysis performed to check for suitability of the data set for conducting EFA and checking for the factorability of the data set. The preliminary analysis leads to factor extraction that involves the process of determining the smallest number of factors that can be used to best represent the interrelations among the set of variables under study is performed. A variety of approaches to extract the underlying factors exists, but the most commonly used is the principle components analysis, whereby items with factor loadings above the cut off point (e.g. $|0.5|$ recommended by Hair et al., 2006) are retained for further analysis. Table 4.7 presents factor retention criteria.

Table 4.6
A Summary of EFA Requirements on Data Set

Condition	Requirement	Reference
Normality of the Data Set	Should be Normally Distributed	Hair et al., 2006; Pallant, 2005
Linearity	No Multicollinearity; VIF < 10	Hair et al., 2006
Outliers	No Outliers accepted	Hair et al., 2006
Sample Size	Minimum: 5 Cases to each study item	Pallant, 2005; Tabachnick and Fidell, 2001
Item to Item Correlations	Majority be ≥ 0.3 but ≤ 0.7	Hair et al., 2006; Pallant, 2005
Bartlett's Test of Sphericity	Be Significant (p < 0.05)	Pallant, 2005; Field, 2000; George and Marley, 1999; Bartlett, 1954.
Kaiser-Meyer-Olkin (KMO) Index	≥ 0.5	Hair et al., 2006; Field, 2000; George and Marley, 1999

Table 4.7
Factor Retention Criteria in EFA

Criteria	Requirement	Reference
Keiser's Criterion or Eigen Value (EV) Rule	Eigen Value ≥ 1	Hair et al., 2006; Malhotra, 2004; 2007; Kim and Mueller, 1978
Scree Test	Above Elbow point on the EV curve plot	Pallant, 2005; Catell, 1966
Variance Extracted	≥ 50 %	Hair et al., 2006

Techniques used in Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) is employed in evaluating unidimensionality and validity of the constructs. The CFA involves two stages of analysis: one is the procedure for items purification; and two is the assessment of the measurement model. These are discussed below.

(a) Procedures for Item Purification

Before the evaluation of unidimensionality and validity of constructs, for each measurement model the process of item purification is carried out through multiple iterations of CFA, with the maximum likelihood estimation (MLE) method that iteratively improves parameter estimates to minimize a specified fit function (Min and Mentzer, 2004). Unsuitable items are deleted from the measurement model, but before the deletion of any item is implemented theoretical assessment should be performed whenever it is deemed necessary. As recommended by Hair et al. (2006), modification of the initially hypothesized model is performed where it is seen to be relevant. This is accomplished based on such indicators as modification indices (MI), standardized residuals, path estimates, squared multiple correlations, offending estimates (Heywood Cases), and qualitative review. These model diagnostics are used to suggest model changes in what Hair et al. (2006) calls specification search, whereby an empirical trial-and-error approach is used. The corresponding cut-off points are given in Table 4.8 with the relevant references.

Table 4.8
Model Diagnostics in Confirmatory Factor Analysis

Model Diagnostic	Requirement	Reference
Modification Index (MI)	$\geq$ 3.84 $\geq$ 4 $\geq$ 10	Jőreskog and Sőrbom, 1988 Hair et al., 2006 Fassinger, 1987
Standardized Residuals	$<$ 2.5 no problem $>$ 4.0 possible problem	Hair et al., 2006
Path Estimates (Construct to Indicator)	$\geq$ 0.5; ideally $\geq$ 0.7; and be significant	Hair et al., 2006
Squared Multiple Correlations (SMC) or Reliability	$\geq$ 0.3	Hair et al., 2006
<u>Heywood Cases</u> Error Terms Standardized Coefficients Very Large Standard errors	 Positive terms $\leq$ 1.0 Should be Moderate	 Hair et al., 2006 Min and Mentzer, 2004
Content and Face Validity	Thorough Review of Literature	Min and Mentzer, 2004

(b) Procedures for Assessing Measurement Models

In the CFA and the structural model derived from structural equation modeling (SEM), the adequacy of the hypothesized model is normally assessed using overall model fit indices. Table 4.9 shows the types of fit measures and their recommended thresholds. According to various authors (e.g. Hair et al., 2006; Wisner, 2003; Schumacker and Lomax, 1996), in SEM there is no single test of significance that can absolutely identify a correct model given the sample data. Consequently, Hair et al. (2006), Wisner (2003), and Garver and Mentzer (1999) suggest the use of multiple indices of differing types in determining the acceptability of fit for a given model. In this respect, for example, Garver and Mentzer (1999) recommend the use of the TLI, CFI and RMSEA.

Table 4.9
Model Fit Indices

Type of Measure	Fit Index	Recommended Value	Reference
Absolute Fit Index (How well the specified Model reproduces data)	Chi-Square Statistic (χ^2)	Values with non-significant p-value	Hair et al., 2006
	Goodness of Fit Index (GFI)	≥ 0.90	Hair et al., 2006 Min and Mentzer, 2004
	Root Mean Square Residual (RMR)	≤ 0.08	Hair et al., 2006
	Root Mean Square Of Approximation (RMSEA)	≤ 0.08 ≤ 0.07	Min and Mentzer, 2004 Hair et al., 2006
	Normed Chi-Square (CMIN/df)	≤ 3.0	Hair et al., 2006
Incremental Fit Index (How well the specified Model fits relative to alternative baseline model)	Normed Fit Index (NFI)	≥ 0.90	Hair et al., 2006
	Comparative FIT index (CFI)	≥ 0.90	Hair et al., 2006
	Tucker Lewis Index (TLI)	≥ 0.90	Hair et al., 2006
	Relative Non-Centrality Index (RNI)	≥ 0.90	Hair et al., 2006
Parsimony Fit Index (Which model is best comparing its fit relative to its complexity)	Parsimony Goodness of Fit Index (PGFI)	≥ 0.90	Hair et al., 2006
	Parsimony Normed Fit Index (PNFI)	≥ 0.90	Hair et al., 2006

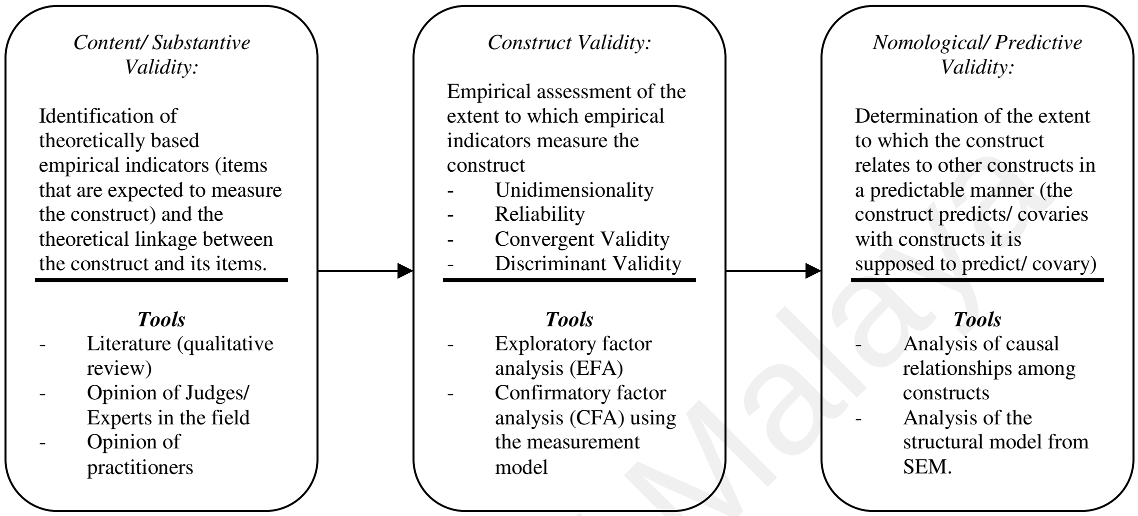
4.11.2 Techniques for Construct Validation

Construct validity involves the assessment of the degree to which a measure correctly measures its targeted variable – abstract, or theoretical construct (O'Leary-Kelly and

Vokurka, 1998; Garver and Mentzer, 1999; Chen and Paulraj, 2004; Hair et al., 2006). Construct validity is made up of several important components: content validity, substantive validity, unidimensionality, reliability, convergent validity, discriminant validity, and, nomological or predictive validity (Hair et al., 2006; Garver and Mentzer, 1999; O'Leary-Kelly and Vokurka, 1998). To achieve construct validity, all of these components must be satisfied.

Among the listed components of construct validity, content validity and substantive validity need no statistical tests nonetheless they are important to the validity of a construct. Regardless of how much the statistical results supports the validity of a construct, if it does not have content and substantive validity, it cannot have construct validity (Anderson and Gerbing, 1988; Garver and Mentzer, 1999). O'Leary-Kelly and Vokurka (1998) outline three main stages in the process of construct validation. These stages and the relevant testing tools are presented in Figure 4.4.

The process, as seen in the figure, starts with establishment of content and substantive validity, followed by the statistical process that begins with testing for unidimensionality, after which construct reliability is established. Only after the construct has been proven to be unidimensional and reliable, then convergent validity, discriminant validity, and nomological/ predictive validity can be tested. Table 4.10 gives summarized steps of the validation process and their corresponding procedures. As it is important to maintain the rigor of research by having strong theoretical foundations and using approaches for example, conducting theory-testing researches (Garver and Mentzer, 1999), construct validity plays an important role in maintaining the rigor of any research. Furthermore, the requirement for measurement instrument development outlines use of multiple tests in the validation of instrument, as detailed in the next sub-section. In this research, the requirement was planned to be extended to all study constructs, as the need to maintain the rigor of the research is far more important.



Source: Adapted (with additions/ modification) from O'Leary-Kelly and Vokurka, 1998.

Figure 4.4
Construct Validation Process

4.11.3 Techniques for Measurement Instrument Development

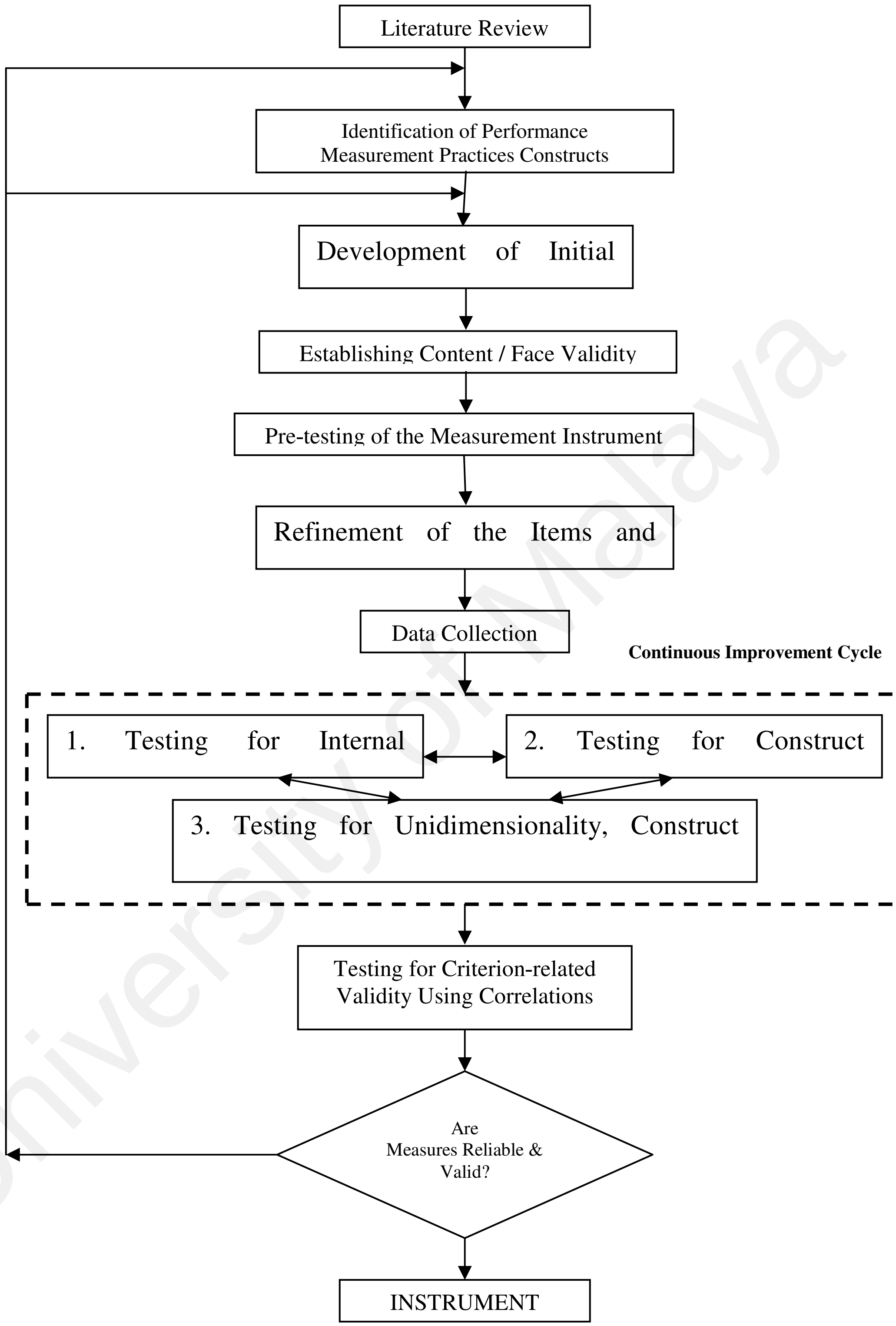
Conversely, authors including Torkzadeh et al. (2005), Chen and Paulraj (2004), and Koufteros (1999), among many, put forward illustrations on the measurement instrument development process. These authors provide similar approaches to the exercise. Similar to this research, is the study by Chen and Paulraj (2004), thus, this research adopts their approach in its exercise to develop a measurement instrument for performance measurement practices pertaining to supply chains. The process is illustrated in Figure 4.5. Most of the test procedures have been discussed in section 4.11.2 of this chapter.

Table 4.10
Construct Validity Assessment

Validity Aspect	Test Procedure / Description	References
1. Content (Face) validity: assessment of the correspondence of the variables to be included in a scale and its conceptual definition. Substantive validity: theoretical linkage between the construct and its items.	- Subjectively assessed through the ratings by expert judges, pretests with multiple sub- populations, or other means. - Linkage between individual items and the latent variable assessed through literature review.	Hair et al. (2006); Li et al. (2006); Ghosh and Jintanapakanont (2004); Garver and Mentzer (1999); O'Leary-Kelly and Vokurka (1998).
2. Unidimensionality: existence of a single trait or construct underlying a set of measurement items	- Items be significantly associated with an underlying construct, as well as each item being associated with one and only one latent variable. - Using EFA • Factor loadings of ±0.3 to ±0.4; but ideally ±0.5 has to be used for practical purposes. - Using CFA • Critical ratios (t-value ≥ 1.96 at α=0.05) • Regression weight ($\lambda \geq 0.7$; sometimes 0.5) • Use of multiple fits criteria (e.g. GFI ≥ 0.9 and RMR ≤ 0.05)	Hair et al. (2006); Li et al. (2006); Garver and Mentzer, (1999); O'Leary-Kelly and Vokurka (1998); Phillips and Bagozzi (1986); Anderson and Gerbing (1982).
3. Reliability: extent to which measures are free from error thus being able to produce consistent results.	- Has repeatability and internal consistency dimensions. - Calculated by split-half method, using EFA, Cronbach's Alpha, $\alpha \geq 0.7$ imply good reliability. - Using CFA it is also calculated by: $CR = \frac{\left[\sum_{i=1}^{n} \lambda_i\right]^2}{\left[\sum_{i=1}^{n} \lambda_i\right]^2 + \left[\sum_{i=1}^{n} \delta_i\right]}$ Where λ is the standardized factor loading; i is the number of the corresponding item, and δ is the error variance term for an item. $CR \geq 0.7$ indicates good reliability. $\alpha < 0.7$ (e.g. 0.6 and 0.5) accepted for exploratory studies. - Proportion of variance (R^2) in the observed variables. $R^2 \geq 0.3$ is considered acceptable.	Hair et al. (2006); Pallant (2005); Chen and Paulraj, 2004; Zickmund (2003); Garver and Mentzer (1999); Arbuckle and Wothke (1999); Carr and Pearson (1999); Kline (1998); Nunnally (1967; 1978).

Table 4.10 (Construct Validity Assessment) continued

Validity Aspect	Test Procedure / Description	References
4. Convergent Validity: the extent to which the items share a high proportion of variance in common.	- Measures the similarity or convergence between the individual items measuring the same construct. - Using EFA • Factor loadings of ±0.3 to ±0.4; but ideally ±0.5 has to be used. • Variance Extracted, $VE \geq 0.5$; Reliability, $\alpha \geq 0.7$; and Eigen value ≥ 1.0. - Using CFA • Individual Regression weights, λ, be twice the SE ($t \geq 2$). $VE \geq 0.5$ where $VE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$ Where λ is the standardized factor loading; i was the number of the item. • Construct Reliability, $CR \geq 0.7$. • Bentler-Bonnet coefficient, $\Delta > 0.9$ [$\Delta = (\chi^2_0 - \chi^2_s)/\chi^2_0$]. • Widaman's three comparison models: significant $\Delta\chi^2$ (where ($\Delta\chi^2 = \chi^2_0 - \chi^2_1$ at df = $df_0 - df_1$)	Hair et al. (2006); Li et al. (2006); Chen and Paulraj (2004); Garver and Mentzer (1999); Hartwick and Barki (1994); Segar and Grover (1993); Bollen (1989); Anderson and Gerbing (1988); Bentler and Bonett (1980).
5. Discriminant Validity: measures the degree to which a construct is truly distinct (unique) from other constructs.	- Using CFA • Widaman's three comparison models: significant $\Delta\chi^2$ where ($\Delta\chi^2 = \chi^2_1 - \chi^2_2$) at (df = $df_1 - df_2$). • Pair-wise comparison of models (constrained model correlation = 1) and unconstrained model: significant $\Delta\chi^2$ (where ($\Delta\chi^2 = \chi^2_{constrained} - \chi^2_{unconstrained}$ at df = $df_{constrained} - df_{unconstrained} = 1$). • VE greater than squared correlation between two variables.	Prajogo and Sohal (2006); Li et al. (2006); Hair et al. (2006); Min and Mentzer (2004); O'Leary-Kelly and Vokurka (1998); Ahire et al. (1996); Widaman (1985); Joreskog (1971).
6. Nomological Validity: assesses the relationship between theoretical constructs. Predictive Validity: examines the relationships of the construct with its antecedents and consequents	- Examine whether the correlations between constructs in the measurement theory make sense. - Seeks to confirm significant correlations between the constructs as predicted by theory - Correlating constructs to other constructs that they should predict: correlations should be substantial in magnitude and significant between two constructs (e.g. values ≥ 0.3, but ≤ 0.7 and significant at $\alpha = 0.05$). - Testing for individual relationships between exogenous and endogenous variables to see their impact. - Structural model: significant links (λ and t values) support existence of nomological validity.	Hair et al. (2006); Min and Mentzer (2004) Malhotra (2004; 2007); Garver and Mentzer (1999); Bagozzi et al. (1991).



Source: Adopted from Chen and Paulraj (2004).

Figure 4.5
The Measurement Instrument Development Process

The continuous improvement cycle in the instrument development process suggested by Chen and Paulraj (2004) is synonymous to the steps covering: convergent validity; fits and unidimensionality assessment; discriminant validity; and construct reliability in the paradigm for assessment of measurement properties in Torkzadeh et al. (2005) and Koufteros (1999). Table 4.11 provides guidelines on the tests to be used in accomplishing the continuous improvement cycle process. It is important to note that the process requires more than one technique to be used in each process of assessing the validity of a construct, so this study abides to this condition even in other constructs.

Table 4.11
Tests for the Continuous Improvement Cycle

Test Aspect	Procedure
1. Internal Consistency	- Use Cronbach's Alpha (Table 4.10)
2. Construct Validity (EFA approach)	- Unidimensionality: Factor loadings (Table 4.10) - Convergent Validity: Eigen value, Variance Extracted-VE, Reliability (Table 4.10).
3. Construct Validity (CFA approach)	- Convergent Validity: t-values, squared correlations (Table 4.10). - Fits and Unidimensionality Assessment: Fits and indices (Table 4.10); Q-plots (points be on a straight line); standard residuals (Table 4.8); Modification Indices (Table 4.8); Per change (for values > 0.3 need to investigate). - Discriminant Validity: constrained and unconstrained model pairs (Table 4.10); Variance Extracted versus squared correlation between factors (Table 4.10). - Construct Reliability: Composite Reliability; Variance Extracted (Table 4.10).

4.11.4 Techniques for Structural Model Assessment and Hypothesis Testing

The main analysis is to be performed using structural equation modeling (SEM) technique. The technique is selected, due to its ability to examine a series of dependence relationships simultaneously, while providing statistical efficiency (Hair et al., 1998). The technique's two-step process, involves the assessment of the measurement model fit, and validity of the constructs, followed by tests on the structural model (performed only after establishing adequate measurement and construct validity).

According to Hair et al. (2006), the focus in testing theoretical models using SEM is: first: the overall model fit; second: the size, direction, and significance of the structural parameter estimates (for both refer to table 4.10). Due to its power, SEM is to be used to explore and contrast hypotheses on causal relationships among the study variables after empirical data has been collected, as suggested by Iriondo et al. (2003). Furthermore, direct and indirect relations among the latent variables are to be assessed, as well as the model's explained and unexplained variance (Wisner, 2003; Byrne, 1998; Schumacker and Lomax, 1996).

4.11.5 Procedures for Developing the Performance Index

The results of analysis using SEM were expected to allow for the development of a performance index, which will enable the categorization of the study firms to be performed. The categorization will be used in the identification and subsequent selection of organizations that are to participate in the second stage of the research. It is important to note that the two kinds of performance i.e., time based performance and overall firm performance, which are treated separately in the SEM will be combined to form an aggregate Performance Index. The following relationship, which is the summation of all products of regression weights of each item, to its observed value and the regression weight of its corresponding first order factor, will be used in calculating the index.

$$Performance\_Index = \sum_{j=1}^{n}\left[\left[\sum_{i=1}^{n}\lambda_{Yi}Y_i\right]\lambda_{Tj}\right] + \sum_{l=1}^{n}\left[\left[\sum_{k=1}^{n}\lambda_{Zk}Z_k\right]\lambda_{Ol}\right] \qquad \text{.........(3)}$$

Where: λ_Y = the regression weight corresponding to each observed or measured variable in the first order relationship in the TBP second order LV

λ_T = the regression weight corresponding to each first order LV in the TBP second order LV

Y = value of the observed or measured variable corresponding to each first order LV in the TBP second order LV

i = the ith observed or measured variable in each of the first order LV in the TBP second order LV

j = the jth first order LV in the TBP second order LV

λ_Z = the regression weight corresponding to each observed or measured variable in the first order relationship in the OFP second order LV

λ_O = the regression weight corresponding to each first order LV in the OFP second order LV

Z = value of the observed or measured variable corresponding to each first order LV in the OFP second order LV

l = the lth observed or measured variable in each of the first order LV in the OFP second order LV

k = the kth first order LV in the OFP second order LV.

n = the maximum number of the corresponding regression weights in consideration.

After calculation of the values of the index for each firm is performed, it was anticipated that groupings according to the level of the index, were to be created to identify the good performance firms, medium performance firms, and the poor performance firms. For the purpose of selecting case study firms, the good performing and poor performing groups will be considered for selecting two firms from each group. The technique involving quartiles will be employed to determine the lower quartile (to the poor performing firms) and the top quartile (to the good performing firms) from the calculated performance index.

4.11.6 Plan for the Analysis of the General Management Aspects from the Survey

Qualitative data, from the survey is to be analyzed using qualitative data analysis technique of content analysis as suggested by (Yin, 1998). It is defined as a research technique for making systematic, procedurally explicit, replicable and valid references from data to corresponding context (Huang, 2007; Malhotra, 2004; 2007). Malhotra (2004; 2007) identifies the unit of analysis in this technique to include: words (different words or types of words in the text), characters (individuals or objects), themes (propositions), space and time measures (length or duration of the text), and topics (subject of the text). Coding is important so as to maintain the objectified manner in which the analysis is to be performed.

The researcher needs to identify structured and patterned regularities in the responses and make inferences on this basis. Therefore, the technique was to be used to analyze the general management aspects from the survey questionnaire. The results are to save as the basic information for understanding the context and content of supply chain management and performance measurement practices in study firms.

4.11.7 Case Study Analysis Plan

The plan for analysis of the case study was to divide the analysis into two stages. The first stage was to deal with, the within the case analysis that involves detailed writ-ups of each case. Eisenhardt (1989) calls this "simply pure descriptions." The write-ups were expected to help in understanding what is taking place in the study organizations, in terms of supply chain management and performance measurement. This stage of analysis is also expected to bring the researcher closer to the firm and the chain into which they belong.

The second stage of the case analysis was planned to be the cross-case analysis. According to Wouters (2004), this stage involves the search for cross-case patterns. The main purpose of this stage was to look for similarities, as well as differences among the studied cases. Eisenhardt (1989) suggests three tactics on how to go about with the cross-case analysis without coming to pre-mature conclusions. The tactics include: selecting categories or dimensions, and then to look for within-groups similarities coupled with inter-group differences; selecting pairs of cases and then list the similarities and the differences of each pair; and, dividing the data by data source. It was expected these techniques were to be employed in the case analysis in this study.

4.12 Assumptions

In a research of this nature, it is important to outline the main assumptions, as ideal situations for such studies do not exist, except for controlled environments. The need for clearly pointing out the assumptions receives support from other authors, including Ibrahim (2002). Earlier in this chapter, the objectives of this research were given. The following assumptions form a basis in the course of conducting this research for the purpose of realizing the research objectives.

- The nature of the current business environment is so dynamic and has the influence of globalization. Due to this, it is assumed that all firms are experiencing the effects of these trends in the course of conducting their operations.

- Adjusting to the environmental changes in business is important for the firms to survive. Among the adjustments is linking to other business partners and stakeholders. So it is assumed that each firm belongs to some supply chain with either managed, not managed, monitored, or communicative process links.

- In line with the above assumption, it is also assumed that all firms implement supply chain management practices (some knowingly and some unknowingly; and at differing levels according to supply chain levels).
- In organizational settings, performance is always monitored. The monitoring process varies depending on the complexity of operations in the firm. The accounting system is the basic performance monitoring system and it exists in all firms since it is part of the business language (Ibrahim, 2002). So, it is assumed that all firms implement performance measurement practices, only at varying levels.

4.13 Summary

This chapter presents a complete design for this research. The research intended to use the two-phase sequential method in accomplishing the study. Phase one was to use a mail survey method combining quantitative and qualitative approaches in data collection. The second phase was to use the case study approach where it was planned that multiple cases be studied. Data collection was to be accomplished by use of a survey questionnaire (in phase one) and interviews (guided by a case study protocol) and a preliminary case study questionnaire (in phase two). Secondary data and information was to be collected and analyzed for enhancement of the validity of the results. The main techniques to be used in analyzing the data included SEM, pattern matching, and content analysis. A Performance Index was to be developed and was expected to assist in the selection of firms to be studied in phase two of the research. In the next chapter, the way the data that was collected in the two stages of this research were analyzed has been described.

CHAPTER FIVE

DATA ANALYSIS

5.1 Survey

This section presents the data analysis for the survey in accordance to the analysis techniques presented in the previous chapter. As discussed in Chapter Four that dealt with research design, a thirteen-page questionnaire was used to measure the theoretical constructs of supply chain management practices (SCMP), performance measurement practices (PMP), time based performance (TBP), and overall firm performance (OFP). Besides covering the four theoretical constructs, the questionnaire also has a section with open-ended questions having coverage of general management practices focusing on the above four practices. After the content and face validity of the questionnaire was ascertained (as discussed in section 4.10.1) the questionnaire was sent to the respondent firms. In the following sections, the collected data is analyzed.

5.1.1 The Response Rate

The questionnaire was sent to the 600 operating firms following the list provided by the Ministry of Industry, Trade and Marketing (MITM) of the United Republic Tanzania. Out of the 600 firms, 264 firms filled in, and returned the questionnaires. Referring to Table 4.2 the number 264 stands to represent a suitable sample for a population above 750, but less than 1,000, in analyses requiring a 5% sampling error. For the research that considered 600 firms, this sample size suffices by far the sampling error requirement. Table 5.1 gives details of the distribution of the respondent firms regional-wise. The questionnaires were returned in two waves, an early one and a late one. The early wave required less follow-up and it lasted about six weeks from the initial dispatch of the questionnaires. In this wave 145 usable questionnaires were retuned. In the second wave, 119 usable questionnaires were returned.

Table 5.1
Regional-wise Distribution of Study Firms

S/No.	Location	Number of Firms	Percentage
1	Dar es Salaam	132	50.0
2	Arusha	52	19.7
3	Tanga	20	7.6
4	Moshi	17	5.3
5	Mwanza	14	3.8
6	Morogoro	10	6.4
7	Mbeya	8	3.0
8	Iringa	6	2.3
9	Musoma	5	1.9
	TOTAL	**264**	**100**

The second wave required a lot of persuasion (to fill in the questionnaire) that necessitated the use of different kinds of follow-up and reminder techniques. The techniques included sending another set of questionnaires (400), making several phone calls, making several visits, and assistance from senior government officials in convincing the respondents to fill in the questionnaires. Some of the returned questionnaires in this wave were incomplete, so it was necessary to ask the relevant firms to complete them. Fortunately, all questionnaires were completed in the major parts. This resulted in an effective response rate of 44 %. In the following sections, the results from the survey conducted using this questionnaire are presented. All analyses (excluding the structural equation modeling, SEM) are performed using the SPSS Version 14 program and Microsoft Excel 2003. AMOS Version 6 program is used in analyzing the proposed research framework through SEM.

5.1.2 Respondent Profiles

The firms indicated having been in operation for an average of 15 years and employ an average of 159 employees. The final sample of respondents, include firms in the manufacturing, processing, and other areas of industry. The details of the distribution presented in Table 5.2. Manufacturing firms manufacture a variety of products that range from metal products to textiles and other consumer goods. Processing firms mainly deal with chemical products and pharmaceuticals, or process agro-products. The 'others' category includes companies in the service industry and construction related industries.

Table 5.2
Respondent Profiles

Profile	Frequency	Percentage
By Type		
Manufacturing	213	80.7
Processing	18	6.8
Others	33	12.5
By Years of Operation		
1 to 5	54	20.5
6 to 10	83	31.4
11 to 15	50	18.9
16 to 20	11	4.2
21 and above	66	25.0
By Ownership		
Private (Local)	216	81.8
Public	15	5.7
Joint Venture (Public & Local Private Entrepreneurs)	6	2.3
Joint Venture (Public & Foreign Private Entrepreneurs)	18	6.8
Joint Venture (Foreign & Local Private Entrepreneurs)	9	3.4
By Size (Number of Employees)		
1 to 4 (Micro)	0	0.0
5 to 49 (Small)	56	21.2
50 to 99 (Medium)	90	34.1
100 and above (Large)	118	44.7

In terms of ownership, it is noted that the private ownership dominates the industry sector of Tanzania. Eighty one percent of the respondent firms are privately owned. Other kinds of ownership include: public, joint ventures between the public and local private entrepreneurs, foreign private owners, and joint ventures between local private entrepreneurs and foreign private entrepreneurs. The distribution of respondent industries according to different kinds of ownership is shown in Table 5.2.

In Tanzania, industries are also categorized as micro, small, medium, or large scale. This kind of categorization is achieved through two ways: first: according to capital investment in equipment and facilities; second: according to the number of employees (MIT, 2003). In this study, the capital investment approach is not used, as information on capital investment was not sought from respondents. So, categorization of firms is accomplished using the number of employees. The categorization and the actual distribution according to this survey results are shown in Table 5.2.

The researcher intended to understand the categories (by profession and field of operation) of employees in the firms. This was to be achieved through the company profile part of the questionnaire. The importance of this part comes in the area of information (IT) development that is strongly linked to supply chain management practices. Also, the notion of poor management skills of local managers could be assessed through this part by comparing performances of firms managed by expatriates and those managed by local managers. Unfortunately, the majority of the firms opted not to respond to this question. So it could not be further analyzed due to insufficient data. In the following section, the actual responses to questionnaire items are presented.

5.1.3 Questionnaire Responses

This section presents a summary of the actual responses of the likert scale questionnaire items. Apart from the 19 parts of the company profile section, the questionnaire consists of 100 items to be assessed using the Likert scale and 11 open-ended questions on general management of operations. The mean scores range from 1.830 to 3.940. The summarized results and the mean scores for all respondents are presented in Appendix

8. A comparison of means of responses between the three groups (small, medium and large) is conducted to explore the impact of company size, in terms of number of employees), on the study items. To make the comparison, a one-way between groups ANOVA was performed. The results indicate the existence of significant differences (at $\alpha = 0.05$) in mean scores between the large and small categories of firms, especially in the majority of supply chain management practices items. Mixed results are observed in the performance measurement practices items. In the time based performance, clear differences are observed between all three groups in delivery dependability and time to market, while differences are observed between small and large firms, in terms of flexibility. No differences are seen in the cash-to-cash cycle-time. In the overall firm performance items, several items show differences in mean scores between the groups especially between both small and medium when compared to the large category.

The post-hoc test results are summarized in Appendix 6 with "Yes" indicating the existence of a significant difference in mean scores of corresponding groups; while a "No" shows the non-existence of any significant difference in group mean scores for the groups. The majority of the results showed small effect size (Eta Squared less than 0.06, the lower threshold for medium effect as per Cohen, 1988).

After the above preliminary analysis procedures were completed, the researcher embarked on further analysis of the data. In the next section, the analysis of non-response bias will be presented.

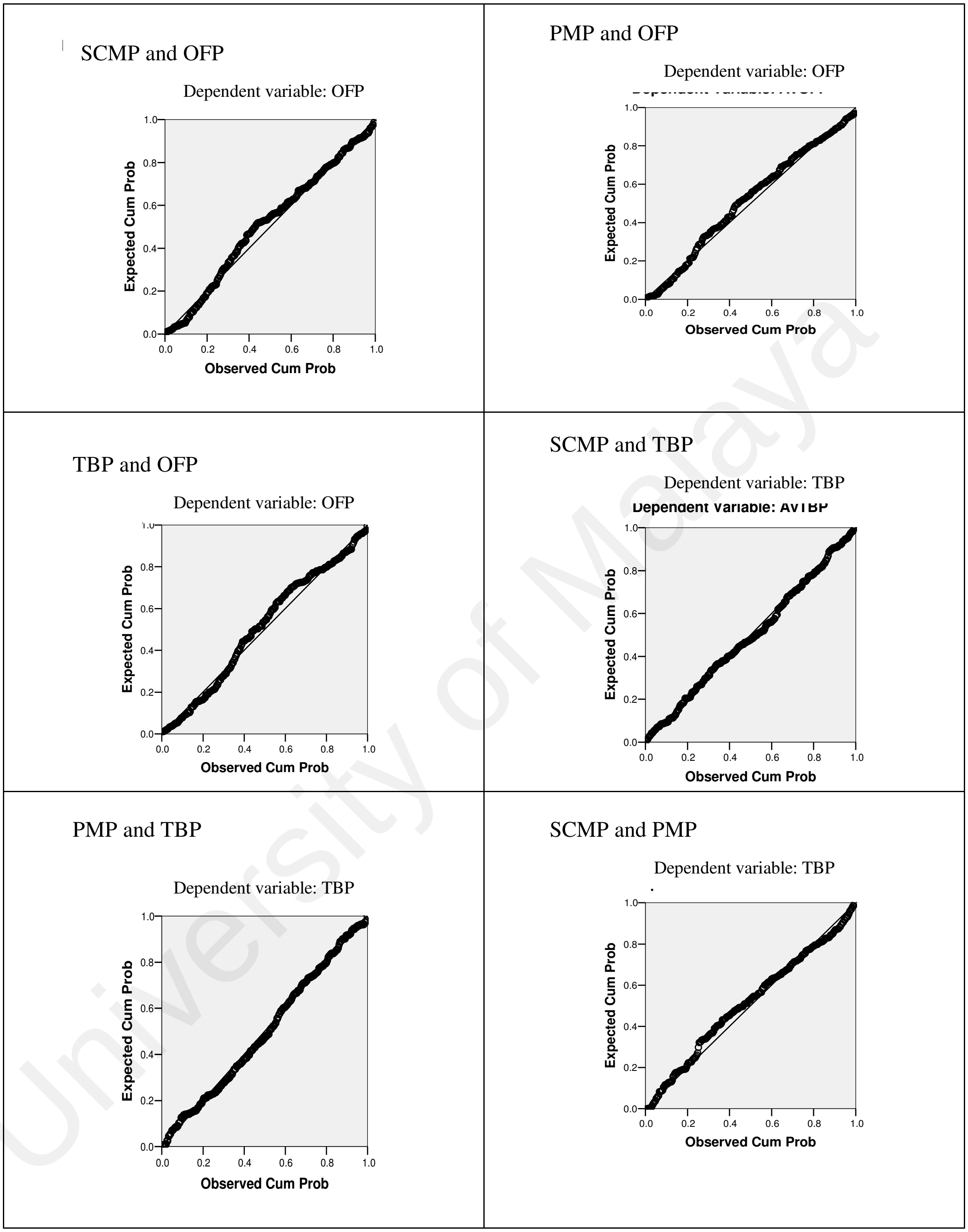
5.1.4 Non-Response Bias

In this research, non-response bias is addressed by splitting the respondents into two groups, representing the early and the late wave of returned surveys as suggested by Lambert and Harrington (1990) and put in use by authors including, Krause et al. (2001); Narasimhan and Das (2001); Stanley and Wisner (2001); Chen and Paulraj (2004); Daugherty et al. (2005); Richey et al. (2005); Griffith et al. (2006); and Swafford et al. (2006). The early wave consists of 145 respondents, and the late wave is made up of 119 respondents. The t-Tests performed on the study items yielded results that indicated no significant difference (at $\alpha = 0.05$) between the two groups of responses. In addition, 200 firms that did not respond to the questionnaire that was sent are randomly selected and information on the number of employees for each is collected, as suggested by Chen and Paulraj (2004) and Swafford et al. (2006). This information is combined with what was obtained from the respondents to represent the population mean. The sample and population means are compared for any significant difference. The t-Test performed on these two values yields no statistically significant difference (at $\alpha = 0.05$) between the sample and population means. The two results from the two approaches suggest that non-response bias appears not to be a problem in this study.

The following sections present the quantitative analysis of the survey data. Before the analysis is performed, assumptions that necessary to be fulfilled by the data set are tested. The actual coverage ranges from bi-variate correlations among the questionnaire items, normality, collinearity, and multicollinearity checks. Also, factor analyses (exploratory and confirmatory) are presented, followed by the testing of hypotheses.

5.1.5 Correlations and Linearity

Following the procedure outlined in section 4.11.1.3, Chapter Four, a visual inspection of the correlation matrix (Appendix A7) between the measurement items was performed and the results show all *r* coefficients are positive and most of the values are above 0.3 (medium to large strength) and significant at 0.05 level of significance, Very few



Key: OFP – overall firm performance; TBP – time based performance; SCMP – supply chain management practices; PMP – performance measurement practices.

Figure 5.1
Normal P- P Plots of Regression Standardized Residuals

values are above 0.7, which allays the fear of the multicollinearity problem. The value 0.3 is the cut off point for many statistical analyses, e.g. EFA, as suggested by Tabachnick and Fidell (2001), where lower values are not suitable for factor analyzing the data.

On the issue of linear relationship of variables, as suggested by Hair et al. (2006) the P-P plots are checked. This study uses average values calculated for each set of items in a second order variable to be representative of all items in the corresponding second order variable. A visual inspection of the P-P plots in Figure 5.1 indicates the items from predictor variables are linearly related to those from the criterion variables. Multicollinearity is checked using the variance inflating factor (VIF) and tolerance (Pallant, 2005). The calculated values for the two indicators are presented in Table 5.3. A visual inspection of these results indicates that the problem of multicollinearity is not to be expected as VIF values are less than 10 and the tolerance values are above 0.1, but < 1.0.

Table 5.3
Multicollinearity Test Results

Variables Tested	Variance Inflating Factor (VIF)	Tolerance	Condition Index	Remarks
SCMP and OFP	1.192	0.839	9.59	No Problem
PMP and OFP	1.261	0.793	11.97	No Problem
TBP and OFP	1.600	0.625	9.01	No Problem
SCMP and TBP	1.984	0.504	9.59	No Problem
PMP and TBP	1.709	0.585	11.97	No Problem
SCMP and PMP	1.453	0.688	9.593	No Problem

Note: The condition index cut off point is 30 whereby any values bellow it indicated no problem of multicollinearity.

5.1.6 Normality Test

This study tests for the symmetric nature and peakdness/ flatness respectively, for the data set using the shape descriptors, skewness and kurtosis. The skewness values for measurement items ranges from -0.292 to +0.283, much within the recommended range from –1to +1 (Hair et al., 2006). Kurtosis ranges from -1.900 to + 1.738, are well within the recommended limit from -2.0 to +2.0 (Coakes and Steed, 2003). Using the statistical tests suggested by Hair et al. (2006), the calculated $Z_{skewness}$ values ranges from -1.937 to 1.877 and the $Z_{kurtosis}$ values ranges from -1.900 to 1.738. When both sets are compared to the critical value of ±1.96 ($\alpha = 0.05$), all figures fall within the limits, indicating no serious deviation from normality by the observed data. The full range of values for $Z_{skewness}$, and $Z_{kurtosis}$ are presented in Appendix 8.

5.1.7 Factor Analysis

This research uses both factor analysis (FA) methods in accomplishing the planned analysis. Since the research adopted items from various authors, as well as developing new items, it is necessary to use exploratory factor analysis (EFA) to determine the underlying structure of the proposed variables. Confirmatory factor analysis (CFA) is used to validate the results of the EFA. This approach is commonly used in the continuous improvement cycles in measurement instrument development processes. Several authors have reported combining the two FA approaches in their research work, including: Lin et al. (2005), Chen and Paulraj (2004), Milfont and Duckitt (2004), and Koufteros (1999). In the following two sub-sections the two approaches are discussed in relation to the survey data collected.

5.1.7.1 Exploratory Factor Analysis (EFA)

In the preliminary analysis, suitability of the data set for factor analysis is examined. The conditions for suitability of the data set for EFA are checked according to the procedure suggested in Chapter Four. Due to sample size limitations, for the purpose of factor analysis, the data is divided into four different groups (according to the second order latent variables) as suggested by Dixon (1992). Recommended threshold values presented in Table 4.6, Chapter Four, are adhered to, and the results of the procedure are presented in Table 5.4.

These results show that, in terms of sample size aspect, the case to items ratio ranges from 5:1 to 24:1 (meeting the 5:1 minimum requirement; Tabachnick and Fidell, 2001) and the strength of the relationship among items, correlations of which the majority are ≥ 0.3 (Hair et al., 2006; Pallant, 2005). All KMO indices (range from 0.893 to 0.929) are higher than 0.5 (as recommended by: George and Mallery, 1999; Field, 2000; Hair et al., 2006), while all Bartlett's test of sphericity, the results are significant (p =0.000). These results confirm the suitability of the data for EFA.

Factors are extracted using the principal component analysis. The results show that most of the items loaded on the first factor, with many more cross loading between two factors. This warrants for the method of rotation to be applied. The Varimax rotation with Kaiser-normalization is used to clarify the factors (Loehlin, 1998; Hair et al., 2006). After a visual inspection of the loadings, items with loadings lower than the threshold of 0.5 on the construct they are supposed to measure, are discarded. Also, a few items loaded on constructs they are not supposed to measure (nuisance items), these are dropped from further analysis. Additionally, some items are observed to have cross-loaded significantly on two different constructs. These are discarded from further analysis.

The criteria for factor retention presented in section 4.11.1.5, Chapter Four, are used in this exercise, including the cut-off points recommended in Table 4.7. All three approaches on retaining factors are considered i.e., the Keiser's Criterion, Scree Plots and the Variance Extracted approach. Only constructs that fulfill all three criterions are retained for further analysis. The summarized results of the retained factors are presented in Table 5.5, showing the variances extracted ranging from 69.083% to 85.133%, above the 50 percent recommended cut off value (Hair et al., 2006). The reliability ranging from 0.614 to 0.952, the lower boundary just above the threshold recommended by Nunnally (1978), while the rest are all above the 0.7 threshold by Hair et al. (2006).

Table 5.4
Results of Examination of Variables for Exploratory Factor Analysis Suitability

Variable	No. of Items	Cases to Items Ratio (≅)	Item to Item Correlation*	KMO Index	Bartlett's Test of Sphericity	*p* - Value	Remark
SCMP	49	5 : 1	$0.3 \leq r \leq 0.7$	0.928	8972	0.000	Suitable
PMP	25	11 : 1	$0.3 \leq r \leq 0.7$	0.929	3924	0.000	Suitable
TBP	15	18 : 1	$0.3 \leq r \leq 0.7$	0.909	2395	0.000	Suitable
OFP	11	24 : 1	$0.3 \leq r \leq 0.7$	0.893	1623	0.000	Suitable

Key: SCMP – supply chain management Practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance.
* Majority of the correlation coefficient values.

Table 5.5
Factor Retention Results From the Exploratory Factor Analysis

Variable	Initial Number of Items	Number of Items Dropped	Dropped 1st order Factors	Number of Items Retained	Retained 1st Order Factors	Variance Extracted (%)	Cronbach's Alpha
SCMP	49	9	1	40	6	69.083	0.886 – 0.952
PMP	25	5	-	20	3	64.686	0.893 – 0.926
TBP	15	2	-	13	4	76.725	0.614 – 0.912
OFP	11	3	-	8	3	85.133	0.880 – 0.913

Key: SCMP – supply chain management Practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance.

Table 5.6
Summary of Items Dropped in Exploratory Factor Analysis

1st Order Variable	Original Number of Items	Final (EFA) Number of Items	Number of Items Dropped in EFA	Description of Items Dropped in EFA
ILP	5	5	0	
SSP	10	10	0	
IS	7	7	0	
CRM	8	7	1	Your organization shares a sense of fair play with its customers (CRM1)
IQ	5	0	5	Information exchange between your organization and its trading partners is timely (IQ1)
				Information exchange between your organization and its trading partners is accurate (IQ2)
				Information exchange between your organization and its trading partners is complete (IQ3)
				Information exchange between your organization and its trading partners is adequate (IQ4)
				Information exchange between your organization and its trading partners is reliable (IQ5)
PST	5	5	0	
CC	9	6	3	Your organization has integrated e-commerce, B2B and B2C in doing its business (CC7)
				Your organization devotes a significant portion of its budget to training in IT and education for its employees (CC8)
				In your organization information system usage is extensive (CC9)
PMS	10	8	2	Your organization has an identified system for measuring performance (PMS) (PMS1)
				Your organization uses a mixture of financial and non financial measures in measuring performance (PMS2)
UPM	9	8	1	In your organization performance measurement is useful in improving the quality of inputs (UPM7)
EDS	6	4	2	Your organization finds it important that performance measurement should be linked to goal development (EDS4)
				Your organization finds it important that measurements of performance should be relative and not absolute (EDS6)
UDF	4	4	0	
TTM	4	3	1	Your organization delivers products/ services to market quickly (TTM1)
DDO	4	4	0	
CCT	3	2	1	Your organization's inventory days of supply is low compared to industry standard (CCT1)
FPO	3	2	1	In your organization the growth rate of profitability is high (FPO3)
FPR	4	3	1	In your organization sales have been growing (past three years) (FPR3)
MP	4	3	1	Your organization's market share is higher than its competitors' (MP1)

Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance; ILP – internal lean practices; SSP – strategic supplier partnership; IS – information sharing; CRM – customer relationship management; PMS – performance measurement system; UPM – uses of performance measures/ measurement system; EDS – essentials of performance measurement system design; TTM – time to market; DDO – delivery dependability; UDF – up and down flexibility; FPO – financial performance – output; FPR – financial performance – resources; MP – market performance.

The total number of items retained for each variable, their distribution in each construct, as well as the Eigen value and the Cronbach's alpha are presented in Appendix 9, and the dropped items are listed in Table 5.6. In the following section, the properties of the extracted constructs are ascertained using CFA.

5.1.7.2 Confirmatory Factor Analysis (CFA)

As stated earlier, Confirmatory Factor Analysis (CFA) is employed in evaluating construct validity and unidimensionality of the constructs. Due to the large number of items involved and the sample size limitation, it is necessary to employ the approach that requires variables to be evaluated individually, using different measurement models (Moorman, 1995; Atuahene-Gima and Evangelista, 2000; Chen and Paulraj, 2004). In this research four different measurement models are evaluated, one for each second order latent variable.

Item Purification

The purification of items for the purpose of searching for model specifications (Hair et al., 2006) is performed following the procedures discussed in the section 4.11.1.5 on Items Purification Procedure, in Chapter Four. The model diagnostics outlined in Table 4.8 are used in the process. The modification index (MI $\geq$ 4); standard residuals (< $|4.0|$); squared multiple correlations (SMC $\geq$ 0.3); path estimates ($\lambda \geq 0.5$); Heywood cases, and qualitative review, (as suggested by Hair et al., 2006; and Min and Mentzer, 2004), are adhered to in the process of purifying the items. In the process, three first order constructs and twenty items are dropped from further analysis (Table 5.7), as they could not survive the model diagnostic procedure. Detailed results are presented in Table 5.8. The following sub-section presents the four measurement models from the above process.

Measurement Models

The assessment of the models follows the procedure and fits recommendations in section 4.11.1.5 and Table 4.9 in Chapter Four, respectively. The final measurement models for the four-second order latent variables in this study are presented in Figure 5.2. The fit results are presented in Table 5.8. The Normed χ^2 ranges from 1.279 to 1.965 (all below the recommended threshold of 3.0; Hair et al., 2006); RMR values (from 0.027 to 0.033) and RMSEA values (from 0.033 to 0.061) are all below the recommended (by Hair et al., 2006) cut-off points of 0.08 and 0.07 respectively. The values of: GFI (from 0.962 to 0.970), AGFI (from 0.933 to 0.941), CFI (from 0.982 to 0.991), and TLI (from 0.974 to 0.988) are all above the recommended (by Hair et al., 2006) threshold of 0.900. These results show that the models under consideration exhibit good fits.

It should be noted that the two measurement models (PMP and SCMP), are attained after the partial disaggregation procedure (Bagozzi and Dhokia, 2006) or item parceling (Hair et al., 2006) is performed, whereby, for latent variables with many items, these are combined to produce lesser items. For this study, the procedure is necessary because of the sample size limitation and the high number of items in the study constructs. The intention is to achieve better fits without compromising the theoretical aspect of the constructs. The procedure has been in application for lengthy period of time, and many studies have applied it, including Bagozzi and Dholakia (2006), Nguyen and Barrett (2006), Chisholm and Ricci (1998), Bagozzi and Foxall (1996), and Bagozzi and Heatherton (1994).

Table 5.7
Summary of Items Dropped in Confirmatory Factor Analysis

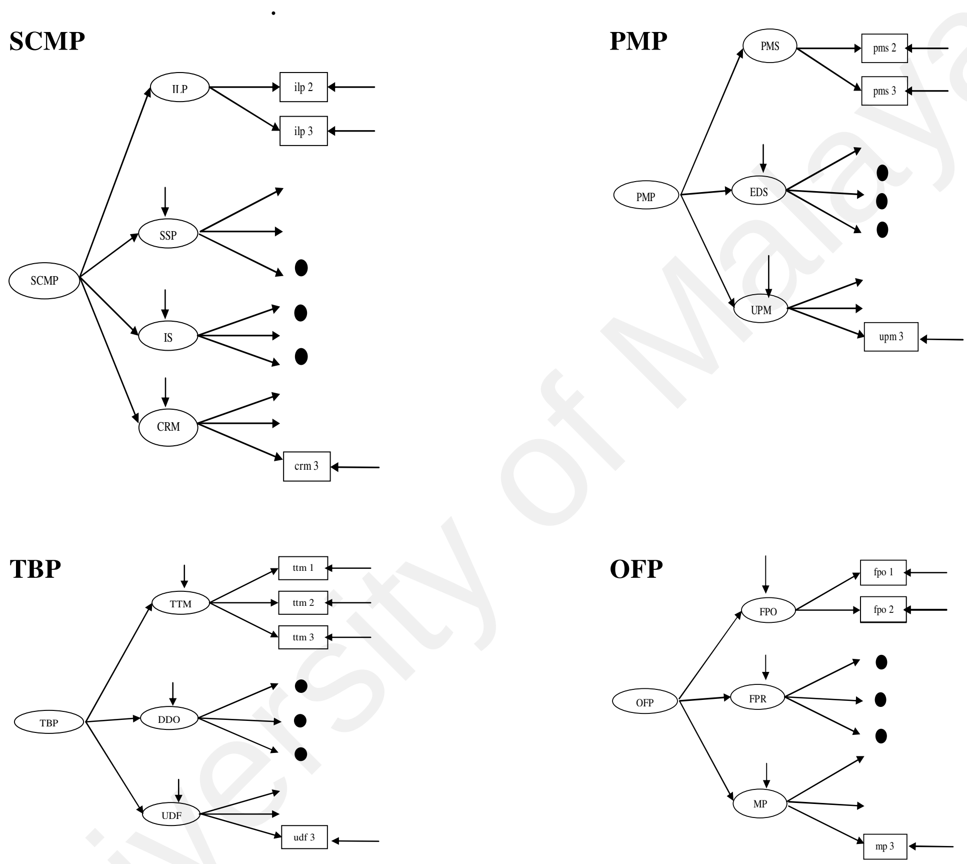
1st Order Variable	Original Number of Items (New)	Final (CFA) Number of Items	Number of Items Dropped in CFA	Description of Items Dropped in CFA
ILP	5	3	2	Your organization produces only according to orders (ilp4)
				Your organization streamlines ordering, receiving and supplier paper work (ilp5)
SSP	5	3	2	Your organization certifies supplier for quality and quality is number one in selecting suppliers (ssp4)
				Organization strives to establish long term relationships and includes supplier in improvement programs (ssp5)
IS	4	3	1	Partners share core business knowledge (is4)
CRM	4	3	1	Organization frequently interacts with customers to set its reliability, responsiveness, and other standards (crm4)
PST	4	0	4	Customization can be carried later at distribution centers (pst1)
				Product assembly delayed till order receipt and is done nearest to customer (pst2)
				Organization's products are designed for modular assembly (pst4)
				Organization's goods are stored at appropriate distribution points close to customers in the supply chain (pst3)
CC	3	0	3	Relies on IT in its business operations and has developed its own website for business (cc2)
				Has invested highly in IT and knowledge capital (cc1)
				Uses intranet and internet for internal and business communication (cc3)
PMS	4	3	1	Has identified PMS, which is dynamic, and employees are fully involved in design of the PMS (pms4)
UPM	4	3	1	In your organization performance measurement helps in raising employee and management consciousness about efficiency, effectiveness and efficacy (upm4)
EDS	4	3	1	Your organization finds it important for employees to be involved in the design of measures/PMS (eds4)
UDF	4	3	1	Your organization is capable of accommodating changes in particular customer needs (udf4)
TTM	3	3	0	
DDO	4	3	1	Your organization delivers customer orders on time (ddo4)
CCT	2	0	2	Your organization's days sales outstanding is low compared to industry standard (cct2)
				Your organization's days payable outstanding is low compared to industry standard (cct3)
FPO	2	2	0	
FPR	3	3	0	
MP	3	3	0	

Table 5.8
Fit Results for Measurement Models after Item Purification

Construct			Number of Items (new) Dropped	Fits								
2nd Order	1st Order (Final)	1st Order Dropped**		χ^2	*df*	χ^2 /*df*	RMR	RMSEA	GFI	AGFI	CFI	TLI
SCMP*	ILP SSP IS CRM	2	13	63.9	50	1.279	0.033	0.033	0.962	0.941	0.991	0.988
PMP*	PMS EDS UPM	-	3	88.5	41	1.654	0.027	0.050	0.967	0.937	0.987	0.981
TBP	TTM DDO UDF	1	4	49.1	25	1.965	0.031	0.061	0.963	0.933	0.982	0.974
OFP	FPO FPR MP	-	-	31.3	17	1.840	0.029	0.057	0.970	0.936	0.991	0.985

Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance; ILP – internal lean practices; SSP – strategic supplier partnership; IS – information sharing; CRM – customer relationship management; PMS – performance measurement system; UPM – uses of performance measures/ measurement system; EDS – essentials of performance measurement system design; TTM – time to market; DDO – delivery dependability; UDF – up and down flexibility; FPO – financial performance – output; FPR – financial performance – resources; MP – market performance.
* Measurement models attained after partial disaggregation of items.
** Include: PST – postponement, and CC – communication connectivity for SCMP; and CCT – cash to cash cycle time for TBP.

In this research, parceling is accomplished following the approach suggested by Hair et al. (2006), whereby items to be parceled should be correlated to a reasonable level and should bring some theoretical sense after parceling. Appendix 10 presents the results from this procedure.



Key: SCMP – supply chain management practices; PMP – performance measurement practices
TBP – time based performance; OFP – overall firm performance.

Figure 5.2
Measurement Models for Study Variables

In addition, Table 5.9 presents the summary of the measurement model results, showing the values for the standard regression weights ranging from 0.634 to 0.958, all above the 0.5 lower limit recommended by Hair et al. (2006). The t-values (critical ratios) ranges from 5.917 to 22.204 all being greater than 2 and significant with p = 0.000 (Hair et al., 2006). The constructs reliability, ranges from 0.714 to 0.821, higher than the recommended value of 0.7 by Hair et al. (2006). Variance extracted is from 0.506 to 0.778. The lower side of the variance extracted is just above the threshold of 0.5 recommended by Hair et al. (2006).

Table 5.9
Summary of Other Results of the Measurement Models

Variable/ Construct	Range of Regression Weights for Items/ 1st Order Latent Variables	Range of Critical Ratios (t-Values) for Regression Weights	Construct Reliability (CR)	Variance Extracted (VE)
SCMP*	0.634 – 0.823	5.917 – 7.131	0.802	0.506
IS	0.723 – 0.818	11.053 – 11.148	0.819	0.602
SSP	0.730 - 0.888	13.157 - 15.170	0.858	0.670
ILP	0.774 - 0.865	12.588 - 13.304	0.852	0.658
CRM	0.691 - 0.879	11.300 - 12.204	0.842	0.641
PMP*	0.762 - 0.888	7.465 - 7.853	0.878	0.708
PMS	0.677 - 0.758	9.065 - 9.689	0.741	0.512
EDS	0.787 - 0.860	14.061 - 15.599	0.921	0.685
UPM	0.742 - 0.859	13.211 - 13.355	0.905	0.672
TBP*	0.711 - 0.958	9.119 - 9.463	0.909	0.771
DDO	0.745 - 0.814	12.995 - 13.359	0.832	0.623
UDF	0.786 - 0.890	14.469 - 16.294	0.876	0.703
TTM	0.654 - 0.915	9.427 - 11.591	0.794	0.568
OFP*	0.847 – 0.950	13.248 – 13.575	0.915	0.782
FPO	0.819 – 0.918	15.583 – 15.583	0.861	0.757
FPR	0.828 – 0.911	18.826 – 22.204	0.913	0.778
MP	0.707 – 0.925	13.752 – 15.806	0.835	0.661

* Second Order Latent Variable;
All regression weights are significant at $p < 0.05$.

5.1.8 Construct Validity Assessment

As Chapter Four states, construct validity involves the assessment of the degree to which a measure (items in a scale) correctly measures the abstract or theoretical construct (O'Leary-Kelly and Vokurka, 1998; Garver and Mentzer, 1999; Chen and Paulraj, 2004; Hair et al., 2006). The procedures for performing the assessment of construct validity are outlined in the same chapter, indicating that the process of assessment is performed in the following sequence: first is content and face validity; second is unidimensionality; third is reliability; fourth is convergent validity; fifth is discriminant validity; and sixth is nomological and predictive validity. The content / face validity does not requires statistical procedures in its assessment.

In this study, content / face validity has been discussed in Chapter Four on how it has been performed to enhance the validity of the survey questionnaire. Therefore, in this section, only procedures requiring statistical techniques are discussed. These procedures are as summarized in Table 4.10. The researcher opts to use multiple techniques for validity assessment of all constructs, to uphold the rigor of the research, and have rigorously tested measurement items, as recommended in the measurement instrument development procedures. It should be noted that, the items adapted from other studies had not been re-validated, thus this approach to construct validation is relevant and necessary.

5.1.8.1 Unidimensionality

The procedure for assessing Unidimensionality, outlined in Table 4.10, requires an assessment, whether the items are significantly associated with an underlying construct, plus each item being associated with one, and only one, latent variable (Anderson and Gerbing, 1982; Phillips and Bagozzi, 1986, O'Leary-Kelly and Vokurka, 1998). In this study the retained items in EFA have loadings ≥ 0.5 (0.504 to 0.917), and in the CFA results, all the regression weights (0.634 to 0.958; with their significant t-values) are also ≥ 0.5, the threshold recommended by Hair et al. (2006). These outcomes indicate that the items are associated with their underlying constructs. The full results on this assessment are provided in Table 5.10. All results, confirm the existence of enough evidence to support the presence of unidimensionality in the set of variables used in this research.

Table 5.10
Results of Construct Validity Assessment

Validity Aspect / Test	Requirement	Construct				Remarks
		SCMP	PMP	TBP	OFP	
1. Unidimensionality						
EFA: Factor Loading	±0.3 to ±0.4; ideally ±0.5	0.564 – 0.854	0.504 – 0.825	0.698 – 0.917	0.734 – 0.882	All accepted
CFA: Regression weight	$\lambda \geq 0.5$	0.634 – 0.888	0.677 – 0.888	0.654 – 0.958	0.707 – 0.950	All accepted
: Critical Ratio	$t \geq 1.96$ at $\alpha = 0.05$	5.917 – 15.170	7.465 – 15.599	9.119 – 16.294	13.248 – 22.204	All accepted
: Multiple Fits Criteria	GFI ≥ 0.9; RMR ≤ 0.05	0.962; 0.034	0.967; 0.027	0.963; 0.031	0.970; 0.029	All accepted
2. Reliability						
EFA: Cronbach's Alpha	$\alpha \geq 0.7$ (also 0.5 or 0.6)	0.886 – 0.952	0.893 – 0.926	0.614 – 0.912	0.880 - 0.913	All accepted
CFA: Construct Reliability	$CR \geq 0.7$	0.819 – 0.858	0.714 – 0.921	0.794 – 0.876	0.835 – 0.913	All accepted
: Proportion of variance in observed variable	$R^2 \geq 0.3$	0.402 – 0.789	0.459 – 0.788	0.428 – 0.918	0.500 – 0.903	All accepted
3. Convergent Validity						
EFA: Factor Loading	±0.3 to ±0.4; ideally ±0.5	0.564 – 0.854	0.504 – 0.825	0.698 – 0.917	0.734 – 0.882	All accepted
: Variance Extracted	$VE \geq 0.5$	0.691	0.647	0.767	0.851	All accepted
: Reliability	$\alpha \geq 0.7$ (also 0.5 or 0.6)	0.886 – 0.952	0.893 – 0.926	0.614 – 0.912	0.880 - 0.913	All accepted
: Eigen Value	Values ≥ 1.0	8.752 – 16.789	16.156 – 26.042	10.588 – 25.334	29.440 – 31.990	All accepted
CFA: Critical Ratio	$t \geq 2.0$	5.917 – 15.170	7.465 – 15.599	9.119 – 16.294	13.248 – 22.204	All accepted
: Variance Extracted	$VE \geq 0.5$	0.602 – 0.670	0.512 – 0.672	0.568 – 0.703	0.661 – 0.778	All accepted
: Construct Reliability	$CR \geq 0.7$	0.819 – 0.858	0.714 – 0.921	0.794 – 0.876	0.835 – 0.913	All accepted
: Bentler-Bonnet Coefficient	$\Delta \geq 0.90$	0.96	0.95	0.96	0.98	All accepted
: Widaman's three comparison Models	Significant Change in χ^2 between model 0 & model 1	984.1 at 12 df	1415.2 at 11 df	1109.9 at 9 df	1376.1 at 8 df	All accepted

Table 5.10 (Results of Construct Validity Assessment: continued)

Validity Aspect / Test	Requirement	Construct				Remarks
		SCMP	PMP	TBP	OFP	
4. Discriminant Validity						
CFA: Widaman's three comparison Models	Significant Change in χ^2 between model 1 & model 2	566.9 at 4df	253.0 at 3 df	209.5 at 2 df	167.6 at 3 df	All accepted
: Pair-wise comparison of models	Significant Change in χ^2 between constrained model (φ =1) & unconstrained model (φ =0)	The change in χ^2 ranges from 57.0 at 1 df to 126.0 at 1 df. All values are significant at $\alpha < 0.05$. Details of the results are found in Table 5.13.				All accepted
: Variance Extracted compared to squared correlation between two variables	Variance Extracted be Greater than squared correlation	Values of variance extracted range from 0.506 to 0.782, while those of squared correlation are from 0.197 to 0.496. The pair-wise comparison shows that all variance-extracted values are higher than the squared correlation for each corresponding pair of constructs. Details of these results are presented in Table 5.14				All accepted
5. Nomological Validity						
CFA: Correlations in the measurement theory	Should make sense	A visual inspection of the correlation matrix (Appendix 11) shows all correlations are in the correct direction as posited in theory				All accepted
Predictive Validity						
Correlating constructs to other constructs they are supposed to predict	Correlations be substantial in magnitude and significant	Correlation values are greater than 0.3, in the correct directions; higher between 1st order variables and their corresponding 2nd order i.e. higher to the variables that they are directly linked to (Appendix 11)				All accepted
Test relationships between Exogenous and Endogenous variables	There should exist significant positive impact	Positive significant impacts exist as seen in Table 5.15 that shows links of: SCMP → TBP; SCMP → OFP; PMP → TBP; PMP → OFP; and TBP → OFP				All accepted
Significant links in the Structural Model	Regression weights, λ, be significant and acceptable Critical ratios, *t* (≥ *2.0)*.	Positive and significant values of Regression weights as seen in Appendix 12 (I).				All accepted

Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance. Significance level < 0.05.

5.1.8.2 Reliability

Repeatability and internal consistency are two dimensions of reliability, which is the extent to which measures are free from error, thus being able to produce consistent results. The recommended procedure in Table 4.10 suggests the use of Cronbach's Alpha value, calculated using the split – half method, in assessing the reliability of constructs. In this study the results of EFA show that Alpha ranges from 0.614 to 0.926, while in the CFA results Alpha ranges from 0.741 to 0.921. In the EFA results it is noted that one Alpha value falls bellow the threshold of 0.7 (Hair et al., 2006; Pallant, 2005; Zickmund, 2003; Garver and Mentzer, 1999; Kline, 1998). The value is still above 0.6, the threshold recommended by Nunnally (1978), thus still acceptable. The Construct reliability values calculated from the CFA results indicate high reliability, as all Alpha values are above the recommended threshold of 0.7. The details of these and other results are found in Table 5.9.

5.1.8.3 Convergent Validity

In this study convergent validity is assessed using Widaman's three comparison models as outlined in Table 4.10. Figure 5.3 presents the example of the three models using supply chain management practices measurement model. Significant Chi-square differences between model 0 and model 1 (result ranges from 984.1, 12 df to 1376.1, 8 df) are seen in Table 5.10, with details in Table 5.11. Also the Bentler – Bonett coefficient (Δ) introduced by Bentler and Bonett (1980), is used in the assessment. As outlined in Chapter Four, Table 4.10, it is calculated by taking the ratio of the difference between the chi-square value of the null measurement model and the chi-square value of the specified measurement model to the chi-square value of the null model (Li et al., 2005), and the for $\Delta \geq 0.9$ it is a demonstration of strong convergent validity (Hartwick and Barki, 1994; Segar and Grover, 1993). The results (range: 0.95 – 0.98) of this test are presented in Table 5.10, with the details in Table

5.12. In both cases of assessment the results demonstrate strong convergent validity prevails in the study constructs.

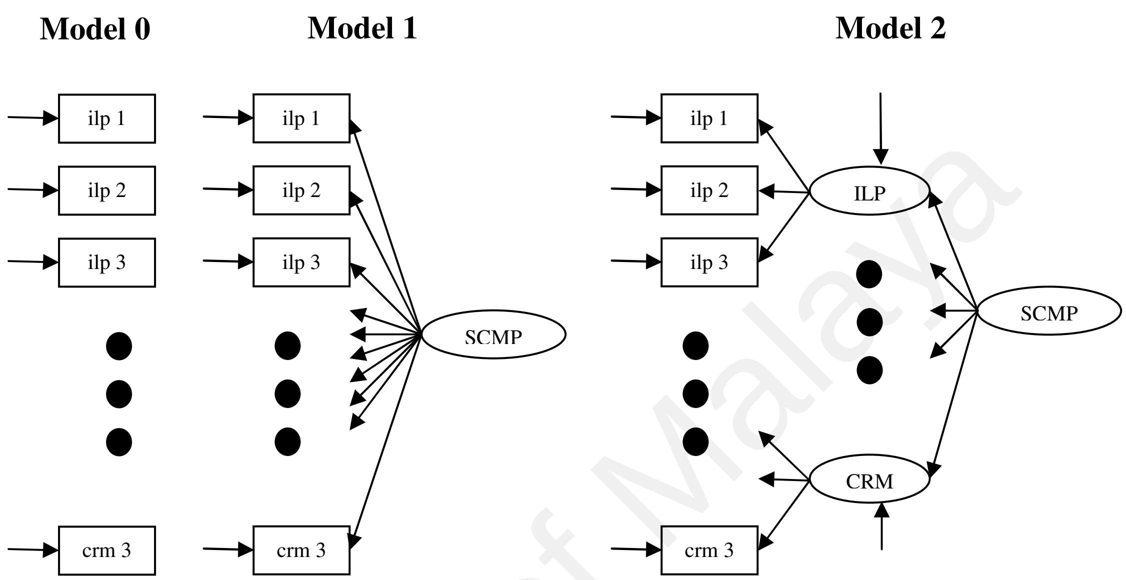


Figure 5.3
Widaman's Three Comparison Models: A simplified Example Using the Supply Chain Management Practices Measurement Model

Table 5.11
Convergent and Discriminant Validity Tests (Widaman's Three Models Test)

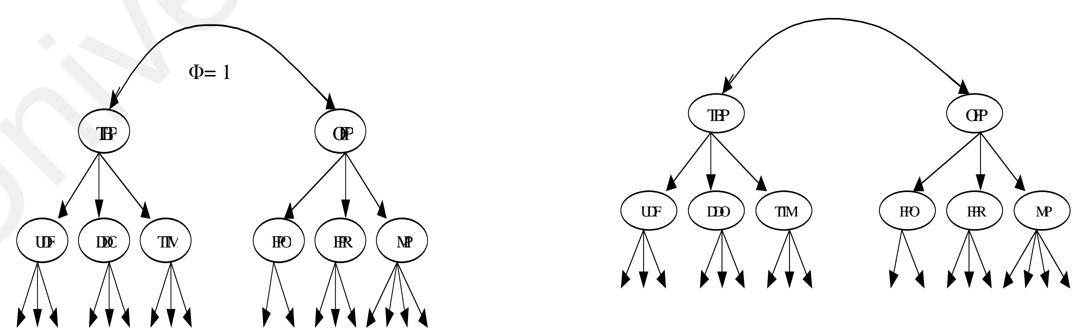
	OFP	TBP	PMP	SCMP
Model 0				
χ^2_0	1575.0	1368.5	1756.7	1614.9
df_0	28	36	55	66
Model 1				
χ^2_1	198.9	258.6	341.5	630.8
df_1	20	27	44	54
Model 2				
χ^2_2	31.3	49.1	88.5	63.9
df_2	17	25	41	50
Model 0 - 1				
$\chi^2_0 - \chi^2_1$	1376.1	1109.9	1415.2	984.1
$df_0 - df_1$	8	9	11	12
Model 1 - 2				
$\chi^2_1 - \chi^2_2$	167.6	209.5	253.0	566.9
$df_1 - df_2$	3	2	3	4

Table 5.12
Convergent Validity Tests (Bentler – Bonett Coefficient Δ)

Model/ Coefficient	OFP	TBP	PMP	SCMP
Model 0 (χ^2_0)	1575.0	1368.5	1756.7	1614.9
Specified Model (χ^2_s)	31.3	49.1	88.5	63.9
Coefficient (Δ) = $(\chi^2_0 - \chi^2_s)/\chi^2_0$	0.98	0.96	0.95	0.96

5.1.8.4 Discriminant Validity

Table 4.10 presents three approaches to discriminant validity assessment: Widaman's three model test, comparison of fits in pairs of the constrained, and the unconstrained models; and, the comparison of variance explained, and squared correlation, among two variables. The results of the first approach, in which the Chi-square difference between model 1 and model 2 is assessed, are seen in Table 5.10, range from 167.6, 3 df to 566.9, 4 df (details in Table 5.11), all values being significant. The comparison of constrained and unconstrained models (as demonstrated in Figure 5.4) yields results in Chi-square difference ranging from 57.0 to 126.0 (at 1 df), all being significant (Table 5.10; details in Table 5.13).



Constrained Pair Model *Unconstrained Pair Model*

Figure 5.4
Models for Discriminant Validity Test (Simplified Example of Time Based Performance and Overall Firm Performance Constructs)

Table 5.13
Assessment of Discriminant Validity (Constrained and the Unconstrained Models)

Description	Model fit indices				Model χ^2 statistic		$\Delta\ \chi^2$ at 1 df
	Unconstrained		Constrained		Unconstrained (df)	Constrained (df)	
	TLI	CFI	TLI	CFI			
SCMP with PMP	0.975	0.979	0.925	0.935	241.7 (181)	367.7 (182)	126.0*
SCMP with TBP	0.971	0.975	0.946	0.953	258.0 (181)	326.5 (182)	68.5*
SCMP with OFP	0.977	0.980	0.939	0.948	224.8 (162)	327.8 (163)	103.0*
PMP with TBP	0.940	0.949	0.908	0.922	267.8 (128)	343.8 (129)	76.0*
PMP with OFP	0.940	0.950	0.902	0.919	256.9 (112)	350.3 (113)	93.4*
TBP with OFP	0.937	0.948	0.916	0.930	271.9 (112)	328.9 (113)	57.0*

* Significant at $p < 0.05$

For the comparison of variance extracted and the square of correlations, the results in Table 5.10 display that for all pairs compared, the variance extracted is higher than the squared correlation between the corresponding constructs. The details of these results are in Table 5.14. The results from all approaches indicate strong support for the discriminant validity criterion.

Table 5.14
Comparison of Variance Explained with Squared Correlation (Test for Discriminant Validity)

Construct	Variance Explained	Correlation	Squared Correlation
SCMP	0.506	0.627	0.393
PMP	0.708		
SCMP	0.506	0.687	0.472
TBP	0.771		
SCMP	0.506	0.444	0.197
OFP	0.782		
PMP	0.708	0.704	0.496
TBP	0.771		
PMP	0.708	0.530	0.281
OFP	0.782		
TBP	0.771	0.580	0.336
OFP	0.782		

5.1.8.5 Nomological Validity and Predictive Validity

Defining a construct and operationalizing it does not suffice in the determination of its conceptual meaning. It is important to examine the relationships of the construct with its antecedents and consequents (Bagozzi et al., 1991). This is a test of nomological validity, which is achievable through correlating constructs to other constructs that they should predict (Garver and Mentzer, 1999). As stated in Table 4.10, when the constructs are correlated, the correlations between the two constructs should be substantial in magnitude and statistically significant.

Bi - variate correlation among the second order and first order latent variables, as well as the measurement items corresponding to each first order latent variable is presented in Appendix 11. The results indicate the existence of significant and positive relationships of large magnitude ($r \geq 0.5$) between each second order variable and the corresponding first order variables, as well as between each first order variable and its corresponding measurement items. Furthermore, the results indicate a significant and positive relationship of large magnitude to exist between supply chain management practices and performance measurement practices.

Regarding individual relationships, there are indications of significant positive correlations among the variables, but showing varying strengths. For example, a look at the relationship in the link SCMP → TBP, there is a significant and positive relationship of large magnitude, while in the relationship for the link SCMP → OFP shows a significant and positive, but of medium strength. Weak outcomes are observed between the second order variables and the items for the other variable. For example, the relationships between SCMP and first order latent variables as well as the measurement items for OFP, the results indicate the existence of positive and significant relationships of medium strength. Also the results reveal the existence of significant and positive relationships of large magnitude between SCMP and all first order latent variables of TBP, as well as all (except two) items in these first order variables.

The relationship in the link PMP → TBP is significant and positive, with a large magnitude, while the one in the link PMP → OFP is also significant and positive, with a large magnitude, although not as large as the one for the PMP → TBP link. The relationships between PMP and the first order latent variables for TBP are seen to be significant and positive, with large magnitude, while the relationship with the items for these first order variables show medium strengths that are significant and positive. Regarding the relationships between PMP and the first order variables and their corresponding items for OFP, it is the results reveal the existence of significant and positive relationships having medium strengths.

Therefore, these results reveal that all correlation values between the second order latent variables are of substantial magnitudes and in their appropriate directions. Also higher values are observed between the first order latent variables and their corresponding second order latent variables (i.e., variables directly linked to), while low values are observed between the first order latent variables and the second order latent variables that they are not directly linked. This provides evidence of nomological validity in this set of constructs.

The testing for the individual relationships between the exogenous and the endogenous variables as presented in the example in Figure 5.5, notes that all relationships show positive impacts (γ, range: 0.447 to 0.813; *t,* range: 4.910 to 7.676; all at p = 0.000). Table 5.15 presents the details of these results. As indicated in Table 5.10, these results support the predictive validity criterion.

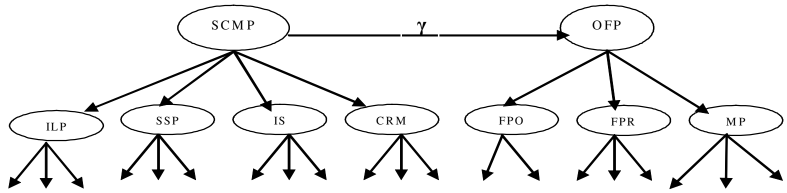


Figure 5.5
Illustrative Example of Testing Predictive Validity

Table 5.15
Results of Predictive Validity Test

Relationship	γ-Value	*t*-Value	*p*-Value
SCMP → TBP	0.813	6.9250	0.000
SCMP → OFP	0.447	4.910	0.000
PMP → TBP	0.663	7.676	0.000
PMP → OFP	0.526	5.926	0.000
TBP → OFP	0.543	6.857	0.000

The structural model is used to assess nomological validity (Min and Mentzer, 2004) as well as predictive validity (Garver and Mentzer, 1999). In this approach, the estimation of the structural model involves a procedure for empirical estimation of the strengths of each relationship between the exogenous (supply chain management practices, SCMP; and performance measurement practices, PMP) and the endogenous (time based performance, TBP; and overall firm performance, OFP) variables depicted in the theory. The structural model is analyzed, based on the modified measurement models using the maximum likelihood estimation (MLE) method.

The results of the fits provided by the paths SCMP/ PMP → TBP → OFP in the structural model (Figure 5.9) are quite reasonable, if one considers the complexity of the model, the sample size limitation, and the number of observed items (Min and Mentzer, 2004). The Normed χ^2 is 1.854, CFI was 0.915, and TLI is 0.907, while RMR and RMSEA are 0.058 and 0.057, respectively. The Normed χ^2 meets the threshold requirement of less than 3, while CFI and TLI values are above the 0.9 threshold value. RMR and RMSEA fulfill the requirement of the respective thresholds (less than 0.08 and 0.07 respectively), according to Hair et al., (2006). As theory suggests, there are positive paths SCMP → TBP; PMP → TBP; PMP → OFP; and TBP → OFP as evidenced by the respective significant critical ratios and standardized regression weights. At this point, it is concluded that positive impacts of the SCMP and PMP links, on TBP, as well as PMP and TBP links on OFP, exist, supporting the nomological validity (as well as predictive validity) of the measurement scales. The results for the nomological and predictive validity tests are included in Table 5.10.

5.1.9 Confirmation of Second Order Latent Variables in This Study

The relevance of the study variables being considered as second order factors emanates from the fact that each of the study constructs reflects several first order factors. This is verified by the reviewed literature, which was used to identify the study constructs, enumerates the relationships that exist between the first order LVs and their corresponding second order LVs. As suggested by Chin (1998) other tests such as examination of strengths of the paths connecting the second order LVs to the first order LVs need to be performed. The requirement is to have a large percentage of these paths having the parameter estimate λ greater than 0.70 as well as adequate model fits. Also the variables need to be subjected to nomological network with other study LVs.

In this study both tests were performed. The strengths of the paths connecting the first and second order LVs, range from 0.593 to 0.952 (Appendix 12 (II)). Only 2 out of 13 paths have strengths below the recommended threshold of 0.70. Considering the nomological networking with other LVs in the study, it shows that the strengths of the relationships between the first order LVs with their corresponding second order LVs are strong as evidenced in the nomological validity test in section 5.1.8.5.

Furthermore, Widaman (1985) used the tree models test (see section 5.1.8.3 and 5.1.8.4) for the purpose of determining whether a study construct is suitable as a first order LV or as a second order LV in the analysis. Basically the test looks into the fits of model 1 and model 2. Model 1 loads study items to the final construct as a first order one, while model 2 loads items to their corresponding first order LVs which are then loaded to their corresponding second order LVs (Refer to Figure 5.3). The difference in the Chi-square values between model 1 and 2 is calculated (with the degree of freedom $df = df_1 - df_2$). If the change in Chi-square is significant, it shows the LV is suitable to be used as a second order LV. Table 5.11 (last row) shows the results of this test for the study variables. The results indicate all the four study constructs are suitable as second order LVs in this study.

5.1.10 Performance Measurement Practices Measurement Instrument

The procedure for the process is outlined in section 4.11.3. So, the procedure for developing the performance measurement practices instrument abides to the guidelines stipulated and these include: a thorough literature review, identification of performance measurement practices constructs, development of Initial instrument from the constructs, establishing content / face validity, pre-testing of the measurement instrument, refinement of the items and development of the final instrument, data collection, testing for internal consistency, testing for construct validity using exploratory factor analysis, testing for unidimensionality, construct validity, and discriminant validity using confirmatory factor analysis, and lastly testing criterion related validity using correlations. For the instrument developed in this study, the implementation of these guidelines is summarized in Table 5.16, presenting the results of each step in the process. The final instrument has 16 items the details of which are found in Appendix A10.

Table 5.16
Results of the Development Process of a Measurement Instrument for Performance Measurement Practices Construct

Step / Procedure	Process Point / Results Point
1. Literature Review	Provides a review of the building blocks of performance measurement practices in supply chains, and relationships with other variables.
2. Identification of Performance Measurement Practices Constructs	Three first order latent variables are identified to add up to the second order latent variable performance measurement practices. The variables are: performance measurement and performance measurement system (PMS); uses of performance measurement and performance measurement system (UPM); and essentials in the design and development of measures and performance measurement system (EDS).
3. Development of Initial Instrument From the Constructs	Items used in the survey questionnaire are developed as in Appendix 2. The number of items are: PMS – 10 items; UPM – 9 items; and EDS – 6 items.
4. Establishing Content / Face Validity	The questionnaire was reviewed, for correctness of wording and relevance of the items, by three academicians who are experts in the area of study; followed by a similar review by three practitioners in the field. No adjustments were recommended for this particular variable.
5. Pre-testing of the Measurement Instrument	A pilot test was conducted whereby twenty respondents were asked to fill in the questionnaire. After analysis the reliability was seen to be high ($\alpha = 0.75$). The high reliability values found in the results of the pilot test suggest that the questions are easy to understand and not ambiguous.
6. Refinement of the Items and Development of the Final Instrument	No changes were instituted in this section after the review by academicians and practitioners; as well as after the pilot study was conducted and its data was analyzed.
7. Data Collection	Data was collected using the questionnaire. 600 questionnaires were distributed to industries in Tanzania. 264 useable filled in questionnaires were received back.
Continuous Improvement Cycle: 8. Testing for Internal Consistency (Cronbach's Alpha)	Results show the range of α is from 0.893 to 0.926; higher than the recommended threshold of 0.7.

Table 5.16
Results of the Development Process of a Measurement Instrument for Performance Measurement Practices Construct (continued)

Step / Procedure	Process Point / Results Point
9. Testing for Construct Validity Using Exploratory Factor Analysis (EFA)	Unidimensionality: EFA factor loadings: 0.504 to 0.825; all > 0.5. Reliability: EFA Cronbach's Alpha, α : 0.89 to 0.926; all > 0.7 Convergent Validity: Factor loadings and Reliability as above; Variance extracted: *VE* = 0.647; above 0.5; Eigen Value: 16.156 to 26.042; all above 1.0.
10. Testing for Unidimensionality, Construct Validity, and Discriminant Validity using confirmatory factor analysis (CFA)	Unidimensionality: Regression weight: 0.677 to 0.888; all > 0.5. Critical Ratio: 7.465 to 15.599; all > 1.96, at α = 0.05. Multiple Fits: GFI = 0.967; > 0.9; RMR = 0.027; < 0.05. Construct Reliability: *CR* is 0.714 to 0.921; all above 0.7. R^2 is 0.459 to 0.788, all above the recommended value of 0.3. Convergent Validity: Critical Ratio: 7.465 to 15.599; all > 1.96, at α = 0.05; Variance Extracted: 0.512 to 0.672, all above 0.5; Bentler-Bonnet Coefficient, Δ: 0.95, above the recommended 0.9 value; Widaman's Three comparison Models: $\Delta\chi^2$ between model 0 and model 1 is significant at α < 0.05 (1415.2 at 9 df). Discriminant Validity: Widaman's Three comparison Models: $\Delta\chi^2$ between model 1 and model 2 is significant at α < 0.05 (253.0 at 3 df); Pair-wise comparison of models: $\Delta\chi^2$ ranges from 76.0 at 1 df to 126.0 at 1 df. All values are significant at α < 0.05; Variance extracted compared to squared correlation between variables: *VE* range from 0.512 to 0.672, while those of squared correlation are from 0.281 to 0.496, showing *VE* values are higher than the squared correlation for each corresponding pair of constructs.
Testing Criterion Related Validity using Correlations	A visual inspection of the correlation matrix (Appendix 11) shows all correlations are in the correct direction as posited in theory; with values of the correlation coefficient being greater than 0.3 for the majority of them, and higher between 1st order variables and their corresponding 2nd order i.e. higher to the variables that they are directly linked to.

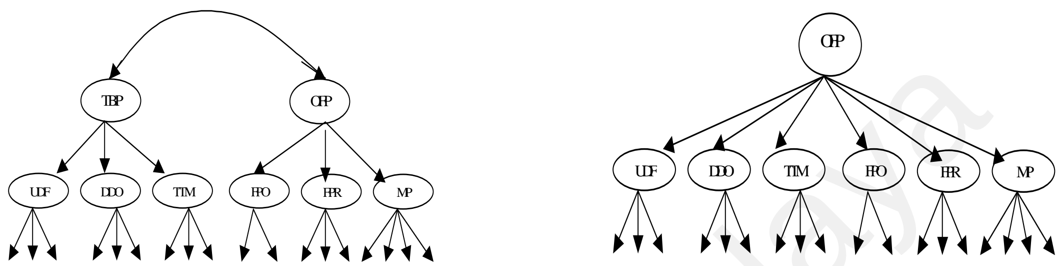
5. 1.11 Distinctiveness between Time Based Performance (TBP) and Overall Firm Performance (OFP)

Before the analysis of the structural model is performed, it is deemed appropriate to assess the distinctiveness of the TBP and OFP constructs, since both are used to measure some sets of firm performance. From the review of literature, TBP and OFP are, in fact, closely related, but have two different concepts. Theoretically the distinction between TBP and OFP is deduced from the building blocks of these LVs, including the measurement items that are used in operationalizing these two constructs. TBP has in the past been operationalized using measures of product development cycle time, new product introduction (time to market), production lead time, and delivery speed (Vickery et al., 1995. Other authors add measures such as flexibility (Beamon, 1999) and cash to cash cycle time (Huang et al., 2005; Bolstorff, 2003).

On the other hand, OFP has been considered by some authors (e.g. Li et al., 2006; Droge et al., 2004; Wisner, 2003; Tan et al., 1999) to include financial performance of the firm (e.g. liquidity, profitability, ROI, ROA) and market performance (e.g. market share, customer service level, competitive position) in the measures used to study the variable. The obvious difference seen in terms of the measures for the two variables presents a clear distinction between the two. Further to this distinction, a statistical approach is pursued bellow to confirm this distinction.

To confirm the distinction between two variables using SEM, Min and Mentzer (2004) propose a method that involves comparing results of two models, say A and B. Model A having TBP and OFP as two correlated, but distinctive second order factors, and Model B having one second order factor to which all first order factors of TBP and OFP are converged. If model A exhibits superior fits than model B, it means that the two constructs are distinct, if otherwise, then the two constructs are the same. Examining the results in

Figure 5.6, it is noted that the results of the correlated model exhibits better fits than those of the converged model, corroborating the theoretical presentation above. These results lead to the conclusion that TBP and OFP constructs are related, but two different constructs, based on the theory and empirical tests.



Correlated Model: χ^2=356.1 (df=145); TLI=0.932; CFI=0.943; RMSEA=0.08; RMR=0.074

Converged Model: χ^2=549.3 (df=145); TLI=0.872; CFI=0.891; RMSEA=0.102; RMR=0.108

Figure 5.6
Test of Distinctiveness between TBP and OFP: Correlated and Converged Models

After the procedures to verify the distinctiveness of the TBP and OFP constructs is completed, it paves the way for the analysis of the mediating role played by TBP in the overall model. The results of the analysis are presented in the following section.

5.1.12 The Mediating Role of Time Based Performance

A variable is said to be a mediator, if it accounts for the relation between the predictor and the criterion variables (Hair et al., 2006; Baron and Kenny, 1986). The authors designate the requirement that all variables (predictor, criterion, and mediator) to be significantly correlated. They outline steps, which need to be followed in evaluating the mediation effect. For two variables with a direct relationship, adding a third variable (C in Figure 5.7) to intervene in the relationship, if the direct relationship remains significant, this means mediation is not supported. If the direct relationship is reduced and remains significant after C is included in the model, then partial mediation is supported. If the direct relationship is reduced to a point where it is not significantly different from zero, after C is included, then full mediation is supported. The important indicators include the regression weights (significant) and the model fit as indicated by the change in the χ^2 statistic ($\Delta\chi^2$).

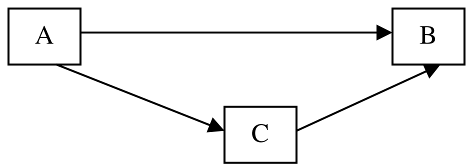


Figure 5.7
Illustration of Mediating Effect

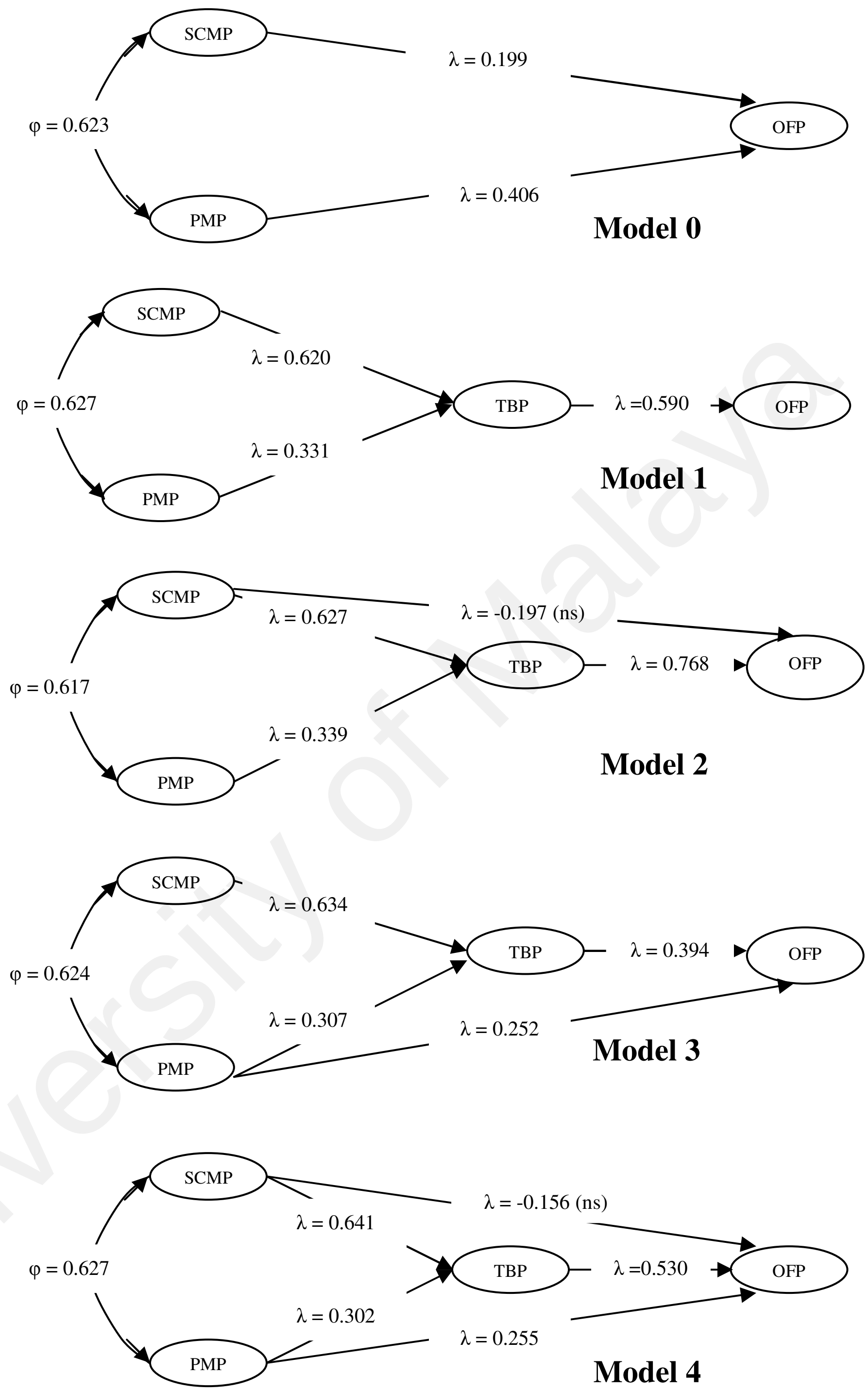
According to Hair et al. (2006) in examining the mediation effect using SEM, when a link that represents a direct relationship (e.g. Link A – B in Figure 5.7) is expected to be equal to zero due to the mediation effect, it is normally not presented at all. Only the relationship through the mediator is to be presented (e.g. Links A – C – B in figure 5.7). If this model provides a good fit, it supports the mediating role of the mediator. Furthermore, the fit of this model can be compared to SEM results obtained from a model that includes the direct relationship of the predictor and the criterion variables (such as the link from A to B in Figure 5.7). If there is a significant improvement in the fit of the model (as indicated by $\Delta\chi^2$) because of the addition of the direct relationship, then mediation is not supported. If the two models exhibit similar fits, then mediation is supported. This approach to the analysis of the mediation effect is similar to what has been proponed by Kelloway (1995). Several authors applied the procedure including Prajogo and Sohal (2006).

This study performs tests on the mediation role of TBP on relationships between SCMP and OFP as well as PMP and OFP. Literature shows there have been studies that obtained results confirming the direct relationship between the study variables as enumerated in Table 5.17. To accomplish the tests, the study assumes variations of the links in the baseline model, which represents the fully mediated model (Model 1 in Figure 5.8). Basically the model is constructed following the existence of direct relationships between SCMP and TBP, PMP and TBP, TBP and OFP, and also including the association between SCMP and PMP. Model 2 in Figure 5.8 presents an additional direct link in the fully mediated model, i.e. the direct link between SCMP and OFP. This may be interpreted as a representation that assumes the existence of a partially mediated model on the relationship between SCMP and OFP. Similarly, the addition of the direct link between PMP and OFP on the fully mediated model may be interpreted as representing a partial mediation effect of TBP on the relationship between PMP and OFP.

Table 5.17
Direct Relationships between Study Variables

Relationship / Link	Author(s) / Study	Remarks
SCMP → TBP	Droge et al., 2004; Rooney, 2002; Tan et al., 1999	A significant, direct positive relationship prevails
SCMP → OFP	Lin et al., 2006; Powel, 2001; Stanley and Wisner, 2001	A significant, direct positive relationship prevails
PMP → TBP	Rosenzweig et al., 2003	A significant, direct positive relationship prevails
PMP → OFP	Morgan, 2004	A significant, direct positive relationship prevails
TBP → OFP	Droge et al., 2004; Rosenzweig et al., 2003	A significant, direct positive relationship prevails

In line with the discussion on conducting the mediation test enumerated earlier, the models in Figure 5.8 (Models 1, 2, 3 & 4) are compared to the non mediated model (Model 0) in terms of the parameters for the direct links SCMP → OFP and PMP → OFP, on top of the test/ comparison of fits (Chi square differences) between the baseline model (Model 1) and each of the other models (Models 2, 3 & 4). A significant difference in Chi square ($\Delta \chi^2$) between Model 1 and any of these models means mediation effect is present. To ascertain whether the mediation effect is full or partial, the corresponding parameters for



Note: (ns) means not significant; all other regression weights were significant at $p < 0.05$.
Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance.

Figure 5.8
Simplified Models for Testing the Mediation Effect of Time Based Performance

the direct links SCMP → OFP and PMP → OFP are compared with those obtained in the non-mediated model (Model 0). If the parameter in the link SCMP → OFP or PMP → OFP in the test model (Model 2, 3 or 4) is significant, but less than the one in the non-mediated model, it implies that partial mediation is supported; but if the parameter is non significant or equivalent to zero, then full mediation is supported.

In this study, the existence of significant correlations is confirmed using Appendix A11. The results of the non mediated model are observed to have significant regression weights of 0.199 and 0.406, respectively for the links SCMP → OFP and PMP → OFP as seen in Model 0 in Figure 5.8. The fits for Models 1, 2, 3 & 4 are as shown in Table 5.18, while the regression weights for each path are as shown in Figure 5.8. All significant paths are significant at $p < 0.05$. As said earlier, Model 1 is used as the baseline model for the test. Results for Model 2 show that path SCMP → OFP is insignificant with a regression weight of -0.197 (t = -1.074, p = 0.283), less than 0.199 (from Model 0) and not significant. The change in χ^2 fit ($\Delta\ \chi^2$ = 1.3) is less than 3.84 (from tables), being non significant change in the fit, thus demonstrating a full mediation effect similar to the baseline model.

Table 5.18
Fits for Models Used in Testing the Mediating Effects of Time Based Performance

Model	χ^2	df	CFI	TLI	RMSEA	RMR	$\Delta\ \chi^2$	Remarks
1	1205.7	648	0.914	0.907	0.057	0.060	-	Full Mediation Model
2	1204.4	647	0.914	0.906	0.057	0.059	1.3	Full Mediation Supported
3	1199.8	647	0.915	0.907	0.057	0.058	5.9*	Partial Mediation Supported
4	1198.7	646	0.915	0.907	0.057	0.058	7.0*	Partial Mediation Supported

* Significant at $p < 0.05$

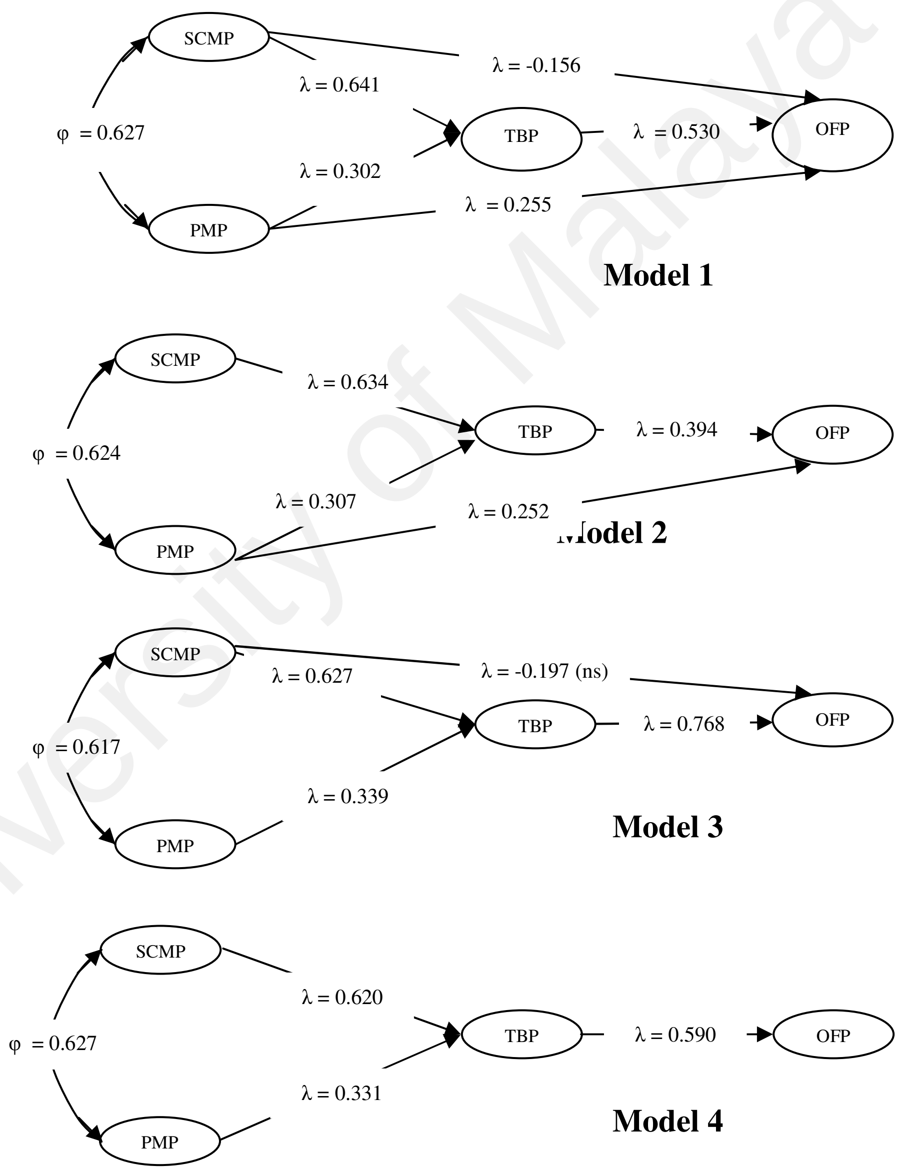
In Model 3, the results indicate that path PMP → OFP is significant (λ=0.252, t = 2.361 at p = 0.018), but less than the value of 0.406 from Model 0. The change in χ^2 fit ($\Delta\ \chi^2$ = 5.9) is greater than 3.84, meaning it is significant change in the fit, thus it is demonstrating no support for full mediation effect. In line with the results of regression weights, this supports partial mediation effect. The results of the test on Model 4 indicate the path SCMP → OFP is not significant (λ=-0.156, t = -0.984, p = 0.327), while path PMP → OFP has a significant regression weight of 0.255 (t = 2.337, p = 0.019), but lower than the value of 0.406 from the Model 0. The change in χ^2 fit ($\Delta \chi^2 = 7.0$) is greater than 3.84, meaning it is significant change in the fit. These results, when combined with results of regression weights, indicated the existence of some support on mediation role of TBP (full mediation on SCMP → OFP and partial mediation on PMP → OFP). But this model is not supported by the data due to an insignificant path SCMP → OFP. This leaves model 3 to be the best combination with results showing partial and full mediation effects.

After the demonstration of the role of TBP in the model as a mediating variable, the following step analyzes the structural model and tests the hypotheses. This was performed as presented in the following section.

5.1.13 Analysis of the Structural Model and Testing of Hypotheses

The structural model is analyzed based on the modified measurement models using the maximum likelihood estimation (MLE) method. The theoretical framework illustrated in Figure 4.2 hypothesizes six relationships among the variables SCMP, PMP, TBP, and OFP. The initial model as shown in Figure 4.2 (or Model 4 in Figure 5.8) is tested using AMOS 6 where the results show one insignificant path coefficient (SCMP → OFP). Acting on the assumption that there were incorrect specifications for the original model, modification is performed.

Some authors do this by comparing the model to alternative models as outlined in Anderson and Gerbing (1988) and applied by many authors e.g. Li et al. (2006) and Lin et al. (2005). The procedure involves comparing the proposed model to alternative models, conducting sequential Chi-square difference tests (SCDTs) by calculating the differences between Chi-square statistic values for the proposed model and each alternate model. The degree of freedom for the Chi-square difference equals the difference in the degrees of freedom of the pair of models being compared.



Note: (ns) means not significant; all other regression weights were significant at $p < 0.05$.
Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance.

Figure 5.9
Simplified Structural Models for Sequential Chi-square difference Tests

This study proposes models presented in Figure 5.9, where Model 1 is the initially proposed model and Models 2, 3, and 4 are the alternative models to be analyzed. The regression weights for each path are as seen in each corresponding figure. Table 5.19 presents the fit results and the calculated Chi-square difference. These results suggest that Model 4 is not the best one, since it has a significant increase in the Chi-square value. Similarly for Model 3, the Chi square increases significantly compared to the initially proposed model (i.e., Model 1). The comparison with Model 2 produces an insignificant change in the Chi-square value leading to the conclusion that this model (Model 2) is the most suitable among the proposed alternative models.

Table 5.19
Sequential Chi-square difference Tests

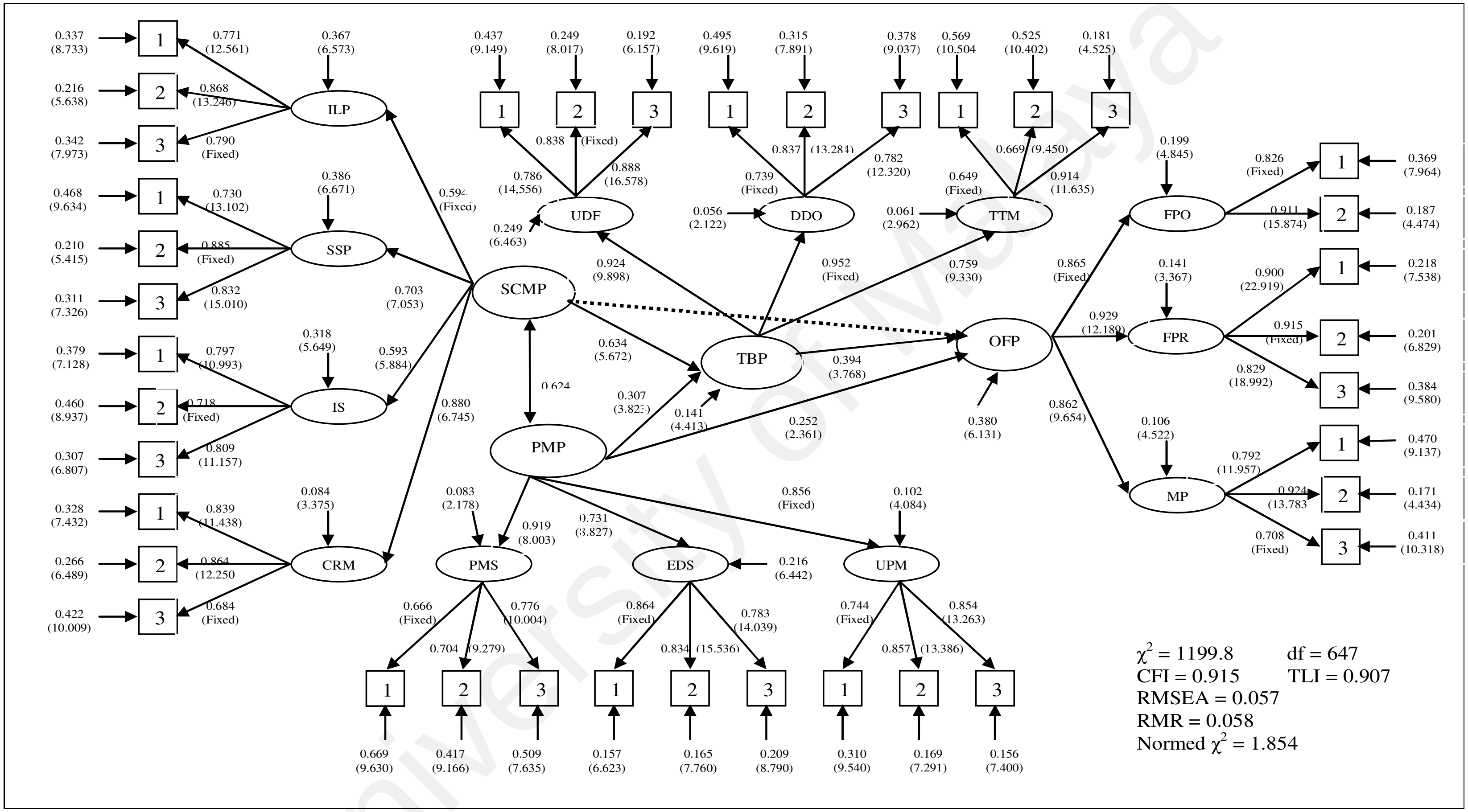
Model	χ^2	df	CFI	TLI	RMSEA	RMR	$\Delta\chi^2$
1	1198.7	646	0.915	0.907	0.057	0.058	-
2	1199.8	647	0.915	0.907	0.057	0.058	1.1
3	1204.4	647	0.914	0.906	0.057	0.059	5.7*
4	1205.7	648	0.914	0.907	0.057	0.060	7.0*

* Significant at $p = 0.05$

Model 2 in Figure 5.9 is again presented in Figure 5.10, with the corresponding details. The open arrows stand for the error variance terms (un-standardized) corresponding to the measured items represented by the numbered boxes (1, 2, or 3) for each of the thirteen first order latent variables linked to, either of, the four second order latent variables. The regression weights for each relationship (significant at $p < 0.05$), with the corresponding critical ratio (t – value) in brackets are shown in the figure. The correlation coefficient for supply chain management practices and performance measurement practices is 0.624 (covariance = 0.148, $t = 5.219$, $p = 0.000$; variances of 0.282 ($t = 5.449$, $p = 0.000$) and 0.200 ($t = 3.982$, $p = 0.000$) respectively). Other results are presented in Appendix 12 (I), depicting the regression weights of each link in the model being significant (as seen from the significant t-values which are all greater than 2, and $p \leq 0.05$ for all links). The effects each indicator (item) as represented by the regression weights in Appendix 12 (II) have direct relationship with the 2^{nd} order variables in the sense that they are caused by these 2^{nd} order variables. Increased activity related to any of the indicators is a reflection of an increase in the level of the 1^{st} order variable and consequently the 2^{nd} order variable.

The results of the fits provided by the paths SCMP/ PMP → TBP → OFP are quite reasonable, if one considers the complexity of the model, sample size limitation, and the number of observed items (Min and Mentzer, 2004). The model is a result of partial disaggregation of some of the variable items. Although, Leone et al. (2001) are of the opinion that total disaggregation models exhibit better fits than the partial disaggregation, or aggregation models, this research also found that partial disaggregation models exhibit better fits than the aggregated models in situations of sample size constrains and large numbers of observed items. Accordingly, it follows that the recommendation by Leone et al. (2001) on the use of TLI and CFI to assess total disaggregation models, is extended to partial disaggregation models and is used in this research.

The Normed χ^2 was 1.854, CFI is 0.915, and TLI is 0.907, while RMR and RMSEA are 0.058 and 0.057, respectively. The Normed χ^2 meets the threshold requirement of less than 3, while CFI and TLI values are above the 0.9 threshold. RMR and RMSEA fulfill the requirements of the respective thresholds (less than 0.08 and 0.07, respectively). All threshold points are according to Hair et al., (2006). Considering the sample size limitation and the large number of observed items, the values for GFI (0.812) and AGFI (0.784) are within what Min and Mentzer (2004) term as reasonable fits in terms of overall model fit indices.



Key: SCMP – supply chain management practices; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance; ILP – internal lean practices; SSP – strategic supplier partnership; IS – information sharing; CRM – customer relationship management; PMS – performance measurement system; UPM – uses of performance measures/ measurement system; EDS – essentials performance measurement system design; TTM – time to market; DDO – delivery dependability; UDF – up and down flexibility; FPO – financial performance – output; FPR – financial performance – resources; MP – market performance.

Figure 5.10
The Final Structural Model

As the reviewed literature (e.g., Tan et al., 1999; Rooney, 2002; Droge et al., 2004) suggests, there are positive paths between SCMP to TBP, PMP to TBP, PMP to OFP, and TBP to OFP as evidenced by the respective significant critical ratios and standardized regression weights (Refer to Figure 5.10 and Table 5.20). At this point it is concluded that the positive impacts of the SCMP and PMP links on TBP, in addition to PMP and TBP links on OFP, exist, supporting the nomological validity of the measurement scales, on top of the data having supported hypotheses H1a, H2a, H2b, H3, and H4, while hypothesis H1b is not supported meaning there is no significant link between SCMP and OFP.

Table 5.20
Results of Hypothesis Testing Using the Structural Model Results

Hypothesis	**Relationship**	**Regression Weight**	**Critical Ratio (*t* – value)**	**Remark on Hypothesis**
H4	SCMP ↔ PMP	0.624**	-	Supported
H1a	SCMP → TBP	0.634*	5.672	Supported
H1b	SCMP → OFP	-	-	Not Supported
H2a	PMP → TBP	0.307*	3.823	Supported
H2b	PMP → OFP	0.252*	2.361	Supported
H3	TBP → OFP	0.394*	3.768	Supported

* All regression *weights* were significant at $p < 0.05$.
** Correlation coefficient with covariance value of 0.148, $t = 5.219$, $p = 0.000$.

These results support hypothesis H1a, which state that there is a direct positive impact of supply chain management practices on time-based performance. The support is demonstrated by the results that show a standardized coefficient of 0.634 that is statistically significant at $p < 0.05$ ($t = 5.672$). On the other hand, the results indicate that the link between performance measurement practices and time based performance is significant with a standardized coefficient of 0.307 ($t = 3.823$ at $p < 0.05$), thus supporting hypothesis H2a, which states that there is a direct positive impact of performance measurement practices on time based performance. Furthermore these results support hypothesis H2b, which state that there is a direct positive impact of performance measurement practices on overall firm performance. In this case, the standardized coefficient is 0.252 with statistical significance being at $p < 0.05$ ($t = 2.361$).

The results further supports hypothesis H3, which states that there is a direct positive impact of time-based performance on overall firm performance. For this support, the standardized coefficient of 0.394 is statistically significant at $p < 0.05$ ($t = 3.768$). The results also support hypothesis H4, which states that supply chain management practices and performance measurement practices are associated. The correlation coefficient is 0.624 (covariance value of 0.148, $t = 5.219$, $p = 0.000$). The summary of the discussed hypothesis testing is presented in Table 5.20, while the total, direct and indirect effects of each path are presented in Table 5.21.

Table 5.21
Results of Total, Direct, and Indirect Effects

Hypothesis	Relationship	Total Effects	Direct Effects	Indirect Effects	Remark on Hypothesis
H4	SCMP ↔ PMP	N/A	N/A	N/A	Supported
H1a	SCMP → TBP	0.634	0.634	0.000	Supported
H1b	SCMP → OFP	0.250	0.000	0.250	Not Supported
H2a	PMP → TBP	0.307	0.307	0.000	Supported
H2b	PMP → OFP	0.372	0.252	0.121	Supported
H3	TBP → OFP	0.394	0.394	0.000	Supported

* All effects are significant at $p < 0.05$; N/A means not applicable.

The survey questionnaire has the quantitative and the qualitative parts as its main components. In the preceding sections and subsections, the analyses of the quantitative component are presented detailing the validation of constructs, as well as the testing of the hypotheses. In the next section the results of the qualitative component of the questionnaire is presented.

5.1.14 Responses on the General Management Aspects

The section of the questionnaire that deals with general management aspects is made up of eleven open ended questions that cover various issues, regarding the general management of operations in the respondent organizations, with a focus on the study variables. The first five questions explore the manner supply chain management is being practiced in Tanzania, while the remaining questions dwell on issues regarding the practice of performance measurement, measures and their development, in the industries in Tanzania. In this section, the responses to these questions are presented. The responses have been summarized and grouped according to major the opinions put forth by the respondents. Whenever possible, the percentages of respondents favoring the response are shown. Table 5.22 provides a summarization of key responses according to the questions in the questionnaire and the corresponding reasons for the given responses.

This part of the survey reveals that some firms understand the concept of supply chain management and is being practiced. In their responses, the firms acknowledge seeing other firms practicing supply chain management, although few in number. The respondents suggest training in various areas related to the practice be undertaken by firms to improve the practice. Also, the respondents have the opinion that the government needs to make deliberate moves in developing the skills for the purpose of promoting practices in supply chain management in industries in Tanzania. Having a lead organization is seen as necessary as the organization will play the role of the pier in the chain.

Another revelation of this part of the survey, involves the agreement of the aspect of the sharing of measurements across trading partners, as this enhances the service to the common customer. Also, revealed is the fact that many organizations still focus on the use of financial measures, although there are also a few who use the mixture of financial and non-financial measures.

Table 5.22
Summary of Responses from the General Management Aspects of the Survey

Issue / Question	Response		Reasons Put Forward
Is the concept of supply chain management well understood by practitioners in the Tanzanian industrial sector?	Yes	22%	**For Yes:** Firms follow-up their products from raw materials to end user due to pressures brought by imports. Other firms see it as part of a standardized management process. **For No:** Poor information technology application is an indication; poor technology use; lack of experts and knowledge in the concept; unfamiliarity of the concept.
	No	20%	
	Ns	6%	
	Nr	52%	
Is the concept of supply chain management practical in Tanzania?	Yes	31%	**For Yes:** The belief that the concept transforms the economy and adapts to globalization effects. **For No:** lack of industrial base; quality problems; high costs of doing business; poor infrastructure.
	No	4%	
	Ns	0%	
	Nr	65%	
To your knowledge, are there any companies practicing supply chain management?	Yes	21%	**For Yes:** Some firms are so advanced technology-wise and in their management techniques. They try to establish strong links with their suppliers and customers.
	Nr	79%	
What has to be done to encourage the practices of supply chain management?			Training (25%); Sensitization (*%); others (9.5%); No response (57.5%). - Specialized training for managers; practical visits to good practitioners. - Government needs to take deliberate moves to introduce necessary skills for promoting the practices.
Is it necessary to have a leading organization in developing a supply chain?	Yes	29%	**For Yes:** Advanced players will lead others by example and be benchmarks. To a wider scope, it is better to have a special organization to promote the practices. **For No:** Differing firm objectives require each to work individually to achieve its goals, so let each struggle on its own!
	No	5%	
	Ns	7%	
	Nr	59%	
Is it necessary to share measurements across trading partners for achieving supply chain goals?	Yes	30%	**For Yes:** The need to have a common focus on serving the same customer makes it necessary to share measurements; it becomes easy to benchmark one's self; smooth operations; saves time. **For No:** there is a high risk in sharing proprietary information in this stiff competition.
	No	8%	
	Ns	3%	
	Nr	59%	
How does the organization develop its performance measures and performance measurement system?			Develop strictly using financial measures (11%); Use what has been put in place during inception of the firm (10%); Train employees (7%); Use external consultants (5%); Use trial and error approach (5%); Use standard manuals (e.g. ISO 9001 – 2000) (4%); No response (58%).

Key: Yes – the answer is yes to the question in the first column; No – the answer is no to the question in the first column; Ns - the respondent is not sure; Nr – no response received.

Table 5.22 (Summary of Responses from the General Management Aspects of the Survey: continued)

Issue / Question	Response	Reasons Put Forward
When was the performance measurement in use introduced? Is the system working according to expectations? Why was it introduced? For the ones not working, why was it so?		- Recently started (12%); During inception of the firm (11%); started as a project due to customer/ investor requirement (4%); No clear performance measurement system (6%); No Response (67%). - Yes (20%); No (10%); No Response (70%). - To fulfill customer requirements (e.g. quality, delivery time) improving operations and increasing productivity; individual performance appraisals; enhancing efficiency; and instilling sense of responsibility. - It is time consuming; low education of employees a hindrance to its implementation; does not meet the current business environment requirements; lack of incentives and expertise.
What are the strengths of the performance system in use? What are the weaknesses of the system?		- It is easy to use and straightforward (24%). - Lack of skills on the part of employees (14%); lack of motivation to users (7%).
What should be done to improve the way performance is being measured so that organizations benefit more out of the process?		- Revamp the implementation process - Have experts committed in developing this area - Train employees in improved methods specific for each organization - Research to identify obstacles hindering proper practice be undertaken frequently - Appropriate motivation of employees is needed. Involve employees fully in setting and implementing performance measures and performance measurement systems.

Key: Yes – the answer is yes to the question in the first column; No – the answer is no to the question in the first column;
Ns - the respondent is not sure; Nr – no response received.

The measures are developed using various approaches, as outlined in Table 5.22. The survey also reveals that the performance measurement systems, currently in use, were either introduced at inception of a company, or started later as the requirements from customers, or investors. The firms that responded to this question reported that most of the systems are working. To further improve the way performance is being measured, so firms benefit more, the survey results indicate training and research in the important aspects related to the area is necessary for further development of the practices in performance measurement. More details on the responses are in Table 5.22.

5.1.15 Performance Index Development

As discussed in the Chapter Four, a Performance Index is developed using the results of the structural model from the SEM analysis. This index results from a combination of two parts i.e., one part from the time based performance (TBP) component of results and the other from the component of results from the overall firm performance (OFP). The corresponding formula (Formula 3) is used in calculating the index is reproduced below.

$$Performance\_Index = \sum_{j=1}^{n}\left[\left[\sum_{i=1}^{n}\lambda_{Yi}Y_i\right]\lambda_{Tj}\right] + \sum_{l=1}^{n}\left[\left[\sum_{k=1}^{n}\lambda_{Zk}Z_k\right]\lambda_{Ol}\right]$$

Where: λ_Y = the regression weight corresponding to each observed or measured variable in the first order relationship in the TBP second order latent variable.

λ_T = the regression weight corresponding to each first order latent variable in the TBP second order latent variable.

Y = the value of the observed, or measured variable corresponding to each first order latent variable in the TBP second order latent variable.

i = the ith observed, or measured variable in each of the first order latent variable in the TBP second order latent variable.

j = the jth first order latent variable in the TBP second order latent variable.

λ_Z = the regression weight corresponding to each observed or measured variable in the first order relationship in the OFP second order latent variable.

λ_O = the regression weight corresponding to each first order latent variable in the OFP second order latent variable.

Z = the value of the observed or measured variable corresponding to each first order latent variable in the OFP second order latent variable.

l = the lth observed or measured variable in each of the first order latent variable in the OFP second order latent variable.

k = the kth first order LV in the OFP second order latent variable.

n = the maximum number of the corresponding regression weights in consideration.

Using the results from the SEM structural model output, the index is calculated as follows:

$$\begin{aligned} Performance\_Index = \{ & [(0.694ttm1+0.669ttm2+0.914ttm3)*0.924] + \\ & [(0.786udf1+0.838udf2+0.888udf3)*0.759] + \\ & [(0.739ddo1+0.837ddo2+0.782ddo3)*0.952] + \\ & [(0.826fpo1+0.911fpo2)*0.865] + \\ & [(0.900fpr1+0.915fpr2+0.829fpr3)*0.929] + \\ & [(0.792mp1+0.924mp2+0.708mp3)*0.862]\} \end{aligned}$$

This calculation was run in the SPSS program using the data collected in the survey stage. The results indicate the 264 companies have a Performance Index ranging from 13.9 to 61.5. The results of the Performance Index calculation for each company that participated in this research are presented in Appendix 13. The quartiles for this index are determined using SPSS, and the companies are categorized into three groups according to the Performance Index as presented in Table 5.23. The first group takes the 25th lower percentile, while the top group takes the upper 25th percentile.

Table 5.23
Grouping of Companies using the Performance Index

Performance Category	Performance Index Range	Company Size			Total Number
		Small	Medium	Large	
Poor	$13.90 \leq PI < 31.45$	17	28	21	66
Average	$31.45 \leq PI < 43.68$	33	50	49	132
Good	43.68 and above	6	11	49	66

From these results the four firms (2 good performing and 2 poor performing) were contacted to seek their consent in the participation in the case study phase of the research. The procedure to select the four companies was lengthy as the researcher had to call almost all companies in the poor and good performance groups located in Dar es Salaam to solicit their participation in the case study. The firms that indicated to be positive in doing so were physically visited. From the discussions during the visit, the researcher could assess the level of cooperation to be expected in the case study. This led to the final decision of selecting the four firms to participate in the case study. In essence the selection was purposive as well as judgmental. So, companies with ID number 36 (PI = 24.8) and 84 (PI = 18.9), were selected from poor performers; and companies with ID number 119 (PI = 50.8) and 145 (PI = 60.8), were selected from good performers. After this selection, the multiple cases case study was conducted, and the results are presented in the next sections.

5.2 Case Study

In the preceding sections of this chapter, the way supply chain management and performance measurement are being practiced, in different industries of Tanzania, was analyzed using the survey data. The analyses of these practices are geared towards answering the questions on aspects of ‘how’ these practices are exercised, and what really takes place in the practices. The following part of this chapter presents the analysis of the case study which considers multiple cases in which four firms are used: two of the firms are good performers while the other two are poor performers according to the performance index developed in the previous sub-section. It is the intention of this study to use the case study as a research strategy for focusing on understanding the dynamics present within single settings. This is anticipated to allow for in-depth understanding of the theories of success and failure in the perspective of supply chain management practices and performance measurement practices in Tanzania’s industrial sector.

As pointed out earlier (section 4.11.7) within the case analysis and cross-case analysis are techniques employed in analyzing these cases. Tactics including selecting categories or dimensions, and then to look for within-groups similarities coupled with inter-group differences; selecting pairs of cases and then list the similarities and the differences of each pair; and, dividing the data by data source are used to accomplish the analysis. The data to be analyzed in this section has been collected using a preliminary questionnaire, physical observations, and interviews guided by the case study protocol presented in Table 4.5 in chapter four.

5.2.1 Within the Case Analysis

In this section, each firm in the case study is analyzed and a summarized description is presented according to its characteristics, as well as its operations. The description also covers the supply chain management practices and performance measurement activities in the organization. The description of each firm is expected to be central to the generation of insight, since it is expected to help in coping with the enormous volume of data (Eisenhardt, 1989) collected during the case study phase of the research. The presentation in this section provides summarized within the case analyses for all four case study firms, focusing on the study variables and activities performed by study firms in relation to the study variables.

5.2.1.1 Company A

Attributes of Company A

Company A, established in the early 1960s, is a listed (Dar es Salaam Stock Exchange) public limited company. The company vision is "To be the number one [the agricultural product] company in East and Central Africa", while the mission statement is "… to build a powerful regional [the agricultural product] company, maximizing value for our key stakeholders". The key drivers of the high growth in sales are investment in sales and distribution infrastructure and in further building brand equity. On the manufacturing side, improvement in quality and operating performance are the key focus of manufacturing. The company has implemented a global Enterprise Resource Planning (ERP) system, driven by SAP software. This helps the company to optimize its purchasing, production and selling activities, while improving operating efficiency and quality of management information for decision making. The company is certified in International Standards ISO 9001 (Quality Management System), ISO 14001 (Environmental Management), and OHSAS 18001 (Health and Safety Management). Employees are encouraged to participate in its business, and it runs an active employee suggestion scheme. A performance driven bonus scheme for all employees is in force, with positive results. After the above introduction on the company, a description of the company's supply chain management practices is given in the next sub-section.

Supply Chain and Supply Chain Management Practices in Company A

This company is basically in a supply chain that is schematically presented in Figure 5.11 showing its location being closer to the customer than the initial source of materials, giving the company an advantage in terms of less distortion of information from the customer side. The chain starts with farmers' activities, through four stages, then to the end customer. The company purchases the processed farm produce once in a year and stocks all its annual requirements in storage facilities in its compound. Obviously the amount of this processed produce (to be used as the raw material) is large, meaning inventory costs are significantly high for this particular item. Internally the company manufacturing process is as represented schematically by the simplified process flow chart in Figure 5.12.

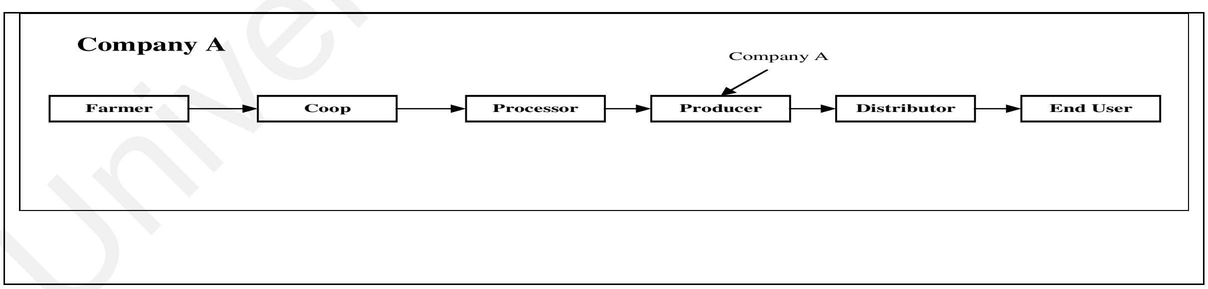
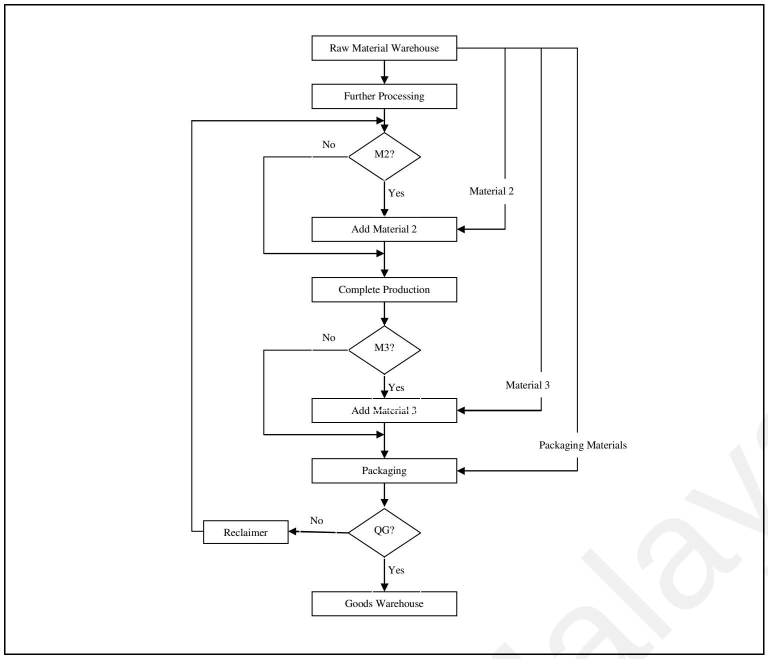


Figure 5.11
Schematic Presentation of Company A's Supply Chain



Key: M2 – Material 2; M3 – Material 3; QG? – is the Quality Good?; FP? – is Further Processing required?

Figure 5.12
Simplified Process Flow Diagram for Firm A

The company has a well established network and a well developed sales force and distribution infrastructure spanning all-over the country. It plays a key role of its own in the Tanzanian arena as it leads members of the supply chain in which it belongs. This is ascertained by the company's participation in Psi Tanzania program as one of the leading firms. Implicitly, the existence of a focal organization, or the role of the company in the chain as a focal company is reflected in the way the company conducts its activities in relation to its trading partners. The kind of process links (managed, not managed, monitored, or non-member) that the company is connected to are partially clear, especially when one looks at the way the company participates in the Psi program, and the collaboration it exercises with its down stream trading partners (partnership for success).

Interviewees in this company acknowledged the existence of a shared vision with its trading partners, but not in the entire chain. It is more pronounced on the downstream side of the chain, especially with distributors of the products of the company and retailers since there is a strong collaboration that exists between them and the company. A similar development in terms of goal congruency is observed for the existence of goal congruency with its trading partners. Cross functional teams are active in training on customer care, marketing and joint promotions. The up stream side has only the normal seller - buyer relationship that one finds in an open market economy. The company acknowledges realizing significant savings in costs and a significant lead time reduction when it uses appropriate local suppliers.

The impact of cross functional relationships is measured in terms of cost savings. On the downstream side, the company believes these relationships help in maintaining customer loyalty and hence improving sales. Also these relationships make it easy for the company to get information on what is exactly happening in the market. This prepares the company for future action to suit the market environment. Since the main objective is increasing sales while maintaining customer loyalty, the impact of these relationships is measured in terms of increased sales, number of customers as well as the level of customer satisfaction.

In this firm, time management training is one of the activities conducted by each department in a bid to reduce wastage in time in departments. Others activities include the use of bidding process for purchasing process as it helps in finding the best products at reasonable prices. Also subcontracting non core activities like transportation, cleaning, sourcing of casual laborers and canteen services have brought benefits as the focus of the company is on its core activities of manufacturing, marketing and sales of its products. The use of inventory KPIs allows for Just-In-Time purchases. Information sharing is also open to the down-stream trading partners for the purpose of understanding customers and market conditions. This is linked to demand management activities that are done in collaboration with its trading partners.

Supply chain management practices are yet to be practiced in their totality in the company. Mostly the company practices earnestly conditions set by the parent company. In doing so it practices supply chain management. Much of these practices are those linked to international standards to which the company is certified. Practices involving Supplier Relationship Management (SRM), Customer Relationship Management (CRM), E-business, E-commerce, cyber-communication, and Collaborative Planning, Forecasting and Replenishment (CPFR) are practiced albeit to some acknowledgeable extent. A few practices like order accuracy and cycle time have been in practice as one finds the response of the company indicates the measure of order fulfillment ratio as a metric for this purpose. Also investment in information technology is seen to be in an advanced stage when compared to other local companies. It may be due to the influence of the parent company's need for transparency throughout its facilities.

Performance Measures and Performance Measurement System in Company A

The case study reveals that Company A has a formal performance measurement system that is used for setting and measuring performance goals. The said system covers among others: structure of the measurement system, procedure of choosing measures, procedure for setting targets/output measurement, procedure for determining input measurement, procedure for determining flexibility measurement, responsibility for measuring performance, and procedure for reviewing the system. The system is formally documented in the company's internal SAP system. On the issue of determining what should be measured in terms of performance, the case study finds that the company fully involves employees through programs that it prepares internally. Teamwork plays a major role in this process. Many of the measuring processes are incorporated in the ERP system that is run by the SAP software. For measures that involve activities that are outside the company e.g.

customer satisfaction, an independent research company is commissioned to carry out regular surveys to determine the level of customer satisfaction. Customer satisfaction is an important aspect to this company as it is believed to drive the business.

In setting performance goals, the company refers to a number of standards and capabilities as a basis for setting its performance goals. This aims at attaining and maintaining or even exceeding these bench marks. The benchmarks include the industry standard, industry best performance, customer requirement, known process capability, and planned investment. Known to impact the performance measurement practices, in this company, systems currently in use include the Enterprise Resource Planning (ERP), Material Requirement Program (MRP & MRP II), Total Quality Management (TQM) and partially the Just-in-Time (JIT) practice. There is also the influence of ISO quality systems (ISO 9000 and ISO 14000), the financial control system, and the Activity Based Costing (ABC) in the practice of measuring performance.

The company has a formally documented set of measures specific for cross-functional teams, activities, and processes that are categorized for use at strategic level, tactical level or operational level. In overall terms, the exact number of measures the company uses was not revealed due to company regulations. The company has several indicators that are not listed in Appendix 5 but are currently in use. These include the customer complaint KPI, count of beetles, energy consumption, carbon dioxide emissions, water consumption, production waste, recycling rate, and accident rate, as stipulated in their EHS program. The beetle count shows the number of beetles captured for a specific period of time. It is important as it indicates the rate of attack on the main raw material. The higher numbers of the catch indicate a high rate of attack. Other indicators relate to environmental protection.

5.2.1.2 Company B

Attributes of Company B

Company B was founded in 1947 and listed as a private company. The company prides itself on producing world class, quality products, and it has a ISO 9001/2000 certification. The company's high quality products range is supplied to leading multinational companies in Tanzania, and also exported to other countries. Company B's products as well as its sister companies', are a vital component of modern living providing protection, portability, preservation and convenience as well as attracting consumers to its customers' products. On the other hand these products are also a visible part of the waste-stream. This has lead to the group of these companies (including company B) to get directly involved in recycling of all the main used materials of their products. As one of the largest producers of the said products in Africa, the group is acutely aware of the impact that its products could have on the environment and is consequently directly involved in many recycling initiatives.

Besides the environmental protection activities, the parent group of companies (and so company B) is involved in other social responsibilities that include promoting education, school partnering, funding HIV and AIDS awareness programs, and promoting an in house graduate training and management development, among other things. Below, a discussion on SCMP is presented, followed by a part that details on PMP in this company.

Supply Chain and Supply Chain Management Practices in Company B

Interviewees in Company B ascertained that there exists a formally established SC that the company could be identified to belong to, where it also takes the role of being the focal organization (Figure 5.13). On the other hand there exist also other SCs in which the company does not play the role of the focal organization. In this kind of SCs, the company supplies inputs that are not the main inputs to its customers' processes but are important ones in terms of a completed product. The two scenarios lead to the company having process links that are managed and those which are just monitored, with internal processes represented by Figure 5.14. In both cases the company operates cross-functional teams with other SC members, especially on the down-stream side of the chain. Although its vision is not clearly seen as a shared vision among the company and its trading partners, in most cases its goals are in line with those of its trading partners.

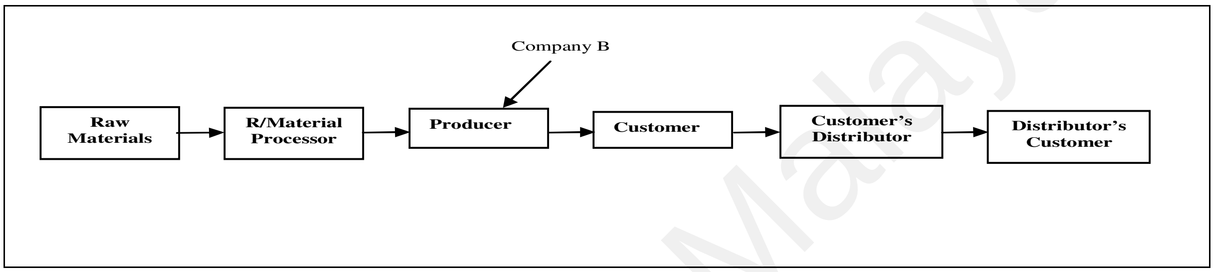
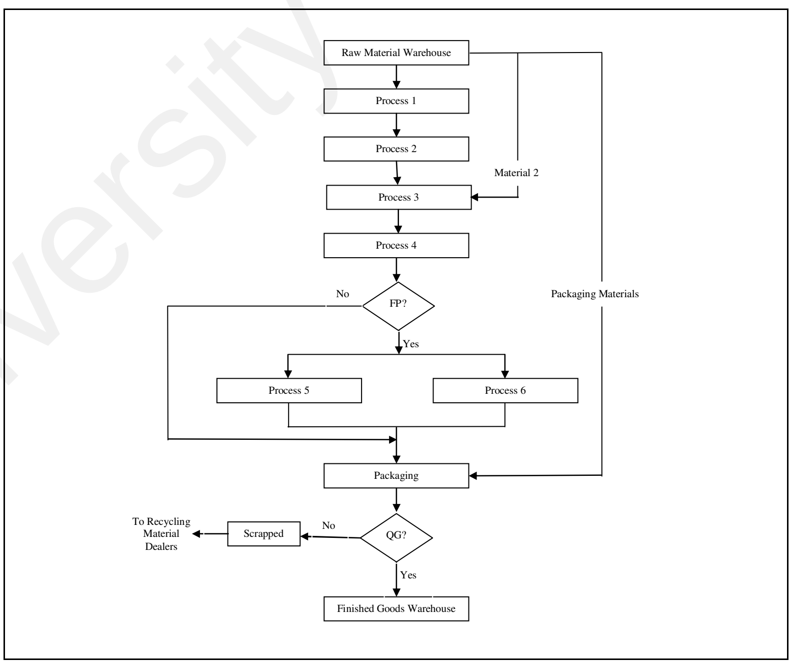


Figure 5.13
Schematic Presentation of Company B's Supply Chain



Key: M2 – Material 2; M3 – Material 3; QG? – is the Quality Good?; FP? – is Further Processing required?

Figure 5.14
Simplified Process Flow Diagram for Firm B

The company imports most of the main raw materials (a small amount comes from the recycling process), leading to the company having no control of processes taking place in the upstream side of the supply chain to which it belongs. So, it should be noted that the process links that the firm faces are not managed in the perspective of company B, as the company can only monitor what was going on so as to adjust its plans accordingly. The crucial thing to company B in this process besides the price was the lead time. Interestingly, company B maintains storage facilities for its products in its major customers' premises. This helps in making sure the customer got the requirements whenever they are needed and in a short time as possible. Running of these facilities is done jointly by company B and the corresponding customer.

The company is in the forefront of strengthening relationships with its trading partners, especially on the down-stream side of the chain. The main kind of relationship that is fostered by this company is the collaborative forecasting as the company believes this stabilizes its business. This kind of relationship is seen by company B as important as it helps in production planning. The impact of this collaboration is determined in the number of change overs (machine set up). A reduction in change overs leads to minimization of time as well as material wastage. Also the company has several teams in different departments for the purpose of finding savings.

Company B strives to reduce the number of suppliers and third party logistics providers as one way of smoothing its operations. The company limits the number of customers in a bid to rationalize the number of products it offered, while demand is managed by striving for accurate forecasting, achieved through maintaining constant contact with customers.

There is a partial development of a customer relationship management (CRM) system, as there are cross-functional teams that have been established, though in some cases these teams are not strong. On the suppliers' side not much had been done due to the nature of business transactions that take place. Collaborative design and manufacturing (CDM) is also partially exercised through design review meetings in case of product or design change. In terms of investment in information technology, the company has managed to invest on the intranet for internal use, while externally the internet is used.

Performance Measures and Performance Measurement System in Company B

Company B has a formal system for setting and measuring performance goals. The system is formally documented in manuals established as per ISO 9000 – 2001 standards. Among other things, there is a documented set of measures specific for processes, activities, strategic level, tactical level and the operational level. In determining what is to be measured in terms of performance, the focus is always on aspects of cost saving. The measuring process is done in such a way that it is part of the job for the process owner. Basically the management decides on these measures through benchmarking procedures and the use of international standards as stipulated in ISO 9000 series. Employees play a major role in deciding the way in which measurements are to be done as they are the ones who really perform the job. Their participation in this process ensures a smooth flow of activities as the employees feel they are part of decision making process and they own the process.

The company sees customer satisfaction as an important aspect as the company believes it improves the business. The techniques and methods used to determine the level of customer satisfaction include, among others, the use of customer surveys, meetings with customers, monitoring customer complaints to determine the number of complaints, and checking on under deliveries.

On the issue of determining areas for improvement, the company uses a high percentage of measures listed in Appendix 5 in measuring its performance. Through the use of key PIs, areas of poor performance are identified, and these are the areas for improvement. The measurements used in company B are defined and reported very consistently among different business units, but not among trading partners. The current measurements reflect current business and operations fairly well as they give clear indication as to the direction or level of performance.

5.2.1.3 Company C

Attributes of Company C

Company C started its operations in Tanzania in the early 1960s. Even with the advent of globalization, the company has remained closed to the outside. Its operations are known better by the management. No transparency is apparent in this company. This was evidenced by difficulties faced in getting the required information for this case study as well as feedback from middle managers in the company. Although the government owns 40% of shares, it distances itself from day to day running of the company.

The company has no clear policy on environmental protection (besides recycling of its waste and rejects), training of its workforce, and social responsibility. It is not certified in any of international standards (ISO 9000 or ISO 14000) and no clear efforts are evident on trying to be certified. The company has its customers in the local market only as no efforts have been made on trying to push for exporting its products.

Supply Chain and Supply Chain Management Practices in Company C

Company C is seen to belong to a chain that is not formally established as practically there are no clearly observable chain links with other firms. The company operates with little transparency in terms of its management and operations. It is neither a focal organization nor is there any other organization that is taking the leading role in this supply chain. So, all links in this chain are not managed, rendering them to be communicative only. All players in the chain follow the market rules to capitalize on short term opportunities. It has no shared vision, no goal congruence, and no cross-functional teams with other chain members. Figure 5.15 presents the schematic diagram of the chain to which this company belongs.

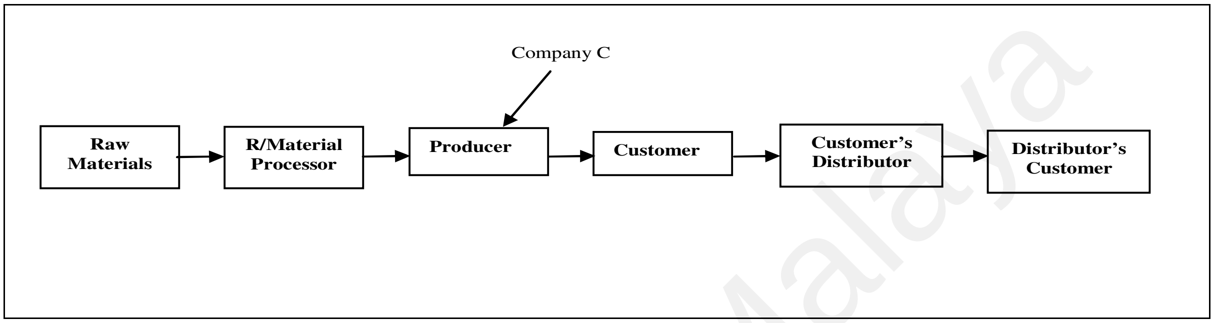
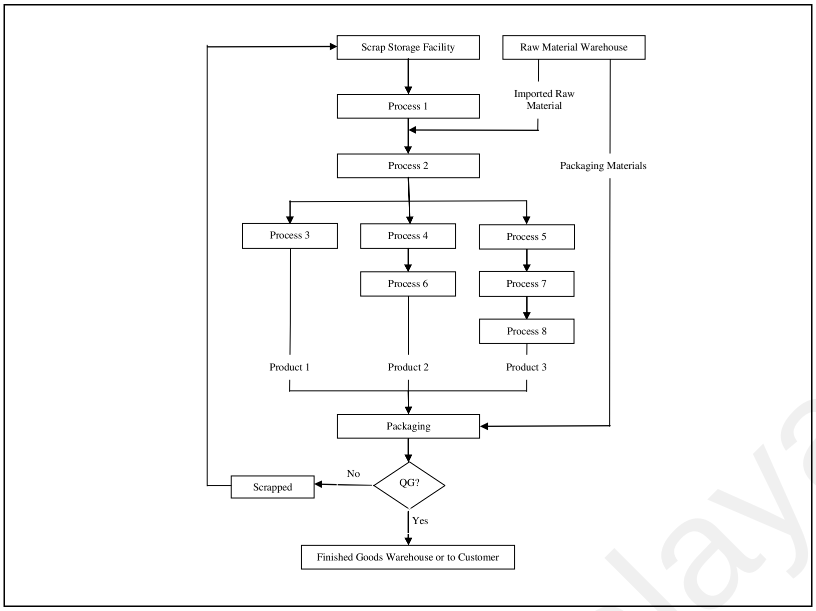


Figure 5.15
Schematic Presentation of Company C's Supply Chain

The company has three products that use the same raw material, though they have varying processes in their production. The raw material is normally imported. Figure 5.16 presents the major steps in the production processes of company C. It should be noted that the company is still having a lot of manual operations in its production lines. The machinery and the technology in use is still of the old type. The stiff competition that the company is currently experiencing has forced the management to start looking for ways that would ensure the company prevails in this new environment. For instance, of late, the company has been looking into ways of retaining key customers by trying to create cross functional teams to review their relationship and propose ways forward.



Key: M2 – Material 2; M3 – Material 3; QG? – is the Quality Good?; FP? – is Further Processing required?

Figure 5.16
Simplified Process Flow Diagram for Firm C

Furthermore, the company sees customers to be the driving force to the business, so their satisfaction is paramount to the company. The level of customer satisfaction is determined by the number of complaints registered. The more the number of complaints the less is the level of their satisfaction. Information flow within and outside the company can be said to be minimal since the company has made minimal investment in IT infrastructure. Reliance on information transfer is on manual basis.

Performance Measures and Performance Measurement System in Company C

Company C has no formal system for setting and measuring performance goals that has been documented. The management decides on what should be measured and how it has to be measured. Much focus is on the financial performance. Mostly the measuring process involves measuring the output. Employees have no role to play in determining what to measure, how it should be measured, and why it has to be measured the way it is being measured.

Customer complaints are an indication of either poor quality or under delivery or delayed delivery. They lead the company to identifying areas of improvement. Customers, as stakeholders influence this company's measures of performance through their requirements. Company C has no proper documentation of its measures except for inputs and outputs. Few measures listed in Appendix 5 are in use in company C. The measurements that are defined are reported very inconsistently within the organization. No information is shared with trading partners. Sometimes the current measurements reflected the current business and operational conditions, though in other instances they are not accurate and are inconsistent.

5.2.1.4 Company D

Attributes of Company D

Company D started its production operations in 1987 as a small company, but now it has evolved to a medium sized company. It has managed to acquire modern machines and equipment and it boasts of having an enthusiastic, energetic, and innovative team. The company vision is to become the most efficient, top quality, medium size company (in its field of production / service) in the country. The mission statement is "to provide affordable quality services with timely delivery schedules". The company believed this is what its customers want, and it believes that is what they indeed deserve. It is not certified in any of the known standards (e.g. ISO 9000 or ISO 14000), and indicates no plans to do so. The company business focuses to the local market only.

Supply Chain and Supply Chain Management Practices in Company D

The interviewees in company D could not acknowledge the existence of any supply chain to which the company belongs to. Figure 5.17 has presented a schematic view of one of supply chains that the company might belong to. The company plays no role as a leader in such chains. The links in such chains are neither managed nor monitored, so only communicative. There may be non-member process links in existence, but it is not clear from the perspective of company D, and implicitly company goals are not in line with those of its trading partners. No cross functional teams with other chain members can be expected in this company since it is not even clear (from within the company) if the company belonged to any chain.

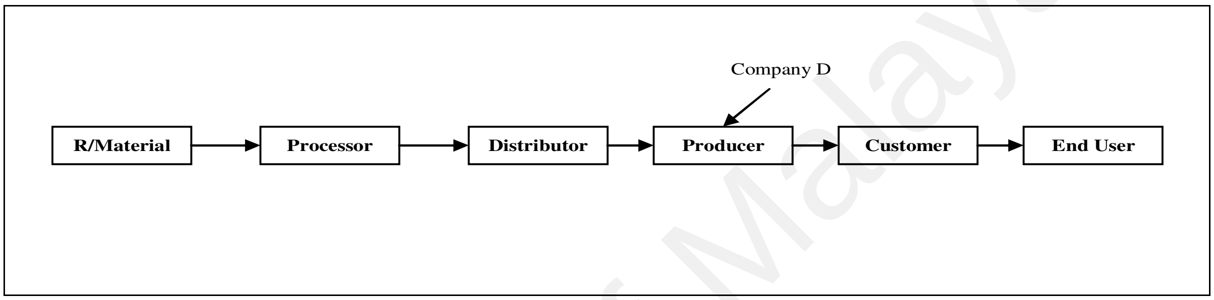
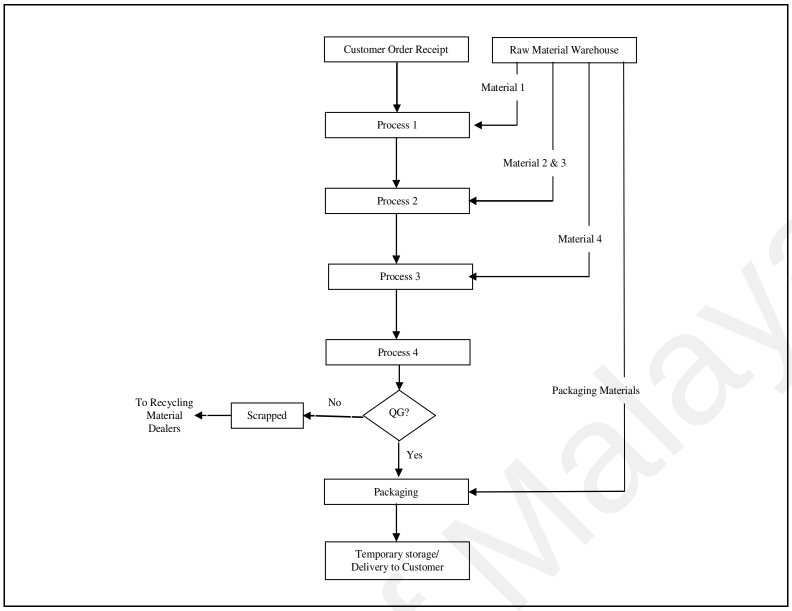


Figure 5.17
Schematic Presentation of Company D's Supply Chain

The processes performed internally by company D are as presented in a simplified process flow diagram in figure 5.18. For the purpose of waste (time and resources) reduction activities related to good house keeping and proper materials handling and storage are conducted in the company. In terms of finding savings, economical use of utilities is encouraged. The company has no fixed number of suppliers although it maintains contact with good suppliers and give them business whenever possible. To achieve corporate excellence, the company tries to enhance communication with its customers. It is difficult for the company to maintain the same thing for suppliers due to its smart buy approach. The kind of communication that prevails between the company and its suppliers is minimal, just the necessary communication. The company basically has not established any cross-functional teams; no supplier relationship management (CRM) activities; no customer relationship management (CRM) activities; no any information or data sharing; and no collaborative planning, forecasting, and replenishment (CPFR) activities done so far.



Key: M2 – Material 2; M3 – Material 3; QG? – is the Quality Good?; FP? – is Further Processing required?

Figure 5.18
Simplified Process Flow Diagram for Firm D

Performance Measures and Performance Measurement System in Company D

Company D has a formal system for setting and measuring performance goals though the system is not formally documented. The process of measuring performance is managed by following up on goals set at the beginning of the year and quarterly reviews are performed to compare the actual performance to the set target. The customer reports are what the company calls open door policy on the performance of the company, whereby customers are contacted and requested to give their feedback on the company performance. The financial control system is the only procedure in use for purposes of monitoring and improving performance. Customer requirements are determined through customer contacts whereby customers provide their requirements.

Company D has identified the core business processes, customer requirements, performance targets, and measurement points. It normally documents them in the work order sheet. There are plans, may be in future, to define process owners as well as suppliers and customers, and key performance indicators.

5.2.2 Cross – Case Analysis

In the cross – case analysis, the four case study firms are compared, with a focus on the clear similarities and differences that are observed in all four companies. The individual differences have been discussed in the preceding section, but brief comparisons are presented below for the attributes, supply chain and supply chain management, and, performance measures and performance measurement system between all four case study firms. Furthermore, this section presents a general view of the differences between the two pairs (good performers and poor performers) is given. The full item by item practice is as presented in Appendix 14, part A. In comparing the companies in the aspect of metrics, the same approach is used as in the comparison of supply chain management and performance measurement listed items is used. The clear similarities and differences in the use of metrics are given. Individual differences and similarities have been discussed in the preceding two sub-sections. The full comparison of metrics used by the four companies is presented in Appendix 14, part B.

5.2.2.1 Comparison of Attributes for the Case Study Firms

The study firms identified as Company A, B C and D, range from medium to large size under the categorization using the number of employees. Ownership is private (100%) or joint venture between the Government (or the public) and private foreign firms, with principal businesses in manufacturing, but in different kinds of products. Firm A produces an agro-based product, firm B produces a product from minerals, firm C produces a product from another kind of minerals, and firm D makes products from natural resources (plants) and chemical products. Among the four firms, two are good performing (A & B) and two are poor performing (C & D) firms. The two good performing firms are certified in ISO 9000 series of standards while the poor performing are not. Company A and B are affiliates of global companies, while C is an affiliate of a family group of companies. Table 5.24 presents the key attributes of each case study firm.

Table 5.24
Comparison of Attributes of Case Study Firms

Attribute	Company			
	A (ID No. 145)	B (ID No. 119)	C (ID No. 84)	D (ID No. 36)
1. Size	Large	Medium	Large	Medium
2. Ownership	Joint Venture (Public & Private foreign)	Private Foreign	Joint Venture (Public & Private foreign)	Private (Local)
3. Principle business	Manufacturing, Marketing and Sales	Manufacturing	Manufacturing	Manufacturing
4. Product	Final product from agricultural produce as input	Intermediate product from minerals	Intermediate product from minerals	Final product from a number of inputs
5. Certification to ISO	ISO 9000; OHSAS 18001.	ISO 9000	None	None
6. Affiliation	Parent company (a Global Company).	Parent company (a Global Company).	Family group of Companies.	None.
7. Transparency in Operations	Encourages employee participation in decision making, entrepreneurial spirit development	Significant employee participation in decision making.	Poor employee participation in decision making	Poor employee participation in decision making
8. Market	Local & Export	Local & Export	Local	Local
8. Social Responsibility	Pronounced: - promoting education & environmental protection activities	Pronounced: - committees for safety, health, environment.	No pronounced activities	No pronounced activities

5.2.2.2 Comparison of Aspects of SC and SCM in Case Study Firms

This section briefly compares aspects of supply chain and supply chain management as observed in the case study firms during the case study field work. Two of the firms (A &

D) are positioned close to customers in their supply chains. This position gives the firms an advantage in terms of accuracy in communication as it is believed positions further from the customer experience information distortions. The other two firms (B & C) happen to be positioned slightly further from the end customer compared to the earlier ones. The firms belong to either partially managed or communicative supply chains.

Most of the processes are standard, although they vary from one firm to another. Firms A, B & C have storage facilities in which raw materials to last between some months to a year are stored. Firm A gets its major raw material from the local processors of the agricultural produce, while firm D get the processed inputs from local suppliers. Firm B & C rely on imports for their main raw materials. Firms A, B & C produce their products for storage meaning their push processes are longer and they depend on accurate forecasting (forecast driven). Firm D produces according to customer orders, meaning the firm has a long pull process (demand driven).

Regarding supply chain management practices, each firm has its own focus in the practices. For example, firm A and firm B have well pronounced activities regarding internal lean practices and customer relationship management, while firm C and firm D acknowledge the non-existence of such activities except for the customer survey. The supplier relationship management is least developed in all case study firms. Information sharing is pronounced on the customer side (down stream-side) of the chain for firm A and firm B), while it is not developed in firm C and firm D. Little is observed to take place regarding other supply chain management practices for all firms except for the component of communication connectivity relating to investment in IT, where firm A is observed to excel other firms, followed by from far by firm B, then D and lastly C. Table 5.25 compares the individual practices the way they are practiced by each case study firm.

Table 5.25
Comparison of Aspects of Supply Chain Management as Practiced in Case Study Firms

Attribute	Company			
	A (ID No. 145)	B (ID No. 119)	C (ID No. 84)	D (ID No. 36)
1. Type of Supply Chain links	Partially Managed (downstream side), efficient.	Partially Managed (downstream side), efficient.	Communicative	Communicative
2. Participation in supply Chain (links)	Focal firm (local component)	Focal firm (local component)	Monitored / acknowledged member	Monitored / acknowledged member
3. Position in supply chain (Figure 5.11)	Closer to final customer: - less distortion of information.	Far from final customer	Far from final customer	Closer to final customer: - less distortion of information
4. Cycle view	Immediate cycles, and all to the downward stream side.	Immediate cycles	Immediate cycles	Immediate cycles, and all to the downward stream side
5. Pull / push view	Long push process: - dependence on accurate Forecasting; produce to stock.	Long push process: - dependence on accurate Forecasting; produce to stock.	Long push process: - dependence on accurate Forecasting; produce to stock.	Long pull process: - demand driven; produce to order.
6. Internal processes (Figure 5.12)	Automated, modern equipment	Partially automated	Mainly manual operations	Both manually operated and automated equipment.
7. Internal Lean Practices (ILP)	Pronounced departmental activities to save time & costs: - training in time management; training in risk reduction; purchase by bidding & JIT.	Pronounced departmental activities to save time & costs: - single minute set-up philosophy; spoilage monitoring, down-time recording & analysis.	No specific activities undertaken to streamline operations in departments and realize savings (time & costs).	No specific activities undertaken to streamline operations in departments and realize savings (time & costs).
8. Strategic supplier Partnership (SSP)	Not very well developed: - large stocks of raw materials; developing local suppliers (Psi)	Not very well developed: - large stocks of raw materials; seller – buyer relationships	Not very well developed: - large stocks of raw materials; seller – buyer relationships.	Not very well developed: - use smart purchase; seller – buyer relationships.
9. Customer relationship management (CRM)	Very well developed: - good distribution network; partnership for success.	Well developed: - stocks kept close to customers; cross-functional teams; collaborative forecasting	Not well developed	Partial development: - use customer surveys; maintaining communication links.
10. Information sharing (IS)	Pronounced on the down stream side	Pronounced on the down stream side	Not pronounced, minimal	Not pronounced, minimal
11. Information Quality (IQ)	Not very clear	Not very clear	Not very clear	Not very clear
12. Postponement (PST)	Not relevant	Not relevant	Not relevant	Not relevant
13. Communication Connectivity (CC)	Partially developed: - investment in IT (e.g. SAP); use intranet & internet	Partially developed: - investment in IT; use intranet & internet	Poor: - insignificant investment in IT	Poor: - insignificant investment in IT

Table 5.26
Comparison of Aspects of Performance Measurement as Practiced in Case Study Firms

Attribute	Company			
	A (ID No. 145)	**B (ID No. 119)**	**C (ID No. 84)**	**D (ID No. 36)**
1. Performance Measurement System (PMS)	Has a formal PMS: defining procedure for choosing measures; defining responsibility for measuring performance; procedure is part of the work process; system documented in the SAP program.	Has a formal PMS: defining procedure for choosing measures; defining responsibility for measuring performance; procedure is part of the work process; system documented in the manuals as per ISO 9000.	Has no formal PMS that has been documented;	Has a formal PMS: defining procedure for choosing measures; procedure is part of the work process; system is not formally documented.
2. Uses of PMS and Measures (UPM)	Used for: setting and measuring performance goals; control resource usage; basis for reward system (annual salary increment, bonus etc); quality control of output.	Used for: setting and measuring performance goals; control resource usage; basis for reward system (annual salary increment, bonus etc); quality control of output.	Not used for setting and measuring performance goals; focuses on inputs and outputs (costs and quantities)	Used for: setting and measuring performance goals; control resource usage; partially the basis for reward system; quality control of output.
3. Essentials in the design of PMS & measures	Employees fully involved; process based; geared towards performance improvement; linked to goal development	Employees play major role; process based; geared towards performance improvement; linked to goal development	Employees not involved; created for control purposes; not linked to goal development	Employees not involved; for control purposes; not linked to goal development
4. Types of measures used	Balance – financial and non financial measures; specific measures for cross-functional teams; perception measures; outcome measures; process measures	Balance – financial and non financial measures; specific measures for cross-functional teams; perception measures; outcome measures; process measures	Mostly financial based measures; not sufficient to cover all important aspects of performance;	Mostly financial based measures; not sufficient to cover all important aspects of performance;
5. Evaluation of current practices	Measures are defined and reported consistently; set of measures in use is just appropriate; frequency of data collection and reporting is sufficient; external benchmarking often used; focus is on customer service and satisfaction.	Measures are defined and reported very consistently; set of measures in use is just appropriate; frequency of data collection and reporting is sufficient; external benchmarking rarely used; focus is on customer service and satisfaction.	Measures are defined and reported inconsistently; set of measures in use is just appropriate; frequency of data collection and reporting is insufficient; external benchmarking used sometimes; focus is on short term production performance.	Measures are defined and reported consistently; set of measures in use is just appropriate; frequency of data collection and reporting is sufficient; external benchmarking rarely used; focus is on customer service and satisfaction.

5.2.2.3 Comparison of Aspects of Performance Measures and Performance Measurement System in Case Study Firms

Three of the study firms have formal performance measurement systems that vary in advancement but well documented. Firm A has the most advanced system that uses the SAP program to run, while firm B has a partially manual system that it developed through ISO 9000 certification procedures, and firm D has a financial measures based system. Mostly the systems are used in performance goal setting and as basis for reward systems in respective firms. Firm A and firm B indicate to be using balanced sets of measures, while the other firms still focus on using financial based measures. The best performing firms define the measures they use and report consistently, in appropriate frequencies. The firms have their main focus on customer service and satisfying customers. Table 5.26 compares individual performance measurement practices as practiced by each case study firm.

5.2.2.4 Differences in the Study Practice Among Case Study Firms

The aspect of supply chain management compares 35 different items. According to Table 5.27 five items (14%) are practiced by all four companies. The practiced items include: customer satisfaction being an important factor to the company; departments are having activities to reduce waste (time and resources); departments having activities to find savings; firms striving to rationalize product offerings; and, firms striving to improve purchasing and procurement practices. Four items (11%) that require the involvement of trading partners in improving time to market and asserts utilization, as well as cycle time improvement activities and practicing activity based costing, are practiced by none of the case study firms, while 20 items (57%) are practiced only by companies A and B. There are only 14 items (30%) practiced by all four companies in the aspect of performance measurement, and 32 items (68%) in this aspect are practiced by companies A and B, only, while only 1 item (2%) is not practiced by any of the case study firms.

Regarding the evaluation of the current practices, all firms affirm to be exercising 6 (29%) of the listed practices. These include: firms having measures of moderate to high quality; information provided by the measurement set being always available; firms having goals for the measures they use; stressing on production / service dimensions of measurement; and, seeing the importance of production / service performance measurement dimensions for long term success of the firm. As in other cases, firm A and B practice more (52%) items in this aspect compared to firm C and D. On measurement processes, 30% of the listed items are practiced by all four companies, and 60% are practiced by companies A and B only.

Table 5.27
Comparison of Study Practices between Case Study Companies

Aspect	Number of Items Practiced by Company								Total No. of Items
	A, B, C & D		A & B Only		C & D Only		None		
	No	%	No	%	No	%	No	%	
Supply Chain Management	5	14	20	57	0	0	4	11	35
Performance Measurement	14	30	32	68	0	0	1	2	47
Current Practice	6	29	11	52	0	0	1	5	21
Measurement Process	3	30	6	60	0	0	0	0	10
Total	28	25	69	61	0	0	6	5	**114**

In overall terms of this analysis, it is noted that companies A and B practice 61% of the items listed, besides 25% of the items that are in practice in all the four firms, in all the aspects analyzed using the preliminary case study questionnaire. The assumption is that, the higher the number of items practiced by a company, the higher are the chances for the company to perform better. The rationale behind this assumption is the fact that the listed items cut across a number of aspects, so the chances that a firm is performing practices from many aspects is higher as the total number of practices it performs gets higher. It is observed from the responses of the questionnaire that for each of the two pairs there is no significant difference in the number of items practiced by each company within the pair. Implicitly, the differences that are observed for the four companies indicate the existence of differences between the two pairs. Thus it can be concluded that there is a significant difference in the number of items practiced by the two pairs.

5.2.2.5 Differences in the Use of Metrics among Case Study Firms

In comparing the number of metrics in use in the four companies (refer to Table 5.28), five dimensions are considered individually. For the measurement of plan performance, three measurement items (19%) are used by all four companies. These items are: total cost, total revenue, and variations against budget. Six measurement items (37%) are not used by any of the four companies, while 7 metrics (44%) are used by companies A and B, only. In the dimension of measures of source performance, none of the items are used by all four companies; three metrics (20%) are not in use in any of the firms, while 4 metrics (33%) are in use in companies A and B, only.

Table 5.28
Comparison of Different Metrics Used by Case Study Companies A, B, C, and D

Dimension	Number of Measures Used by Company								Total No. of Measures
	A, B, C & D		A & B Only		C & D Only		None		
	No	%	No	%	No	%	No	%	
Plan Performance	3	19	7	44	0	0	6	37	16
Source Performance	0	0	4	33	0	0	3	20	15
Production / Service Performance	1	9	3	27	0	0	2	18	11
Delivery Performance	1	6	10	60	0	0	2	12	17
Customer Service and Satisfaction	1	9	2	18	0	0	2	18	11
Total	6	9	26	37	0	0	15	21	**70**

In all the eleven measurement items, for the dimension of measures of production / service performance, only one metric (total production / manufacturing costs) is used by all four companies, while three metrics (27%) are in use in companies A and B, only. One measurement item (quality of delivered goods) in the dimension for measures for delivery performance is used by the four companies. Two other items are not used by all four companies, while 10 metrics (60%) are in use in companies A and B, only. Of the eleven measurement items for the dimension measures of customer service and satisfaction only one metric (number of customer complaints) is used by all four companies. Two items (budget for training in customer relationship management and level of customer perceived value) are not used by the four companies.

The same assumption used in the analysis of items practiced by the four companies is adopted in this analysis i.e., the higher the number of metrics used by the company, the higher is the possibility of performing better. The above analysis shows that there is a significant difference in the number of measurement items used by the two pairs. The good performing companies indicate to use more metrics than the poor performing companies.

5.2.2.6 An overview of the Differences among Case Study Firms

The good performing firms presented clear vision and mission statements. Their visions show a focus on achieving top positions in their areas of business in the continent. Their mission statements show a strong orientation towards building powerful companies that strive to maximize value to their key stakeholders. To achieve their missions, the firms believe in: delivering the best in customer satisfaction; producing quality; maintaining competitive edge by improving their organizations; encouraging and promoting employee entrepreneurial spirit and excellence, discipline and speedy decision making; attracting and retaining quality employees; and acting ethically in business.

On the other hand, these good performing firms affirm that they have visions that are partially shared, and goal congruency existed with their trading partners, especially on the downstream side (customer side) of the chains to which they belong. These firms are in the forefront of strengthening their relationships with their trading partners in particular those on the customer side. The firms say they do this to ensure customer satisfaction through better service is attained. The relationships that are considered important include: the development of cross-functional teams (which undertake activities such as training on customer care), marketing, joint promotions and, collaborative forecasting (as it stabilizes the business and help in production planning). On the up-stream side (supply side), the case study reveal, not much of such relationships has been fostered. Of late there have been efforts to develop local suppliers as firms realize more savings when they use local suppliers, less capital is tied on inventory as orders are in smaller batches, and lead times are shorter.

The impact of such relationships is assessed in terms of cost saving, number of customers served (for commodity products), sales volume, delivery time, quality and quantity, and, customer satisfaction. The respondents say they do such assessments since: cost saving is determined as it has a direct link to profitability, 'if other thing remain equal'; the number of customers determines the size of the business (for firms dealing in commodities) as customers are the main source of revenue; increased sales have a direct link to profitability also; while delivery time and in right quantity relates to customer satisfaction (especially to production oriented customers), leading to customer retention and more business; customer satisfaction surveys help in determining the actual needs of customers, provide the actual market situation, hence help in firms to respond appropriately to their customers and the market.

On the implementation of supply chain management practices, the interviewees from the good performing firms presented similar approaches that involve use of various supply chain management implementation tools (e.g., TQM, JIT), which basically embeds the process. For the TQM implementation, these firms adhere to the ISO 9000 certification procedures and requirements, which are mainly linked to supply chain management practices. For instance, when implementing the component of TQM that requires firms to eliminate wastage (time and resources), automatically the firms are implementing the initial stage supply chain management practices of internal lean practices. Similarly, other supply chain management practices are implemented by these firms while implementing ISO 9000 certification requirements, since the practices are embedded in the processes for the standard.

As a recap, in the ISO 9000, the focus is on the process-based management system, providing fundamentals of quality management. The quality management principles are based on customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision making, and mutual beneficial supplier relationships. Employee teams (quality cycle teams) in each firm play a major role in monitoring the implementation of the practices. For processes spanning across firms, cross-function teams perform the task. Leaders of each team play a key role in monitoring the practices.

Regarding the determination of what should be measured in terms of performance, the good performing firms provide a clearer approach as compared to the poor performing firms. The process starts from the decision on what area is the firm competing in, in other words it is guided by the competitive strategy being pursued. The decision comes from the top management (after consultations with internal and possibly external experts), then this leads to the identification of strategic objectives; which then leads to identification of key success factors. From the key success factors, action plans are developed, and key variables are identified (e.g., quality, cost, time, flexibility, safety, etc.). the identification of key variables allows for the determination of what is to be measured, points at which measurements are to be taken, the responsibility of taking the measurements, and the target results. After the decision on strategic objectives, employees are fully involved in all other processes as they are the key players in measuring performance in these firms.

According to interviewees, the reasons as to why the above approach is used in determining what should be measured include: it assures these firms of not deviating from their strategic objectives; assures the firms in maintain their competitiveness and customer focus. The process of measuring performance is performed in such a way that it is part of the job for the process owner. It is set in this way on purpose, so as to avoid disruption of the work process. Accordingly, employees play a major role in deciding the way in which measures are to be taken as they are the ones who actually do the job. Their participation in this process ensures a smooth flow of activities as the employees feel they are part of the decision making process and they own the process.

These interviewees acknowledge the importance of customer satisfaction to their firms as they believe that it is related to improvements in business performance. The firms employ various techniques in determining the level of customer satisfaction, including: customer surveys, interaction with customers, monitoring customer complaints, and, checking on under-deliveries.

5.2.2.7 Reasons for Practicing the Study Aspects for Case Study Firms

Case study firms gave reasons as to why their practices in the study aspects were conducted in the manner observed during the process of studying the firms. These are summarized in Table 5.29. The main reasons put forward by these study firms have a focus on the customer. This is in line with their (the case study firms) recognition of the customer as the key to the survival of the businesses that was observed in the earlier analyses. These firms believe by satisfying customer needs appropriately, firms stand a better chance of

Table 5.29: Summary of Reasons for the Activities Performed by Study Firms

Practice (Questionnaire Items)	Actual Firm Response	Reason for the Action/ Activity
Internal Lean Practices – ILP (A - 6, 7, 8 & 9)	Cost and time saving activities include: training on time management; training on risk reduction; practicing single minute set-up philosophy; spoilage monitoring; down-time recording and analysis; employing just in time (JIT) technique in production; and, purchasing by bidding.	Respondents believe that firms perform these activities to realize time and cost savings. For instance, the reduction in cost reflects directly into the profitability of the firm and also to the cost passed to the customers. Thus less cost for the same quality of the product implies more value to the customer. Time saving in the process of saving the customer and in the production process implies a faster product or service delivery to the customer. These results improve customer satisfaction level, and ultimately leading to more benefits to the firm.
Strategic Supplier Partnership – SSP (A – 1 to 5, 8, 9 & 11)	Supplier management activities include: developing local suppliers through Psi; use of JIT in acquiring inputs for production; and, purchase of production inputs by bidding process.	The respondents say their firms engage in developing local supplies because of the benefits realized, which include lower inventory costs. This results from the fact that when using local suppliers firms order in small batches as lead time is not an issue due to the proximity of suppliers. Another resulting benefit is that firms tie less capital in inventory, therefore reducing capital cost. The ultimate result is lower costs reflecting improved profitability for the firm.
Customer Relationship Management – CRM (A – 1 to 5, 8, 9 & 11)	Customer relationship management activities include: customer care; surveys to identify actual customer needs; development of distribution network; stock goods near the customers; create cross-functional teams for product design/ development; and, engage in collaborative forecasting activities.	Study firms believe that customers are a key to their businesses performance, so they find it important to know their customer needs better and serve them in the best possible way. Network development is performed because it allows the relevant firm to bring reliable service close to their final customers thus boosting the business. All other activities are performed to fulfill customer requests in the best possible way and in the shortest possible time. This guarantees customer satisfaction, which in turn improves customer loyalty, resulting into sustained business relationship that guarantees benefits to the relevant firm.
Information Sharing – IS (A – 10 & 11)	Activities performed by firms include: sharing information on customer needs; and, sharing information on actual market condition.	The respondents acknowledge the importance of customers to the survival of any business due to the fact that they are the ones who bring in finances for the businesses. This makes firms to pay more attention to customers by striving to know their customer needs. Sharing information in a chain serving the customer makes this task easier and guarantees the same focus in serving the customer. This is the main reason put forward by respondents as to why they find information sharing to be important to their firms.

Table 5.29: (Continued)

Practice (Case Study Questionnaire Items)	Actual Firm Response	Reason for the Action/ Activity
Performance Measurement System – PMS (B – 1 to 12, D)	Activities and issues pertaining to PMS as performed by study firms include: having a formal PMS, with documented procedures; having defined procedures for choosing measures; defining the responsibility for measuring performance; and, making the procedure for measuring performance to be part of the work process.	Study firms perform the listed activities because of the belief that proper performance measurement helps in proper management of their resources. The activities are also performed because performance measurement leads to identification of areas needing adjustments for the purpose of improving the performance of the relevant firm. Better performance leads to having high levels of customer satisfaction. Since customers bring finances to the firm, it is important to have proper customer attention.
Uses of PMS and Measures – UPM (B – 6, 8, C- 1, 2, 4, & 6)	Activities and issues pertaining to UPM as performed by study firms include: the use of the system in setting and measuring performance goals; using the system in controlling resource usage; using the system as a base for reward; and, using the system in controlling the quality of the output.	The reason for study firms to engage in the listed activities emanates from their belief that appropriately set goals leads to the realization of better performance results. In terms of rewards, employees are encouraged to perform to their capacity as they are certain of being rewarded for good performance. Fair remuneration that depends on the performance of individual employees leads to better firm performance. The proper control of resources reduces wastage, resulting into lesser costs, and ultimately improved profitability. With good quality outputs, customer satisfaction goes high, resulting into better business performance.
Essentials in Designing and Developing PMS an Measures – EDS (C – 3, 5, 8, D, & E)	Activities and issues pertaining to EDS as performed by study firms include: fully involving employees in the process of designing the PMS; making sure the design is process based; making sure the system focuses on improving performance; and, the system being linked to goal development.	Respondents believe that by involving employees in the process of developing a PMS, less resistance is encountered in cases where changes have to be implemented. They believe that employees get a better sense of responsibility and belonging to the firm, raising their morale to serve the firm. The respondents also believe that the design of a PMS that is process based helps in cases where the product has processes spanning across to other business partners. For partners having the same goal of serving their customers, it becomes easier to achieve the set goals as it is gauged under the same measures through the entire process. Involvement of employees enables firms to effect changes in the system since employees have the relevant know how in the development of the system. When these firms achieve success in serving the customers, the result is higher firm performance, which the main objective of all the practices.

improving their business performances. It is the driving force for these firms to seek savings in terms of time and costs, to engage in developing local suppliers with the aim of reduction of inventory costs and lead times, and striving to understand their customers, among other things that they practice.

Conversely, the case study firms believe that by measuring performance appropriately, they are poised to be able to manage their resources efficiently and effectively. The understanding of the essentials in developing performance measurement systems and measures is believed to enable the firms to act promptly whenever there is a need to do so, especially when it comes to getting the right measures at the right moment. These firms believe that by implementing the practices earnestly, they are poised to serve their customers in a better way, leading to better performance of the firms.

5.3 Summary

In this chapter several aspects are presented regarding the analyses of the survey data collected in the field and their corresponding results. The company profile shows that, most firms are privately owned and average 15 years in operation. The response data is seen to be normally distributed. The EFA results (after items parceling for supply chain management practices and performance measurement practices) allowed for CFA to be performed. Using the CFA results, all constructs are tested for validity and are proven to possess validity in all tested aspects. In addition, the distinctiveness of time based performance and overall firm performance, as well as the mediation role of time based performance are demonstrated. The performance measurement practices measurement instrument development has been demonstrated too.

The results of the structural model (which resulted from model re-specification) demonstrate support to five out of the six hypotheses. Also, the structural model results made it possible to develop the Performance Index used in the selection of the participating firms in the case study (multiple cases). Furthermore, the results of the qualitative part of the questionnaire shows a number of aspects, e.g. poor understanding of supply chain management practices and performance measurement practices, among the study firms. The need for training and sensitization reveal as useful ways to raise the awareness, and hence the level of practices in these firms.

The results of the case study are presented following the recommendations of Eisenhardt (1989) among others. The results show a clear difference between the good performing companies and the poor performing ones. This is demonstrated in the analysis of various comparisons. Good performers balance their measurement sets by using both financial based and non-financial based measures. Furthermore, good performing firms demonstrate that more practices, in terms of supply chain management practices and performance measurement practices, lead to exemplary performance. The results tally with results from the survey analysis. The study firms provide various reasons as to their choice of practices in supply chain management and performance measurement. The reasons focus on the fact that the customer is important to these firms; hence serving the customer properly has been the driving force to their practices.

The following chapter discusses the results and findings of the research. The chapter provides answers to answers to some of the questions posed at the beginning of the research, and also it gives the concluding remark for the entire research.

CHAPTER SIX

DISCUSSION OF THE FINDINGS

6.1 Introduction

This chapter discusses the results of the analyses (survey and case study) presented in Chapter Five. The discussion enumerates the academic, managerial as well as the practical implications of the findings of this research. The research questions posed by the researcher at the beginning of the research process are revisited and relevant answers according to the findings and other research results are put forward.

6.2 Recapitulation of Data Analysis Results

This section runs through the results of the data analysis covered in chapter five of this research report. The ANOVA results indicate a significant difference to exist in the responses of the small firms and those of the large firms. This is linked to poor financial capability inherent in SMEs that lead to poor management practices (Pissarides, 1999; McCormick et al., 1997). Large firms are able to invest in modern management techniques and practices due to their financial capability. Thus, as noted above, these results reflect findings from previous studies. The strong association between supply chain management practices and performance measurement practices (SCMP ↔ PMP) evidenced through the high and significant correlation coefficient value is supported by the existence of significant relationships between measures of the two constructs as seen in the results from the correlation analysis.

The statistical significance of the path SCMP → TBP representing hypothesis H1a confirms that supply chain management practices have a strong influence on time based performance for a firm in a supply chain. Hence for the scenario presented by the industrial sector of Tanzania, implementation of supply chain management practices may directly improve a firm's time based performance. The correlation analysis also supports this result through the indication of supply chain management practices having a significant and positive relationship with time based performance, meaning that adoption and practicing of supply chain management will usually drive the time based performance in firms. The posited direct relationship between supply chain management practices and overall firm performance (SCMP → OFP), as hypothesis H1b has not been supported in this study, leading to a conclusion that supply chain management practices in the Tanzanian industrial sector, have no significant direct effect on the overall firm performance.

The standardized coefficient of the effect of performance measurement practices on time based performance (PMP → TBP) provides support to hypothesis H2a. This indicates that performance measurement practices positively impact time based performance. This result is strongly supported by the correlation analysis results indicating that the performance measurement practices variable and its measures are significantly and positively related to time based performance and its measures. The significant direct effect (PMP → OFP) that supports hypothesis H2b confirms the direct positive impact of PMP on OFP. Results of the correlation analysis provide support to this outcome by indicating the existence of relationships between performance measurement practices and all measures of OFP. The two observations on hypotheses H2a and H2b mean that improved performance measurement practices positively influence the OFP directly and indirectly through the mediation of TBP.

Equally, the significant standardized coefficient of the direct link between time - based performance and overall firm performance (TBP → OFP), supporting hypothesis H3, shows that TBP has a direct positive influence on the OFP. This result is further substantiated by findings from correlation analysis suggesting that TBP is significantly and positively related to OFP measures, indicating that TBP as an intermediate performance plays an important role for a firm to achieve satisfactory overall performance.

Furthermore, part of the results of the case study provides evidence to the above results when the good performing firms are analyzed. There is strong evidence linking their good performance to the implementation of supply chain management practices and performance measurement practices, so corroborating the above discussed findings. The results of the general management aspects from the survey reveal several facts regarding supply chain management practices in the industrial sector of Tanzania including: the concept of supply chain management being a new phenomenon to the sector; supply chain management can be practiced in the sector; there is lack of relevant infrastructure for the practice of supply chain management; there is a lack of expertise in the area of supply chain management; a poor industrial base hinders the progress in practicing supply chain management; and, training and sensitization on supply chain management practices being seen as necessary to enhance the understanding of this important concept.

Additionally, the results from the general management aspects of the survey reveal several facts regarding the performance measurement and the corresponding practices. These include: the importance of sharing measures for the purpose of reducing operational problems in running operations involved in processes that span across organizations; the dominant measurement approach in the sector uses traditional (financial based) measures as the traditional way dominates the area of development of measures; most of the systems for measuring performance were introduced during the inception of the company; lack of skills and motivation on the part of employees are weaknesses in the development of the area; and, there is a need for deliberate steps to be taken to correct the entire approach to measurement processes and development of systems for measuring performance.

The categorization of study firms using the developed performance index indicate the poor performance group to be dominated by small and medium sized firms, while the good performers group is dominated by the large companies. This categorization refers to the industrial sector of Tanzania, so a good performing firm in this study may not be the best in the country in terms of supply chain management practices, or performance measurement practices as there may be a firm, among those who did not participate in the study, that may be doing better than the best found in this study. Also, it is important to note that even the results of the structural model do not include all practices in supply chain management and performance measurement since not all firms are in advanced levels of practice in Tanzania so the data failed to support the advanced levels of the practices.

Furthermore, results of the case study indicate the good performing firms to exercise the following in terms of supply chain management practices: have partially managed supply chain links that strive to be efficient; play the role of focal organization in the chains they belong to; are dependent on accurate forecasting (long push process); have departmental activities aimed at realizing savings (cost & time); not very well developed links with suppliers; well developed links with customers; share information with business partners on the customer side; and have reasonable investment in IT. On the other hand, the poor performing firms are far behind in implementing these practices when compared to good performing firms.

Regarding performance measurement as practiced in the case study firms, the results reveal that each of the good performers: has a formal performance measurement system with proper documentation (e.g., how to choose measures, define the responsible for the process, etc.); is using the system to set and measure performance goals, control resource usage, & use it as a basis for reward system; employees are involved in the development process of the system; the system is process based; and, it uses a balanced set of measures (financial &

non – financial based). Similarly, in this aspect the poor performing firms lag far behind in the implementation of these practices.

According to the respondents in the case study interviews, the firms perform the listed practices so as to stay competitive and maintain their focus on their customers. All practices are aiming at delivering better value to the customers, ultimately improving the firm performance. The way these firms perform the practices is much influenced by the affiliate companies' ability in supply chain management practices and performance measurement practices, or through the ISO 9000 certification requirements. On the other hand, the lack of knowledge in the two areas plays a role also in the way these practices are performed.

The next section presents discussions on the findings of this research emanating from the results presented in this section.

6.3 Discussion of the Key Research Findings

The presentation of the key findings of this research covers findings from both stages of the research. The findings provide a picture of how the study firms are conducting their operations and what makes them survive in the prevailing business environment. The importance of these findings lies in the identified actual practices, actual performance measures, and their influence on the performance of the relevant firm. It is very important to take note that the discussion in this chapter is based on the results from the good performing firms, which make about twenty five percent of the study firms, and partially the results from the average performing group that makes about fifty percent of the study firms. It has been conceived that the practices in the average performance group are not as intense as in the good performing group. The rationale behind this fact emanates from the point of generalizing results of the case study in combination with those of the survey.

6.3.1 The Positive Impact of Supply Chain Management Practices on Time Based Performance

As one of the findings of this research, supply chain management practices (SCMP) are seen to positively influence time based performance for firms in the industrial sector of Tanzania. The practices that have a strong reflection of supply chain management practices include: internal lean practices, strategic supplier partnership, customer relationship management, and information sharing. The reflection of these practices imply that their increased activity in a firm reflects an increase in the activity of supply chain management practices, which in turn increases its positive influence on time based performance in the respective firm.

According to the responses of the interviewees and observation in the field during the case study, internal lean practices, encompasses: quality programs, reduction of waste in terms of time and a focus on shorter lead times. Quality programs lead to improved quality of products, lesser re-working, lesser loss of materials, and importantly lesser lead time and cost. For instance, it was observed that when the TQM is implemented in the study firms, inspection time and cost were eliminated due to that all these activities are being performed during each production stage and process. The product spends less time in the production line, hence improving the lead time as well as the costs.

Regarding the strategic supplier partnership, the interviewees in the study firms pointed out that the process involved mainly solving problems jointly with suppliers and helping them in quality improvement. The good performing firms reported to include suppliers in product development as well as in setting goals, but only for few, dependable high quality suppliers. According to the managers, these activities improve the reliability of supplies for inputs for the production process. Improved quality of inputs guarantees to high extent the quality of the product, linking to benefits of better quality product discussed earlier. Fewer problems to suppliers guarantee smooth operations for the production firm, resulting into reliable deliveries, and lesser lead times. Including suppliers in product development prepares the supplier for new products, cutting short the preparation time, again resulting into shortened lead time. This is crucial for semi processed inputs. Dealing with few suppliers reduces administrative hustles, leading to ease in strengthening of relationships.

For the study firms, customer relationship management mainly focuses on customer satisfaction, thus the main activities include follow-up feedback on quality, determination of future customer needs, evaluation of customer need and the relationship, evaluation of customer complaints, and, facilitation of assistance seeking. According to the interviewees, the main outcome from these activities is the better understanding of customer needs, which helps firms in delivering appropriate products to their customers. These activities also lead to a better understanding of actual market condition, thus enabling the firms to respond promptly and in time to the changing market conditions. Furthermore, the interviewees point out that early understanding of changes in customer needs allows their firms to make timely and proper adjustments in terms of facilities, inputs and organizational set-ups required in serving the customer, hence enhancing flexibility.

Customer satisfaction is a key to business success as seen in the case study whereby all firms acknowledge the importance of customer satisfaction to their businesses, it is evident that the good performing firms have created stronger and closer relationships with their customers. This is affirmed by the interviewees who believe that the relationship results in enhanced customer satisfaction as the firms know the needs and wants of their customers clearly and timely thus serving their customers properly. These firms take extra efforts to survey their customers, which helps the firms in obtaining a better understanding of what the customers want.

From the study, it has been observed that information sharing touches many parts in any business. For instance the managers of the study firms observed that, when a firm is informed of anticipated changes in the supplier's facility, it is capable of adjusting itself accordingly and on time, thus avoiding disruption of its services or reducing significantly the impact of the changes by taking appropriate and timely action. Also the managers of these firms saw that information from the customer side is very helpful in production planning, while sharing some key information (e.g. point sales data) improves the visibility of the chain, thus reducing negative impacts of lack of information such as the bull-whip effect. In all actions, the final aim, according to the interviewees, is to achieve customer satisfaction and ultimately improving performance of their firms and ultimately the performance of the chains to which they belong.

Supply chain management being practiced in Tanzania is a result of several external forces including: requirements from parent company (for affiliate companies of big multinational companies) and requirements from key customers (mostly multinational companies) through ISO 9000 certification. On the other hand, large firms (local) that are affiliated with multinational companies know the benefits of supply chain management practices, so they take initiatives to develop local suppliers. The initiative benefits both players. It is not clear on the firms that started practicing, due to direct effects of the globalized business environment. What is important to be noted here is the fact that only items that make up the early stages of supply chain management practices as per categorization by Poirier and Quinn (2003) are feature in supporting the relationship.

Clear mission statement with clearly defines goals that are congruent with those of trading partners is a characteristic of good performance firms n Tanzania. The case study firms believe that strong relationships among trading partners enhance appropriate delivery of goods and services to customers, and also leads to the realization of savings, in terms of costs and time for the firms, in addition to having smooth operations that lead to enhanced profitability. This fact, which has been revealed by the case study results, is in line with other studies (e.g., Li et al. 2006), who found that such practices have positive impact on firm performance.

The finding also shows a similar outcome as previous studies in terms of the relationship between supply chain management practices and time based performance. The support provided by the significant regression weights of customer relationship management items, internal lean practices items, strategic supplier partnership, and information sharing are fully in line with findings from previous studies in influencing time based performance (e.g., Tan et al., 1999; Rooney, 2002; Droge et al., 2004). Also Li et al. (2004) substantiate the bottom – line impacts of supply chain management practices to be confirmed by real world examples, when they cited Sheridan (1998) who reports in a survey that found that organizations, that were best at supply chain management, held a higher advantage in their cash-to-cash cycle time over average organizations, and the top organizations carried lesser inventory than their competitors.

Better organizational performance has also been reported to be linked to supplier relationship and customer relation practices (De Toni and Nassimbeni, 2000). Other examples, include lower total costs, higher-order fulfillment rates, shorter-order cycle times, making dependable deliveries, and introduction of products to market quickly result from high level of information sharing (Lin et al., 2002; Jarrell, 1998); with increased customer responsiveness and satisfaction (Powel et al., 2001), and reduced time to market (Ragatz et al., 1997) are linked with strategic supplier partnership.

To conclude on this finding, firms wanting to excel above their competitors in the time based performance, need to practice earnestly the identified supply chain management practices identified in the study.

6.3.2 The Positive Impact of Supply Chain Management Practices on Overall Firm Performance

This relationship has not been supported by the research results consequently showing that supply chain management practices have no direct impact on overall firm performance. This kind of relationship may have resulted from the fact that practicing supply chain management demand substantial time and financial investment in the implementation process. Also it is factual that supply chain management may fail to produce short term results, particularly in terms in of financial performance, as the cost of implementing supply chain management practices may override the potential benefit that could be expected from it. These facts were pointed out by the managers of the study firms.

Also it is worth noting that, OFP is measured in overall terms such as market share and return on investment. These measures are of general nature (financial and market oriented measures). This, points to the fact that there are many other variables, which may be economic or managerial oriented, that impact on performance. Therefore, this might be another reason as to the failed direct relationship between SCMP and OFP. If the SCMP is measured in a few of the firm's relationships, it will be difficult to establish a relationship between SCMP and OFP.

The above results corroborate results from a study by Wisner (2003) who found similar results when studying the relationship between supplier management strategy and firm performance; and between customer relationship strategy and firm performance. The supplier management strategy and customer relationship strategy are embedded in the supply chain management practices in the current study. Similarly, Vickery et al. (2003) failed to find a significant direct relationship between supply chain integration and firm performance. Therefore, it can be concluded that supply chain management practices in the Tanzanian industrial sector, have no significant direct effect on the overall firm performance. Only indirect effect through time based performance is noted to be significant.

On the contrary, these results defy what many authors (Lin et al., 2006; 2002; Powel, 2001; Stanley and Wisner, 2001; Shin et al., 2000; Carr and Person, 1999; Lamming, 1996; Stuart, 1993) found in the past, including: supply chain management practices having a direct impact on the overall financial and marketing performance of an organization; increased market share, improved return on investment, improved financial performance, as well as improved overall competitive position, being reported to result from supply chain management practices. This may have emanated from the nature of the samples that were studied, the origin of the samples, and levels of development of the economies, among many other things.

6.3.3 The Positive Impact of Performance Measurement Practices on Time based Performance

This finding indicate that performance measurement practices, reflected by strong indications from the first order constructs performance measurement systems, uses of performance measurement, and, essentials of measurement system design, have a positive influence on the time based performance. The reflection implies that when there is an increased activity of the listed measures in a firm, it is anticipated that there will be an increase in the performance measurement practices, and consequently an increased influence on time based performance.

The interviewees pointed out that by defining the ownership of measuring performance, firms tie the responsibility to the relevant employees. This makes the employee more sensible by knowing that the task belongs to no one else than him / her. Furthermore, the interviewees believe that proper approaches and full participation in the decisions on the measures, the employee will have a sense of belonging to the firm and perform the task willingly resulting into accurate measures being taken. The analysis of these data guides as to what appropriate actions should the firm take to improve its performance. In line with this, the measurement process is geared towards continuous improvement, so correctness of the measurements also enhances this focus.

The interviewees also reported that the use of perception measures allows firms to get actual information regarding the perception of customers on the product. With timely and appropriate actions taken, the firm stands a better chance of satisfying the customers accordingly. So these measures allow the firm to be responsive. On the other hand, the interviewees believe that outcome measures and process measures allow their firms to focus on the defined specification and quality aspects of the product. The financial measures complement the other types of measures in monitoring the performance financially. The defined frequency for taking the measures allows for timely responses in terms of taking corrective actions.

Moreover, the interviewees pointed out the fact that by using a suitable system of measuring performance (i.e., whose development has fully involved employees) in the firm, it allows for standards to be introduced in the firms as employees have confidence in the system used in setting the performance standards. The standards guarantee the achievement of goals as confidence on the part of employees is raised due to the fact that they are part of the whole process of developing the standards. This leads to the realization of better performance results. In line with this, basing the reward system on the performance of individuals, leads to better performance results as employees will not feel any unfairness in the treatment since they will be assessed according to the set performance standards using agreed performance measures. This encourages employees to deliver more as they are certain of being rewarded accordingly. In turn this leads to better performance results.

Furthermore, the interviewees reported that their firms use the results from performance measurement to make decisions regarding the progress of the activities in the firm, determining relevant amounts of inputs, identification of areas needing adjustments for the purpose of realizing savings, improving quality of products, and in clarifying objectives. These activities are geared towards improving the performance of the relevant firm.

The above discussion suggests that up and down flexibility, time to market, design and delivery dependability (among other things) are the appropriate targets for organizations in excelling above their competitors in terms of time based performance, and ultimately the performance of their supply chains. Firms have to be flexible to changes in customer needs as well as supplier performance, achieve lower time to market in terms of products, and, have dependable delivery systems for higher performances. In overall performance, better output financially, and better market performance are key to the ultimate firm performance.

6.3.4 The Positive Impact of Performance Measurement Practices on Overall Firm Performance

The good performing firms have shown how firms value and practice the performance measurement to enhance their performance in Tanzania. This has been revealed by interviewees by acknowledgement that appropriate uses of performance measures are reflected as good contributors to performance. Extending the belief, they see that firms with a clear understanding on the uses of performance measures and performance measurement systems have better results in their organizational performance. Furthermore, performance is linked to appropriate considerations during the design of performance measurement systems as demonstrated through the strong indication of the performance measurement construct by essentials in performance measurement design and consequently the impact of performance measurement practices through time based performance and overall firm performance.

The goals of supply chain performance measure types include achieving high levels of efficiency (resource), high levels of customer service (output), and the ability to respond to a changing environment (flexibility) (Beamon, 1999). Efficient resource management is critical to profitability, while without acceptable output, customers will turn to other supply chains. In an uncertain environment, supply chains must be able to respond to change. All these aspects are made possible by using appropriate measures that allow for positive improvements in all categories of performance.

The measures for the good performing firms emanates from the agreed strategy so they are be aligned to firm strategy as suggested by Monczka and Morgan (2000). This guarantees the achievement of strategic objectives. The use of balanced measures (perception and objective) is important as these measures have made it possible for the firms to get timely information (lagging, as well as current) that enabled the firms to make timely and appropriate adjustments in their operations. These changes are performed to steer the firm to better performance. Proper combination of metrics has helped these firms in performing proper planning and control of production operations, in setting objectives, evaluating performance, and determining future courses of action as suggested by Gunasekaran et al. (2004). Appropriate performance measurement systems lead to better margins (Morgan, 2004).

The importance of the knowledge on how to design and develop measures and performance measurement system suitable for a firm, need to be underscored as this allows for timely reviews of the measures and performance measurement system, hence allowing for appropriate corrective action to be taken on time. All efforts discussed above i.e., all efforts of measuring performance, facilitating the process through the development of measures, as well as understanding the appropriate use of different measures results in improving performance.

6.3.5 The Mediation Role of Time Based Performance and its Impact on Overall Firm Performance

Another finding in this study indicates that time based performance mediates two relationships: one, it fully mediates the relationship between supply chain management practices and overall firm performance; two, it mediates partially the relationship between performance measurement practices and overall firm performance. The importance of the mediation effect of time based performance is brought to light, as noted; supply chain management practices have no significant direct effect on overall firm performance. In exercising supply chain management practices, firms need to take note of this mediating effect of time based performance.

The mediation role of time based performance is also supported by the results of the correlation analysis. In particular, this result suggests that the direct effect of performance measurement practices on overall firm performance is lower in strength compared to that between time based performance and overall firm performance. What can be inferred from this is that time based performance increases the impact of performance measurement practices because of its higher effect on overall firm performance compared to the direct effect of performance measurement practices on overall firm performance. It is important to take note and understand that, when organizations want to pursue market performance, or financial performance, in the pure sense that includes characteristics of being a market leader, and being the industry leader in performance, performance measurement practices and time based performance in themselves, would not suffice in realizing these objectives, consequently, organizations would need to complement performance measurement practices and time based performance with other resources.

Conversely, time based performance fully mediates the relationship between supply chain management practices and overall firm performance. This result suggests that for a firm to realize the positive effects of supply chain management practices, only through the mediation of time based performance can this be achieved. The strong effect of supply chain management practices on time based performance indicates the potential that exists on improvement of overall firm performance by improving time based performance through supply chain management practices. The link between time based performance and overall firm performance is observed to be lower than that between supply chain management practices and time based performance. This may suggest that firms that target to improve their overall firm performance need to realize that supply chain management practices alone do not suffice in achieving this objective. Firms need to employ other resources to fully reach the objective of excelling in the market as well as in the industry.

The above two observations are not to be seen as so peculiar as several authors (e.g., Li et al., 2005), point out the fact that a firm's overall performance depends on a multitude of factors, so managers need to identify such factors and take them into consideration in pursuing excellence in their firms' performances. Also literature posits that time based performance allows firms to identify and eliminate non-value adding activities and subsequently strengthens product quality and delivery, thereby providing a foundation for sales growth (Rosenzweig, 2003). Consequently, time based performance, through flexibility, enhances the ability of the firm to accommodate seasonal demands, poor supplier performance, poor production performance, poor delivery performance, new products, new markets and new competitors (Beamon, 1999). The result are reduced number of backorders, lost sales, number of late orders, and increased customer satisfaction. This in turn, with appropriate costs, improves revenue, as well as resource utilization.

The fact is also partially supported in the findings of the study by Droge et al. (2004) where it was seen that the intermediate performance (time based performance), improved the performance of the firm by the impact from integration practices that are part of supply chain management practices. The fact that time based performance has a positive impact on the financial and market performance is of uttermost importance, since the variable has interacting effects on the direct relationships between supply chain management practices and performance measurement practices.

6.3.6 The Association between Supply Chain Management Practices and Performance Measurement Practices

As one of the findings, a high correlation between supply chain management practices and performance measurement practice in supply chain firms is indicated as seen in the results of the structural model. This indicates that supply chain management needs specific practices in terms of performance measurement aspect. In the perspective of supply chain and supply chain management, Chan and Qi (2003a) and Holmberg (2000) state that performance measurement takes a holistic system perspective beyond company boundaries. As observed in the good performing firms, this is made possible by the use of process based measures, which in turn, lead to a continuous improvement in the firms and consequently the supply chains to which they belong. Supply chain members need to have congruence in their goals and share metrics, so as to achieve the highest levels of customer service. The sharing of metrics among chain members is a link to the association of the two sets of practices (supply chain management practices and performance measurement practices).

In respect to the above, it is concluded that some metrics encourage the practice of supply chain management (e.g., measures spanning several organizations), and also some supply chain management practices encourage improved performance measurement practices (e.g., measures have to be aligned to strategy, in supply chain management a common strategy is encouraged for supply chain members, this results in the use of common measures, improving performance measurement practices). As posited by the theory, these results have been able to demonstrate the need for the Tanzanian industrial sector to incorporate specific characteristics, or performance measurement practices in measuring their performance and that of the chains.

It is worth noting that the significant association between supply chain management practices and performance measurement practices has a strong influence on overall firm performance besides the direct effect from performance measurement practices and the indirect effects through time based performance outcomes. The association implies for managers that while there is performance impact of implementing either supply chain management practices or performance measurement practices, it may be better to proceed simultaneously, rather than sequentially in implementing these practices.

The results of this study in both stages point out the fact that development of measures and performance measurement systems is not well practiced in the Tanzanian industrial sector. This finding is reflected in the response on how the firms develop their measures and the kind of measures they use where still firms focus on the use of financial based measures, although the survey reveals that few firms use balanced sets of measures (financial based and non-financial) in measuring their performance. The results show that the use of standard procedures as outlined in standards manuals (e.g. ISO 9000) is the only concrete procedure for developing measures/ performance measurement systems for firms that use balanced sets of measures. It is also revealed that the sharing of measures (as one of the practices in supply chain management) across trading partners is good in smothering operations and understanding the best way these partners can save their common customers.

From the above discussion the results of the quantitative analysis of survey data revealing the existence of the association of the performance measurement practices and supply chain management practices is further corroborated in this finding by the fact that the low development of supply chain management practices has a link to the low development of performance measurement practices. Further evidence on this finding is derived from the correlation analysis results, where the supply chain management practices variable is shown to have a significant and positive relationship with the performance measurement practices variable. This means that adoption performance measurement practices in firms in supply chains, is driven by supply chain management and the related practices. This result is substantiated by findings suggesting that both supply chain management practices and performance measurement practices individually are significantly and positively related to measures of each other (first order latent variables), indicating that supply chain management can be employed as a catalyst of implementing appropriate performance measurement practices, which in turn will fuel further practicing of supply chain management practices.

Supply chain management and performance measurement are practical in developing economies as demonstrated by their positive impacts on the time based performance and overall firm performance. It is definite that firms with low to medium indications have the opportunity to improve their performance as it is possible to engage in the practices that have been proven to work positively in enhancing performance. The poor and medium performing firms have shown the ability to prevail in such turbulent business environment indicating that the opportunity for improvement exists. For the firms that are in the high category, this is not the end of story, since their position at high levels of performance is relative to the medium and poor performers of Tanzania. The high performers still have the opportunity to further their performances upwards; they need to further strengthen their technological bases and management skills as modern technology, IT, and new management skills have proven to be necessities in the practices for better performance.

6.3.7 General Findings

In this sub-section, other findings are presented. These findings bear some important outcomes that play great roles in operations of the study firms in the aspects of supply chain management practices and performance measurement practices. These are issues that can also be treated as lessons from the study.

Through field observations, it was seen that the use of modern technology in production and use of appropriate IT provides an upper hand in competition, as seen in the difference in performance of the case study firms. When comparison is performed between the good performing firms and the poor performing ones, it is noted that the good performing firms are ahead, in terms of production technology and investment in information technology. These two facts are observed to be helping the good performing firms in the sustenance of their competitive strategy as they perfect their operations. Firms need to adopt and implement these aspects among others for continued survival in the current turbulent business environment.

On the other hand, social responsibilities implemented by firms enhance their image to the society where the firms are operating. This has been demonstrated by the two good performing firms through their various activities directed towards the societies where they operate. This approach is one way of seeking to satisfy stake holders who are not direct customers of the firms, and maintaining the good will of its customers.

In the study, the good performing firms are seen to conduct their operations with some focus on stakeholders internally and externally. This is demonstrated in two ways. First, internally firms involve and empower employees in decision making processes.

According to managers of the study firms, this improves the sense of responsibility on the part of employees and raises the sense of ownership of processes, leading to employees to willingly release their full potential in performing their jobs. Accordingly, the managers say that, externally, the participation of third parties in some operations of the firms (e.g. participation in product design, provision of services, forecasting) allows the firm to gain advantage in its production activities such as shorter lead times in new product development. Also, this allows the firm to focus on core activities, resulting in higher productivity, hence higher performance.

Furthermore, the discussed findings reflect differing levels of practicing supply chain management practices and performance measurement practices among study firms. The high performance firms recognize the importance of continuous improvement and act to implement the concept. The fact of incorporating the performance measurement system with other systems that are already in existence in firms is acknowledged as necessary for better results. The lack of appropriate knowledge is seen as a hindrance to supply chain management practices and performance measurement practices.

Moreover, these firms indicate to have ways of validating their performance measurement data; they acknowledge the importance of having measures spanning and benefiting the whole chain, though it is not often so in actual practice; measures used in all firms reflect the prevailing business conditions, but at varying levels of satisfaction to users, mainly depending on the objectives of use; use of external benchmarking is characteristic of the good performing firms; and the dimension of source performance is still lagging behind in its practice in all firms as demonstrated by the poor development of the upstream linkages of study firms. Plans for future inclusion of other measures, which are not in use, demonstrate the way forward for good performance firms in terms of developing the use of performance measurement systems.

The implementation of supply chain management practices and performance measurement practices is in its early stages (according to categorization by Poirier and Quinn, 2003) and the initiatives for the two practices are not fully recognized in Tanzania. The low level of application of some of the information and communication technologies and insufficient skills should be the main concerns for the government, academic and professional institutions, as well as for senior and middle management. Supply chain management involves suppliers, manufacturers, distributors, retailers and customers. Establishing trustworthy relationships among all supply chain partners is the most important factor that leads to sharing accurate information and to earnestly practice supply chain management. The earnest practicing of supply chain management must be accompanied by appropriate performance measurement practices. This combination of practices, among other things, ultimately drives chain members to excellent performance.

The next section presents the answers to research questions as found in the research.

6.4 Re-Addressing the Research Questions

The presentation in this section provides answers to the research questions that were posed by the researcher at the initial stage of this study. As seen in the earlier, i.e., during the process of designing this research, five research questions were posed by the researcher. The questions have been used to guide the study process. This section revisits the questions and furnishes answers with elaborations according to the findings of the research. The main research questions posed are: (A) How is supply chain management being practiced and how is performance measured in supply chains of Tanzania; (B) Why are performance measures used the way they are, in supply chains of Tanzania; and (C) What is the impact of supply chain management practices and performance measurement practices on time based performance and overall firm performance. The five specific research questions posed are:

RQ1 What are the supply chain management practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector?

RQ2 What are the performance measurement practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector?

RQ3 How is time based performance related to overall firm performance of firms belonging to the chains in the industrial sector of Tanzania?

RQ4: How are supply chain management practices and performance measurement practices linked in firms belonging to supply chains in the industrial sector of Tanzania?

RQ5: Why is supply chain management and performance measurement being practiced, the way that it is in the firms, in the industrial sector of Tanzania?

RQ6: Are there any similarities, or differences in practices on supply chain management and performance measurement between the industrial sector of Tanzania and the good performers in developed countries' supply chains?

The question, what are the supply chain management practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector (RQ1) can be answered using both the survey findings and the case study findings. The identified supply chain management practices used in Tanzanian firms have been identified in the survey to include: internal lean practices; strategic supplier partnership; customer relationship management; and information sharing (identified measures are as presented in Appendix 12 part A). These practices are found to have a direct positive impact on time based performance, but no direct impact on the overall firm performance. In the case study results, it is found out that firms practicing the listed practices have good performance results as noted in the good performing firms studied. The practices are implemented through the use of supply chain management implementation tools such as TQM and JIT, involving employee groups in monitoring the actual practicing. In the course of implementing processes and procedures for these tools, supply chain management practices are implemented as part of the tools.

Accordingly, it was observed that the whole implementation process of supply chain management practices is apparent in both stages of the research. Delving deeper into the case study results, it is seen that the entire implementation process of supply chain management entails the internal set-ups of each organization and their roles in implementing the practices. As observed in the good performing firms, the participation of all employees is paramount to the implementation of supply chain management practices. The management also has its important roles (e.g. strategic decisions regarding the practices) and more importantly its sincere support to the process of implementation of the practices.

Through the interviewees and field observation, it was revealed that the process basically starts from the decision of the management, the area that the firm wants to compete. This leads to a string of chain reactions that can be implemented through the strategy deployment tools such as the TQM system. The decisions are dependent on the pursued competitive strategy. In case of high performing firms of Tanzania, their decisions are mainly a result of requirements from their major customers, or parent companies, or due to changes in the business environment. For example, some impositions require firms to be certified under the ISO 9000 series. The ISO 9000 involves the TQM system in its implementation. The TQM system uses quality management principles that, to a great extent, engulf supply chain management practices (i.e., customer focus, leadership, involvement of people (employees), system approach, continual improvement, factual approach, and mutual beneficial supplier relationship). For these firms, the ISO 9000 certification obliges them to practice supply chain management.

The TQM system clearly states through its outline of quality management principles the importance of all players (customers, leadership, employees) in the chain during its implementation. This is coupled with the establishment of clear structures within the firm that allows for the practices to be implemented. Employee teams, groups, or committees are used in monitoring the practices internally, while process managers, for processes that spill into other firms are the key players after the cross-function teams. So, the implementation process, for the set of practices, has owners who are responsible for monitoring the implementation. The clearly established reporting system (diagnostic control) in these firms, in conjunction with the interactive feedback system (interactive control) appraises the management to what is taking place in the firm.

The survey has been able to identify the best practices for supply chain management to include measurement items in internal lean practices, strategic supplier partnership, customer relationship management, and, information sharing (details in Appendix 12), indicating that Tanzanian firms acknowledge practicing these practices, be it fully or partially. The case study results also support this fact as in the supply chain management practices section; it is revealed by the good performing firms that they practice the majority of the listed supply chain management practices. The implementation process varies from one firm to another depending on the circumstances that made the particular firm engage in the practices. There are firms that practice following the ISO 9000 certification requirements; there are those firms which practice due to engagement with Psi; and, there are those firms that practice following parent company requirements.

Conversely, the low performing firms do not feature in the above explanation as the majority of them are still managed the old way where employee empowerment is seen as not a good practice, as demonstrated by these firms' responses in the case study. The practicing of supply chain management in these firms is not as clear as in the good performing firms. The few practices that one can observe being practiced by these firms are literary impositions from top management downwards to the workers on the shop floor. The effect is always minimal as evidenced by these firms' results in the case analysis. Implicitly, the level of supply chain management practices is not significant.

The impact of supply chain management practices on firm performance is clearly observed in the survey quantitative analysis results where it has been demonstrated that supply chain management practices impact overall firm performance in a positive way, through time based performance. This is further supported by the results of the case study analysis, where it is seen that the firms that engage in more supply chain management practices are poised to have better performances, as demonstrated by the two good performing firms.

Furthermore, on what are the performance measurement practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector (RQ2), can also be answered using findings from both the survey findings and the case study findings. The performance measurement practices identified in the survey findings include: performance measurement system; uses of performance measures and performance measurement systems; and, essentials in developing and designing performance measures and performance measurement systems (relevant measures identified are found in Appendix 12 part B). These practices are strongly reflected in the findings of the case study whereby good performing firms show that practicing these practices results into better firm performance.

The implementation process of these practices is embedded in the work procedures and it involves the measuring of processes that are linked to key variables and action plans. The strong link that exists between supply chain management practices and performance measurement practices has a major influence on the way performance is measured in firms belonging to supply chains in Tanzania's industrial sector. It is obvious, for the good performing firms, that the decision to implement supply chain management practices has to link with appropriate ways of measuring performance, starting with the decision on the strategy to be pursued by the firm, which is normally decided by the management, followed by charting of the strategic objectives that lead to key success factors, action plans, identification of key variables, measures, and setting targets. In this case, employee participation from the point of choosing measures, the way to be used in collecting and presenting measurement data, assessment of the measures, and, the whole process of reviewing performance measurement is necessary.

Through interviews and field observation, it became apparent also that since measuring performance is part of the work process, process owners are responsible for the measures, the measurement process and the review of these measures. As in the implementation of supply chain management practices, various employee teams play important roles in the process of measuring performance and monitoring its implementation in the firms. Again, the management control systems are useful in reporting the outcomes. The way it is performed in the good performing firms demonstrates the positive impact that performance measurement practices of the firms, in a supply chain, can have on performance of a firm.

Subsequently, the impact of performance measurement practices on the firm performance has been demonstrated by the results of the survey, where it is seen that performance measurement practices impact positively the overall firm performance, as well as having an indirect positive impact through the mediation effect of time based performance. Performance measurement practices seen to have more impact on these results include measure of performance measurement system and performance measures, uses of performance measurement system and performance measures, and, essentials for the design and development of performance measurement system and performance measures (details in Appendix 12 part B). The case study results, also supports, this fact of performance measurement practices having a positive impact on performance (time based and overall) as noted, the good performing firms acknowledge practicing majority of the practices related to performance measurement practices, evidenced in the results of the case study analysis. The poor performing firms indicate practicing much fewer of the performance measurement practices practiced by the good performing firms in this research.

The question on the relationship of time based performance and overall firm performance (RQ3), the results from the survey data analysis shows that time based performance has a positive influence on the overall firm performance. Besides this relationship, time based performance is shown to have a full mediation effect between the relationship of supply chain management practices and overall firm performance, as well as a partial mediation effect on the relationship between performance measurement practices and overall firm performance.

On the question of the link between supply chain management practices and performance measurement practices (RQ4), the survey analysis results demonstrate the existence of a strong association between the two aspects. This fact has been supported by the results of the case study analysis, where the good performing firms practice a high percentage of the supply chain management practices, as well as performance measurement practices; there is a linkage between the two sets of practices. The poor performing firms indicate practicing fewer items in both sets of practices.

Answering the question, why is supply chain management and performance measurement being practiced in the way that it is, for the firms in the industrial sector of Tanzania (RQ5) involves both analyses (survey and case study) since this has a direct relationship to the type of measures in use. Through interviews and field observation, it was revealed that in the process of implementing, or developing a performance measurement system, firms identify key success factors, followed by action plans and key variables. These give clear indications as to the kinds of measures to be used, so as to achieve their set targets. The high performing firms measure the processes that are linked to the key variables and action plans. The reason for measuring these processes is to see how the firms fare, in terms of achieving the set objectives, or goals, which can be benchmarks as well.

In many cases the high performing firms indicate the use of both leading and lagging measures, as these allow the firms to have timely reviews of their performance and take corrective actions, whenever it is deemed necessary. In poor performing firms, the focus is in measuring inputs and outputs because of the focus on financial performance only. They mainly use quantitative financial based measures, which are lagging measures, giving historical data. Thus, it can be deduced that performance measurement in study firms is practiced in the way it is, because firms believe the approaches lead to achieving their set targets.

As to what contributes to the way the measurements are being performed, the answer comes from the business environment perspective. Interviewees from firms that perform well, responded by stating that their firms undertake their measurement processes for the purpose of sustaining competitiveness, or remaining competitive in the current dynamic business environment. Competitive pressures have increased tremendously in this globalized business environment. This entails firms to look at various fronts of competition (e.g., quality, customer satisfaction, price, etc.) and to ensure that they are competitive in those aspects. To achieve this, the firms need more than the traditional way of measuring performance, hence this makes firms to measure performance the way they are now doing as evidenced in the case study analysis results.

For the poor performing firms, it is their focus to financial output that drives them to the way they measure their performances. Perhaps failure to acknowledge the dynamism of the current business environment has made them stick to their old ways. As results from the management aspects part of the survey show, knowledge of performance measurement and performance measurement systems is poor in the industrial sector of Tanzania, it leads one to point this out as one of the reasons for the study firms to perform their performance measurement in the way reported in this research.

On similarities or differences between Tanzanian firms and the good performers in other supply chains (RQ6), one can say the difference exists, in terms of measures used in measuring performance. In the Tanzanian industrial sector fewer measures are seen to be in use due to the level of supply chain management practices that the firms are found to be practicing. The level of practices is lower when compared to good performing chains, especially in developed economies. Developed economies are referred to, since the measures and practices used in this research originate from the developed countries. As noted earlier the level of technological development in Tanzania widens the gap, in terms of measurement practices between the firms in Tanzania and the good performers in the developed counties. Also the good performers of Tanzania are not at the same level of the good performers as found in developed economies, as the level of development of Tanzanian firms is still low as demonstrated by the results of this research and the findings, and similarities in the items that are practiced, since both kinds of supply chains (from Tanzania and from the developed economies) practice the same way, but at different levels.

After answering the research questions, Table 6.1 presents a summary of the above discussion as linked to the research objectives, hypotheses, and findings of this research. Furthermore, Table 6.2 summarizes the linkages between the research questions, findings in terms of the survey results and case study results in relation to the theoretical and practical implications.

Table 6.1
Research Questions, Objectives, and Hypotheses Revisited

Research Question	Objective	Hypothesis	Finding
1. What are the supply chain management practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector?	1. To identify and study supply chain management practices being used by firms in supply chains of the industrial sector of Tanzania and determine their relationship to time based performance and overall firm performance of these firms.	1a. There is a direct positive impact of supply chain management practices (SCMP) on time based performance (TBP). 1b. There is a direct positive impact of supply chain management practices (SCMP) on overall firm performance (OFP).	1. - SCMP used in Tanzania have been identified to include practices in ILP, SSP, CRM, and IS. They are implemented through the use of supply chain management implementation tools such as TQM and JIT; involving employee groups in monitoring the actual practicing. - SCMP is observed to have a direct positive impact on TBP, but no direct influence on OFP.
2. What are the performance measurement practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector?	2. To identify and study performance measurement practices being used by firms in supply chains of the industrial sector of Tanzania and determine their relationship to time based performance and overall firm performance of these firms.	2a. There is a direct positive impact of performance measurement practices (PMP) on time based performance (TBP). 2b. There is a direct positive impact of performance measurement practices (PMP) on overall firm performance (OFP).	2. – PMP used in Tanzania have been identified to include practices in PMS, UPM, and EDS. These practices mainly involve the measuring of processes that are linked to key variables and action plans. - The practices are implemented with a close link to SCMP whereby employee teams monitor the performance measurement implementation process; management control systems are used in reporting outcomes. - PMP has direct positive impacts to both TBP and OFP.
3. How is time based performance related to overall firm performance of firms belonging to the chains in the industrial sector of Tanzania?	3. To study the nature of the relationship between time based performance and overall firm performance.	3. There is a direct positive impact of time based performance (TBP) on overall firm performance (OFP).	3. - TBP has a positive impact on OFP. - It fully mediates the relationship between SCMP and OFP. - It partially mediates the relationship between PMP and OFP.

Table 6.1: (Research Questions, Objectives, and Hypotheses Revisited – continued)

Research Question	Objective	Hypothesis	Finding
4. How are supply chain management practices and performance measurement practices linked in firms belonging to supply chains in the industrial sector of Tanzania?	4. To understand the relationship between supply chain management practices and performance measurement practices in firms belonging to supply chains in the industrial sector of Tanzania.	4. There is an association between supply chain management practices (SCMP) and performance measurement practices (PMP).	4. SCMP and PMP are positively correlated. SCMP influence the choice of measures; and PMP for SCM encourage implementation of SCMP.
5. Why is supply chain management and performance measurement being practiced in the way that it is, for the firms in the industrial sector of Tanzania?	5. To understand the causes for implementing supply chain management practices and performance measurement practices, in firms belonging to supply chains in Tanzania's industrial sector.		5. The basic reason for practicing is to remain competitive in the market. Influence on the practice comes from various sources: - Good performers have been induced by: affiliate companies (multinationals); international customers who impose conditions like certification in ISO 9000; or, realization of savings (cost & time) by developing local suppliers. - Poor performers are still indulged in the traditional ways because they lack expertise in the areas of developing measures and performance measurement systems. They also do not embrace SCM as they are still focusing on local optimization, and lack expertise on its implementation.
6. Are there any similarities or differences in practices on supply chain management and performance measurement between the industrial sector of Tanzania and the good performers in developed countries' supply chains?	6. To understand the difference, if it exists, between practices in supply chain management and performance measurement in firms belonging to supply chains in Tanzania's industrial sector versus the ones in developed economies.		6. Practicing of SCM and PM is similar except that the level differs as the developed countries' practitioners are more advanced; they have the relevant infrastructure and expertise as compared to practitioners in developing countries such as Tanzania.

Table 6.2
Linking Research Questions, Findings, and Implications

Research Question	Literature Review	Research Finding		Implication	
		Survey	Case Study	Theoretical	Practical
1. What are the supply chain management practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector?	1. Literature identifies practices in ILP, SSP, IS, CRM, IQ, PST, and CC to be among important SCMP for firms in a supply chain. The practices have shown to have positive impacts on TBP and OFP.	1. SCMP used in Tanzania have been identified to include practices in ILP, SSP, CRM, and IS. SCMP is observed to have a direct positive impact on TBP, but no direct influence on OFP.	1. Firms practicing SCMP indicated to have good performance as seen in the cases of good performing firms. These firms indicated to be implementing more of these practices as compared to poor performing firms.	1. The identified SCMP and their corresponding items can be used in advancing the study on SCMP in environments similar to the Tanzanian environment, and enable comparative studies with other environments to be carried out.	1. Under the studied environment, firms need to embrace the identified SCMP for them to excel in their time based performance for the purpose of achieving better firm performance.
2. What are the performance measurement practices used by Tanzanian firms and what is the impact of these practices on the performance of firms belonging to a supply chain in the industrial sector?	2. Literature identifies practices in PMS, UPM, and EDS to be among important PMP for firms in a supply chain. The practices have shown to have positive impacts on TBP and OFP.	2. PMP used in Tanzania have been identified to include practices in PMS, UPM, and EDS. PMP has been observed to have direct positive impacts to both TBP and OFP. Further to these impacts, PMP has an indirect impact to OFP through TBP.	2. Firms practicing PMP indicated to have good performance as seen in the cases of good performing firms. These firms indicated to be implementing more of these practices as compared to poor performing firms.	2. The identified PMP and their corresponding items can be used in advancing the study on PMP pertaining to SCs in environments similar to that of Tanzanian, and enable comparative studies with other environments to be carried out.	2. Under the studied environment, firms need to embrace the identified PMP for them to excel in both TBP and OFP, and ultimately to excel in their OFP.
3. How is time based performance related to overall firm performance of firms belonging to the chains in the industrial sector of Tanzania?	3. Literature identifies TBP to include: DDO, TTM, UDF, and CCT. It allows for identification of non value adding activities, enhances the ability to accommodate seasonal demands, new markets, ultimately improving revenue and resource utilization.	3. TBP has a direct positive impact on OFP, it fully mediates the relationship between SCMP and OFP, and it partially mediates the relationship between PMP and OFP.	3. The good performing firms indicated to have dependable delivery and order fulfillment, as well as faster time to market and high flexibility in customer orders. These are linked to better OFP.	3. The understanding of the mediation effects of TBP on the links between SCMP and PMP to OFP is of uttermost importance as it enables the interacting effects of TBP on the direct relationships between SCMP and PMP to OFP to be studied.	4. The full mediation effect on SCMP and OFP means that for firms to realize the positive effects of SCMP on OFP, it is only through TBP that it can be realized. TBP has a magnifying effect on PMP through its mediation effect as noted in the survey results.

Table 6.2: (Linking Research Questions, Findings, and Implications - continued)

Research Question	Literature Review	Research Finding		Implication	
		Survey	Case Study	Theoretical	Practical
4. How are supply chain management practices and performance measurement practices linked in firms belonging to supply chains in the industrial sector of Tanzania?	4. Literature shows that the practicing of SCM leads to a requirement of specific practices in terms of PM since different entities in a SC chain need to be gauged as one (nature of SCs).	4. The findings show a strong significant positive association to exist between SCMP and PMP.	4. Firms that indicated to practice SCMP are the ones also that indicated to practice PMP. These firms are the ones that revealed to have good performance.	4. The understanding of the association between SCMP and PMP will help in understanding the important interactions among these variables and how best they can be combined to realize better TBP and OFP.	4. The association has a strong influence on OFP besides the direct effect from PMP and the indirect effects through TBP. It implies that, while there is an impact in practicing either SCMP or PMP, it is better to proceed simultaneously rather than sequentially.
5. Why is supply chain management and performance measurement being practiced in the way that it is, for the firms in the industrial sector of Tanzania?	5. The literature has identified various practices in terms of SCMP and PMP. Also the driving forces to the implementation of the practices have been pointed out in relevant literatures.	5. The best practices in SCMP and PMP are identified with their corresponding measurement items.	5. Firms practice SCM and PM to remain competitive. Good performers are influenced by affiliate multinationals, customer requirements to ISO standards, or to realize savings. Poor performers lack the skills.	5. The identification of the reasons for practicing SCMP and PMP widens the understanding of the logic behind the implementation of the practices by firms. Also the needed skills can be studied and imparted to the firms.	5. Firms can embark on implementing the practices through various approaches, the direct one being through ISO certification. The necessary skills for the implementation of the practices can be identified and improved.
6. Are there any similarities or differences in practices on supply chain management and performance measurement between the industrial sector of Tanzania and the good performers in developed countries' supply chains?	6. The relevant literature is based on practices implemented in developed economies where the microeconomic conditions and infrastructural capabilities are better than those in developing economies.	6. The identified good practices in both variables originate from literatures from the developed countries. This indicated the existence of similarities in the practices.	6. Firms indicate to implement practices that are identified from literatures referring to SCs from the developed economies. Similarities exist.	6. Constructs used in developed economies can be employed to study the practices in developing economies. But this should be performed with uttermost caution as the implementation conditions differ.	6. Implementation of the practices adopted from developed economies should not be wholesale. Implementers need to consider the actual environment and conditions that they face before embarking on implementing the practices.

Key: SCM – supply chain management; SCMP – supply chain management practices; PM – performance measurement; PMP – performance measurement practices; TBP – time based performance; OFP – overall firm performance; ILP – internal lean practices; SSP – strategic supplier partnership; IS – information sharing; CRM – customer relationship management; PMS – performance measurement system; UPM – uses of performance measures/ measurement system; EDS – essentials performance measurement system design; TTM – time to market; DDO – delivery dependability; UDF – up and down flexibility; FPO – financial performance – output; FPR – financial performance – resources; MP – market performance; TQM – total quality management; JIT – just in time.

6.5 Summary

In this chapter, the research findings have been discussed. It is seen that the positive impact of supply chain management practices on time based performance results from efforts by study firms to: realize cost savings; time saving (reduction in lead time); maintaining the quality of products through total quality management; cooperating closely with suppliers; knowing customer needs and serving them accordingly. The lack of direct influence of supply chain management practices on overall firm performance is believed to result from the fact that supply chain management practices require investment in time and resources, which may erode the immediate positive results of the practices on overall firm performance.

On the other hand, performance measurement practices are seen to impact time based performance and overall firm performance in a positive way due to the fact that it allows for timely reviews and institution of corrective measures. Also time based performance is seen to mediate the relationship between supply chain management practices (full mediation) and overall firm performance, and that between performance measurement practices and overall firm performance (partial mediation) due to the fact that the improved firm's capability in flexibility, delivery dependability, and time to market improves customer satisfaction, resulting into improved business performance. The strong association between supply chain management practices and performance measurement practices emanates from the fact that the nature of supply chain management practices requires specific measures in monitoring them, while also some performance measurement practices encourage the practicing of supply chain management in firms.

It has been noted that supply chain management is practiced following supply chain management implementation tools such as JIT and TQM, while performance measurement practices implementation follows the strategic objectives; and is implemented as part of the work process. Lack of expertise and poor industrial base have been pointed out to be hindrances to the actual practice of these two sets of practices in Tanzanian firms.

In the next chapter, the conclusion and recommendations emanating from the research are discussed.

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

This chapter presents the conclusion that result from the entire process of conducting this research. Furthermore, the chapter discusses the limitations encountered during the research process, and areas for future research in the subject are presented, as well as recommendations to practitioners, academicians, and other stake holders, regarding the studied practices are offered. In the next section, the limitations are discussed.

7.2 Limitations

In the course of conducting this research, several limitations are observed by the researcher. The limitations stem from various aspects including within the research process itself and outside the process. In the following paragraphs, these limitations are discussed.

The first limitation is the small sample size, which is the result of difficulties in getting respondents answer the study questionnaire. Despite all the techniques used by the researcher from the design aspects to follow-ups, the response was low compared to total requirements of the analysis technique. Because of this limitation it was not possible to carry out the re-validation process of the constructs. The limitation extends to the other processes of analysis, for instance, the confirmatory factor analysis (CFA), whereby under normal circumstances, the recommendation is to have it performed together among all study variables.

Under the conditions faced by this research, the option was to use other approaches, including analyzing constructs individually (as recommended by Moorman, 1995; Atuahene-

Gima and Evangelista, 2000; Chen and Paulraj, 2004) and parceling of items (as recommended by Bagozzi and Dholakia, 2006; Nguyen and Barrett, 2006; Hair et al., 2006; Chisholm and Ricci, 1998; Bagozzi and Foxall, 1996; Bagozzi and Heatherton, 1994) for the purpose of achieving the analysis requirements, while maintaining the meaningful number of study items, as well as achieving reliable results. In line with this limitation, it was not possible to test the final model to ascertain the results obtained so far. It would have been of great benefit to test the model for each group of firm performance individually (e.g. poor performers and good performers).

Furthermore, the responses from some categories of industries were very minimal, leaving the manufacturing sector to dominate the research in terms of number of respondents. Also some of the required information especially on the categories of employees was not availed by most respondents. These facts limit the analysis and generalizability of the results. It is a shortfall in this research.

Supply chain management practices and performance measurement practices, as well as time based performance and overall firm performance, have a lot more items that can be used to study the practices. This study chose a few facets to be used in studying the concepts because of the technical limitations that could be faced if the number of study items were further increased. Different combinations of study items could have been used to study these concepts for the purpose of securing a clearer understanding of the relationships that exists between the study variables and the consolidation of the earlier findings by other researchers. This situation is seen as another limitation by the researcher.

According to various authors including Li et al. (2006) supply chain management practices may become influenced by a firm’s size, a firm’s position in the supply chain, the length of the chain, the operating environment (e.g. macro-economic conditions), among other contextual factors. Due to the length of the study, the researcher has not taken into consideration the above mentioned factors, which may prove to have some influence to results of this study. For example, firms with different sizes have different financial capabilities, which in turn can influence the implementation of the practices. Also, varieties of products have different influences on the practices. Because these facts are not in the study, the results of this study face a limitation concerning their implications.

The study has not considered other relationships among variables, such as the recursive links and direct links from first order variables of one second order variable to other second and first order study variables. This is seen as a limitation since there may be some significant influences that can be deduced from such relationships e.g. a firm with substantial amount of profits is prone to re-invest more in the practices. This may have limited the explanations on the relationships, especially the causal ones.

The study considered and assessed practices in one firm in a chain, while in actual practice a supply chain consists of several firms. It may be possible for the results from this one firm to be more focused to it than other members of the chain. Another fact is that one firm may belong to several chains, depending on the number of products, or services that it is involved in providing. Thus, a firm may have varying levels of practices among the chains it belongs to. This brings difficulties in assessing the firm properly and the chains also. This fact may have affected the responses of respondents, hence the results.

The part of the questionnaire asking respondents to compare their firm practices to industry standard proved to be problematic to many respondents. The real huddle comes from the fact that the study has considered firms of varying sizes and differing sub-sectors. It may prove difficult to choose which industry standard is to be used especially in terms of different firm sizes. This is a hindrance in one way or other in terms of continued use of the questionnaire to study the same variables as in this research.

After the presentation of the limitations faced by the researcher, a discussion on the direction for future research is presented, in the next section, and the presentation identifies what the researcher proposes to be the subjects of focus when doing research in this area.

7.3 Suggestions for Future Research

As noted in research results from the survey and the case study, several issues arose as drawbacks in the study, which have been presented earlier in the previous section. These limitations can be addressed in future research work that may focus on studying the relationships among variables used in this research, as well as in related areas of research. Rectifying the shortfalls addressed in this research will be of value to future research work. These suggestions are presented in the following paragraphs.

Earlier on it was stated that, re-validation of the model and the constructs was not performed due to the sample size limitation; this researcher suggests that future research works in this area should use different data sets to re-validate the model and constructs used in this study. On the other hand, although this limitation has been faced by a reasonable number of researchers in operations management, future studies should strive, whenever possible, to collect large enough samples of data to allow for full analyses to be conducted within one study. This will permit the avoidance of using special techniques such as item parceling as seen in this research.

This study perceives that the entire industrial sector of Tanzania has firms that have homogeneous operating features, but in reality, different sub-sectors faces with different operating conditions within the same environment due to various reasons that may include the type of products, or services they offer; or the technology in use for the production processes, and its level; etc. There is a need for the replication of this study on the basis of sub-sector by sub-sector to identify the best practices for each sub-sector. This may prove useful in accelerating the development of individual sub-sectors in the industrial sectors of countries, like Tanzania, where resources are found to differ far from one sub-sector to another.

The introduction of supply chain management practices and performance measurement practices in a firm definitely touches other practices that may be in existence in the firm. Also, the introduction of these two sets of practices is bound to be coupled with an appropriate performance measurement system that matches the practices. This is poised to attract research attention in firms for the purpose of avoiding clashes and possible duplications of efforts within one firm. So, the researcher suggests that firms introducing these practices should align and prepare themselves to do such studies for smooth operations.

There is a great need to study other links between the study variables as this research has not been able to consider all the possible relationships that may exist among the variables. The links that have been ignored are those creating a recursive model from the non-recursive one used in this study. For example, it is possible that increased financial performance may have a positive impact on the practices of supply chain management and performance measurement. Therefore, a study of such links is poised to add more value to the results of this research work.

Further research also needs to be carried out in the area of modern technology usage and IT, as these are identified as important elements to appropriately practice supply chain management and performance measurement. This kind of research should be geared towards ascertaining the kind of technology that is appropriate for use, the level of the technology and its appropriateness in the industrial sector, such as Tanzania (e.g., assessing the introduction of automation in mechanical production, while there is abundant skilled and cheap labor, if it would it be a viable option).

This study has been conducted at a point in time, which means it will not suffice in analyses that are longitudinal. Thus, there is a need for longitudinal research in this line of variables to be undertaken in the future. This will help in analyzing issues, like the evolution of supply chains in industrial sectors of countries, like Tanzania. Understanding the pace at which the evolution is taking place is important, especially to policy makers and regulators of industrial development activities.

A dire need exists for researchers in this area of study to come to a consensus on the definitions of supply chain, supply chain management and performance. The different definitions that are found in different literatures have varying meanings that depend on the focus of the author. Therefore, it becomes difficult for one to make the best choice of a definition, due to the diversity of the definitions that exist. Subsequently, this researcher puts forward an appeal to other players in this area of study that common efforts be exercised to have universally accepted definitions for practical and academic / research purposes for such important terms.

In line with the above appeal, the researcher suggests that concerted efforts be made by researchers, at least to come up with a framework that will guide practitioners on how to start practicing supply chain management practices and the related performance measurement practices, from scratch. This is due to the fact that each supply chain is unique, so it not an easy task to have a "one fits all" solution in terms of performance measurement system. In doing so, firms should be trained in the development of measures and performance measurement systems suitable for individual needs.

Lastly, but no least, for future studies to be able to use the questionnaire without hassles, there is a need for researchers intending to do so to clarify the standards that need to be referred by each industry under their study.

After the presentation of suggestions on areas for future research, what can be concluded from the research is put forward in the next section.

7.4 Conclusion

This research has been able to study the nature and processes of supply chains in the industrial sector of Tanzania. The relationships between supply chain management practices and performance measurement practices to firm performance (time based or overall) in supply chains found in the Tanzanian industrial sector have been examined. What constitutes good performance in the context of Tanzanian industry sector and the existence of the opportunity for firms to improve their performances has been highlighted.

The majority of these chains are not managed, while some are monitored. It may be concluded that most supply chains in Tanzania are communicative in nature, dominated by non-important linkages. Their performance is not to the level of managed supply chains. This is not a peculiar result of poor practicing of supply chain management in most of the firms in the study. There is no effective use of modern technology and information technology in all the firms, except for a handful of good performing firms. Different supply chain management practices have been observed to be influencing different kinds of performance in the study firms. These practices should be taken to represent the best practices, in terms of supply chain management practices in the Tanzanian industrial sector, hence be used by firms to focus on particular areas of performance.

In terms of performance measurement, in firms in the supply chains found in the Tanzanian industrial sector, it is seen that the majority of these firms do not use appropriate performance measurement systems in measuring their performance and that of the chains to which they belong. Most are still glued to using financial based measures. The few good performing firms demonstrate the use of balanced sets of measures leading to their good performance. Many firms demonstrate less understanding of the process of developing measures which forces them to adhere to the traditional financial based measures. In some cases, the firms practice different aspects from what they advocate. A good example of this is the indication of understanding the usefulness of having measures spanning across the firms in a supply chain, but still, the majority of these firms have measures specific for their individual operations.

The research has proposed, developed, and validated a multi-dimensional, operational measure of the construct performance measurement practices, hence providing a useful tool for evaluating the comprehensiveness of researchers' and practitioners' of current supply chain related performance measurement practices. Through the analysis of the relationship of performance measurement practices and supply chain management practices, it has been shown that the two constructs are highly associated. Also, through the analysis of the relationship of performance measurement practices and firm performance it has been demonstrated that performance measurement practices may directly impact firm performance (financial and market performance) or indirectly through the interaction of the intermediate firm performance (time based performance). These results verify the importance of performance measurement practices in the supply chain management perspective.

On the other hand, from the results of this study it can be deduced that, firms need not view or evaluate their supply chain management practices or performance measurement practices independently. Instead a system approach should be used, wherein firms recognize for instance, that performance measurement and performance measurement system, as well as their intended use, depend on the practices being performed in terms of supply chain management, and they, in their persuasion, influence supply chain management practices. Moreover, measures for supply chain management practices influence the kind of performance measurement system and the corresponding measures that has to be used in a firm. Thus, for managers who are involved in supply chain management and performance measurement, this study offers a clear conceptualization of the two practices in that performance measurement practices is part of an important implementation process that is necessary in practicing supply chain management practices, as both, positively impact time base4d performance, which in turn influences overall firm performance.

Furthermore, managers should be constantly mindful of the finding that appropriate supply chain management practices and performance measurement practices pay off as they influence firm performance as demonstrated by this study. The few good performing firms demonstrate positive impacts of both supply chain management practices and performance measurement practices on time based performance and overall firm performance. The performances are clearly distinct between the firms that embrace these practices (supply chain management and performance measurement practices) and those who do not embrace the practices. As noted earlier, this study has attempted to increase the understanding of supply chain management and its related performance measurement, to provide useful insights to managers seeking to improve performance in their firms as well as that of the chains they belong to. Thus, the results of this study can make a good addition to in-house management training material on supply chain management and performance measurement. The identification of specific practices and their impact on performance paves a way for firms to focus their attention on specific areas for the betterment of their performances. This will allow for the efficient use of resources in these firms.

The completion of the presentation of the conclusion as derived from the research gives room for recommendations also arrived from the research are presented in the next section.

7.5 Recommendations

This section puts forward suggestions on issues related to the promotion and development of the supply chain management practices and performance measurement practices. These suggestions need to be scrutinized by various stake holders in the industrial sector of Tanzania, including the central government (through the Ministry of Industry, Trade and Marketing (MITM); Industrial support organizations (SIDO, TIRDO, CAMARTEC, and TEMDO), industrial promotion bodies (Confederation of Tanzania Industries (CTI); Tanzania Chamber of Commerce, Industry, and Agriculture (TCCIA)), United Nation Bodies (UNIDO), and the Tanzanian industrialists.

Tanzania is moving from a centralized economy regime to an open market economy. This is a very significant change that is taking place so fast in an economy that is small like Tanzania's. The research results and findings show how firms are having difficulties in copping with these changes, being imperative now that the government, through various players, should introduce deliberate moves to promote supply chain management practices and performance measurement practices in the industrial sector. The moves should not start at the industry level only, but should start from the roots by introducing subjects related to the two practices in schools, colleges, and universities that train the workforce, which is absorbed into the industrial sector. This exercise cannot be avoided, as every part of the globe is trying to embrace supply chain management.

In the developed economies, this may not be seen as the task of the government. It should be noted that in countries, like Tanzania, the infrastructure is not much developed to allow for industries to compete fairly. By this fact, even specialized training is not conducted in training institutions, as these institutions are still not sufficiently developed. Therefore, deliberate efforts need to be put in place to rescue the industrial sector in the mentioned practices. By promoting education in these aspects, it will guarantee the availability of expertise in these aspects; hence promote the practices in the industrial sector of the country. The issue of underdeveloped infrastructure extends to other physical structures, such as roads and telecommunication facilities. Besides increasing efforts in the development of the said infrastructure, the government needs to give special priority to the development of the information highway that may boost the application of IT in the country. The research has shown the importance of IT in the promotion of supply chain management and performance measurement practices, thus by developing the IT infrastructure there will be an increase in the possibility of firms embracing supply chain management and its related performance measurement practices.

The previously stated recommendations take a long time in their implementation. For short term steps, the government can introduce policy incentives that may attract industrialists to promote supply chain management practices and performance measurement practices in the industrial sector of Tanzania. One example of such incentive can be tax waivers on expenditure on training in the areas of supply chain management and performance measurement. Also, as an example, firms that promote supply chain management practices in the industrial sector of Tanzania be given tax waivers for costs incurred in the process of promoting local suppliers. This has to be implemented in conjunction with CTI and TCCIA in order to ascertain the actual practices in the field.

Many of the respondents suggest the introduction of a central body to oversee the promotion of supply chain management. This body can be similar to supply chain management organizations found in the developed economies, whereby these organizations are run by industries and they help in the promotion of supply chain management. The Tanzanian industrial sector is still small and not very strong. The government can take the initiative to start a supply chain management organization in the country and fund its operations in the early years of its inception. As time progresses, firms will see the importance of this organization and eventually it will be transferred to industrial promotion organizations for financing. Such an approach was used for the introduction of some of the industrial promotion organizations for different sub-sectors.

Finally, it should be noted that the concepts of supply chain management practices and performance measurement practices, are strategic in nature, and thus, the scales in this study are not intended to provide a detailed activity list for implementing supply chain management practices and performance measurement practices for a day-to-day operation at operational level. This implies that, it will be more beneficial if the managers take the initiative by being creative and come up with specific, everyday activities that fit in the strategic level implementation of supply chain management practices and performance measurement practices.

To close the research report, it is worth reproducing a quotation found in Ibrahim (2002) that says:

If you don't measure results, you can't tell success from failure
If you can't see success, you can't reward it
If you can't reward success, you're probably rewarding failure
If you can't see success, you can't learn from it
If you can't recognize failure, you can't correct it
(Osborne, D and Gaebler, T).

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