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INFORMATION CONTENT

AND

INTERRELATIONSHIPS

OF

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SINAN SULIEMAN ABBADI

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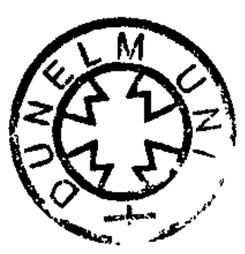
DOCTOR OF PHILOSOPHY

DURHAM BUSINESS SCHOOL

DURHAM UNIVERSITY

1 2 OCT 2009

SEPTEMBER 2009



With special appreciation, to my wonderful parents; for their unending support, tireless prayers, and ongoing encouragement!!

ABSTRACT

Academic and practitioners have recently shown great interest in the use of non-financial performance measures in management control, internal and external reporting, and compensation plans. This interest is often due to the belief that these measures have the ability to capture, in timely way, aspects of managerial behaviour and activity that have an impact on firms' long-term financial performance, and that; as a result, these measures are leading indicators of future financial performance. If these assumptions are true, these measures can be used to forecast future performance, and can, as a result, aid decisions that rely on such forecasts. Such measures can also be used to help managers focus on the long-term impact of their decisions. However, little empirical evidence is available on the nature of the relationship between non-financial measures and financial performance, and even less evidence is available on the links between the nonfinancial measures themselves on one hand and the financial performance on the other to understand the interrelationships among these measures and how do they interlink with each other. Understanding this relationship is important to enable managers to know when, where, and how to intervene to guide their organisations toward their favourable goals. This research uses multiple generic non-financial measures within the airline industry to tackle these issues.

The first empirical part of this research uses multiple regression econometrics models to investigate the information content of these measures; specifically, it investigates whether these multiple non-financial performance measures have incremental and/or relative information content beyond that provided by the financial measures to explain or predict current and future financial performance.

The results indicate that several non-financial measures have incremental information content beyond that provided by the financial measures both for explaining contemporaneous financial performance and for predicting future financial performance. However, they also demonstrate that non-financial measures do not have relative information content in comparison with financial performance measures. In other words, non-financial performance measures have additional information content to that of past accounting figures, but they do not offer any more information than financial measures.

The second empirical part of the research uses structural equation modelling to investigate the links between the non-financial metrics and financial performance in an attempt to understand the interplay between these different performance indicators.

Structural equation model analyses reveal that the relationships between non-financial metrics and financial performance are indirect rather than direct, mediated by other non-financial aspects of performance. The results also show that dynamic models fit the data better than static models, and that the model which provides the best fit assumes a one quarter lag between changes in non-financial measures and financial outcomes. Finally, the results suggest that the relationships between measures are complex rather than simple, best described as logical-final and interdependent rather than causal. These are important insights about the way non-financial measures interrelate and interact to affect current and future financial performance.

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Due acknowledgment must always be made of any material contained in, or derived from, this thesis.

Acknowledgments

I am learning all the time. The tombstone will be my diploma (Eartha Kitt)

I would like to express my sincere gratitude and heartfelt thanks to my supervisors, Professor Rob Dixon and Mrs. Anne Woodhead, for their guidance and support throughout my doctoral training. They nurtured my curiosity, and constantly expected greater things from me and helped me to produce them. This PhD would not have been possible without their patient guidance. I cannot thank them enough.

I am thankful to my examiners, Professor John Cullen and Dr. Aly Salama, for their valuable time and inestimable comments which gave the final shape to this thesis.

I would also like to thank the faculty members and students of Durham Business School for their help and support during my doctoral studies. A special thanks to the doctoral office team, Jane Charlton, Patricia Linford, Kate Brennan, and Anne Bailey, and to the Business School Library staff, Colin Theakston and Debra Corner for their kind assistance, nice company and continuous support for the last three years.

Thanks are also due to several of my relatives and friends: to Professor Shtaywy S. Abdalla, Dr. Abdel Nasser Abbadi and Dr. Majdi Zriegat, for their encouragement and support; and to Murya Habbash and Shadia Hamida, for sharing me my ups and downs!!

Lastly, I wish to thank my family and friends for their unending love, encouragement and support.

Sinan Abbadi

September, 2009

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List of Abbreviations

AAA	American Accounting Association
ABC	Activity Based Costing
ABEPS	Abnormal Earnings Per Share
AIC	Akaike's Information Criteria
AICPA	American Institute of Certified Public Accountants
ASM	Available Seat Miles
BIC	Bayesian Information Criterion
BSC	Balanced Scorecard
CAM	Computer aided manufacturing process
CASH	Operating Cash-Flows
CBI	The Cap Gemini Ernst & Young Centre for Business Innovation
CEO	Chief Executive Officer
CIM	Computer Integrated Manufacturing
COST	Operating Expenses
CS	Customer Satisfaction
CSTS	Cross-Sectional Time–Series
CU	Airline Unit Cost
EPS	Earnings Per Share
ET	Employee Training
EVA	Economic Value Added
FAE	Fixed Assets Efficiency
FMS	Flexible Manufacturing Systems

GFI	Goodness of Fit Index
IOMA	The Institute Of Management And Administration
JIT	Just In Time production
KLIC	Kullback-Leibler's Information Criterion
KPIs	Key Performance Indicators
LE	Labour Efficiency
LF	Load factor
LR	Likelihood Ratio
MS	Market Share
NFM	Non-Financial Measure
OLS	Ordinary Least Squares Regression
PCA	Principal Component Analysis
Q-Q plots	Quantiles Normal probability plots
REV	Operating Revenue
ROA	Return On Assets
ROI	Return On Investment
RPM	Revenue Passenger Miles
RU	Airline Unit Revenue
SEM	Structural Equation Modelling
TQM	Total Quality Management

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Chapter One

Introduction and Overview

"If we picture a company as a living organism, say a tree, then half of the mass or more of that tree is underground in the root system. And whereas the flavour of the fruit and the colour of the leaves provides evidence of how healthy that tree is right now, understanding what is going on in the roots is a far more effective way to learn how healthy that tree will be in years to come"(Edvinson and Malone, 1997, p.10)

1.1 Research background

The value relevance of performance measurement has been a subject of much debate in recent academic and professional literature. Value relevance studies typically assume that there is a statistical association between financial figures and the current stock prices, due to a belief that financial figures are good indicators of future earnings, and that efficient financial markets will reflect this hypothetical relationship in current stock prices and returns. As a result, value relevance studies tend to focus on the ability of particular variables to explain contemporaneous stock returns, typically examining the predictive value of Generally Accepted Accounting Principles (GAAP) or International Financial Reporting Standards (IFRS) figures in the field of financial accounting and reporting such as earnings, book values, or cash flows among other financial statements figures. They tend to focus on incremental information content at the expense of the no less crucial relative information content. Because of this oversight, the relevance of these studies and of the inferences drawn from them for different purposes e.g. standard settings and evaluation is often questionable (see, for example, Holthausen et al., 2001; Barth et al., 2002).

Otley (2008, p. 236) calls for comprehensive thinking about performance measurement systems to broaden current understanding of the way information is used in the context of performance measurement. Specifically, he states that "management accounting is only one part, and a possibly diminishing part, of the ways in which we need to think about designing and using information and performance management systems for organisational control". This research uses two concepts of value relevance - incremental and relative information content - taken from the field of financial accounting to examine the information content of multiple financial and non-financial measures of performance for the purposes of management accounting control systems, that is, for performance evaluation.

The argument that high-quality operational actions will produce better financial performance because financial performance is a coherent consequence for rational managerial behaviour is often found in management accounting literature (Ittner and Larcker, 1998). Consequently, non-financial measures of performance (i.e. operational) may provide incremental and/or relative information content which may help explain future financial performance, stock return, and stock prices. Since non-financial metrics can capture the actions which create value, (Norton and Kaplan, 1996; 2001), this ought to (assuming an efficient financial market) be reflected in stock returns and prices.

1.2 Motivation and Objectives of the Study

Despite the literature's emphasis on the value of non-financial measures of performance for the purposes of evaluation, rewarding, planning and control, very few studies have investigated the value relevance of such non-GAAP performance measures (e.g. Amir and Lev, 1996; Itnner and Larcker; 1998; Najar and Rajan, 2001; and Riley et el. 2003). Numerous previous studies have examined whether non-financial measures such as market

penetration, customer satisfaction, web traffic measures for internet companies, and patents are leading indicators of future financial performance (Anderson, 1994; Amir and Lev, 1996; Anderson et al., 1997; Ittner and Larcker, 1998; Najar and Rajan, 2001; Lidetka, 2002; Riley et al, 2003; Widener, 2006). However, these studies tend to disregard the multi-dimensional nature of organisational performance, investigating only a small number of measures, rather than taking a holistic view of performance as Kaplan and Norton (1996, 2001) amongst others, recommend. As a result, they overlook the complex interactions between different perspectives on organisational performance. Ittner and Larcker (2001, p.372-373) confirm this, arguing that "in particular, the studies *(examining the value relevance of non-financial performance measures)* examine only one of many potential non-financial value drivers, and ignore interactions with other potential value drivers. These limitations can result in misleading inferences if non-financial measures are highly correlated (i.e., correlated omitted variable bias), or if different non-financial value drivers are complements or substitutes". Previous studies also fail to differentiate between incremental and relative information content, as Biddle et al. (1995) recommend. This research seeks to fill the gap left by these earlier studies by investigating the information content and the interactions of multiple financial and non-financial measures of performance.

The literature has identified many difficulties in handling performance measures. Roos and Roos (1997) point out several: first, the difficulty of selecting the right measures from an unlimited number of possible measures; second, the difficulty of identifying the relative importance of different measures; third, the difficulty of ensuring the accuracy and reliability of performance measures; and finally, difficulty of errors and noise in performance measures which may render them irrelevant to the measurement problem.

Hemmer (1996) suggests that different measures might be ranked according to their quality, and weighted accordingly when used in the evaluation and rewarding of managers. Most of the problems listed by Roos and Roos (1997) might be addressed by ranking measures according to their quality of informativeness by means of assessing their incremental and relative information content. The first empirical part of this research (chapter five) deals with these research problems by utilising concepts of relative and incremental information content to test how useful and informative different financial and non-financial performance measures are for explaining current financial performance and predicting future financial performance. Multiple non-financial measures of performance are tested to ascertain whether they offer incremental and/or relative information content beyond that provided by financial performance measures.

The unique contribution of this study is in its introduction of incremental and relative information tests to non-financial measurement of performance field whilst acknowledging the multidimensional nature of performance. It tests the incremental and relative information content of multiple non-financial measures and also investigates the interrelationships and interactions between different dimensions of organisational performance. Use of a lag search allows for an examination of the persistence of the value relevance of different performance measures, in response to Ittner and Larcker's (1997) claim that the value relevance of performance measures changes over time. Therefore, the first empirical part of this research seeks to address three questions. First, do non-financial measures of performance provide incremental information beyond that provided by lagged financial measures to explain current financial performance? Second, do non-financial measures of performance provide incremental information beyond that provided by current financial measures to predict future financial performance? Third, is the information about a firm's performance provided by non-

financial measures more valuable than that provided by financial measures? In other words, do non-financial measures offer relative information content compared to that offered by traditional accounting measures for evaluating firms' performance?

Kaplan and Norton (1996, p.15) state, "The emphasis on cause and effect in constructing a balanced scorecard introduces dynamic systems thinking. It enables individuals in various parts of an organisation to understand how pieces fit together, how their role influences others, and eventually the entire organisation". They also argue that scorecards are underpinned implicitly by causal relationships stemming from an organisation's corporate strategy, which makes assumptions about issues such as the time lag between cause and effect (response time), and the extent to which measures affect each other. For example, how long does it take before improvements in customer satisfaction lead to improvements in sales? To what extent do improvements in customer satisfaction affect sales? Kaplan and Norton assert that hypothesis testing can establish the validity of such assumptions as they call for quantification of relationships between measures in different perspectives of the balanced scorecard in terms of the time lag between cause and effect, and magnitude in the form of hypothesis testing. However, despite the large number of studies in the area of performance measurement these claims have been overlooked. Banker et al. (2000, p. 90) state: "we believe it will be fruitful to direct future research to enhancing our understanding of this complex interplay between knowledge of links between nonfinancial and financial measures, structure of incentive plans, and performance". Also, Marr et al. (2004, p. 318) also assert "we believe that efficient management of organisational assets is impossible without understanding the interrelationships and interdependencies of such assets".

The second empirical part of this research (chapter 6) contributes to the debate about the static/dynamic nature of the balanced scorecard, utilising the structural equation modelling

technique to test five competing models and to investigate the interrelationships among the multiple measures of generic performance measurement framework. The first model tested, static fully mediated model, assumes a static framework in which measures of organisational learning and growth are the drivers of measures of internal business processes, which in turn drive measures of the customer perspective, which subsequently drive financial measures, and it is assumed that all of these impacts occur simultaneously, with changes in one measure immediately affecting all other measures on the basis that some efforts will affect outcomes immediately. The second model, dynamic fully mediated model, assumes a dynamic Balanced Scorecard with a one quarter lag between changes in non-financial perspectives and their impact on the financial perspective. The third model, chronological-dynamic fully mediated model, assumes chronological relationships between measures in each perspective, with a one quarter lag between each perspective and the next i.e. the measures of organisational learning and growth at quarter (t) are the drivers of the measures of the internal business processes at quarter (t+1); which in turn the drivers of the measures of the customer perspective at quarter (t+2), while these measures are the drivers of the financial measures at quarter (t+3). The fourth model, dynamic partially mediated model, represents a complicated interaction by a partially mediated model which assumes that measures within the lower rank perspectives affect measures in all other perspectives, not only in the subsequent perspective. Finally, the fifth model, direct relations model, assumes direct rather than indirect relationships between measures in the different non-financial perspectives and measures of financial performance.

Structural Equation Modelling suggests interesting conclusions about the interactions between non-financial perspectives of performance and contemporaneous and future financial outcomes. The results of these tests are subsequently used to address four additional research

questions: first, how non-financial measures are related to each other and to financial measures; second, whether relatively simple relations or more complex relations between measures appear to be more consistent with the data; third, whether dynamic or static measurement models better fit the data; and fourth, whether non-financial measures are directly associated with financial performance, or mediated by other measures of performance in the same or in other performance perspectives. However, bec ause performance measurement (and management) is, by its nature, is multifaceted, dealing with multiple complexly related factors, constraints of time and data availability means that this research is by no means comprehensive neither in the measures of performance it surveys nor in the possible permutations of relationship between them. Nevertheless, it is hoped that this thesis provides a useful contribution towards greater understanding of the issues it tackles.

1.3 Key Contributions of this Study

Despite the large number of arguments in both academic and practitioner research in favour of the use of non-financial measures of performance in management control systems, internal and external financial reporting, and managers' rewards, very little empirical evidence is available on the relationship between financial and non-financial measures of performance. Furthermore, there is a lack of research into the information content of financial and non-financial measures of performance, specifically as to which measures contain more information, have greater predictive value, and are better indicators of future performance. This study seeks to contribute to this area capitalising on the availability of published data on the airline industry in the United States to investigate the relationship between current non-financial performance measures and contemporaneous financial performance as well as future financial performance. It also offers empirical evidence for the incremental information content of financial and non-financial measures of performance and the persistence of this

assumed information content i.e. whether this incremental information content has the quality of continuing over time.

There is also a lack of studies which address the relative information content of different measures of performance notwithstanding the significance of their relative information content, especially when making unavoidable tradeoffs among different performance measures whilst deciding about which measures to include in a firm's performance measurement system and how much weight will be put on these measures.

The lack of empirical studies in this area is due to the lack of accessible primary data on the non-financial perspectives of performance, which in turn is attributable to the fact that organisations do not report these measures of performance. Previous studies either depend on self-reported measures of performance or limit their investigation of non-financial measures to a small number of non-financial measures of performance such as customer satisfaction or employee satisfaction. While these studies provide important insights into the relationship between financial and nonfinancial measures of performance, they overlook the interrelation and multidimensional nature of performance, meaning that management control systems which embrace multiple measures of performance, which is closer to practice, have remained impenetrable. Given that many organisations do in fact make use of a large number of measures of performance, focusing on a wider range of these measures is important in order to acquire a better understanding of the performance measurement problem. Understanding the relationship between performance measures is crucial to our ability to design better performance and control systems. If particular measures show incremental information content and predictive ability to forecast future financial performance (e.g. predicting future revenues), they can be utilised in managerial decisions which seek to direct organisations towards their goals. For example, in the airline industry, aircraft acquisition is a managerial

decision which benefits greatly from the ability to make predictive forecasts, as the process of aircraft acquisition takes from two to three years. It is therefore of great importance that managers have access to economic predictions before carrying on with new aircraft purchase or lease decisions, as inferior fleet planning and plane acquirement policy can expose airlines to costly short-term solutions.

Despite Kaplan's and Norton (1996) argument that assumptions such as the quantification of relationships between measures in different perspectives of the balanced scorecard in terms of the time lag between cause and effect, and magnitude can be tested in the form of hypothesis testing, there are no empirical studies in the literature that tackle this issue, as all previous studies deal with the balanced scorecard as a static snapshot rather than dynamic measurement system. In addition, the previous literature (e.g. Ittner and Larcker, 1998) argues that several non-financial measures are leading indicators of financial performance with time lag, yet previous studies have focused solely on contemporaneous analysis rather than lag analysis (e.g. Kekre and Srinivasan, 2002; Bryant et al., 2004). This research goes beyond these limitations by investigating the timing effect on the interrelationships between different perspectives' measures to capture the linkages between different measures of performance and their associations with the financial performance to offer various contributions to the academic literature in the field of performance measurement. First, it examines the incremental information content of multiple performance measures in explaining current financial performance, as well as their incremental information content in predicting future financial performance. Second, it investigates the relative information content of multiple non-financial measures compared to accounting measures in predicting future financial performance in a multi-lags model. Third, it examines the causal relationships between different generic measures within the balanced scorecard, seeking to establish

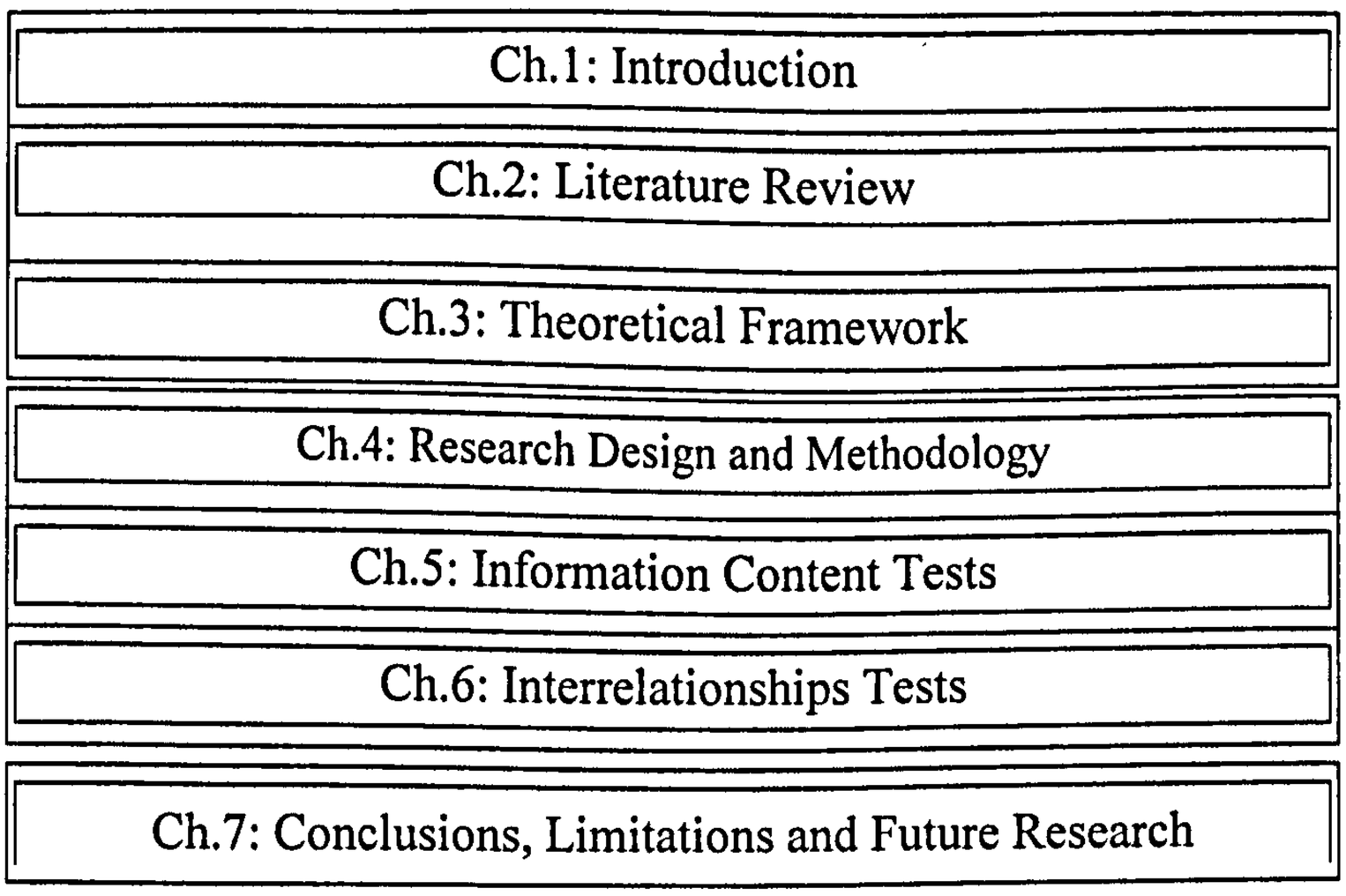
whether different non-financial measures are directly or indirectly related to financial performance via a chain of cause-effect relationships as argued by Kaplan and Norton (1996). Fourth, it examines whether the relationship between non-financial measures is mediated by other non-financial measures in the same or other perspectives of performance. Fifth, despite Norton and Kaplan (1996) arguing that the Balanced Scorecard is a dynamic rather than a static system, previous studies such as Kekre and Srinivasan (2002) and Bryant et al. (2004) consider it as a static measurement system, this research examines whether a static or dynamic model better captures managerial activities. Sixthly, it investigates the effect of time on the interactions between different measures and on their impact on financial performance. Lastly, most previous studies use ordinary least squares regressions for a cross-sectional or time series data to investigate associations between the independent variables and stock return or market value, resulting in imbalanced results and imprecise estimations of coefficients' parameters. This research applies a more dependable regression method (panel data regression) and structural equation modelling, (as recommended by Gajurati (2005)) to overcome those shortfalls, and depends on a valid data set rather than self reported measures. Taken together, these different elements of the study seek to provide a better understanding of the performance measurement problem.

1.4 Structure of the Thesis

This thesis is organised into seven chapters, including this introductory chapter (figure 1-1). Chapter Two reviews previous studies of performance measurement and attempts to set the issue of the value-relevance of non-financial data in its managerial context. Chapter Three reviews management theories and concepts related to this research, and explains the theoretical background of its research questions. Chapter Four outlines the research methodology, data collection, measurement of variables and applied statistical techniques.

Chapter Five illustrates the statistical test results for the value-relevance investigation, and discuss the results in the light of previous studies. Chapter Six discusses what the results suggest about the interrelationships between multiple performance measures. Finally, Chapter Seven concludes with a brief summary of the results, suggestions for future research, and a discussion of the limitations of the current study.

Figure (1-1): The Structure of the Thesis



1.5 Conclusion:

This chapter provided a synopsis of the work which is reported in this thesis. Also, it illustrated motivations, objectives and contributions of this work. The subsequent chapters of this thesis provide more detailed explanation of the research.

Chapter Two

Performance Measurement:

Literature Review

2.1 Introduction

Tests for incremental information content have been employed widely in accounting research to deal with questions including the relative information content of cash flows further than earnings or working capital, and incremental information content of additional financial disclosures that should increase the value of information content of financial statements (Biddle et al., 1995).

This research utilises concepts of relative and incremental information content to test the informativeness and usefulness of financial and non-financial measures of performance. This study conducts tests to investigate whether financial measures or non-financial measures have relative and/or incremental information content.

Several streams of research into issues relating to non-financial performance measures exist. The first stream investigates the use and consequences of non-financial performance metrics in firms implementing world class manufacturing practices such as JIT, TQM, and manufacturing flexibility (Banker et al., 1993; Abernethy and Lillis, 1995; Perera et al., 1997; Chenhall, 1997; Abdel-Maksoud et al., 2005; Al Bhimani, 1994)

The second stream investigates the use of non-financial metrics in compensation plans for rewarding managers, linking managerial rewards with organisational strategy (Govindarajan and Gupta, 1985; Ittner, Larcker and Rajan, 1997; Ittner & Larcker, 1998)

The third stream of the literature uses contingency theory to investigate the relationship between contingent variables, the use of control and performance measurement systems and organisational performance (Otley, 1995; Butler et al., 1997; Otley, 1999; Hoque and James, 2000; Mitchell et al., 2000; Hoque, 2004; Chenhall, 2003; Hoque, 2005).

The fourth stream investigates the effects of the adoption of performance measurement systems (e.g. Balanced Scorecard) on future performance (Kaplan and Norton, 1992, 1996, 2001; Chenhall, 2005; Ittner et al., 2003; Hoque and James, 2000)

The fifth stream investigates the claim that non-financial measures are leading indicators to the lagging financial measure (Ittner and Larcker, 1998; Riley et al, 2003; Amir and Lev, 1996; Anderson, 1994, 1997; Liedtka, 2002; Najar and Rajan, 2001; Widener, 2006).

This chapter reviews the key studies in the above streams to highlight the importance of the non-financial measures and justify their usage in performance evaluation. It also looks at the empirical studies conducted in this field which provide the basis for the current work to answer its research questions.

A general argument in the literature is that high-quality operational actions will produce better financial performance, as financial performance (e.g. profitability) is a coherent consequence for rational managerial behaviour and actions (Ittner and Larcker, 1998). Therefore, non-financial (i.e. operational) measures may have incremental and/or relative information content over the financial metrics themselves to explain future financial performance, stock returns, and stock prices. Since non-financial metrics have the ability to capture current value creation actions, (Norton and Kaplan, 1996; 2001), (assuming an efficient financial market) these ought to be reflected in stock returns and prices.

Despite the large number of studies in the field of performance measurement, few empirical studies of this type have been conducted. Therefore, there is a noticeable need to look at the informativeness of non-financial measures in comparison with conventional financial statements metrics, because it is well documented in the literature that high-quality, relevant performance information will lead to informed decisions, better planning, and superior managerial actions (Neely and Jarrar, 2004).

2.2 Performance Measurement Description:

In any business, managers are concerned to use goals to implement strategies that focus on creating value for customers and distinguishing products and services. However, managers must design measures for desired outcomes (Simons, 2000).

The Committee on the Foundation of Accounting Measurement defines accounting measurements (AAA, 1971, p.3) as: "an assignment of numerals to an entity's past, present, or future economic phenomena, on the basis of observation and according to rules".

Neely et al. (1996, p. 424) state that "in a business contest, performance can be defined as the efficiency and effectiveness of actions". They build on this definition to define performance measurement as "the process of quantifying the efficiency and effectiveness of action" and the performance measure as "a metric used to quantify the efficiency and/or effectiveness of actions". However, organisational effectiveness is more comprehensive than business performance, as effectiveness encompasses not only organisational performance but also internal performance measures related to efficiency and effectiveness of operations, and external indicators other than the economic performance measures (Devinney et al., 2005).

Dixon et al. (1990) argue that the functions of a measurement system are to facilitate compliance to developing actions and strategies, to encourage organisational learning, and to help organizations to cope with changes in a competitive environment.

Nanni et al. (1992, p.10) accept the notion of performance measurement involvement in all business management cycle activities. Specifically, they state: "performance measurement needs to be assessed in determining the adequacy of the strategies for achieving organisational objectives, in revising the strategies, in communicating them, and in development of tactical objectives as well as in its traditional role of control feedback''.

Otley (2001) affirms that performance is a multi-dimensional construct in so far as different stakeholders look for different facets of performance. Furthermore, he argues that effectiveness can be evaluated only in objectives and strategy context, with the consequence that different firms with different strategies will have different measures of effectiveness. Correspondingly, Devinney et al. (2005, p.6) define organisational performance as "the external measures of ultimate performance encompassing three specific areas: (1) financial performance (profits, return on assets, return on investment, Tobin's Q, etc.); (2) market performance (sales, market share, etc.); and (3) shareholder return (total shareholder return, economic value added, etc.)."

Similarly, Nanni et al. (1992) argue that performance measurement is a focal part of firms' infrastructure, alongside policies, systems and practices, providing the required information for business management in order to ensure that strategies are suitable for attaining organisational objectives.

Neely (1998, p.5-6) point out that "[a] performance measurement system enables informed decisions to be made and actions to be taken because it quantifies the efficiency and

effectiveness of past actions through acquisition, collection, sorting, analysis, interpretation, and dissemination of appropriate data"

The much-quoted adage "what gets measured, gets done" has more strength when it is combined with managers' awareness of these measures, controls and performance measures as efficient means for enhancing employees' actions to achieve the required outcomes, because it is often that what is not measured gets less attention (Otley, 2003).

From the above overview, it could be concluded that the choice of performance measures is one of the most critical challenges facing companies. Measuring and documenting performance through performance measurement systems has important implications for developing strategic plans, evaluating achievement of organisational ob jectives, resource allocation, making decisions, and rewarding managers. Performance measurement can help managers to know how programs or systems are working, and where awareness may be needed.

2.3 Performance Measures

A growing body of literature in management accounting concentrates on the study of performance measures. Simons (2000, p. 234) states that "performance measures may be either financial or non-financial. Financial measures are stated in monetary terms, usually drawn from a business's accounting systems. Revenue and profit are examples of financial measures. Non-financial measures are quantitative data created outside the formal accounting system."

2.3.1 Financial Measures of Performance

Many companies have, in recent years, adopted new technologies such as Total Quality Management (TQM), Just In Time (JIT), Computer Integrated Manufacturing (CIM), and Flexible Manufacturing System (FMS) (Kaplan and Norton, 1996). Moreover, numerous companies now highlight teamwork, and encourage their employees to deal successfully with problems and create pioneering approaches to develop and increase production (Banker et al., 1993). These internal restructurings have shifted management attention to strategies that include quality, flexibility, a shorter lead time, delivery credibility and cost efficiency (Suwignjo et al., 2000).

Traditional accounting-based measurement systems that rely primarily on financial performance measures have been the dominant performance measurement system within most companies. However, these systems have recently been increasingly criticized on the ground that there are significant limitations in relying completely on accounting metrics of performance. Criticisms of these accounting-based measurement systems include the following:

- They are insufficient for mobilizing strategic decisions (Kaplan and Norton, 1992, 1996).
- They fail to provide information on customers' needs and competitors' performance (Kaplan and Norton, 1992).
- They do not show value-relevance to investors on an individual basis (Shevlin, 1996).
- They are not suitable in Total Quality Management settings (Chenhall, 1997).
- They fail to incorporate the key variables which are necessary to compete in today's global competitive environment: their focus is too narrow (Kaplan and Norton, 1992, 1996, 2001).

- They are historical and backward looking, and therefore they fail to help managers to understand the origins of performance problems, and do not reflect future performance (Ittner and Larcker, 1998)
- They do not consider intangible assets (Ittner and Larcker, 1998).
- They do not connect the financial numbers with non-financial indicators (Kaplan and Norton, 1992).
- They are misleading because of their short term focus (Otley 2003).
- They are not the preeminent indicators of upcoming financial performance (Horngren, 2004). They are lagging measures that inform executives of the consequences of past actions (Eccles and Pyburn, 1992).
- "They are distortable because of the accounting procedures, governmental policies, and human errors" (Devinney et al, 2005, p.16).
- They cannot be used as measures of an individual or team performance because they are too aggregated and too late (Parmenter, 2007; Chow and Stede, 2006).

As an alternative to the single accounting-based measures and ratios such as earnings, profits, cash flow, return on assets (ROA), and earnings per share (EPS), Stewart (1991) introduced Economic Value Added (EVA®) as an external and internal financial performance measure which in its simple form is net operating profit less cost of capital. Stewart argues that EVA® is "... the financial performance measure that come closer than any other to capturing the true economic profit of an enterprise. EVA® also, is the performance measure most directly linked to the creation of shareholder wealth overtime (Stewart, 1991, p.66)". However, several studies suggest that these claims are doubtful. For instance:

- Ismail (2006) found that net operating profit after tax and net income do better than EVA in explication of stocks' return for UK companies. West and Worthington (1999) found similar results for a sample of Australian companies.
- Biddle et al. (1997) exploit incremental and relative information tests to provide evidence that earnings outperform EVA given that earnings are found to be more closely associated with stock returns and the value of a firm.

Furthermore, relying on financial measures of performance exclusively is insufficient, and can be dysfunctional and counterproductive. For instance, Anthony and Govindarajan (2007, p.461) offer the following arguments for this conclusion: First, [exclusive reliance on financial measures of performance] may encourage short-term actions that are not in the company's long-term interest. Second, business unit managers may not undertake useful long–term actions, in order to obtain short-term profits. Third, using short-term profit as the sole objective can distort communication between business unit manager and senior management. Fourth, tight financial control may motivate managers to manipulate data". Therefore, they conclude that relying on financial measures solely is inadequate to ensure successful strategy implementation, and make the case for measuring and valuating business units' managers by adopting multiple-measures control systems that incorporate financial and non-financial measures of performance.

Consistent with the above arguments, Norton and Kaplan (1996) argue that focusing on short-term financial performance results in sacrificing investments in future opportunities. For example, focusing on short-term financial performance perhaps causes managers to reduce spend on new product, process, human resources, customer and market development, or reduce their investments in information technology and systems. Further, managers may attempt to achieve impressive short term profitability by maximising selling price or

minimising provided services. In the short-term, financial measures reflect these actions as increases in reported earnings. However, these actions may harm a company's performance in the long-term by shrinking its assets and therefore reducing its capability to create value in the future.

2.3.2 Non-Financial Measures of Performance

Substantial work has already been undertaken by the accounting profession on performance measurement (Bititci et al., 1997). Indeed, most manufacturing corporations have put in place comprehensive new (non-financial) measures in an attempt to compensate for the limitations of financial measures. This literature review indicates that, prior to the 1990's; non-financial performance measures were extensively used in companies, albeit only at lower levels. In the early 1990s, increasing attention was given to systematising non-financial performance measures and integrating them into the managerial process at the highest managerial levels.

Bruns and McKinnon (1993) conducted a field study, interviewing 73 managers in twelve industrial firms in United States and Canada to investigate how managers employ accounting information. This study found that manufacturing senior managers made more use of physical unit data such as pounds of scrap, hours of overtime and variances than monetary data such as revenues and costs, especially when these were related to the control of daily production, operations, and sales. The study also suggested that managers utilise management accounting reports information not to confirm whether the actions which are taken yield the desired consequences, but to help with day-to-day decision making.

Vaivio (1995) also suggests further areas which would benefit from greater research. These include the relationship between traditional financial and newer non-financial performance

measures, and the ways in which non-financial performance measures are integrated into the management process as a whole.

A number of researchers identify an increase in the uses of non-financial measures such as customer satisfaction, product quality, market share, lead time, on-time delivery, product returns, and intellectual capital for performance measurement and rewarding managers in the last decade (Ittner& Larcker, 1998; Ittner, Larcker & Rajan, 1997; Kaplan& Norton, 1996). However, Al-Bhimani (1994) reports that this managerial tendency is focused on the internal use of non-financial performance measures regardless of their increasing importance.

Further, many management accounting researchers (e.g. Atkinson et al., 1997; Norreklit, 2000) criticize the sole reliance on financial performance measures, and suggest incorporating both financial and non-financial performance measures as integral parts of management information system.

A substantial body of management accounting literature (e.g. Ittner and Larcker, 1998; Norreklit, 2000) highlights the need for more non-financial information. Management accounting researchers (e.g. Kaplan and Norton, 1996; Hoque and James, 2000) advocate using both financial and non-financial performance measures in order to provide managers with appropriate information about the overall company situation.

It is clear, then, that many research studies have analyzed the use and effect of non-financial performance measures in companies. However, several researchers recommend further research on the implications of non-financial performance measures. For instance, Fisher (1995, p. 62) states: "most accounting research on control has focused on financial control systems (i.e. budgeting and standard cost systems. Future research should incorporate non-financial performance measures".

Otley and Fakiolas (2000) argue that the latest changes to practices of managerial control have highlighted the reduced role of the financial performance measurement systems - for example, budgeting has been demoted to the role of financial planning technique rather than manufacturing control tool. Furthermore, most new developments in managerial accounting and managerial control are externally oriented (i.e. towards customers and competitors) rather than internally focused.

Much of the literature reviewed focuses on non-financial measures in themselves, rather than specifically addressing their implications for the managerial process as a whole. The literature also tends to be practitioner oriented, written by consultants who have focused mainly on promoting the virtues of non-financial performance measures. Case studies by Fisher (1995) and Brancato (1995) have identified three principal reasons for incorporating non-financial measures into their performance reporting systems. They are:

1. Perceived limitations of financial performance measures.
2. Competitive pressure.
3. Growth of other initiatives such as the implementation of total quality management programs whereby new non-financial measures have been required to support the initiative.

Managerial accounting is developing to include a further strategic approach that highlights the detection, measurement, and managing of the key financial and non-financial drivers of strategic success and shareholder value (Institute of Management Accountants, 1999).

A recent study by Said et al. (2005) evaluates the economic performance of a group of companies using both financial and non-financial performance measures against the performance of a sample of firms that depend exclusively on financial measures in their

performance measurement. Their panel data analysis signifies that non-financial measures are significantly associated with future accounting-based and market-based return. In addition, the results point out that the use of non-financial measures is linked to innovation-oriented strategy, the implementation of quality initiatives, a shorter length of product development, and a lower level of financial distress. Furthermore, the results suggest that a better fit between firms' features and their non-financial performance measures yields an enhanced performance.

Managerial accounting is developing to include further strategic approaches that highlight the detection, measurement, and managing of key financial and non-financial drivers of strategic success and shareholders' value (Institute of Management Accountants, 1999).

Otley (2001) argues that performance evaluation has become an essential element of management accounting. However, although many organizations use a large number of financial and non-financial measures, there is seldom a link between the use of these measures and consequent administrative actions.

Ittner et al. (2003) argue that non-financial performance metrics are assumed to present superior information on strategic improvement and achievement. Consistent with these arguments, numerous accounting researchers have provided proof that non-financial measures are able to be leading indicators of a lagging financial performance (e.g. Ittner & Larcker, 1997; Banker et al., 2000). In other words, non-financial measures can predict the direction of the financial measures. However, the non-comparability of those measures across companies decreases their value and may lead stakeholders to focus largely on financial measures for performance appraisal (AAA Financial Accounting Standards Committee, 2002).

2.4 Multidimensionality of Organisational Performance

It is widely accepted amongst management accounting researchers that business performance is a multi-dimensional concept (Neely, 1999). According to Sink and Tuttle (1989), performance is basically a complex function of seven critical performance criteria, namely effectiveness, efficiency, quality, productivity, quality of work life, innovation and profitability. In addition, Lillis (2002) suggests that the performance has at least three dimensions, namely responsiveness, quality and efficiency. Lillis argues that the difficulties facing current performance measurement systems are related to managing the combination of responsiveness, quality and efficiency measures, while mitigating the conflicting effects between these dimensions on strategy fulfillment.

In fact, performance measurement is a multifaceted subject that encompasses not less than three dimensions: economics, management, and accounting (Tangen, 2004). This is consistent with Anthony and Govindarajan's (2007, p. 441) statement that "...financial performance, although important, is only one aspect of an organization's performance".

Parmenter (2007, p.33) states that there are three categories of performance measures: "Key result indicators: that tell the board how managers have performed in terms of a critical success factors or perspectives of the balanced scorecard, the performance indicators: those tell staff and mangers what to do, and the key performance indicators: those tell managers and staff what to do in order to increase performance dramatically"

Further, Parmenter also argues that these key performance indicators are all non-financial measures, and that progress on these measures will influence other measures positively.

2.5 Integration between Financial and Non-Financial Measures of Performance

During the 1980s, many organizations introduced very complicated systems to measure financial performance. However, practice has proven that non-financial aspects of performance were leading the industries. Dimensions like customer satisfaction and quality have shown a great impact on the firms' financial performance (Anthony and Govindarajan, 2007). However, improvements in these non-financial aspects, however important, are not enough if they are not ultimately reflected in enhanced financial performance. Financial reports are still fundamental and cannot be abandoned, because they are efficient ways to keep managers' eyes on the congruence between periodic non-financial operational measures and a long-term profitable strategy. If an organisation is doing well in non-financial metrics but these improvements are not mirrored in accounting figures, this implies that it needs to reconsider its strategy and therefore its non-financial measures (Norton and Kaplan 1996).

Norreklit et al. (2006, p.53) state that "A crucial part of any management control system is the creation of a hierarchy of objectives and performance measures that make managers act in the overall interest of their companies when they act out of self-interest. It assumes goal congruence in organizations; it assumes that the top management defines the congruent goals and that systems alone can manage a company"

As a consequence, the different types of measures (i.e. financial and non-financial measures) ought to be seen as complementary (Chow and Stede, 2006). This is consistent with Norton and Kaplan (1992), and with Kaplan and Atkinson (1998, p.569) who state that "having a balanced set of financial and non-financial measures, explicitly derived from and linked to their business unit's strategy, will enable companies to manage both short and long term value creation".

Executives have often claimed that financial figures fall short of supplying a perfect view of the firm's advancement, and that their prominence in management information prevents organizations from making long-range investments in value. Despite these continuing concerns, various recent propositions have recommended the use of a balanced group of financial and non-financial metrics, collated in a single record and tailored to the organization's strategy.

For example, Wallman (1996, p.141) states, "I believe it is clear that financial reporting is in danger of becoming less useful in accelerating pace...for example, traditional financial statements are now significantly less reflective of the assets that create wealth than in times past". He argues that financial statements are failing to include new categories of assets related to knowledge based economy organizations (i.e. soft assets), such as human resources, brand names, research and development expenditures, patents, copy rights, and intellectual capital. In the same vein, Bititci (1994) calls for an integrated collection of performance measures which reinforce business objectives.

Henri (2006) conducted a survey among large number of manufacturing companies, and the results from the 383 respondent companies indicate that financial measures remain among the main performance measures. Furthermore, this study suggests that high-performing companies make use of a larger set of financial and non-financial performance measures than low-performing organizations.

Contemporary performance measurement methods, try, on the one hand, to focus on the importance of non-financial measures. On the other hand, they attempt to integrate non-financial with financial measures, with a greater emphasis on modern forward-looking indicators such as customer satisfaction, employee satisfaction, quality, and innovation rate. For instance, Kaplan and Norton (1992, 1996) argue that executives do not depend solely on

one set of measures (e.g. financial) and rule out other measures, because they believe that a single measure will be ambiguous about targets and will not give the required attention to the critical success factors; instead they need a balanced mix of financial and non-financial (e.g. operational) measures. Perhaps the most popular integral measurement system is the Balanced Scorecard model developed by Kaplan and Norton (1992, 1996, and 2001), Balanced Scorecard assembles measures under four views: financial, customers, internal business process and learning and growth. This system employs financial measures that verify the outcomes of past activities and previous decisions. However, it adds leading non-financial measures which account for causes that will impel future financial and operating performance forward. These non-financial measures are considered strategically vital for long term performance. Balanced Scorecard is a management system (rather than measurement system) which integrates four different dimensions namely [financial perspective, customer perspective, innovation and learning perspective, and internal business perspective] into a holistic approach using both financial and non-financial measures based on the organization's key success factors. Kaplan and Norton claim that this model will give managers information from four different viewpoints, whilst simultaneously reduce information surplus by restraining the quantity of measures.

Balanced Scorecard streamlines performance measures into four perspectives as follows:

- Financial perspective: it embraces financial measures as a helpful means of measuring the economic consequences of actions which have already been taken, in order to verify whether the final outcomes of corporate strategy meet the original financial objectives (higher profitability, sales growth, reduced risk or any other desired long-run financial outcomes). This perspective comprises profitability measures such as

operating income, return on capital employed, sales growth, cash flows generation, economic value added and return on investment.

- Customer perspective: it focuses on the customer and market segments in which companies have chosen to compete. Seeing that companies are dealing with heterogeneous rather than homogenous potential and existing customers, company strategies can be developed by identifying target customers (Kaplan and Norton, 1996). It encompasses measures such as customer satisfaction, customer retention, customer response time, market share, customer profitability, new customer acquisition, and number of customer complaints.

- Internal business process perspective: identifies critical factors for achieving customer and shareholder goals. Measures and objectives in this perspective are derived from the objectives of upper perspectives in the hierarchical order: namely, customer and financial perspectives. Kaplan and Norton (1996, p. 93) state: "in the Balanced Scorecard, the objectives and measures of the internal business process perspective are derived from explicit strategies to meet shareholder and targeted customer expectations". This chronological hierarchical process will identify new business activities that the organisation must excel in. This perspective includes measures such as product design, product development, post-sale service, quality, manufacturing efficiency variance, rate of scrap loss.

- Innovation and learning perspective: it identifies where a business must do extremely well to achieve distinguished performance. According to Kaplan and Norton (1996, p. 127), there are three main dimensions of this perspective: employee capabilities; information systems capabilities; and motivation, empowerment, and alignment. This perspective includes employee training and corporate cultural attitudes related to both

individual and corporate self-improvement such as the number of new products, employee satisfaction, and the number of new patents.

Kaplan and Norton assert that the Balanced Scorecard takes into account new trends in business such as integration, customer-supplier partnership, team accountability, customization, and global scale; so that an organization might ensure that it is putting its strategy in practice appropriately. The multidimensionality of performance means that managerial actions will affect different aspects of organisational performance in different ways, and so different measures (subjective and objective; financial and non-financial) are needed to capture these different effects (Devinney et al. 2005).

Over the last decade the Balanced Scorecard model (BSC) (Kaplan and Norton, 1992, 1996, 2001) has been extensively implemented in practice, and much investigation of performance measurement has dealt with this model. It has undoubtedly been the most widely accepted performance measurement model, and it has been claimed that it successfully overcomes the shortfalls of traditional performance measures by incorporating modern non-financial measures linked to a firm's strategy.

Balanced Scorecard moves the emphasis from traditional historical financial measures to a collection of non-financial metrics connected to three main perspectives namely, learning and growth, internal business process and customer perspectives (Kaplan and Norton, 1992, 1996). It is crucial that the right information is accessible at the right time for decision making and performance measurement in order to satisfy contemporary organizations in an era of information and competition (Banker et al. 2004). However, this indicates how problematical performance measurement has become, increasingly expected to play multiple roles in every area of management, including the formulation, implementation and

communication of strategy, and in decisions about managerial rewards (Kaplan and Norton, 1996).

Viaene and Willems (2007) argue that management's objective is to be and remain in control of the implementation of strategy whilst facing rapid environmental change. They demonstrate that management is about (re-) planning, organizing for execution, and control. Therefore, established management at strategic, tactical and operational levels must be capable of fast incremental learning as it moves incessantly going through the process of planning, organization/execution, and control. Moreover, there is a need for continuous harmonisation of all three levels of management. This leads to a need for scorecards and dashboards which are based on a balanced group of key performance indicators, which ensure the delivery of the right information at the right time to enhance decision making processes. Viaene and Willems (2007, p. 26) state: "Dashboards and scorecards are visually attractive monitoring mechanisms for information consumers. They are aimed at capturing the most critical performance information at a single glimpse...Scorecards on the other hand are monitoring devices of a more aggregate and periodical nature for tracking the status and evolution of a set of higher-level performance objectives, their underlying cause and effect relationships, critical success factors and Key Performance Indicators (KPIs)".

Balanced Scorecard's originality lies in many aspects. On the one hand, it embraces strategic long term non-financial measures to reduce the pressure of short term financial measures for the sake of promoting prospective growth opportunities since financial metrics are deemed insufficient for appraising corporate performance. On the other hand, it seeks to reduce the proliferation of performance measures which cause information overload, which in turn distracts managers into chasing a large number of measures rather than the performance itself (Kaplan and Norton, 1996; Banker et al., 2004). Thus, a high-quality performance

measurement system should contain only the metrics that strictly have to be traded off against alternative measures to avoid confusion and distortion resulting from large number of measures included in the measurement system (Banker et al., 2004). In other words, success has to be accomplished on key non-financial indicators prior to realizing progress on key financial indicators (Davis and Albright, 2003). Dependence on financial performance measures "on their own" might lead companies to make bad decisions, because the value is added, in most cases not from a firm's tangible assets, but from intangibles such as intellectual capital, customer loyalty, supplier relationships, and the development of pioneering new products (Kaplan and Norton 1992; Bible et al., 2006).

The latest versions of the Balanced Scorecard have developed from a simple performance measurement model to a multifunctional instrument.

Kaplan and Norton (1992) adopted the idea of the detrimental reliance on financial metrics alone to determine the organizations' performance and compensating managers. They argued that this would direct managers to make short-term oriented decisions instead of encouraging enduring value creation programs. For example, strict cost cutback plans may improve profitability – a short-term financial measure - but these reductions could come at the expense of employee loyalty, product or service quality, research and development or customer satisfaction, all of which represent fundamental factors in the success or failure of any business organization. Thus, they offered the Balanced Scorecard as a measurement system that avoids shortfalls related to exclusive dependence on financial measures. In the first generation of the Balanced Scorecard Kaplan and Norton suggested using measures from four common disciplines to answer four basic questions:

1- Financial perspective: how do we look to our shareholders?

2- Customer perspective: how do customers see us?

3- Internal business perspective: what must we do well at?

4- Innovation and learning perspective: can we improve and create value?

At this stage, the main purpose of the Balanced Scorecard was building a sense of balance between leading and lagging indicators, internal and external aspects of performance, and short and long-term of performance in order to reallocate managers' attention to future performance drivers rather than historical performance.

In 1996, Kaplan and Norton launched the second generation of the Balanced Scorecard, describing it as a keystone of innovative strategic management system, tying the firm's long-term plan to the actions of managers. This claim relied on the fact that depending on financial measures alone as a management control tools would create a gap between the building of a strategy and its execution.

Kaplan and Norton (1996, p.1) state that: "Managers using the balanced scorecard do not have to rely on short-term financial measures as the sole indicators of the company's performance. The scorecard lets them introduce four new management processes that separately and in combination, contribute to linking long-term strategic objectives with short-term actions".

These four-management processes are:

- Translating the vision: Assists managers to agree upon the firm's vision and strategy in the form of a collection of approved goals and measures as critical success factors
- Communicating and linking: In this process, executives convey the strategy through the organization while connecting it to divisional and personal goals to make sure that these goals are allied with the organization's strategy.

- Business planning: In this process, executives utilise the balanced scorecard measures to assign tangible and intangible resources of the firm to the activities that promote the factors that assist in achieving a firm's long-term objectives.
- Feedback and learning: this process promotes the notion that balanced scorecard endorses instantaneous learning via getting feedback from the non-financial perspectives (i.e. customer, internal business, and learning and growth perspectives) regularly to asses and adjust the firm's strategy.

Therefore, Kaplan and Norton (1996) broadened the scope of the balanced scorecard from measuring performance to strategic management system. Moreover, Kaplan and Norton (1996, p.10) argue that balanced scorecard promotes strategic learning by articulating the firm's shared vision, supplying the strategic feedback system, and assisting in reviewing the strategy for strategic learning purposes.

Furthermore, Kaplan and Norton (1996, p.11) give the following examples of uses of the balanced scorecard:

- Clarify and update strategy.
- Communicate strategy throughout the company.
- Align unit and individual goals with the strategy.
- Link strategic objectives to long-term targets and annual budgets.
- Identify and align strategic initiatives, and
- Conduct periodic performance reviews to learn about and improve strategy.

In their latest work, Kaplan and Norton (2001 a, b) describe the balanced scorecard as a management system which depicts value-creating strategies that employ tangible and intangible assets. However, the role of the Balanced Scorecard is to measure these intangibles

assets in non-monetary terms and to describe how these tangible and intangible assets can be deployed to yield better financial outcomes, rather than assigning financial values to assets. Consequently, they introduced the strategy maps that identify the crucial components of successful strategy implementation and therefore they claimed that the Balanced Scorecard is an outline that portrays strategy's cause and effect relationships, and the organisational priorities which need to be created to support strategy implementation.

However, balanced scorecard doesn't relate only to the use of additional measures. It also addresses how the use of strategic measures might help managers to focus on a few critical factors to reach balance and progress amid the four perspectives rather than paying attention to one measure on expense of the others (James and Hoque, 2000).

Ghalayini et al. (1997) argue that the main limitation of this method is that it is mainly designed to offer a general overview of firms' performance to top management. Consequently, it is not beneficial at lower operations levels. They also argue that the balanced scorecard is designed as a monitoring instrument rather than an improvement instrument. Likewise, Neely et al. (2000) suggest that, despite the importance of balanced scorecard as a measurement framework introducing important dimensions in which performance measures might be helpful to firms' success, it provides little guidance on how to identify the right measures to be incorporated in the measurement process. Also, Norreklit (2000, p.76) criticizes Balanced Scorecard concluding that "causality claimed to hold between perspectives is problematic. Specifically, the cause-and-effect relationship is problematic since claiming that some factors are necessarily profitable is problematic unless this follows logically from the concepts involved". Smith (2005) summarised the criticisms against the balanced scorecard as follows: Its bias towards shareholders and failure to address the contribution of employees and suppliers, its silence on the selection of specific performance

measures and the role of performance targets, and its failure to address human resources issues

2.6 Strategic Performance Measurement Systems and Performance

Many performance measurement systems have been developed during the last two decades including Balanced Scorecard (Kaplan and Norton, 1996), Performance Pyramid (Cross and Lynch, 1992), and the Performance Prism (Neely et al., 2001). However, Horngren (1995) suggests that management accounting systems ought to be judged by taking into consideration two important aspects: how well they produce information which enables wise economic decisions, and how well they motivate subordinates to achieve a firm's objectives. He argues that non-financial measures will gain greater importance and reputation over time, and anticipates that, due to the balanced scorecard, the role of non-financial measures will be emphasised to balance the tendency of financial measures to encourage short-term behavior.

Performance measurement systems differ significantly among organisations. This is due to the connection of management systems to corporate strategies, which are specific to individual companies. However, utilisation of non-financial performance measures is popular for designing performance measurement systems (Medori and Steeple, 2000).

There is a large body of literature assessing strategic performance measurement systems. For example, Chenhall (2005) proposes that the influence of integrative strategic performance measurement systems (particularly Balanced Scorecard) on strategic outcomes is indirect, working through the alignment of manufacturing with strategy and organisational learning. He found that both Balanced Scorecard adopters and non-adopters were achieving high levels of integrative information from their performance measures, and his results indicate that the

implementation of Balanced Scorecard is not a reliable indicator that performance measurement system will offer integrative knowledge for managers and users.

Chenhall (2005) also discusses the unique emphasis of strategic performance measurement systems (e.g. Balanced Scorecard) on providing managers with financial and non-financial measures relating different perceptions, which translate organisational strategy into a consistent group of performance measures which are relevant and connected to managerial actions. Performance measurement systems are not only planned and put into practice, but develop gradually over time to reflect improved managerial understanding of how measures are linked to each other (Waggener et al. 1999; Eccles and Pyburn, 1992).

Hoque and James (2000) examine the relationship between organization size, product life cycle stage, market position, Balanced Scorecard usage and organisational performance in Australian manufacturing companies. Their results point to a significant relationship between companies' size and Balanced Scorecard practice, as larger firms make more use of Balanced Scorecard to support their decision making process. The results also imply that firms with a higher percentage of new products have a greater reliance on Balanced Scorecard, specifically new product measures. However, they did not find a significant association between the market position and Balanced Scorecard adoption. In general, Hoque and James' (2000) study is consistent with Banker et al. (2000) and Ittner et al. (2003) in that companies that do not rely solely on financial measures have superior performance compared to companies that depend on financial measures alone in decision making and performance evaluation. Additionally, Hoque and James (2000) argue that adopting Balanced Scorecard involves more than simply using more measures, implementing Balanced Scorecard means utilising a few crucial strategic measures in one report to make cause-effect relations clear for directors and to give a balance amid the four perspectives of the Balanced Scorecard.

Ittner et al. (2003) investigate the association between measurement system satisfaction, actual financial outcomes (accounting and stock returns) and various strategic performance measurement approaches, namely: greater measurement diversity and enhanced alignment with firm strategy and value drivers. Using data from 140 American financial service firms, they found reliable evidence that those firms making more use of a broad set of financial and (specifically) non-financial measures than firms with similar strategies have higher measurement satisfaction and stock market returns. These results were found to be stronger in firms that reported minor changes in their performance measurement systems in the last two years, suggesting that these performance measurement applications yielded lagged financial outcomes. In the same vein, Ittner et al. (2003) suggest that adoption and implementation of performance measurement models such as the Balanced Scorecard, economic value measurement and the causal business modeling is associated with higher measurement system satisfaction but not with economic (financial) performance. On the contrary Davis and Albright (2004) employed a field study method to investigate the relationship between improved financial performance and the implementation of Balanced Scorecard in fourteen branches of a banking organization in the United States; they found that branches implementing the Balanced Scorecard outperformed the non-Balanced Scorecard branches financially, suggesting that insertion of non-financial measures into the performance measurement system is associated with enhanced financial performance. Banker et al., (2000) found similar results in the hotel industry.

Neely and Bourne (2000) conclude that the successful implementation of a definite strategy needs a thriving implementation of a well integrated performance measurement system.

2.7 Performance Measures Relation with Contingent Variables

The contingency theory of management accounting proposes that there is no universally applicable system of management control, but that the selection of appropriate management techniques will depend upon the particular circumstances of a specific organization (Otley, 1999). In other words, there is no perfect measure of performance; a range of tools may be used to justify and forecast the conditions under which particular management control system will be found or where they will be connected with superior performance (Chenhall, 2003).

A contingency approach to performance measurement has been widely used in management accounting research (Butler et al., 1997). Contingent variables have been mainly used in previous research to explain variations between management control systems. This stream of research, however, has two limitations. First, it makes use of only a limited number of variables. Second, pays little attention to whether the hypothesis fit between the contingent variables and certain characteristics of management control systems that also can result in better organisational and managerial performance (Epstein and Manzoni, 1997). Several researchers (e.g. Kaplan and Norton, 1992, 1993) suggest the need to focus on financial and non-financial performance measures and this combination may be contingent upon organisational circumstances.

The above argument was also supported by other researchers (e.g. Kaplan and Norton, 2000). In addition, the literature on contingency theory investigates the relationship between contingent variables, the use of control and performance measurement systems, and in turn organisational performance. The study of organisational performance has been a focal point in management accounting research, but real issues still exist concerning its definition and measurement. Several researchers (e.g. Hoque and James, 2000) argue that companies

achieve higher performance when they use a diversity of financial and non-financial performance measures.

The variables most often identified by contingency theory literature are: environmental uncertainty, size, industry type, market environment (competition), strategy, technology, national culture and organisational structure (Otley, 1995; Mitchell et al., 2000; Hoque, 2004, 2005; Chenhall, 2003).

Consistent with the preceding arguments, Bititci at el (1997, p.525) state that "the performance measurement system, to be effective in achieving its objectives, should take account of the strategic and environmental factors relating to the business as well as considering the structure of the organization, its processes, functions, and their relationships"

2.7.1 Performance Measures and Environmental Uncertainty

Hoque (2005) examines questionnaire data from fifty two New Zealand manufacturing organizations, and suggests that it is in situations of environmental uncertainty that non-financial measures are most useful in improving organisational performance. He argues that greater dependence on non-financial performance criterion is related to improved performance, but only where there is a high degree of environmental uncertainty within the organization.

2.7.2 Performance Measures and Strategy

Govindarajan and Gupta (1985) point out that greater reliance on long term measures (sales growth, market share, new product development, market development, research and development, personal development, public and political affairs) for rewarding managers of strategic business units within diversified companies will have a positive influence on

performance for those companies enforcing "build" strategy i.e. maximizing market share. However, short term measures such as cost control, operating profits, profit margin, cash flow, and return on investment are suitable for rewarding managers in firms applying "harvest" strategy (i.e. increasing short term profits and cash flow as much as possible) to boost their firms' performance.

Simons (1987) investigated the relationship between management control systems and strategy. He found that high performance prospectors concentrated on controlling procedures that are related to forecasting data, tight budget goals and careful monitoring of outputs, but paid little attention to cost controlling methods. In addition, large high performing prospectors emphasized frequent reporting and the use of uniform control system which can be modified when necessary. Simons also found that control systems were used less intensively by defenders than by prospectors. In large defenders, high financial performance was negatively correlated with tense budget goals and use of output monitoring.

Similarly, Chenhall (1996) suggests that for organizations seeking competitive advantage by adopting strategies of manufacturing flexibility, performance will be improved by using direct manufacturing performance measures as an important element of their official managerial evaluation system. Chenhall claims that those measures will guarantee the required balance between responsiveness to the market demands and cost concerns, through providing relevant feedback that leads to better learning and hence enhanced performance.

In addition, Ittner et al. (1997) report that significant determinants of the weight placed on non-financial performance measures included the extent to which a company followed an innovation-oriented or prospector strategy, and the adoption of quality initiatives. They argue that in firms following either a quality or an innovation-oriented strategy, non-financial measures offer incremental information, focus the firm's directors on long-term strategic

objectives, and help the alignment of enhanced interests within the firm; however, financial performance measures related to profitability, margins, and efficiency may more appropriate for CEOs in firms paying attention to cost leadership (e.g., defender like firms).

Simons (1995) in his book "Levers of Control" introduces the notion of boundaries, diagnostic and interactive control systems to explain the non-financial performance measures interaction within the management process, and how managers should utilise the accounting information systems. He suggests that management accounting practices – including both financial and non-financial measures – act as diagnostic systems to monitor the implementation of planned strategy. However, the interactive control systems are those systems used to deal with emerging threats and opportunities in order to trace the strategic uncertainties. However, Vaivio (1999) claims that non-financial measures are more than merely diagnostic tools which serve the implementation of the intended strategy. In addition, they may have active roles to play in the management control process.

Measurement is used to lead strategy implementation through actions as well as evaluating strategy in terms of the consequences of taking these actions (Nanni et al., 1992). Moreover, Devinney et al. (2005) propose that performance measurements should take into consideration the strategic position of the firm in association with its competitive context.

From a contingency framework, Hoque (2004) examines the impact of the selection of performance measures on the relationship between strategic priorities and performance, and between environmental uncertainty and performance. Established upon a survey data from fifty two manufacturing companies, the results show the existence of a significant positive relationship between management strategic choice and performance performing through management's high use of non-financial measures for performance appraisal.

Bhimani and Langfield's (2006) survey and interviews with senior corporate accountants reveals that strategy development and implementation processes tend to be controlled and methodical, and that while greater emphasis is placed on financial information in strategy implementation, both financial and non-financial information are used in strategy development .

Based on data obtained through questionnaire survey from 105 randomly selected manufacturing firms in Sydney/Australia, Perera and Harrison (1997) investigate whether firms which maintain a customer-focused manufacturing strategy also maintain an emphasis on non-financial measures in their performance measurement system, and whether such an emphasis is associated with improved performance for those firms. They find evidence of the increased use of non-financial performance measures by firms pursuing a customer-focus strategy, but do not find any relationship with organisational performance.

It could be concluded from the above arguments that non-financial performance measures may have a more active role to play as a focusing interactive control that serves the discovery and communication of strategy's elements. In other words, non-financial measures are means to achieve the firm's strategic objectives, to enable improvements in non-financial aspects of performance such as quality, satisfaction, and productivity, and as such should contribute to long-term profitable strategy in the form of enhanced profitability, reduced operating costs or better assets utilization (Norton and Kaplan 1996).

2.8 Non-Financial Performance Measures and World Class Manufacturing Practices

Banker et al. (1993) acknowledge that providing information to manufacturing area staff is positively associated with implementation of world class manufacturing practices such as just in time, quality, and team work. This suggests that there is a relation between these practices

and performance measurement systems that stress the role of personnel (i.e. non-financial measures).

Al Bhimani (1994) documents that the manufacturing process (e.g. adopting JIT or TQM systems), the forces of the market in which a firm operates (e.g. high quality competitiveness), and the style of management e.g. managers' concerns) affect the categories and types of performance measures used within companies.

Furthermore, other researchers have reported a positive association between the emphasis placed on total quality management, just-in-time production processes and other advanced manufacturing practices and the provision of non-financial information (e.g. Abernathy and Lillis, 1995; Perera et al., 1997).

Chenhall (1997) proposes that the likelihood that Total Quality Management will increase a corporation's profitability is increased when directors are assessed by direct measures of manufacturing. The analysis provides evidence for the suggestion that enhanced performance will be connected with the interaction between Total Quality Management (TQM) programs and a reliance on manufacturing performance measures: in other words, better performance is united with implementation of both Total Quality Management programs and non-financial operational measures. The results of this study support the argument that manufacturing performance measures (i.e. non-financial measures) must shape part of the official assessment of mangers to determine their rewards and compensation packages.

Hoque et al. (2001) examine the effect of market competition and the computer aided manufacturing process (CAM) on the use of multiple measures of performance in manufacturing settings along with the Balanced Scorecard. Their results provide empirical evidence that both organizations facing intensive market competition and organizations

utilizing computer aided manufacturing application tend to use multiple measures (financial and non-financial) for performance appraisal. These results appear to be consistent with earlier research conducted by Govindarajan (1985); Perera et al. (1997); and Ittner and Larcker (1998).

In the same way, a study by Abdel-Maksoud et al. (2005) based on shop floor level and contingency theory framework in UK manufacturing companies revealed that competitive environments and the adoption of Japanese influenced production techniques such as Just in Time and Total Quality Management are likely to be connected with substantial interest in non-financial performance measures because these systems help to communicate the importance of these initiatives to employees.

2.9 Non-financial Performance Measures and Compensation Plans

Anthony and Govindarajan (2007, p. 505) state that "Incentive compensation is an important mechanism that encourages and motivates managers to achieve organisational objectives. Managers put forth a great deal of effort on activities that are rewarded and less on activities that are not rewarded". Therefore, it is of great importance to measure and reward actions that lead to organization goals in order to avoid any dysfunctional behavior.

Several researchers have examined the use of non-financial measures in compensation plans. For instance:

Stone and Banks' (1997) survey which investigated the extent to which non-financial measures (i.e. customer and employee based measures) are used within The Times top 500 companies in current payment and reward systems reveals that sixteen percent of companies used customer-related, fifteen percent used with employee measures, and eight percent used quality indicators. Moreover, the results suggest that linking pay and rewards to these soft

measures encouraged organisational awa reness of these issues. In other words, this link conveys clearly what really matters to organizations, suggesting the importance of performance measurements as tools of communicating, implementing, and spreading strategy through the organization to achieve its priorities, (Kaplan and Norton, 1996).

Ittner et al. (1997) use the informativeness precept as the basis of an examination of the utilization of performance measures in CEO compensation plan. They argue that, for CEOs in firms pursuing either a quality- or an innovation-oriented strategy, non-financial measures supply incremental information respecting the firm's long term strategic purposes and allow alignment of interests within the firm; however, traditional financial measures may be more appropriate for CEOs in firms concentrated on cost minimization.

Lau and Sholihin (2005) examine how far the behavioral effects of non-financial measures are distinct from those of financial measures, and whether these effects are influenced by the relative importance given to these different measures .In particular, their study theorizes that the use of performance measures for performance appraisal significantly affects managers' job satisfaction. They find that the course by which non-financial measures affect employee job satisfaction is similar to that of financial measures, and that the relative importance of the measures has no significant impact on subordinates' job satisfaction.

Kelly (2007) suggests that a business's reliance on tangible vs. intangible assets and the way in which these non-financial measures are related to managers' remuneration both affect the influence of non-financial measures on the quality of managerial decisions. Specifically; the quality of managerial decisions improves in firms relying on intangible assets when non-financial measures are introduced to the performance measurement system. Moreover, additional improvements occur when these non-financial measures are linked to compensation schemes. In contrast, the managers of tangible assets firms show no

improvement in the quality of their decisions when non-financial measures are added to the performance measurement system or linked to compensation schemes.

2.10 Non-financial measures and the regulated industries

Literature has shown that these conclusions are also valid in the regulated industries. For example; The Institute of Management & Administration (IOMA) Pay for Performance Report (2002) emphasises that both regulated industries (e.g. utilities industries) and highly cyclical industries have found non-financial measures to be beneficial. Regulated industries found non-financial measures such as safety, customer satisfaction, employee satisfaction and service reliability to be helpful because their financial indicators are exceedingly reliant on rigid authoritarian controls, and in view of the fact that the non-financial performance measures have a better alignment with their strategies. In the same vein Said et al. (2003, 2005) find that regulated firms are more reliant on non-financial performance measures than non-regulated firms. Studies by Bushman et al. (1996) and Ittner et al. (1997) suggest that financial measures may be less enlightening in regulated industries, where supervisory bodies can implicitly or clearly connect profits or rate raises to non-financial objectives such as customer satisfaction, reliability, or employee safety. In these cases, it is in the company's economic interests to encourage employees to enhance performance in non-financial areas. These results are consistent with Ittner and Larcker (2002, p.80) who state that "Utilities are associated with the use of non-financial quality, safety, and attendance measures together with the cost measures, the results also indicate that utilities tend to use some non-financial measures in their incentive plans, but are no more likely than other companies to focus exclusively on non-financial measures"

2.11 Non-financial measures and financial performance

The growing literature reveals that present non-financial measures are better forecasters of long-term financials than current financial measures as they give information not included in contemporary accounting metrics "predictive ability", but which is able to reveal and gauge the causes of value creation in the organization "value drivers", helping managers to focus on the long term implications of their actions. However, little empirical evidence is currently available on the relationship between non-financial measures and the financial performance (Banker et al., 2000; Ittner and Larcker, 1998)

Several studies have examined the link between the use of non-financial performance measures and future financial performance. These studies have reported various results. Banker et al. (1998) for example, find positive associations between customer satisfaction measures and future accounting performance in eighteen hotels. Anderson et al. (1994, 1997) report that customer satisfaction in seventy seven Swedish companies was positively related to accounting rate of return for the same period but found negative relationships in service companies. Similarly, research by Ittner and Larcker (1998) report that customer satisfaction measures are the leading indicators of future growth in customer base, changes in business unit accounting performance and current market values consistent with Behin and Riley (1999). In the context of the airline sector, they argue that financial statement numbers lack information content due to considerable fixed costs associated with the acquisition and operation of their aircraft. Consequently, they affirm non-financial performance metrics could assist in avoiding such a deficit by signifying financial performance. However, Behin and Riley (1999) use one and two months of nonfinancial data from seven major airlines to predict the same quarter revenues, expenses, and operating income. In contrast, the current research employs quarterly data from a larger sample to predict the following next four

quarters financial performance seeking for incremental information content as it assumes that it takes more than two months to reflect enhanced operational performance in the form of financial outcomes.

Eccles and Pyburn (1992, p.6) state: "Any development in one measure leads to an improvement in another and will be captured within the period in which the measure are taken. The longer the period, the more likely this fact is to be true". They argue that improving non-financial measures sooner or later leads to a better financial performance, although there is some lag time between the action and its impact.

Aaker and Jacobson (1994) examine whether changes in a firm's value - measured by stock prices - are related to the information provided by that firm's quality measures. Their results indicate that a positive relationship exists between changes in stock prices and changes in quality assessments after controlling for firm's ROI and economy-wide factors. These results imply that quality measures have some advantage over accounting measures in predicting future business performance. Accordingly, disclosure of such information (e.g. brand quality perceptions) would be helpful in presenting the future directions of the firm, allowing investors to depend less on short-term financial measures of performance, and managers to pursue long-term value creation strategies.

Amir and Lev (1996) investigate the value-relevance to investors of one financial (accounting) and two non-financial measures (total population in a service area and the ratio of subscribers to total population) used in independent Cellular Corporations. They establish that financial information is largely irrelevant for security evaluation, whereas non-financial indicators are extremely value relevant. However, when financial information is unified with non-financial information, some of these variables do give the explanation of stock prices. This indicates that current financial reporting in telecommunication companies is insufficient,

and reveals the relationship between financial and non-financial measurements. It also highlights the fact that long-established attention to accounting measures may lead to an unwanted outcome. The research suggests that non-financial measures are more valuable to investors in assessing the future financial performance than metrics derived from the accounting reports.

Ittner and Larcker (1998) examine the relationship between customer satisfaction measures and economic variables such as customer retention, future sales, and stock prices. Their study tests the hypothesis that customer satisfaction measures are indicators of future returns and future profits. The authors characterize their findings as evidence of a significant positive relation between current customer satisfaction measures and future revenues and customer retention rates. They examined, based on firm-level data, whether non-financial measures (i.e. customer satisfaction) provide incremental information to the stock market beyond the information contained in current accounting measures to explain the differences in the market value of equity. They found that disclosure of such measures is significantly associated with excess stock market returns, suggesting that this public release provides information to the financial markets on potential cash flows. In other words, the results reveal the value relevance, the predictive ability, and the incremental information content of customer satisfaction measures.

The Cap Gemini Ernst & Young Centre for Business Innovation (CBI) studies suggests that enhancement in the key intangible categories (innovation, management quality, and employee relations) results in improved market value. For instance, in the case of e-commerce companies, many non-financial value drivers are considered pre-requisites for creating value e.g. innovation, strategic alliances, brand investment, and market share or changes in the achieved percentage. These drivers are considered crucial as non-financial performance

measures reveal the health and wealth-creating prospect of a company in a different way compared to the retrospective financial measures of performance (Low, 2000).

Similarly, Lidetka (2002) argues that non-financial performance measures provide information absent from a comprehensive set of financial performance measures. His study offers evidence that, for the airline industry, a large number of non-financial performance measures supply performance information not provided by a financial performance measures.

Riley et al. (2003) examine the value relevance of non-financial performance measures (revenue load factor, available ton miles, market share, and customer dissatisfaction) for seven of the largest airlines in the United States during the period 1988-1999 using panel data econometric technique. In contrast to Amir and Lev (1996), these findings suggest that accounting earnings and changes in abnormal accounting earnings are significantly related to stock returns in the airline industry. However, consistent with Amir and Lev (1996) and Lidetka (2002), when both financial and non-financial performance measures are included in the model, the analysis indicates that non-financial measures show incrementally greater explanatory power than accounting financial metrics.

Said et al. (2005) in their study of the retention of non-financial measures find that those firms which continue to utilise non-financial measures maintaining persistent growth in stock price returns.

Widener (2006) hypothesises that two workforce variables: namely, reliance on human capital and the firms pay structure, are related to the use of non-financial measures in top directors' bonus compensation schemes since they provide more information than traditional measures. The analysis supports the argument that labor-intensive firms are more likely to emphasise non-financial measures along with conventional financial measures, and less likely

to rely solely on traditional financial measures. Furthermore, this relationship is moderated by a firm's pay structure. The results of the statistical testing confirm that the association is stronger in firms which employ a hierarchical pay arrangement. The findings of Widener (2006) are consistent with Kaplan and Norton (1996). On one hand, Widener (2006) argues that non-financial measures are used to give incremental information necessary to focus managers on strategic objectives and to ally individual and organisational objectives to reduce the agency cost. On the other hand, Kaplan and Norton (1996) argue that firms employ performance measurements to translate and communicate strategy throughout a firm by connecting the company's durable strategy with its short-range actions.

2.12 Value Relevance (Informativeness) of Performance Measures

Performance measurement systems developed as ways of supervising and sustaining organisational control, which is the procedure of guaranteeing that a firm adopts strategies which enable it to achieve its specific goals and objectives. Performance measures are the key instruments in "performance measurement" systems that support management in foreseeing future fiscal performance in addition to helping to disclose possible changes in operations to maintain congruence with the intended strategy (Otley, 1999; Simons, 1999).

Performance measurement is extremely important and could be very expensive for the organization, so the measurement process should be efficient and effective. Efficiency is related to devising as few measures as possible to measure the issues that really matter, whilst effectiveness is related to ability to acquire appropriate performance measurement data (Neely and Bourne, 2000).

Simons (1990, p135) states, "Managers have neither the time nor the capacity to process all the information available to them". For this reason, management accounting reports and

particularly management control systems should embrace the most informative measures, as only a limited amount of the firm's formal management control processes can be considered by top management, the rest being delegated to lower managerial levels because the complexity of managerial roles limits the amount of time and attention managers can give to processing this information (Simons 1990). Viane and Willems (2007, p 16) state that "In view of the massively available potentially interesting information floating around, highly efficient and effective filtering mechanisms are essential for supporting contemporary organisational management".

In addition, Horngren (2004) affirms that an emphasis on selecting appropriate non-financial measures by managers will encourage subordinates to focus on the causes of future profits. He defines the correct measure as the measure which "...performance improvement in this measure causes progress toward strategic goals" (Horngren, 2004, p.209).

Ittner and Larcker (1997) emphasise the importance of selecting appropriate measures (financial and non-financial), arguing that inappropriate measures may focus awareness on the irrelevant objectives and cannot be linked to the desired results. Accordingly, using the wrong measures could result in rewarding undesirable behavior.

As a result, the selection of performance measures is a significant decision for any organisation, since poorly selected measures lead to serious risks including unsuccessful implementation of an organisation's strategy, improper judgments and undesirable consequences (Ittner and Larcker, 1998). This claim is consistent with professionals' point of view: for instance, Chambers (2003, p.1) states "The big challenge for every company is the development of reliable and valid measurement methodologies for value-relevant, non-financial performance measures that have predictive value--measures that are an indication of how much shareholder value will be generated in the future".

Anthony and Govindarajan (2007, p.462) assert that "A single measure cannot control a complex system, and too many critical measures make the system uncontrollably complex." This is consistent with Neely and Bourne (2000, p.6), who state that: "...In the 1980s and early 1990s, the fundamental problem was that we were measuring the wrong things. Now the problem is that we are measuring too much. We need to stop trying to quantify everything that walks and moves and worry more how to extract the value from the data we have access to".

Banker and Datar (1989) studied two additional characteristics of performance measures: namely, sensitivity and noise. Sensitivity is the marginal effect of managers' actions on the performance measure; noise is the change in performance measures caused by uncontrollable random events rather than actual performance. They conclude that while, on one hand, there is a positive association between sensitivity and a performance measure's weight, there is, on the other hand, a negative association between a performance measure's noise and the weight given to it. Intuitively, one would expect from the above definitions that, by their definition, financial performance measures have less sensitivity and more noise compared with non-financial performance indicators.

Concerns about selecting the right measure, measuring too much, the insufficiency of single measures, and the sensitivity and noise of performance measures suggest that there are necessary tradeoffs between measures, as firms cannot incorporate all the critical measures in their control systems, as this would make it too complicated, and cannot depend on one measure, which would make it inadequate. Consequently, firms must rank their performance measures according to their relevance and informativeness.

Malina and Selto (2004, p.452) define informative measures as "performance measures that differentiate managers facing similar and uncontrollable factors." Ittner and Larcker (1998,

p.206) point out that most economic theories analyzing the selection of performance measures indicate that performance measurement and reward systems should incorporate any financial or non-financial measures that provide incremental information on managerial effort (subject to its cost). Moreover, Holmstrom (1979) argues that any performance indicator which gives incremental information about executives' decisions at zero cost should be used in the evaluation of managers' performance and therefore in arriving at a decision about their remuneration. A growing body of management accounting literature argues that existing non-financial measures are better forecasters of long-term financial performance than existing financial measures. They have the ability to give information not provided by contemporary accounting metrics: in particular, they have "predictive value", and are able to reveal and gauge causal value creation by the organization's "value drivers". Therefore, they help managers to focus on the long term effects of their actions. However, little empirical proof is available on the relationship between non-financial measures and financial performance (Ittner and Larcker, 1998; Banker et al., 2000).

These studies also examine the link between the use of non-financial performance measures and future financial performance, reporting varying results. Schefczyk (1993) investigates the relationship between cost efficiency and profitability for 15 international airline companies, concluding that factors such as high operational efficiency, high passenger load factor, and high percentages of passenger revenue are reliable predictors of high profitability

In general, a common theme in the academic research is that non-financial performance measures have relevance and predictive power for both future financial performance and evaluation of firms' equity, and that non-financial performance measurement has a good level of reliability. For example, Horngren (2004) argues that non-financial measures are leading

indicators, in a way that they have significant discernible meaning, and they are controllable at the different levels within an organization.

An efficient and effective filtering method to limit information overload, suggested by many academics in the accounting literature is information content. Information has been defined as "change in expectations about the outcome of an event" Theil ((1967), cited in Beaver 1968), while Beaver (1968), in the context of a study of annual earnings announcement, argues that an annual report is considered to have information content if it "leads to change in investor assessment of the probability distribution of future returns or prices".

Jennings (1990, p.925) stated "A nonzero coefficient on one accounting variable (measure) is interpreted as evidence that the variable has information content that is 'incremental' to the other variables in the equation." However, most previous studies in the incremental information content area consider only financial measures of performance as explanatory variables, and only security returns or prices as dependent variables. For example, previous studies have examined the information content of current cost accounting income incremental to historical cost income or a range of its components in explaining stock prices or returns (Jennings. 1990).

The previous arguments show the importance of the information content of performance measures to be included in measurement models and compensation plans. However, information content implies two qualities namely, the relative information content and the incremental information content as argued by Biddle et al. (1995).

Biddle et al., (1995, p.2) introduce tests of incremental and relative information content, and state: "Tests for incremental information content have been used extensively in accounting research to address questions such as the incremental information content of supplemental

financial disclosures. Incremental comparisons apply when one or more accounting measures are viewed as given and an assessment is desired regarding the incremental contribution of another. In many contexts, however, the relevant research question is not whether one disclosure provides information content beyond another, but rather which provides greater information content. Specifically, when information content comparisons are being made among mutually exclusive alternatives, or when ranking by information content are desired, the relevant research question is one of relative rather than incremental information content."

In other words, incremental information content evaluations enquire whether one measure (e.g. non-financial measures) provides information beyond that given by another measure (e.g. financial measures). However, relative information content judgments are made on the basis of which measure has greater information content (e.g. non-financial measures vs. financial measures). This comparison is applied when making a decision about which of a variety of available measures will be included in a particular performance measurement model, or when applying ranking by information content for different measures (Biddle et al., 1995). Ittner and Larcker (1998) emphasize the need for more research about the unavoidable compromises that managers need to make between different financial and non-financial performance measures, as the practical evidence demonstrates that a number of measures are irrelevant and other indicators should be measured to fit companies' particular requirements (Eccles and Pyburn, 1992). Neely and Bourne (2000) argue that the greatest challenge at this moment in time is the question of how to extract the most valuable information from performance measurement data. Hence, relative information content is a more valuable tool than incremental information content because its comparisons reflect variance in incremental information content (Biddle et al., 1995).

Ittner and Larcker (1998, p. 226) state that, "predictive validity is one of the key attributes of interest when selecting performance measures, from an accounting standpoint, a crucial test is whether a broad set of non-financial measures such development as employee satisfaction, employee turnover, product cycle time, and supplier relations possess incremental ability to predict future financial performance, after controlling for the predictability of past financial performance". Furthermore, they suggest that environmental and structural factors such as an organization's strategy, competitiveness, and product or industry life cycle are likely to be crucial to the explanatory power of the various measures.

Banker et al. (2004) affirm that a high-quality performance measurement system ought to be very frugal, including only a limited number of measures in order to avoid confusion and loss of focus. Existing frameworks of performance measurement such as Balanced Scorecard, Performance Pyramid, and the Performance Prism all attempt to restrict the number of measures so as to prevent information overload and consequent confusion for managers (Tangen, 2004). Among the various frameworks, one approach that could be utilised in the selection of measures is the incremental and relative information content. For example, Neely (1994) suggests that managers are interested in removing weak points (e.g. lack of incremental information content) in their measurement system in order to enhance those systems. Correspondingly, Biddle et al. (1995) argue that in investment analysis context, where it is expensive to produce, obtain or process information, it is helpful to order financial measures by their information content in view of their relative informativeness.

The majority of incremental information content studies address either abnormal returns or stock prices on multiple financial measures such as cash flow from operations, earnings, or EVA. There are also studies that suggest that the incremental information content of performance is a fundamental criterion for choosing which measures to report on, especially

when presenting financial accounting reports to investors (Jennings (1990); Ali (1994); Ali and Pope (1995); Biddle et al (1995; 1997)). Biddle, et al. (1997) carried out tests to examine the incremental and relative information content of different measures: namely, earnings, residual income, cash from operations, and EVA. Their results indicate that of these measures, earnings have the greatest incremental and relative information content.

Biddle et al. (1995, p.3) state that, "incremental information content comparison assess whether one accounting measure (or set of measures) provides information content beyond that provided by another. Relative information content comparisons ask a subtly different question, which is whether one measure provides greater information content than another". In other words, incremental information tests examine if a performance measurement system including measures A and B will provide information beyond that provided by measure A or measure B alone, while relative information tests examine if measure A has greater information content than performance measure B. These relationships are depicted in figure 1-1 where the areas inside the circles depict the amount of variation in dependent variables explained or predicted by performance measures X and Y. According to Biddle et al. (1995), in incremental content assessments only the areas outside of the overlap between the circles are important, a greater area of intersection between the measures indicating a higher correlation between them, and thus a lesser incremental information content obtained by using the two measures in conjunction with one another. In relative assessments, by contrast, the size of the circle is also important, as it signifies greater information content and therefore greater relative content compared to a particular benchmark measure.

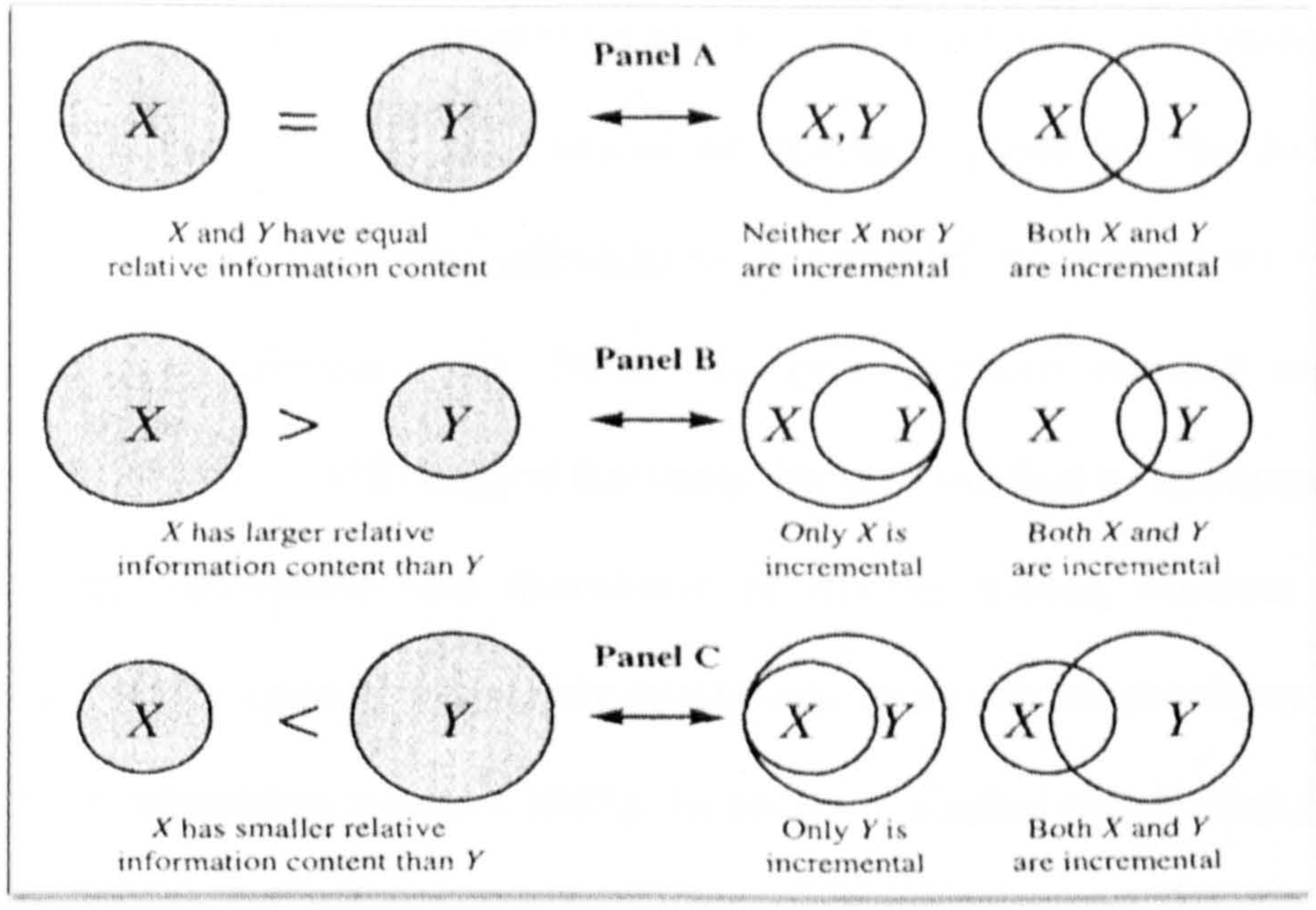


Figure (2-1): Relative versus incremental information content: adapted from (Biddle, 1995, p.4).

Biddle et al (1995) acknowledge the importance of relative and incremental information content tests at the company level whilst assessing different performance measures for management accounting purposes e.g. managerial control or managers' remuneration. Studies in the management accounting sphere focus on either one or two non-financial measures. These measures include service area population, the penetration of the firm into the service area (Amir and Lev, 1996) customer satisfaction (Ittner and Larcker, 1997), and employee satisfaction and delivery punctuality (Wiersma, 2008). However, Biddle et al. (1995, p.6) state that: "Relative information content comparisons also could be useful when evaluating alternative performance measures for internal evaluation and control. In applications such as these, it may be useful to assess relative information content for a dependent variable other than stock prices or returns". For example, an organization may be interested in evaluating the relative information content of different performance measurement systems.

To sum up, the most important argument for the use of non-financial performance measures is that they are leading indicators of financial performance, predicting the direction of the financial outcomes, and providing information incremental to that given by historical financial performance (Banker et al. 2000). However, previous research reports mixed results: Ittner and Larcker (1998) suggest that many firms do not find a significant association between customer satisfaction and accounting or market returns, whereas in contrast, Anderson et al. (1997) argue that customer satisfaction measures are positively related with current return on investment measure (ROI). In addition, Kaplan and Norton (1992) argue that current non-financial performance measures are better indicators for future financial performance than financial performance measures, while Banker et al. (2000) document that measures of customer satisfaction and loyalty are leading indicators of financial measures such as profit and revenues in hotels industry.

Similarly, Najar and Rajan (2001) examine the ability of non-financial performance information to forecast and predict future financial information. In particular, they investigate the relationship between future sales (financial information) and product quality measures (namely defect rates and on-time delivery) for eleven plants belonging to an industrial Fortune 500 firm. They offer the following hypothesis:

"H1: reported financial quality measures *(internal and external failure costs)* are leading indicators of future sales.

H2: reported non-financial quality measures *(defect rates and on time deliveries)* have incremental power to explain future sales, even after controlling for financial quality measures." (Najar and Rajan, 2001, p.498) (Italic added).

It is observed that financial quality measures and non-financial quality measures include considerable information about future sales and consequently have the potential to predict sales one quarter in advance. In contrast, non-financial measures contain significant additional forward-looking information beyond financial quality measures, suggesting an integrative relationship between financial and non-financial measures and the relative information content of the non-financial measures compared to the financial indicators. In support of this, Liedtka (2002) argues that non-financial performance measures offer information not already provided by a comprehensive set of financial performance measures. This is consistent with Amir and Lev (1996) and Riley et al (2003), who suggest that when both financial and non-financial performance measures are included in a model, analysis indicates that non-financial measures show explanatory power incremental to that contained in accounting financial metrics. In the same vein, Ittner et al. (2003) argue that non-financial performance metrics are presumed to present superior information on strategic improvement and achievement. Consistent with these arguments, numerous accounting researchers provide evidence to demonstrate that non-financial measures can be considered to be leading indicators of lagging financial performance (e.g., Ittner & Larcker, 1997; Banker et al., 2000). In other words, non-financial measures can predict the direction of financial measures. However, while earlier studies have examined the relationship between nonfinancial measures and financial performance, they have largely ignored the fact that firms in practice are using multiple measures of performance rather than depending on a single or small number of nonfinancial measures. As a result, they tend to overlook the tradeoffs as well as the interaction between these measures of performance. In addition, these studies, although they imply incremental information content of these measures, tend to disregard the relative information content of multiple competing measures.

Recently, Wiersma (2008) employed three years' monthly observation data for twenty seven responsibility centres of a Dutch service firm to check the value relevance of two non-financial performance measures - on-time delivery and absence frequency - compared to financial performance measures for explaining future financial performance. The results indicate that the tested non-financial measures do not have extra relative information content compared to lagging accounting measures, but do have incremental information content compared to the lagged accounting-based measures to explain prospective costs and revenues.

2.13 Relevant studies in the airlines industry

A small number of studies have been conducted in the airlines industry setting:

- Schefczyk (1993) investigates the association between operational performance (particularly cost efficiency) and profitability for fifteen international airline companies, in an attempt to identify an enhanced depiction of operational performance that would be appropriate to international airline companies. Utilising Data Envelopment Analysis technique, he concludes that factors such as high operational efficiency, high passenger load factor, and high percentages of passenger revenue foretell high profitability.
- Behin and Riley (1999) identified a group of non-financial performance metrics by reviewing market analysts and related Wall Street Journal articles: load factor, market share, capacity, and customer satisfaction. As these data are available on a monthly basis, they employed the opening month and the initial two months of a quarter to forecast quarterly financial results (i.e. operating revenues, operating expenses, and operating income), as well as investigating the simultaneous association between

these non-financial indicators and the financial performance for seven domestic American airline companies.

- Liedtka (2002) utilised exploratory and confirmatory factor analyses to assess the information content of various financial and non-financial performance measures of the 7 major US airlines operated from 1988 until 1998. The study concludes that, for airline industry, a large number of non-financial performance measures can provide performance information over and above that provided by financial performance measures.
- Riley et al. (2003) examine the value relevance of conventional accounting measures, (earnings (EPS) and changes in abnormal earnings (ABEPS)) and other non-financial information (fitted complaints, load factors, market share, and available ton miles) for seven American airline companies in order to establish associations between these performance variables and stock returns. The results of this study indicate that both financial and non-financial performance variables have a significant relationship to stock returns.

2.14 Conclusion

This chapter has presented a review of the literature on performance measurement. The review shows that performance measurement system is an important part of the management control system as they have a key role in organisations because of their effect on the success of organisations, as well as for their importance as a source of information about financial transactions and the internal activities. However, there is a general agreement about the inadequacy of relying solely on the financial performance measures. Also, it is clear that there is a need to consider non-financial performance measurements. Hence, there is interest for integrating traditional financial measures with non-financial performance measures to

overcome these inadequacies. This interest is largely due to the argument that these nonfinancial measures are leading indicators of future financial performance as well as they have the capability to overcome inherent shortfalls in the financial measures. How ever, despite the large number of arguments in research in favour of the use of non-financial measures of performance in management control systems, internal and external financial reporting, and managers' rewards, very little empirical evidence is available on the relationship between financial and non-financial measures of performance. Furthermore, there is a lack of research into the information content of financial and non-financial measures of performance, specifically as to which measures contain more information, have greater predictive value, and are better indicators of future performance. This study seeks to contribute to this area, investigating the relationship between current non-financial performance measures and contemporaneous financial performance as well as future financial performance. It also offers empirical evidence for the incremental information content of financial and non-financial measures of performance and the persistence of this assumed information content i.e. whether this incremental information content has the quality of continuing over time. Finally, it explores the interrelationships among multiple measures of performance to understand the nature of these interlinks between different measures of performance and their associations with the financial performance to offer several contributions to the academic literature as illustrated in chapter one.

Chapter Three

Theoretical Framework

3.1 Introduction

This study addresses the relative and incremental information content of non-financial measures of performance compared to financial measures of performance in explaining and predicting current and future financial performance. In addition, it explores the direct and indirect relationships between different perspectives on a firm's performance.

This chapter examines frameworks and concepts which help in understanding the business environment in general and the performance measurement problem in particular. It briefly explains theoretical paradigms such as expectancy theory, agency theory, shareholders theory and stakeholders' theory, as they aid theoretical rationalization of the hypothesised links which this research investigates. The chapter tackles several related issues such as the qualitative characteristics of accounting information. In addition, it describes the Balanced Scorecard, the most popular performance measurement system making use of both financial and non-financial perspectives on businesses' performance. This chapter, along with the literature review (chapter two), provides a solid theoretical foundation for hypothesised relationships between variables, and underpins the methodology employed in this study and described in greater detail in chapter four.

This chapter reviews the most common theories found in performance measurement research. Section 3.2 describes expectancy theory, agency theory, shareholders theory,

stakeholders' theory, and agency-stakeholders theory. Section 3.3 revisits the conceptual accounting framework in order to link relevance and representational faithfulness qualities with the subject of study and to link the academic perspective with the practitioners' perspective. 3.4 explains the balanced scorecard, the most popular application that integrates financial measures with non-financial measures, and which seeks to extend reporting to satisfy all stakeholders' informational needs. Section 3.5 explores the way this theoretical background has been put to use in the airline industry. Section 3.6 summarises the theoretical arguments that support use of nonfinancial measures for management control purposes. Finally, Section 3.7 briefly lists theoretical arguments that support the inclusion of non-financial measures of performance in systems of evaluation and remuneration.

3.2 Theoretical Paradigms

Management accounting research has relied heavily on informal reasoning derived from several managerial theories, namely: expectancy theory, agency/contracting theory, stakeholder theory, and agency-stakeholder theory. Most of the issues tested in recent work of management accounting researchers are based on or derived from interpretations of these theories. Consequently, it is important to have a general understanding of these theoretical paradigms.

3.2.1 Expectancy theory

Expectancy theory is a theory of motivation developed by Vroom (1964), which has been used extensively in work motivation, organisational behaviour, and compensation

literature (for example, Mitchell and Donald, 1972; Walker et. al., 1977; Fudge and Schalacter, 1999).

Fudge and Schalacter (1999, p.296) define expectancy theory as "a process theory of motivation, according to which motivation is a function of individuals' perceptions of their environment and the expectations they form based on these perceptions".

The theory concentrates on an employee's interaction with their environment, distinguishing three different dimensions which together affect motivation.

First, the effort-performance expectancy refers to the employee's view of the relationship between effort and performance, particularly whether the two are viewed as positively correlated. According to the expectancy theory; the higher the expectation that effort and performance are positively correlated, the higher the individual's motivation to exert effort in order to boost performance. Vroom (1964) defines the effort-performance expectancy as "the subjective probability that an action or an effort will lead to an outcome or performance".

Second, the performance-outcome expectancy (instrumentality) refers to an employee's perception of the correlation between their performance and their compensation. Where performance and compensation are seen to be linked, this is expected to increase motivation, encouraging the employee to exert themselves in order to increase their remuneration.

Third, the valence dimension refers to the way a person evaluates and perceives the incentive offered. According to the expectancy theory, the more the individual values the incentive, the higher their motivation to expend effort on a given task.

Taken together, these three dimensions imply that organisations could seek to increase workers' motivation and therefore enhance performance three ways: by increasing expectations that superior effort is linked to better performance, by reinforcing the links between performance and compensation, and by improving the perceived value of the rewards offered in return for superior performance (Sloof and Praag, 2006).

Figure 3-1 adopted from (Fudge and Schalacter 1999, p.298) portrays the elements of expectancy theory model and illustrates the relations between them.

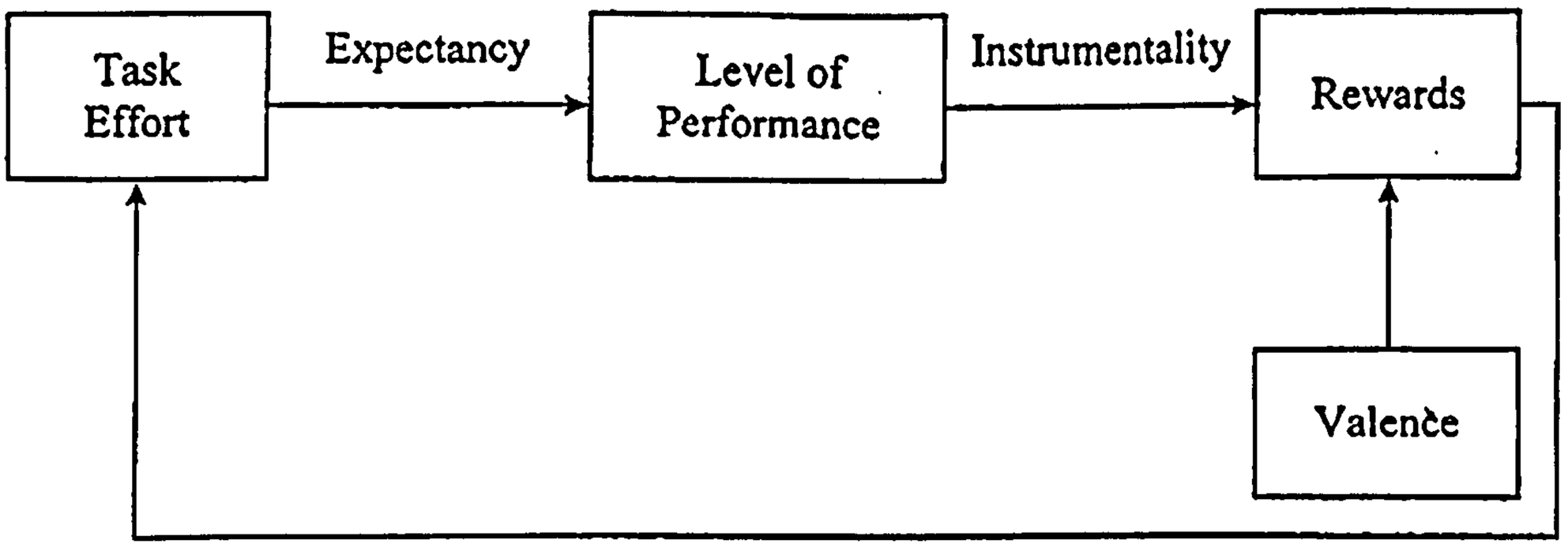


Figure (3-1) adopted from Fudge and Schalacter (1999, p. 298)

An important implication of expectancy theory in the performance measurement field would be that including non-financial measures of performance in systems for

determining remuneration could enhance managers' and employees' perception of the relationship between effort and performance on the one hand, and performance and reward on the other, improving motivation within the organisation, connecting the firm's desired outcomes with employees' desired actions via the firm's performance measurement system (Klein, 1991). It is well documented that non-financial measures have the upper hand in capturing the desired outcomes (Norton and Kaplan, 1996; 2001). Kelly (2007, p. 527) states: "Non-financial value drivers reflect activities that drive future financial performance and are intermediate variables between current investments and future profits. For example, R&D investments first affect a non-financial measure reflecting R&D productivity, which ultimately affects profits". This is consistent with a general tendency in the literature to argue that favourable operational actions will produce enhanced financial performance since the future financial performance is a consistent consequence for rational managerial behaviour in taking actions, (Ittner and Larcker, 1998).

To conclude, expectancy theory suggests that employees' motivation is improved by the perception of a stronger connection between effort and pay. This link between performance and remuneration would be clearer for subordinates when measured by indicators that capture these exerted efforts i.e. non-financial performance measures. Therefore, usage of non-financial performance measures would indirectly affect the financial health of an organisation through boosting efforts the exertions offered by employees and managers. Consistent with Sloof and Praag (2006, p.2), who argue that: "a performance measure with less noise will give stronger incentives to exert effort".

Lawer (1970, p. 229) introduces two new elements to the original expectancy theory model: ability and problem solving approach, as shown in figure (3-2)

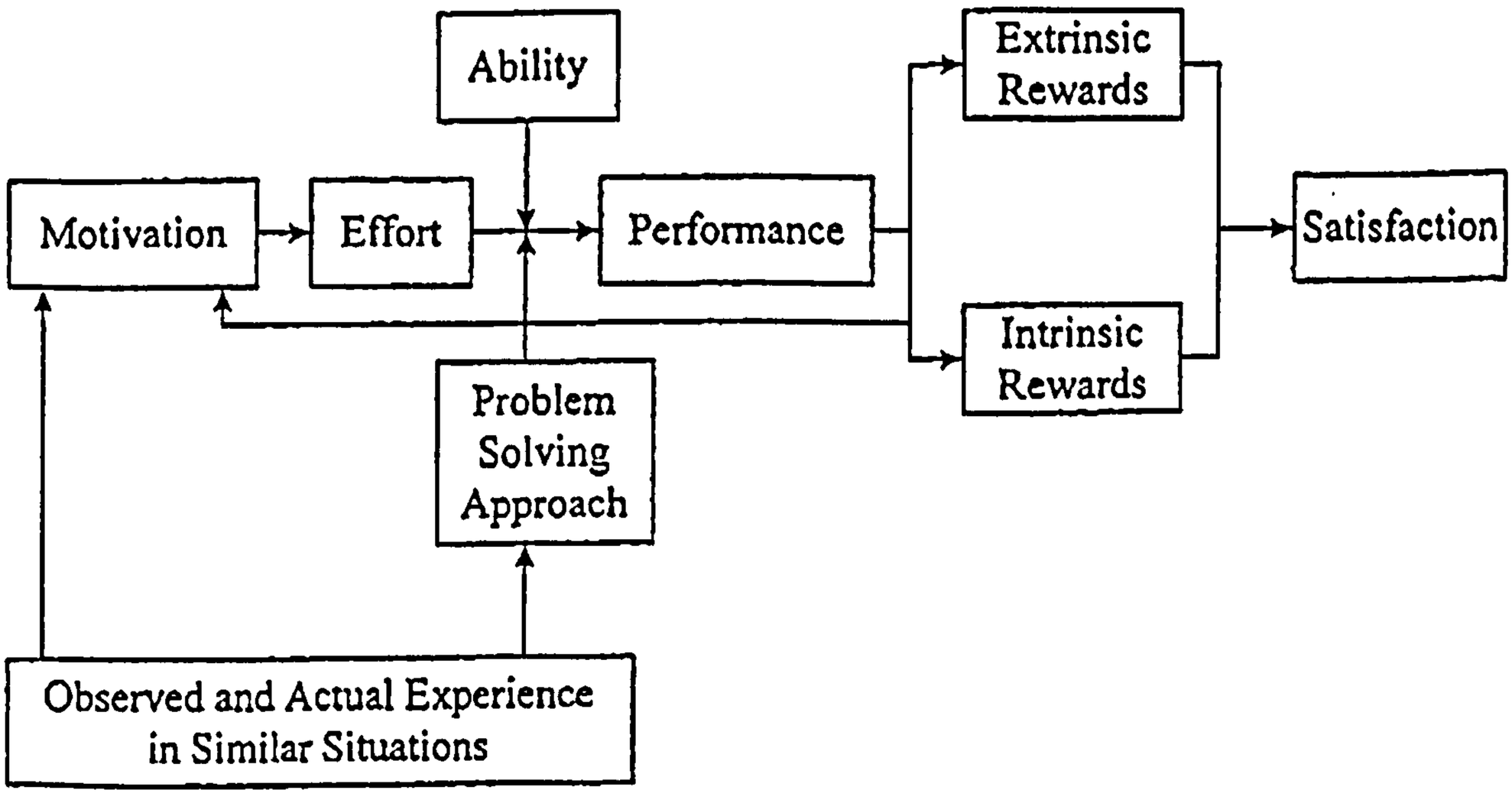


Figure (3-2), adopted from Lawer (1970, p. 229) cited in Fudge and Schalacter (1999).

The most important new element is the employee's ability. This which emphasises the importance of employee training as it is expected that higher spending on training employees is linked to increased employee ability to perform certain jobs, which in return improves the employee's rewards and consequently fosters the employee satisfaction (Fudge and Schalacter, 1999).

The ability factor also has implications for goal-setting criteria. Targets should not be too difficult, as "people do not try to perform at levels which they do not feel they can achieve" Lawer (1970, p. 229). This is consistent with Klein (1991), who found significant association between expectancy theory's constructs, goal choice and

performance, arguing that expectancy theory constructs act as mediator between goals and performance.

Expectancy theory research seems to be consistent with behavioural accounting research which has found that areas such as budget design and usage may influence organisation's participants' behaviour alongside other aspects such as employee satisfaction, employees' performance and organisational performance. Behavioural research has also investigated the behavioural assumptions of management accounting, and tested the influence of accounting techniques on participants' behaviour. It has examined elements of the control process (e.g. budgetary process) that can have an impact on individuals' behaviour, and consequently has identified behaviours and elements that can be manipulated to maximise performance and minimise the dysfunctional consequences of accounting (Ryan et al., 2002)

3.2.2 Agency theory

Jensen and Meckling (1976, p. 308) describe the principal agent relationship as "a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decisions making authority to the agent." This is typical of the relationship between owners and managers within a firm.

Subramaniam (2006, p. 55) describes agency relationship as the relationship that "...arises when one party (the principal) hires another (the agent) to perform a task. In most cases, this would involve the agent making decisions on behalf of the principal". Jensen and Meckling (1976, p. 310) define firms as "legal fictions which serve as a nexus for a set of

contracting relationships among individuals". However, conflict of interest between owners and contracted individuals can result in moral hazard in the form of hidden cost. This is due to the information asymmetry whereby managers – involved in the day-to-day running of the firm have an information advantage over owners who can only evaluate managers based on outcomes as they are unable to observe managers' actions on daily basis (Scott, 1997).This is consistent with Holmstrom's (1979) argument that "a moral hazard" could occur when people share risks under circumstances in which actions taken could affect the likelihood distribution of an outcome. This situation could arise in managers' contracting including their compensation where managers (agents) are able to take decisions on behalf of the owners (principal).

Principal-agent theory focuses on a situation in which an agent takes an action to increase a particular output. The agent's action itself is non-verifiable, so only output can be contracted upon. This output is initially owned by the principal, but the principal might share it with the agent by paying him a wage dependent on this output.

Holmsttrom (1979, p.74) suggests that moral hazard (e.g. an incentive problem) is due to information asymmetry among individuals resulting from the fact that individual actions are not observable and therefore cannot be contracted upon. He suggests that this problem could be solved by devoting resources to monitoring agents' performance, and using this information as the basis for remuneration. However, full monitoring is infeasible, and so imperfect estimators of actions are used as proxies for performance in contracts. Such measures are used heavily in management accounting practices to mitigate moral hazard (Holmstrom, 1979).

Agency theory suggests that when individuals experience a conflict of interests, they will tend to act upon their own self-interest. It looks at the way management accounting system design and any contracts among an organisation's members could affect individual interests, and seeks to alleviate any inadequacy resulting from these conflicts of interest (Baiman, 2006).

One important aspect of agency theory is that it considers information as a commodity which has costs and could be acquired. This assumption affects organisation's formal information systems (such as their performance measurement models and budgeting), as well as their informal information systems (such as managerial supervision). The implication is that organisational investment in such information systems will minimise the likelihood that agents will take advantage of the information asymmetry between agents and principals (Eisenhardt, 1989).

According to agency theory, a performance measure should be chosen on the basis of its ability to provide information about employees' and managers' actions (Bushman et al., 1996). Gibbs et al. (2004) argue that powerful performance measures should offer precise, informative and well-timed information about subordinates' performance. Therefore, a measure's ability to inform about a manager's actions is an essential condition for its inclusion in compensation plans (Hemmer, 1996), as this renders its ability to align subordinates' actions choices with principals' objectives (Feltham & Xie, 1994).

Lambert (2001, p.4) states, "Accounting systems produce numerous measures of financial performance, including costs, revenues, and profits. Each of these financial

measures of performance can be calculated at the "local" level or at higher levels, including the firm-wide level. The question of how to choose the best measure of performance is an important one because accounting and budgeting systems, performance measurement systems, transfer pricing systems, and decision support systems affect how people and organisations interact". Traditional performance measures have been criticised widely on the grounds that they encourage managers to pay attention to the wrong aspects of organisational performance due to inherent shortfalls in these measures (e.g. their short term focus and tendency to be backward looking).

Due to these potential shortcomings in the financial measures of performance, companies have started to incorporate non-financial operational performance measures in their performance measurement systems, such as quality, customer satisfaction, new patents and innovation measures, and many others. Daum (2006, p. 238) states that, "financial measures are lagging indicators; they give delayed information about company reality. Therefore, proactive managers need to balance the focus on both actual short-term financial performance (which is a proxy for the efficiency of an organisation) and on tangible assets that will derive value in the future". Academics have attempted to introduce new measurement models that integrate the traditional, backward looking measures with newer, forward looking non-financial measures. For example, Norton and Kaplan (1992, 1996) suggested the Balanced Scorecard which integrates four perspectives of organisational performance in a holistic approach seeking to capture the critical success factors that lead to value creation, and exploit intangible assets, and provide information about short-term performance on timely basis, while at the same time minimising information surplus by limiting the number of performance measures.

Furthermore, controllable measure is a metric that reflects managers' ability to influence actions; this definition has been refined to include the possibility that managers' actions can affect performance measures, implying that controllability is a degree issue: in other words, that it depends on a measure's sensitivity to changes following managers' actions, and precision that is lack of noise i.e. lack of changeability in the measure caused by uncontrollable events (Banker and Datar, 1989). Financial measures are too aggregated (Parmenter, 2007) and so may fail to provide detailed information about managers' performance. In view of the above definition of controllability, non-financial measures seem to be more controllable than financial measures (Ittner and Larcker, 2000), so if performance measures are to be used to evaluate managers, it could be argued that non-financial measures have incremental information content beyond that provided by financial measures due to their closer correlation to controllable events, whereas if the aim is to assess divisional economic performance, financial performance measures could be more appropriate (Ghosh, 2005).

The preceding discussion, taken with the arguments outlined in chapter two, suggests that financial measures are noisy and inadequate signs of agents' effort. On the contrary, non-financial measures seem likely to reduce noise by conveying immediate signals about managers' actions to capture the relationship between effort and outcomes.

Control management systems used as monitoring strategies can guarantee greater congruence between participants' interests and hence less agency costs. This connection suggests that agency theory analysis is appropriate for investigating management accounting issues, as the two share common goals. Agency theory has valuable insights to the design and use of management accounting practices and measures e.g. managers'

remuneration, budgeting, and performance measurement (Baiman, 2006). Subramaniam (2006) suggests that one approach to mitigating the agency problem and its related costs is to introduce monitoring strategies such as performance measurement systems which aim to set targets for managers as well as monitor and restrain their behaviour.

Accounting researchers have accepted the broad outlines of agency theory as a way of explaining the influence of accounting information on relationships within organisations at the individual level, as well as organisational processes and interactions on the market level.

Hemmer (1996) argues that agency theory implies that a compensation contract based on non-congruent measures leads to suboptimal effort distribution across tasks and therefore encourages managers to improve one area of operations at the expense of others. Hemmer (1996) investigates the design of non-financial measures that originate within an organisation to compensate for the limitations of financial measures in capturing the long term consequences of managers' (agents) actions, and to minimise the problem of managerial short-sightedness. Hemmer's (1996) findings suggest that, although several non-financial measures are comparable from an economic perspective, measurement problems may give a particular measure more value than others by overemphasising it in compensation plans. These findings are in harmony with Hauser et al. (1994), who advocate measuring customer satisfaction, and incorporating this information into compensation plans, due to its impact on profitability.

Feltham and Xie (1994) argue that in situations when managers' effort is multidimensional, the use of non-financial measures along with a financial measure (e.g.

profit) would boost organisations' profitability. In other words, introducing more performance measures means monitoring more aspects of managers' performance, and accordingly emphasises the favoured actions. In addition, making use of a broader range of performance measures alleviates the risk that managers will focus on particular goals e.g. short term profitability at the expense of others e.g. long-term value. For instance, in agency theory, the variability of a principal's benefit depends on managers' short term and long term oriented efforts, so depending on short term financial measures alone would encourage short-term oriented efforts at the expense of the long-term oriented efforts. However, incorporating additional measures that capture long-term oriented i.e. non-financial measures would reduce agency cost (in terms of principal long-term loss). Hence, consistent with Hemmer (1996), if non-financial measures of performance are signals of long term efforts then this condition makes them more valuable.

These arguments are also supported in practitioners' literature. For example, Barua et al. (1995) and Hauser et al. (1994) argue that a manager's effort gives rise to outcomes occur immediately, for example customer satisfaction, these developments are best mirrored by non-financial metrics. In turn, these developments eventually result in financial outcomes. These indirect cause-effect relationships suggest that non-financial measures contain more direct information about managers' effort compared to the aggregated financial measures.

The argument of a cause-effect relationship is based on the idea that managerial actions are captured by non-financial measures, which in turn are leading indicators of the future financial performance. Hence, non-financial measures are considered better indicators of the long-term organisational performance (Hemmer, 1996).

This suggests that non-financial measures have a major role to play in reducing agency cost as a result of the direct linkage between these measures and managers' actions (due to their sensitivity and precision). They can also reduce agency cost by reducing managers' ability to take sub-optimal actions necessary in order to enhance their division's short term profitability consistent with the decentralised authority suggested by Chenhall (2004, p.106), who states "...performance assessment would assess the mean value of the measure as it responds to the managers decentralised actions, adjusted for other measures that may also change".

These implications are consistent with the findings of Gersbach (1998) that control systems depending on aggregate measures provoke suboptimal effort allocation on different tasks if these tasks are not equally significant. Gersbach also finds that specific control system practices (i.e. the use of multiple measures) will boost performance as managers will divide their attention more equally on all important tasks. However, although introduction of these multiple measures will alter managers' behaviour, it is important to place appropriate weights on these measures: improper weighting will also result in suboptimal effort allocation (Smith 2002). In the same vein, Bryant et al. (2004, p. 116) state, "Managers' effort can be focused across the various tasks by linking the tasks with a mix of appropriate performance measures. Otherwise, managers may choose to pay too little attention to tasks that are not appropriately captured by the performance measurement system of the firm". For example, if a firm's goal is creating value for its stakeholders, while managers' remuneration is based on short-term goals such as profitability, managers may chase profitability by taking short term oriented decisions such as reducing research and development expenditures, decreasing employees training

spend or focusing on short term tasks regardless of their long term consequences for the firm (for example, harm customer satisfaction or lessen employees loyalty). On the other hand, if managers' evaluation is based on multiple measures, capturing a firm's multidimensional performance, including non-financial elements such as innovation, internal process, customers' relations and financial performance, managers are more likely to consider these measures when allocating their efforts. Consequently, it is expected that concentrating managers' efforts on non-financial aspects of organisational performance will eventually enhance performance on other non-financial aspects, as well as future financial performance.

Finally, research on agency theory in accounting has shown that models of moral hazard tackle the relative weight of different performance measures in compensation plans. Banker and Datar (1989) and Kim and Suh (1991) show that the relative value of a performance measure for incentive purposes depends on its informational intensity, as determined by its sensitivity and precision. Therefore, for rewarding managers in a moral hazard setting, they argue that only future performance is relevant, and imply that if non-financial measures are leading indicators of future performance then they ought to play a role in performance evaluation and rewarding managers.

3.2.3 Shareholder Perspective

Shareholder theory argues that a manager's (as agents for owners) task is to maximise owners' wealth by making the most of their investment to amplify their returns. It asserts that a firm's main objective ought to be maximising shareholders' returns, on the basis that shareholders advance resources (investments) to a firm's executives, whose role is

believed to spend these resources only in ways aligned with shareholders' interests and on the basis of property rights for shareholders. This means that shareholders have the right to decide on how their property are exploited and consequently how their investment is managed, where managers are seen as the shareholders' agents of the owners who are responsible for carrying out their plans and focusing on meeting their objectives (Friedman, 1970; Fligstein, 1990). Accounting has traditionally served this perspective by reporting on income, equity and shareholders' wealth (capital maintenance) using its established reporting system, including reports of balance sheet, income statement, and cash-flow statement.

3.2.4 Stakeholder theory

According to stakeholder theory, managers are stakeholders' agents and have two duties: to make sure that the stakeholders' ethical rights are not disregarded, and to maintain balance between stakeholders' interests when making decisions. The purpose of this dual role is to balance shareholders' return maximization with the organisation's ability to survive as a going concern by maintaining good relationships with its stakeholders; this good relationship can be sustained by extending the firm's objectives from merely serving shareholders' interests (i.e. maximising returns) to serving the legitimate interests of all stakeholders, which consistently leads to building and maximising long term value (Freeman, 1984; Clarkson, 1995).

The literature offers several rationalisations for this theory. Buchholz (1993) sees organisations as social bodies which have positive impacts on society, such as economic improvement, as well as negative impacts, such as pollution. DiMaggio and Powell

(1991) and Deegan (2002) argue that organisations have to meet stakeholders' (in a particular society) expectations entailed in a "social contract" to gain legitimacy and to acquire the required support for sustainable operations. This is consistent with the new institutional theory, which highlights procedures in which companies conforms to their social and environment contexts while interacting with their stakeholders (DiMaggio and Powell, 1991) although this conformity comes at the expense of profits.

Atkinson et al. (1997) identify two clusters of stakeholders: the environmental stakeholders, comprising customers, owners, and the community; and process stakeholders, comprising employees and suppliers.

Anthony and Govindarajan (2007, p. 55) state, "...economic performance is not the sole responsibility of a business, nor is shareholder value. Most managers want to behave ethically, and most feel an obligation to other stakeholders in the organisation in addition to shareholders".

3.2.5 Stakeholder -Agency Theory

Departing from stakeholder theory and agency theory; Hill and Jones (1992) introduced the stakeholder–agency theory. This theory expands the standard principal–agent relationship of financial economics, creating a comprehensive theory of agency by including other stakeholders in the model. Consequently, managers are considered the agents of multiple stakeholders rather than agents for owners alone. However, different stakeholders have different stakes in the firm, and their ability to persuade managers differs accordingly. This is consistent with Freeman and Evan's (1990, p. 352) statement that "managers administer contracts among employees, owners, suppliers, customers, and

the community. Since each of these groups can invest in asset specific transactions which affect the other groups, methods of conflict resolution or safeguards must be found".

The work of both Freeman and Evan (1990) and Hill and Jones (1992) on integrating agency theory and stakeholder theory highlight the role of managers in harmonising the interests of different stakeholders by balancing their influence on management. However, the 'information asymmetry' between managers and multiple stakeholders enlarges firms' management responsibility, adding the duty of protecting the business's wellbeing by balancing the often contradictory claims of multiple stakeholders. These arguments call for a monitoring and evaluation devices that reduce information asymmetry (Hill and Jones, 1992).

Taken together, the above arguments suggest that performance measurement systems which rely on traditional financial accounting alone are no longer relevant for the needs of contemporary organisations, which must be able to report on many dimensions of performance to satisfy the informational needs of a wide range of stakeholders, including customers, employees and suppliers. In other words, contemporary performance reporting should account for many social parties including soft-intangible dimensions of firms' performance rather than focusing on shareholders only as in the case of traditional performance measurement systems. Alam (2006, p.24) states: "Accounting from stakeholder perspective is concerned with a wider conception of organisational performance and reporting, not purely to shareholders, but to a broad range of stakeholder that make up the society. Such a perspective promotes financial, social and environmental information to be disclosed so that different stakeholders can be informed about the effects of organisational operation". This is consistent with Gray et al.'s (1997)

argument that the stakeholder theory approach has the potential to extend the range of accountability, and with Atkinson et al.'s (1997) argument that the stakeholder approach records strategic planning matters, which in turn affect performance measurement systems design to serve the needs of different stakeholders. Balanced Scorecard can be a good example of extending the range of accountability and reporting, as it includes both financial and nonfinancial measures of performance. This allows an organisation's managers to understand and evaluate the important factors for success, helping the organisation to do well in a competitive environment by considering the expectations of a wide range of stakeholders whilst continuing to emphasise the overarching financial objectives of profitability, maximisation of owners' wealth, and the creation of sustainable value.

3.3 Qualitative Characteristics of Accounting Information Perspective

Revisiting the accounting conceptual framework, the Financial Accounting Standard Board's (FASB) statement number 2 (1980) regarding qualitative characteristics of accounting information emphasises the importance of several qualities that make this information useful, and provides criterial characteristics to help make accounting choices. The Board discussed the qualitative features of accounting information. It suggested that the choice of accounting procedures should be directed by the characteristics that make information a valuable commodity. These characteristics can be seen as a chain of intrinsic qualities, in which decision usefulness is the most important. According to this statement, the primary merits that make accounting information valuable and useful are its relevance and reliability. If either of these features is absent, the information will be of little use. Relevance and reliability are important qualities which distinguish better

information from inferior information (FASB, 1980, statement 2). Paragraph 51 of the statement describes feedback value and predictive value as components of relevance as follows:

"Information can make a difference to decisions by improving decision makers' capacities to predict or by confirming or correcting their earlier expectations. Usually, information does both at once, because knowledge about the outcome of actions already taken will generally improve decision makers' abilities to predict the results of similar future actions. Without knowledge of the past, the basis for a prediction will usually be lacking. Without an interest in the future, knowledge of the past is sterile"

The same statement defines reliability as the quality of information that assures that information is reasonably free from error or bias, and faithfully represents what it purports to represent. In regard to measures, paragraph 59 states that the "reliability of a measure rests on the faithfulness with which it represents what it purports to represent, coupled with an assurance for the user, which comes through verification, that it has that representational quality". To conclude: the most important elements of reliability are representational faithfulness and verifiability (FASB, 1980).

Of the two characteristics of relevance and reliability, relevance is perhaps the more important. Snavely (1967, p. 232) states that "If information is not relevant, it is of no use even though it may be perfectly reliable, understandable, significant, sufficient, and practical". According to Snavely's developed criteria for accounting information, "relevance is a second-level criterion. That is, first, information must be useful; and consequently, for information to be useful, it must be relevant". He considers that

"relevant information is that which will assist in (1) valuing a firm, (2) evaluating management, or (3) evaluating management's policies" (ibid, p. 228).

Furthermore, FASB (1980, statement 2 paragraph 63) describes representational faithfulness as crucial to the usefulness of information:

"Representational faithfulness is correspondence or agreement between a measure or description and the phenomenon it purports to represent. In accounting, the phenomena to be represented are economic resources and obligations and the transactions and events that change those resources and obligations". However, as the representational faithfulness of accounting measures which entail estimation and allocations cannot be directly verified, the reliability of many accounting measures may be significantly lower than is usually believed, due to different outcomes for the same measure using different accounting methods. For example, different allocation and amortisation methods and different inventory evaluation methods have a great impact on profits as an outcome financial measure. This variation raises questions about the reliability of these measures. Reliability in this context does not mean precision of calculation since all accounting measures are mathematical concepts, and applying different accounting methods will result in mathematically precise outcomes, yet mathematical correctness does not necessarily reflect representational faithfulness in depicting economic events in the financial reports (Johnson, 2005). Financial measures, may be mathematically accurate whilst might mismeasuring managers' actions and the reality of economic events. This argument is consistent with Sterling's (1985, p.28) argument in an essay on recognition:

"Accountants who continue to seek more precision are to be admired and encouraged. However, those who seek absolute precision might be instructed by considering what has been learned in the so-called "exact" sciences. Einstein . . . drew a sharp and clear distinction between the certainty of calculation and the uncertainty of representations of phenomena: "As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality." The same is true for accounting: as far as the mathematical methods used in accounting refer to reality, they are not certain; as far as they are certain, they do not refer to reality".

Accordingly, an essential component of representational faithfulness is completeness, which means including in financial reporting all the information that necessary for faithful representation of the economic phenomena that the reporting purports to represent (FASB, 2006, QC32). In other words, an organisation's financial reports should encompass everything about the organisation that is needed to capture the effects of economic events and to provide relevant information to users such as managers and owners to assist them in decision-making, and to reduce suboptimal behaviour within organisations.

The above arguments, taken together, suggest greater use of non-financial measures of performance for management accounting and management control purposes, because they imply that non-financial information is more relevant, more reliable, and more representationally faithful for performance measurement purposes. Non-financial measures are better indicators of a business's current and future performance by means of capturing intermediate actions and economic events. Therefore, they better ease evaluating businesses' performance as well as their future prospects.

3.4. Balanced Scorecard

In the last two decades, seeking to compete successfully in the information era, businesses have deployed new development programs such as Total Quality Management (TQM), Just in Time production (JIT), Activity Based Costing (ABC) management, alongside other initiatives such as employee empowerment, customer focused organisations and reengineering.

Most of these initiatives failed to deliver the desired outcomes: enhanced performance and increased value for companies' stakeholders. Possible reasons for this failure include a lack of links with corporate strategy, or with measurement and management systems, as competing successfully in such intensive competition environment cannot achieve breakthroughs with the traditional measurement systems normally embraced in annual and quarter financial reports (Kaplan and Norton, 1996).

Such reports reflect tangible assets, recorded in historical cost in most of cases, while businesses are competing on intangibles and intellectuals basis such as customer relations, human capital and innovation (Daum, 2001). Therefore, there is a considerable gap between current financial reporting and the critical factors for success in the information age (Kaplan and Norton, 1996; Daum, 2001).

This gap was the motivation for the creation of the Balanced Scorecard. Kaplan and Norton (1996, p. 8) state that "the collision between the irresistible force to build long-range competitive capabilities and the immovable object of historical-cost financial accounting model has created a new synthesis: the Balanced Scorecard".

The Balanced Scorecard (Kaplan and Norton, 1992) endeavours to extend the narrow scope of financial control systems in attempt to extend reporting from shareholder theory to stakeholder theory, in order to satisfy the informational needs of all stakeholders instead of focusing on shareholders alone. In support of this argument, Otley (2005, p.88) states: "it could be said that the balanced scorecard essentially adopts a stakeholder perspective on the business. Shareholders and customers are clearly identified, and employees feature sometimes in the internal box and sometimes in the innovation box"

The Balanced Scorecard reports on four main perspectives on organisational performance linked with corporate strategy: financial perspective, customer perspective, internal business process perspective, and learning and growth perspective (Kaplan and Norton, 1996).

The measures among the four perspectives can provide the necessary links in the form of indirect cause-effect relationships among these measures on one hand, and between the measures and the corporate strategy on the other as explained in Norton's and Kaplan (2004) strategy maps and Hesketts' et al. (2008) service profit chain.

Norton's and Kaplan (1996, 2004) Balanced Scorecard and strategy maps are ideal examples of interaction between corporate strategy and management control systems. They assist in comprehensively depicting strategy, allowing objectives to be detailed, and performance measures to be established and managed to gauge organisations' progress towards their strategic objectives. However, balanced scorecards and strategy maps are designed to focus on generic strategy, over-emphasising financial objectives in order to meet shareholders expectations of sustained value (Nixon, 2006). Therefore, whilst

balanced scorecard and its strategy maps acknowledge stakeholder theory, they nonetheless still conform to shareholder theory by emphasising the overarching financial perspective of organisations' performance.

Anthony and Govindarajan (2007) highlight that measures in balanced scorecards should be clearly linked to corporate strategy, and must therefore be strategy specific i.e. firm specific. However, Kaplan and Norton (1996) as well as Anthony and Govindarajan (2007) acknowledge that the Balanced Scorecard ought to include generic performance measures.

Lipe and Salterio (2000) found that divisional performance evaluations mirror information contained in the generic measures across divisions, while ignoring the information contained in the customised performance measures that are unique to particular business units. This is consistent with Banker et al. (2004), whose results indicate that evaluators depend more heavily on generic measures when lack information about strategic business unit strategy.

Following the foregoing discussion, and accounting for the special nature of airline industry, generic performance measures are utilised to build a dash board of performance measurement consistent with Kaplan and Norton's (1992, 1996) Balance Scorecard to capture the multidimensional performance of the investigated companies to examine the research questions whether non-financial aspects of performance can explain current financial performance and predict future financial performance and if these non-financial aspects have incremental information content beyond these provided by the financial perspective of performance.

The suggested dashboard (generic performance measurement framework) has four perspectives, as follows:

- Learning and growth perspective: measures in this perspective include employee training and employee productivity.
- Internal business process perspective: this perspective covers measures of airline load factor, fixed assets efficiency, fuel efficiency, revenue passenger miles, available seat miles, airline unit revenue, and airline unit cost.
- Customer perspective: this includes measures of customer satisfaction and market share.
- Financial perspective: this includes three measures of financial outcomes: operating revenues, operating expenses and operating cash flows.

The following section explains the theoretical rationalisation of these measures and illustrates why they are considered critical success factors in the airline industry:

3.5 Nonfinancial Measures of Performance in the Airline Industry

Consistent with the Balanced Scorecard framework, the non-financial measures of performance were divided into three categories as follows:

3.5.1 Innovation and Learning Perspective Measures

Widener (2006) found that executives in non-manufacturing firms performed better when they paid attention to employee and operational factors and sought to build human capital; this suggests that leading key performance indicators in service organisations are

those allied with investment in human resources. Consequently, this research focuses on the investments in human capital in the learning and growth perspective.

3.5.1.1 Employee Training

There is a relative descent in manufacturing and an increase in service-based businesses in the developed world, due to the intensity of technical superiority driven by technological change. Consequently, a key resource of developed economies is the expertise and proficiency of personnel in providing first-class goods and services (Otley, 1994), and so organisations are increasingly realizing that a business's greatest asset is its trained individuals; investing heavily in human resources training and development as a result (Buckingham and Coffman, 1999).

Human resources theorists have argued that training employees has a positive influence on their job satisfaction, enthusiasm at work, aptitude for their jobs, and personal development, as a result of enhanced knowledge, improved self-confidence, self-efficiency, reduced need for management and greater overall satisfaction. Santos and Stuart (2003) conducted a questionnaire-based study to investigate employees' assessment of the possible personal benefits of training. Their results showed that 79% of respondents thought that training led to higher job satisfaction, 90% of respondents perceived training as enabling them to do their jobs better, and 78% felt more motivated at work after training. In Santos and Stuart (2003, p36), an interviewee training manager stated: "If people feel they have been invested in, automatically their trust in the organisation increases and that has an indirect benefit for their work and ultimately for performance-related issues". In other words, investment in human resources would

increase employee's loyalty. However, Heskket et al. (1994) argue that employees' loyalty is always linked to productivity. In the same vein, Johnson, Ryan, & Schmit (1994) report that attitudes regarding training and development were considerably associated with customer satisfaction, and Schlesinger and Zornitsky (1991) argue that satisfied employees are able to deliver higher level of outstanding service to customers. Schneider and Bowen (1992) suggest that service quality can be improved by providing job training, which leads to job satisfaction, and the findings of Norton and Kaplan (2004) also support this argument: they find that investment in employees training has indirect causal relationship with customer satisfaction as it improves service quality. Molina and Ortega (2003) acknowledge that training can have a positive effect on firm performance through aspects such as employee satisfaction and customer loyalty. They find that higher levels of training are allied with considerable benefits which can amplify firm value measured by Tobin's Q and total returns to shareholders. Taken together, these arguments suggest a variety of motivations for training employees, including improved job satisfaction, greater efficiency, less employee turnover, and enhanced motivation and morale among employees, all of which are likely to be associated with enhanced financial performance. These arguments are also consistent with the traditional theory of performance as a characteristic that depends on ability and motivation (Campbell, 1976).

Moreover, the literature provides significant evidence in support of the argument that organisations can improve the quality of their employees by improving their skills through formal training programs. Such investments in training activities can generate advantageous organisational outcomes in the form of organisation-level returns (Russel et

al., 1985; Bartel, 1994; Knoke and Kalleberg, 1994). However, according to expectancy theory, trained employees need to be motivated to achieve high level of performance.

An important implication of the above discussion on management control systems would be including of measures of [knowledge-based employees] to gauge their reactions to customers' requirements in order to assure high levels of innovation and responsiveness (Otely, 1994).

Within the airline industry, labour is a crucial element of operations: pilots, flight attendants, luggage handlers, customer service, call centre employees and others are all vital to a business's success. According to the Air Transportation Association (ATA), labour is also the number one cost for the airline industry.

3.5.1.2 Employees' Productivity

Labour economists such as Brown (1989) and Lynch (1992) have endeavoured to gather empirical evidence on the relationship between training and labour productivity by utilizing data on individual workers. There is a common belief among labour economists that training enhances labour productivity. However, lack of data on employees' productivity means that this relationship must be investigated indirectly by testing the association between training and wages as an indication of the relationship between training and productivity (Lillard and Tan, 1986; Lynch, 1992).

Bishop (1990) provides evidence that participation in company training programs increases the productivity of newly hired employees. Holzer et al. (1991) find similar results, suggesting that when firms provide more formal training to their employees, their

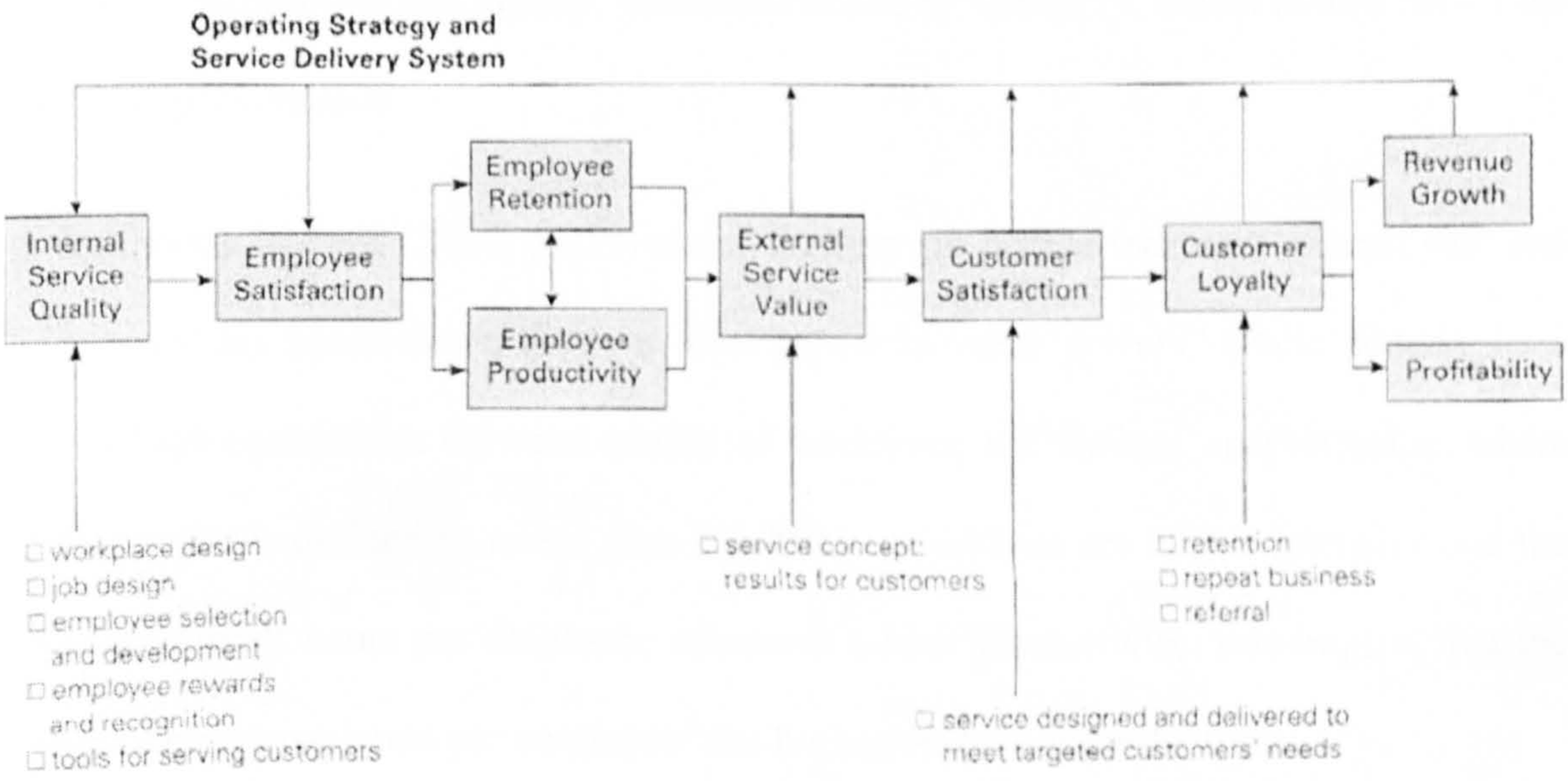
employees, in turn, will produce higher quality work i.e. enhanced productivity. A major pitfall of the preceding studies is that they investigate the alleged effect of employee training on employee productivity on the individual rather than the organisational level. Nevertheless, Bartel (1994) provides evidence that a relationship exists between employee training and employee productivity on the organisational level. His findings also suggest the existence of an inverse relationship between employee productivity and employee training i.e. companies with greater employee productivity will spend more on employee training.

Kaplan and Norton (1996, p. 131) state that: "employee productivity is an outcome measure of the aggregate impact from enhancing employee skills and morale, innovation, improving internal processes, and satisfying customers. The goal is to relate the output produced by employees to the number of employees used to produce the output".

Hesket et al. (2008, p.118), discussing the service profit chain, state: "profit and growth are stimulated primarily by customer loyalty. Loyalty is a direct result of customer satisfaction. Satisfaction is largely influenced by the value of services provided to customers; value is created by satisfied, loyal, and productive employees. Employee satisfaction, in turn, results primarily from high quality support services and policies that enable employees to deliver results to customers". These relations are depicted in the following figure (3-3)[1]:

[1] Adapted from Heskett et al. (2008, p.120), Putting the service profit chain to work. Harvard Business Review. July-august 2008, pp. 118-129

Figure (3-3): the links in the service-profit chain:



Furthermore, Human Resources management literature suggests that the use of inclusive employee enrolment practices, intensive employee training and comprehensive participation enhances the understanding, proficiency, and capabilities of a firm's present and prospective employees, increases their motivation and decreases the turnover of well qualified employees, thus increasing productivity and hence improving financial performance (Jones and Wright, 1992). However, Huselid (1995) acknowledges that employee turnover and employee productivity mediate the relationship amid systems of high performance work practices for example; performance appraisal, promotion, and incentive compensation system, and firms' financial performance.

Furthermore, Lockwood (2006) highlights the fact that the use of talent management strategies, which incorporate attracting, selecting, developing, engaging, and retaining employees is a significant source of competitive advantage, as such strategies increase employee satisfaction and loyalty, which increasing productivity, which in turn boosts the financial performance.

A case study by Low (2000, p.259) states that, for the airline industry, "'Employee' and 'efficiency' are hands-down the two most powerful *value* drivers" (Italic added). Low shows high correlations between quality of workforce and airlines' market value, where market value is defined as assets plus liabilities. As airlines are labour intensive and the revenue aircraft hours per employee measures labour productivity, this implies that the higher the revenue hours per employee[2] the higher the labour productivity.

3.5.2 Internal Business Process Perspective Measures

The operational processes of any firm drive its performance. However, these processes have to be aligned with corporate strategy and integrated with its performance management system. This perspective comprises measures of airline load factor, fixed assets efficiency, revenue and cost unit, fuel efficiency, available seat miles, and revenue passenger miles to measure the effectiveness and efficiency of operational processes.

3.5.2.1 Airline Load Factor

Caves, Christensen, and Tretheway (1984, p. 473) define load factor as "the ratio of seat miles sold to seat miles actually flown"; in other words, it is the portion of airline seats

[2] Full time equivalent employee

filled by revenue passengers. Load factor in the airline industry is used as a capacity utilization measure (Badi et al., 1995). Higher capacity utilisation implies higher operating revenues, lower total costs, and lower costs per passenger. For example, Caves et al. (1984) and Ng and Seabright's (2001) findings suggest that load factor has an inverse relationship with an airline's total cost. Specifically, Caves et al. find that a 1% increase in load factor leads to a .26% decrease in total cost, while Ng and Seabright find that a 1% increase in load factor implies a decrease of .10% in cost. Their findings suggest that this relationship exists for both major airlines (Trunks) and local airlines. However, Borenstein (1989) argues that although load factor may have an inverse relationship with an airline's cost per passenger; it also has an inverse relationship with the perceived quality of service, as higher load factor is associated with packed flights. Furthermore, Borenstein (1989, p.349) describe the relationship between load factor and airlines fares as follows: "Load factor may affect fares in three ways. As the load factor on flights increases, the per-passenger cost of the flight declines, thus possibly lowering fares. On the other hand, flights with high load factors fly full more often and are more likely to operate at peak demand times. The opportunity cost of aircraft in use on a specific route is higher during these times, possibly increasing fares. Finally, as the load factor increases, the quality of service decreases, thus lowering consumers' reservation prices for the flight".

Load factor is a measure of engineering capacity utilisation rather than economic capacity utilisation i.e. the capacity with the lowest average cost output. The difference between engineering capacity and economic capacity is that the former does not reflect the rise in marginal cost associated with higher load factor. Load factor represents maximum

capacity rather than economic capacity utilization (Baltagi et al., 1998). This may explain the inverse relationship between extremely high load factor and the perceived quality as described by Ng and Seabright (2001).

Schefczyk (1993, p.1) lists two reasons for the difficulty of international evaluation for the airline industry, namely: "most airlines lease a substantial fraction of their aircraft, and different accounting and taxation rules in various countries result in different impacts of leased assets on profit and balance sheet information". He suggests that non-financial measures such as load factor would be appropriate alternatives to financial measures to overcome these problems. He argues that load factor signals aircraft capacity more precisely than conventional flight equipment depreciation due to the lease problem. Consistent with this argument, Schefczyk (1993) suggests that a higher load factor predicts higher profitability.

The lease problem is one cause of distorted financial measures. Operating profit, as a financial measure, might not completely reveal the costs associated with leased airplanes and could, as a result, be misleading for decision making. Therefore, in assessing an airline's performance, it is crucial to relate the services provided to the resources consumed in order to provide these services (Schefczyk, 1993). The load factor ratio, a common productivity measure in the airline industry, is a possible link between the services provided (revenue passenger miles) and the resources consumed (available ton miles via fixed assets) is the load factor ratio. Hence, load factor is a common productivity measure in the airlines industry.

Furthermore, a recent study by Davila and Tachalam (2004, p.445) finds a positive and significant relationship between airline load factor and CEOs' cash compensation, implying that this measure contains incremental information content about managers' actions which could be included in remuneration plans. Specifically, Davila and Tachalam find that a 10% increase in load factor is correlated with a $134,000 increase (37% of base salary) in CEO compensation. This is consistent with Behn and Riley (1999), who find that load factor as a non-financial measure has incremental information content beyond these provided by traditional financial measures. These results imply that load factor is an important aspect of airlines performance since it has incremental information content beyond that provided by the financial performance measures, and that is why it is rewarded in the form of cash rewards in managers' rewarding schemes.

Load factor is considered to be an extremely significant measure in the airline industry. Davila and Tachalam (2004, p.444) state that, "Unlike other non-financial performance measures (e.g., customer satisfaction) that are often viewed as leading indicators of firm performance, passenger load factor captures operational efficiency of an airline and hence is more of a current indicator of firm performance".

Passenger's load factor does not capture non-passenger inputs and outputs ((Schefczyk, 1993), and so revenue ton miles have been used to capture passenger as well as cargo inputs and outputs.

3.5.2.2 Fixed Assets Efficiency

Although load factor is considered to be a valuable indicator of an airline's performance, especially in capacity utilization aspect, inherent deficiencies in this measure have to be considered. For example:

- Load factor overlooks major inputs apart from aircraft capacity, such as facilities, allied companies, reservation systems, hotels, other fixed and current assets that participate in generating revenues. This is probably due to the fact that these inputs are measured using different units of measurement (Schefczyk, 1993).

- Load factor ignores differences in load cost between companies (Schefczyk, 1993).

- Load factor is an incomplete measure, which does not take account of all actions taken by managers, and so cannot measure issues affecting future financial performance such as investment decisions, input prices such as fuel and salary costs, or output prices such as tickets costs (Davila and Tachalam, 2004).

These limitations highlight the importance of including other non-financial measures in the internal business process perspective to capture airlines' fixed assets efficiency in order to reflect operational performance on the whole level.

The huge cost and capital spending on fixed assets within the airline industry means that fixed assets efficiency is a critical aspect of an airline's performance measurement and management. Therefore, greater fixed assets efficiency is likely to signal greater efficiency and better performance overall.

3.5.2.3 Cost and Revenue Unit

When assessing an airline from credit and equity aspects, an examination of its cost and revenue performance is crucial. Carrier's cost unit and revenue unit are of great importance in the airlines industry. This is confirmed by Francis et al. (2003, p. 129), in the context of identifying preferred performance measures for 16 industries. They argue that the airline industry (SIC code 4512) appears to prefer load factor, unit revenue and unit cost measures stating: "Revenue per passenger mile *(airline unit revenue)*, cost per available seat mile, and cost per passenger mile, *(airline unit cost),* (commonly defined as total operating costs divided by available seat miles), and load factor, (defined as revenue passenger miles divided by available seat miles) are preferred for airlines" (italics added).

Companies incur costs in order to perform activities such as training employees, providing services, handling luggage, calling on customers etc. Cost advantage comes from performing activities and delivering services more efficiently than rivals, and higher efficiency is linked with lower cost per unit on average. If a company succeeds in creating value for its customers at lower cost, greater profitability follows directly.

An airline's unit cost is an important indicator of how well it is doing overall. Unit cost signals efficiency, since variations in unit cost may be due to stage length, inputs prices, or productive efficiency, amongst other variables. Any variations not explained by stage length or inputs prices could be explained by an airline's efficiency. This is consistent with Oum and Yu (1998) who find that airline unit cost declines when efficiency increases.

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Similarly, an airline's unit revenue is very important, given that profits are generated by the gap between unit revenue and unit cost.

Generally speaking, these are always of great interest for companies as well as analysts. For instance, a journalist reported to Reuters: "Continental Airlines Inc said on Monday that passenger revenue per available seat mile, or unit revenue, rose between 5.0 percent and 6.0 percent in February. The fourth-largest U.S. airline by passenger traffic said its consolidated load factor -- the percentage of seats filled with paying passengers -- fell 1 point from a year earlier to 76.0 percent. Traffic, as measured by revenue passenger miles, rose 4.5 percent in February, while capacity, as measured by available seat miles, increased 5.8 percent." (Reiter and Gevirtz, 2008)[3]

3.5.2.4 Fuel Efficiency

The airline industry is exceptionally sensitive to fuel costs. According to the Air Transportation Association (ATA), fuel is an airline's second biggest expense. Efficiency can vary greatly between carriers, as take-offs and landings consume high quantities of fuel, meaning that short haul airlines are usually less fuel-efficient. As a result, it is important to consider fuel efficiency as a nonfinancial measure of performance.

An important factor in fuel efficiency is the average stage length, which has been defined as "the average length of a carrier's flights in miles" (Banker and Johnston, 1993, p. 582). This is considered as a possible source of economies. As it increases, economies are achieved because take-off and landing require a greater quantity of fuel than flying. Kirby

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3 Source: http://uk.reuters.com/article/basicIndustries/idUKWNAS333820080304

(1986) finds that increases in average stage length are associated with lower total operating cost. Higher fuel efficiency is expected to be associated with higher operating revenues, as passengers on long flights pay higher price for their tickets.

Recent technical developments result in higher fuel efficiency in newer aircraft, due to new engine designs. Airlines with higher fuel efficiency tend, therefore, to have new fleets and therefore higher productivity, efficiency, and improved customer satisfaction resulting from the fact that new fleets are also more comfortable. This in turn is likely to lead to better financial performance.

3.5.2.5 Available Seat Miles (Capacity)

In the airline industry, a carrier's output capacity is usually surrogated by the available seat miles (ASM). Available seat miles equal the total number of passengers' seats multiplied by the number of miles flown by an airline. Capacity can be improved by increasing the flight hours per airplane by reducing the maintenance hours and by increasing available seats (by reducing first class seats, for example). It is important that an airline has enough capacity to cater for all the potential passengers' needs.

3.5.2.6 Revenue Passenger Miles (Traffic)

Traffic is an important aspect in analyzing passengers' airline revenues as revenues in the airlines industry have two components, traffic and pricing. Traffic can be measured in terms of revenue passenger mile. A revenue passenger mile is flown when a revenue passenger is carried one mile. It is measure of the volume of passengers transported by a particular airline. This measure is an important indicator in the airline industry as it

signifies airlines' productivity. However, there are tradeoffs between productivity and service quality. The best way to manage this association can be, effectively manage human resources, by providing extensive training. Also, greater revenue passenger miles measures implies greater number of passengers, as number of passengers raises, the strength of the word of mouth as a free advertising method builds.

3.5.3 Customer Perspective Measures

This perspective aims to measure the extent to which a firm is fulfilling its customers' needs. Two generic measures have been used to reflect this aspect of performance, namely customer satisfaction and market share.

3.5.3.1 Customer Satisfaction

A large number of studies both in marketing and management literature hypothesise that there is an association between customer satisfaction and companies' financial performance i.e. profitability (Nelson et al. (1992); Heskett et al. (1990, 1994)). However, few empirical studies have been conducted to test this hypothesis. Customer satisfaction measures offer a view on how successfully companies are meeting their customers' needs (Kaplan and Norton, 1996).

Although customer satisfaction is a popular concept, there is a lack of consensus how it should be defined, which generates three problems: choosing a definition for a particular study; operationalising the definition to embody a particular aspect of customer satisfaction; and the difficulty of comparing results between studies (Joan et al. 2000). Joan et al. (2000, p.1) state: "most satisfaction researchers do not justify their choice of

definition. In some cases, satisfaction is not defined at all. Even if a researcher attempts to define satisfaction, there are no clear guidelines for selecting an appropriate definition for a given context. As a result, the selection of a definition for satisfaction becomes idiosyncratic".

Oliver defines customer satisfaction as a state of mind resulting from the customer's comparison of their expectations preceding a purchase with their impressions after utilising the purchased service or goods (Oliver 1993, Oliver 1996)

Anderson et al. (2004) suggest that the rationale underlying the theoretical association between customer satisfaction and the long-term financial performance is that customers are the main resource of future positive cash flows, and that customer satisfaction signifies the steadiness of the firm's customer relationships and subsequently the timing, level, and constancy of cash flows.

Despite the assumed connection between customer satisfaction and a companies' profitability, it is not the customer's state of mind that causes profitability but the subsequent behaviour of the satisfied customer that makes this association more compelling (Söderlund and Vilgon, 1999).

These subsequent behaviours include customer loyalty, free word-of-mouth marketing, and less price sensitivity (Anderson et al, 1994). Therefore, satisfied customers could be a good predictor of enhanced future revenue. Söderlund and Vilgon (1999) find a significant positive association between customer satisfaction and repurchase intentions, between repurchasing intention and purchasing behaviour (i.e. purchase amount), and between purchase amount and customer profitability. Thus, it is acceptable to use these

marketing measures in performance measurement models such as activity based costing and Balanced Scorecard (Kaplan & Norton 1992).

Large numbers of previous studies have looked at the relationship between customer satisfaction and accounting measures of performance (Griffin and Hauster (1993); Anderson and Sullivan (1993); Ittner and Larcker (1998)). The literature shows a common belief in a positive association between customer satisfaction and economic consequences. Anderson et al (1994) suggest that there is a significant relationship between customer satisfaction and economic returns, and they emphasise that this relationship is of long-term nature, as the benefits of customer satisfaction will not be realised instantaneously.

Simons (1999) acknowledges the necessity of connecting profit performance to major market constituents such as customers, and evaluating this performance. Smith and Wright (2004) suggest that, within the computer industry, product value attributes are associated with customer loyalty as well as the product's average price, and so customer loyalty correlates to changes in revenues and profits and creates a competitive advantage. This is consistent with Lev (2001) and with Eccles et al. (2001), who argue that a causal relationship exists between product performance in the market and future financial performance. In the field of performance measurement, several studies suggest that customer satisfaction metrics are better indicators of financial outcomes than financial measures i.e. they have positive and significant relationship with future financial performance (Ittner et al. 1997, Ittner and Larcker 1998).

Furthermore, Banker et al. (2000) provide evidence from the hotel industry that customer satisfaction measures are associated with enhanced financial performance. This relationship is more significant in the long run than the short run; an average six months' lag exists between customer satisfaction and financial performance in the hospitality industry. Their results also show that these non-financial measures improved after being included in managers' compensation plans, suggesting the necessity of incorporating non-financial measures in remuneration plans to ensure management attention to these important factors in future financial performance.

3.5.3.2 Market share

Generally speaking, performance within the airline industry is driven by a large number of factors whose interrelations are not well understood. It is a highly competitive industry in which both individual-consumers and business customers are of equal significance and are affected by different forces. This could affect the relationship between market share and an airline's performance. Szymanski et al. (1993, p.8) state, "The market share-profitability relationship is likely to be strongest for consumer businesses, weakest for industrial businesses, and moderately strong for a mixed group of businesses, i.e., some consumer and some industrial".

Many studies have reported a positive and significant relationship between market share and profitability. Szymanski et al. (1993) conduct a meta-analysis on 276 market share profitability findings from forty-eight studies in order to explore the relationship between market share and profitability. Their results indicate that, on the whole, market share has a positive effect on companies' profitability. This suggests building a higher market share

could be a feasible strategy for enhancing a business's performance, measured in profitability. However, Boulding and Staelin (1990) and others suggest that intangible factors such as strategic decisions taking skills (Buzzell 1990) and vertical integration (Aaker and Jacobson, 1987) might moderate the relationship between market share and profitability.

For the purposes of this study, we will use absolute market share as suggested by Szymanski et al. (1993), which relates business sales to the total sales in a given market. We will utilise the absolute market share rather than market share as the ratio of a business's market share to the collective market share of its three largest competitors or the largest competitor in the market. This is because, as Szymanski et al. (1993, p.9) state, "Absolute measures of market share are preferred when specific industries are studied... because the sum constraint (the market shares of individual firms should sum to 100%) and bound constraint (market shares of individual firms should be between zero and 100%) can be satisfied".

Many grounded theories provide theoretical explanation for the hypothesised relationship between market share and profitability. Market power theory proposes that firms with high market shares employ higher power to set the price of their products and services rather than being price takers, and, get their inputs at lower costs by getting concessions from suppliers and customers ((Schroeter (1988); Staten et al. (1988)). Efficiency theory suggests that cost efficiencies for firms with elevated market shares lead to greater profitability by way of economics of scale (Demsetz, 1973). Smallwood and Conlisk (1979) introduce product quality assessment theory, which suggests that buyers use

market share as an indicator for goods or service quality where a product's common acceptance is perceived as a sign of associated better quality.

Literature from various management disciplines provides theoretical rationalisations for the proposed association between higher customer satisfaction and higher market share, leading to healthier future financial performance i.e. better operating revenues, lower operating expenses and probably positive net cash flows. It is expected that higher in-flight spend per passenger would generate increased customer satisfaction, leading to greater market share, which in turn linked to higher revenues, lower costs, and improved cash flows in the near future i.e. one quarter to four quarters.

3.6 Management Theories and Performance Measurement

The above discussion offers a strong theoretical background for this research. To recap, supporters of including non-financial measures in managerial reports and compensation plans have several arguments to justify their support:

- Accounting data is only one source of information among many others that help in achieving the long-term objectives of managers, investors and other stakeholders (Ittner and Larcker, 1998a).

- Many non-financial variables reported in the Balanced Scorecard or other dashboards are considered to be leading indicators of the future financial performance by quantifying particular goals at different levels of the organisation and hence facilitating strategy communication and implementation (Kaplan and Norton, 1996; Ittner and Larcker, 1998)

- Expectancy theory literature suggests that performance measures with less noise are useful to motivate employees to work harder and managers to take favourable actions (Klein, 1991).

- Agency theory literature suggests that that any informative signal is useful for contracting purposes (Holmstrom, 1979)

- Stakeholder theory suggests that widening the scope of financial reports to satisfy all stakeholders' information needs enables a focus on multidimensional aspects of an organisations' performance rather than focusing on stockholders' need only.

- Contingency theory suggests that contingent variables such as intense competition result in emphasising new trends such as quality and customer satisfaction and consequently encourage the measurement of these aspects using non-financial measures of performance (Hoque, 2004).

- Including non-financial measures in manager's remuneration plans enhances organisational performance (Eccles, 1991)

- Non-financial measures of performance add to short term financial measures, enabling the measurement of long-term oriented performance (Johnson and Kaplan, 1987; Kaplan and Norton, 1992)

- Non-financial measures signal the effects of current managerial decisions that will not occur in the financial reports until the end of the fiscal year (Kaplan and Norton, 1992)

- Non-financial measures encourage long-term focused efforts (Feltham and Xie, 1994).

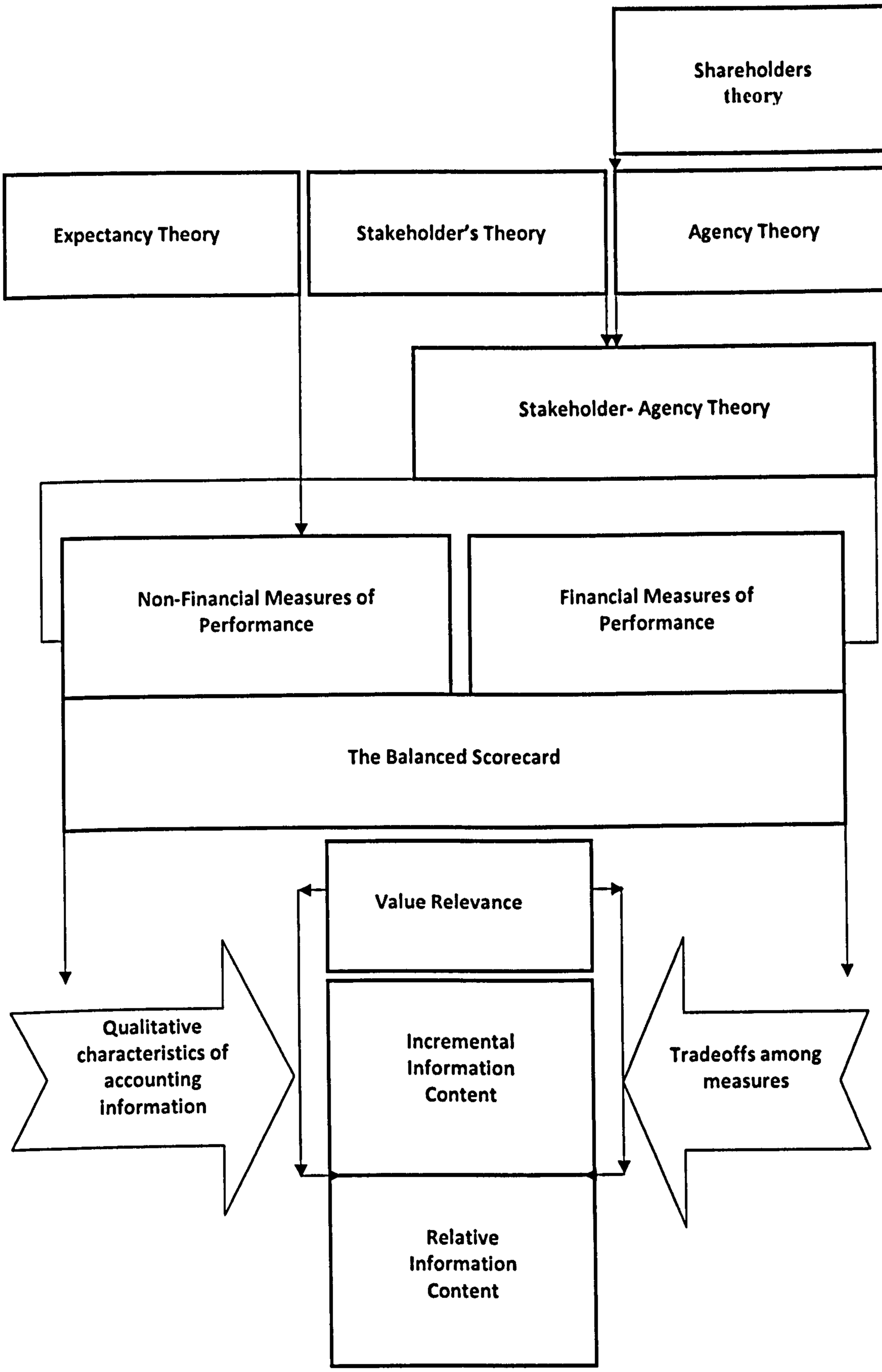
- Non-financial measures are less open to manipulation risk, well-timed, and easy to understand (Singleton-Green, 1993).

- The value relevance of non-financial performance measures is believed to overcome the value relevance of traditional financial measures especially in high technology industries such as telecommunication and biotechnology companies (Amir and Lev, 1996)

3.7 Conclusion:

This chapter makes a detailed theoretical case for the incorporation of non-financial measures of performance into contemporary management control systems. Five established management theories have been employed for this purpose, namely: expectancy theory, shareholder theory, agency theory, stakeholders' theory, and stakeholder-agency theory. Taken together, they provide powerful arguments for the potential benefits of the inclusion of non-financial perspectives of performance, including higher motivation, lower agency and contracting costs, and meeting stakeholders' informational needs. The Balanced Scorecard has been deployed as a reputable theoretical model of performance measurement to categorise different dimensions of performance for evaluation purposes. Furthermore, qualitative characteristics of accounting information as suggested by Financial Accounting Standard Board FASB (1980) have been utilised to introduce further motivations for the advocated proposal of including non-financial measures for performance evaluation and rewarding managers on

the grounds that they are more relevant, reliable and faithfully representative. Previous discussion has shown that performance measurement is a multidimensional concept. Therefore, from a theoretical standpoint, researchers have to consider more than one theory to justify the linkages between nonfinancial measures and financial performance on one hand and the interrelations among nonfinancial measures on the othe r. This research utilises expectancy theory to justify the motivation reasoning from employees' point of view. It also uses the agency-stakeholders theory to address the contractual relationship between managers and stakeholders. Finally, this study revisits the accounting conceptual framework to address the qualitative characteristics that distinguish superior information from inferior information. These relations are depicted in Figure 3-4 below which shows the theoretical framework of the study:


Shareholders theory
Expectancy Theory
Stakeholder's Theory
Agency Theory
Stakeholder- Agency Theory
Non-Financial Measures of Performance
Financial Measures of Performance
The Balanced Scorecard
Value Relevance
Qualitative characteristics of accounting information
Incremental Information Content
Tradeoffs among measures
Relative Information Content

Chapter Four

Research Design and Methodology

4.1 Introduction

This research investigates the incremental and relative information content of multiple non-financial measures of performance in explaining and predicting three important components of financial performance: operating income, operating cost, and operating cash-flows.

The previous chapters, comprising a literature review and outline of the theoretical framework, presented the theoretical bases of this study. This chapter explains the methodology employed and describes the test instruments employed in the empirical analyses (illustrated in chapter five and chapter six), taking into consideration epistemological and ontological considerations arising from the conceptual model discussed in chapter three.

Saunders et al. (2007) define research as "something that people undertake in order to find out things in a systematic way, thereby increasing their knowledge". They underline the importance of the expressions "systematic research" and "find out things". Ghauri and Gronhaug (2005) argue that doing research systematically implies that it concerns logical relationships rather than beliefs. Similarly "find out things" suggests that the researcher intends to find out an answer to the research question in order to add to existing knowledge of a particular subject of study (Saunders et al, 2007). This is consistent with Burns' (1994) definition of research in Kumar (2005, p.6) as "a systematic investigation to find answers to a problem" and with Grinell's (1993, p.4) definition of research as "a structured inquiry that utilises acceptable scientific methodology to solve problems and creates new knowledge that

is generally applicable". Thus, this research will deal with the present research question by utilising adequate, systematic, structured and formalised methodology, as described below.

An empirical approach was employed to collect the data, along with a comprehensive review of the literature (as described in chapter 2) in order to spot the key subjects of concern and to achieve a reasonable understanding of the area of performance measurement, the role of the financial and non-financial measures of performance, and the existing understanding of the implications of their use or effect on the financial performance of businesses. The academic and professional arguments have been reviewed and assessed, and their implications for the research hypotheses will be investigated in order to ensure that the hypotheses are consistent with the standards laid out by Saunders et al. (2007), as they list numerous potential purposes for research namely describing, explaining, understanding, criticising, and analysing. The intention of this chapter is set out the rationale for the methodology employed in this piece of research. The following sections of this chapter cover research philosophy, research approach, and management accounting models development. Also, it demonstrates research frameworks, and research method, including sample selection and variables measurement, and tests of incremental and relative information content. Finally, this chapter explains the structural equation models employed to investigate the potential interrelationships between different measures and perspectives of performance.

4.2 Research philosophy

According to Saunders et al. (2007) there are three major ways of thinking about research philosophy namely epistemology, ontology, and axiology.

4.2.1 Epistemology

Saunders et al (2007, p.102) state that "Epistemology concerns what constitutes acceptable knowledge in a field of study;" in other words, the nature of knowledge within a particular discipline. There are two epistemological perspectives: positivism and interpretivism

4.2.1.1 Positivism

Positivism is defined by Remenyi et al (1998; p.32) as, "working with an observable social reality and that the end product of such research can be law-like generalisations similar to those produced by physical and natural scientists". Positivist epistemologies are inclined to quantitative research and maintain that observable phenomenon generate trustworthy data, which can be gathered and used to test research hypotheses, which in turn may challenge, contradict or develop existing theories (Saunders et al., 2007). Therefore, one function of research could be to examine existing theories and develop them to be tested by future research (Bryman and Bell, 2003). Remenyi et al. (1998, p.33) underline a fundamental component of positivism: that "the researcher is independent of and neither affects nor affected by the subject of the research". This implies that researchers are unbiased in both the data collection stage and in deducing results from data, as they have less influence on the data collected, which in turn gives greater authority to any conclusions which are drawn from the data. Overall, then, positivism attempts to clarify and forecast social events by seeking to exploit standard and causal patterns of their elements' relationships (Morgan, 1979).

The definitions above imply the importance of the role of the observer, since "observation is the essence of knowledge" (Remenyi et al., 1998, p.73), and emphasise the importance of passive observation. This approach is often used in management research in cases where researchers have to depend on existing evidence rather than conducting experiments.

Furthermore (Remenyi et al., 1998) list eight important steps for passive observation within a positivistic strategy for a business research, namely:

- Literature review.
- Assessment of the established theory.
- Theoretical conjecture.
- Hypotheses or empirical generalisations.
- Measuring instruments.
- Sampling.
- Testing and analysis.
- Confirmation and refined theory.

4.2.1.2 Interpretivism

"Interpretivism and qualitative research are sometimes used interchangeably" (Williams, 2000, p.209). Interpretivism is defined by Saunders et al. (2007, p.600) as "the epistemological position that advocates the necessity to understand differences between humans in their role as social actors", and by Remenyi et al. (1998, p. 35) as using "the details of the situation to understand the reality or perhaps a reality working behind them". Interpretivism is more inclined towards qualitative research, as this requires that researchers need to use their intuition to feel and understand the assumed relationships between theses social actors (Saunders et al, 2007). This philosophy is based on the assumption that science is subjective and therefore allows alternative versions of reality. In contrast to the positivist

philosophy, it stresses the researchers' subjective interpretations as relevant factor to the research process and it underlines the social interaction and influence among researchers (Peter and Olson, 1983).

Interpretivism implies that science is a continuing social process and that a full understanding of the scientific theories can be achieved by observing their development's dynamics which can be guaranteed by the social agreements among researchers about the meanings of these theories and their implications. In the performance measurement context, interpretivism implies that knowledge about organisational performance is limited and it is an ongoing process. It also contends that performance measurement is influenced by many factors including past experience and training and therefore it contradicts the notion of objectivity as suggested by positivists.

This research is carrying out observation within an interpretivistic strategy to achieve its research objectives.

4.2.2 Ontology

Ontology deals with nature of reality and is concerned with researchers' underlying assumptions about how the world functions (Saunders et al, 2007). The term is borrowed from philosophy where ontology is concerned to give an account of existence. Crotty (1998, p .9) states, "Ontology is the study of being. It is concerned with 'what is', with the nature of existence". Research ontology falls into two main categories: objectivism and subjectivism.

4.2.2.1 Objectivism

Objectivism is the ontological belief that social entities (e.g. management) exists in a reality exterior to social actors (Saunders et al., 2007, p.108). This research adopts objectivist ontology to underline the existence of performance measurement as a reality.

4.2.2.2 Subjectivism

According to Saunders et al., (2007, p. 108) the subjectivist view is "that social phenomena are created from the perceptions and consequent actions of social actors, what is more, this is a continual process in that through the process of social interaction these social phenomena are in a constant state of revision". Remenyi et al. (1998) emphasise the importance of learning about the details of a particular situation to understand its reality and the factors which create it.

4.2.3 Axiology

Saunders et al. (2007, p. 110) define axiology as "a branch of philosophy that studies judgments about values". This is an important area because of the impact of a researcher's values on the decisions they make during research and hence on the credibility of their results.

4.3 Research approach

Researchers attempt to answer research questions and to generate theories by deduction, induction, or a combination of the two ((Zikmund, 2000; Sekaran, 2003). The deductive approach sets out to test a given theory, and the inductive approach is a method for formulating theories (Saunders et al. 2007).

Sekaran (2003, p.32) defines deduction as "the process of arriving at conclusions by interpreting the meaning of the results of the data analysis". Sekaran (2003, p.32) lists seven steps of the hypothetico-deductive method of research, as follows:

1. Observation
2. Preliminary information gathering
3. Theory formulation
4. Hypothesising
5. Further scientific data collection
6. Data analysis
7. Deduction

The deductive approach predominates in the natural sciences, where laws are used to explain and predict phenomena, and to anticipate their consequences (Collis and Hussey, 2003). Its dominance is due to its ability to explain causal associations between variables, to operationalise concepts, to allow quantitative measurement of the facts, and to generalise results (Saunders et al. 2007)

The other approach is the inductive approach. Zikmund (2000, p.43) defines inductive reasoning used to generate a theory as "the logical process of establishing a general proposition on the basis of observation of particular facts". In fact, theory tends, over time, to be the outcome of a combination of deductive and inductive reasoning. Zikmund (2000, p.44) lists seven chronological phases through which the scientific method of research will progress:

1. Assessment of relevant existing knowledge

2. Formulation of concepts and propositions

3. Statements of hypotheses

4. Design the research to test the hypotheses

5. Acquisition of meaningful empirical data

6. Analysis and evaluation of data

7. Provide explanation and state new problems raised by the research

This approach suggests that it is possible to draw conclusions for use in the construction of management decision models by the use of deductive reasoning i.e. by deriving conclusions from a well-known premise (Ryan et al. 2002; Zikmund, 2000).

4.4 Management accounting models development

Management accounting is, in essence, the branch of accounting whose purpose is to fulfil managers' decision-making needs. It stems from cost accounting, which assesses product costing; including controlling for primary costs and overheads to identify the unit's full cost by applying absorption costing method. Cost accounting developed in order to meet managers' needs for information which would facilitate decision making, planning and control. The shift from identifying accurate unit cost (in the case of cost accounting) to identifying the different costs relevant to different decisions (in the case of management accounting) was huge and significant (Ryan et al. 2002).

Management accounting expanded and developed over years from being "the process of identifying, measuring, and communicating economic information to permit informed judgments and decisions by the users of the information," as defined by American Accounting Association (1966) to being a provider of "management accounting measures and reports financial as well as other types of information that are primarily intended to assist managers' in fulfilling the goal of the organisation" (Horngren et al., 1999, p.5)

Management accounting research in the 1960s relied heavily on the assumptions of neoclassical economics (i.e. the availability of complete and perfect information at no cost, the non-existence of uncertainty, and profit maximisation for a business's owners) to establish deductive reasoning of the early decision models suggested in managerial accounting (Ryan et al. 2002).

In the 1970s, statistical decision theory challenged the neoclassical economic framework by considering the conditions of uncertainty concerning a decision's outcome. This in turn led to assumptions of the availability of information at no cost have being called into question, since provision of information shrinks uncertainty, so researchers attempted to construct realistic models which recognise uncertainty and information production costs in building decision models (Ryan et al. 2002).

The application of information economics in management accounting has led researchers to differentiate between information system choice and information system design (Demski, 1972), underlining the design issues entailed by new and complicated systems compared with simple techniques of management accounting used in practice (Ryan et al, 2002). In the 1980s, management accounting researchers attempted to utilise concepts like opportunity cost and overhead allocation in principal-agent framework to show that

simple techniques in management accounting could be the most advantageous. This marks a change in the emphasis of management accounting research: from providing theories which develop over time into new practices, to developing theories that envelop current practices to eliminate the time lag between theory and practise. Positive accounting research that depends on empirical data began as a means of explaining and predicting what does/will happen, rather than what ought to happen, as in the normative theories which depend on value judgments and theoretical assumptions (Baiman, 1982; Ryan et al, 2002). In other words, positive accounting research seeks explanations and predictions of existing accounting practices grounded in empirical data. Positive accounting is coupled with the contractual perspective of the firm where the firm is considered as a connected group of contracts and accounting is used as an instrument to help develop and deliver contracts (Jensen and Meckling, 1976).

Agency perspective accounting, including management accounting practices, emerged as a tool to minimise contracting cost by creating mutual agreement between the contracted parties. However, this contractual side of accounting theory contrasts with value-relevance studies in the way they look at accounting information; the former emphasizes the value of accounting for contracting purpose (e.g. compensating managers) while the latter argues that the role of accounting is in the valuation of firms (Watts and Zimmerman, 1986).

Agency theory originates from information economics. The main difference between agency theory and ''traditional' information economics is that agency theory believes that multi-person, incentive, asymmetric information are together important in understanding how organisations work (Lambert, 2001).

The positive theory of accounting is important because it helps to answer normative questions asked by academics and professionals (Jensen, 1976). Jensen (1976, p.11) states that "theory has come to mean normative propositions. The so-called accounting theory texts are almost entirely devoted to the examination of questions of a 'what ought to be done' nature." Jensen (1976, p.13) also asserts: "...development of positive theory of accounting will explain why accounting is what it is, why accountants do what they do, and what effects these phenomena have on people and resources utilisation".

Departing from agency theory and the positive theory of accounting, Jensen (1983, p. 334) differentiates between the principal-agent perspective as a normative approach and the positive theory of agency as a positive approach. Agency theory research focuses on justifying and explaining accounting practices which represent progress in management accounting research methodologies where researchers assume that managers elect actions derived from their preferences, wants, and needs, and based on their understanding how the relevant variables interact. This is the role of positive accounting theories: to illustrate how relevant variables interact in reality. However, appropriate variables for positive accounting theory research are identified by use of assumptions like value creation or benefits maximisation in agency theory settings (Jensen, 1983; Ryan et al., 2002). As Ryan et al. (2002, p.76) say, "Positive researchers cannot assist in the choice of a decision model, but they can help the decision-maker to understand how the relevant variables interact, that is, how the world works".

In this research, it is important to understand how non-financial measures of performance interact with financial measures of performance to produce future organisational outcomes, as this enhances our current understanding of choices and tradeoffs among measures, and enables us to select measures on the basis of their incremental and relevant

information content in explaining future performance. This research also investigates the relationships between different measures of performance. This is expected to provide a reasonable understanding about how "relevant variables" - in our case, performance measures - interact with each other.

4.5 Research Frameworks

Baxter and Chua (2006, p.43) list seven different research perspectives which researchers have used to construct, narrate and critique the practice of management accounting; the common characteristic of these perspectives is that they critique the economically rational structure of organisational performance where the primary role of management accounting is to realise organisational strategies, goals and objectives efficiently and effectively. These seven perspectives are:

Non-rational frame

This research perspective underlines the role of management accounting in helping organisations understand their goals. Non-rational research depends on the pluralism among an organisation's members, which arises from incongruous views on the nature and significance of their organisations' goals and how they serve particular objectives. According to this frame researchers consider that management accounting could be used in situations in which a lack of clarity exists about the causal links between actions taken and goals promoted despite general agreement about the firm's strategy (Baxter and Chua, 2006).

Naturalistic frame

This perspective emphasises the logic of established management accounting practices in their everyday contexts. The naturalistic frame is motivating different researches to conduct studies within the management accounting field (Baxter and Chua, 2006). Generally speaking, naturalism is a philosophical stream of science that studies science as it is rather than as it ought to be (Giere, 2000).

Radical frame

Research conducted under this umbrella is characterised by its association with, and devotion to, the politics of liberation (Giddens, 1998). It connects management accounting to social conflicts resulting from unfair resource allocation, unequal life chances in society, and the dissatisfaction which this creates (Tinker et al., 1982). It also connects management accounting with historical and cultural contingent variables: for instance, the allocation of scarce resources requires management control among organisations' members through the use of management accounting techniques. Radical research creates the potential of considering operations management accounting in "situations characterised by instability, disorder, and disintegration, rather than conventionally assumed conditions of equilibrium, tidiness, and ongoing order" (Baxter and Chua, 2006, p.51).

Institutional frame

Baxter and Chua (2006, p.52) state that, "institutional theorists argue that the visible structures, control practices, and routines that make up organisations are the consequences of legitimated templates that are established or institutionalised

within the larger environment". According to this research frame, management accounting practices have emerged to meet organisations' cultural need for objective and reasonable resources allocation which is integrated with the everyday operations of an organisation (Meyer and Rowan, 1977). Thereby highly institutionalised environments are linked with higher bureaucratic control systems, which in turn are not allied with higher efficiency since these bureaucratic controls were adopted to meet cultural expectations which are not necessarily to do with higher efficiency (Gupta et al., 1994). Institutional theorists such as Abernethy and Chua (1996) argue that high levels of competition, technology, and complexity encourage businesses to imitate each other in adopting management accounting practices, which leads to the fast dissemination of management accounting tools and practices such as Balanced Scorecard, Activity Based Costing and other contemporary practices. Chenhall (2004, p.111) states "... it may be suggested that innovations in performance measures are the result of 'fads and fashions'. The practices are adopted because organisations mimic each other and wish to appear to be contemporary with little concern as to whether the practices lead to economic benefits".

Structurationist frame

This perspective on management accounting is based on structuration theory, which suggests a robust relationship between structure and actions. Baxter and Chua (2006, p. 54) based on the seminal work of Giddens (1976, 1979, 1982, 1984) state that "structures provide recursive rules and resources, which shape and inform human interaction in terms of its signification (or meaning), legitimating (or morality), and domination (or power relations). Human agency, in turn,

perpetuates and changes these structures. Such changes may result from either conscious choices to act differently or the unintended consequences of behaviour". An important aspect of the structurationist frame is the incorporation of procedural and human elements of management accounting systems, given that management accounting systems offer practices, rules, and values that stabilise firms and facilitate legitimacy and accountability (Granlund, 2001). Structuration theory has motivated management accounting research to investigate the potential links between institutional structures and the moral and political aspects of management planning and control systems (Baxter and Chua, 2006).

Foucauldian frame

This perspective on management accounting is derived from the philosophy of the French thinker Michel Foucault. Foucault's work focuses on issues around the creation of knowledge and power relations, and how these govern the relationship between the areas under discussion and structures like culture (Danahar et al., 2000). Management accounting research has applied this approach to investigate the emergence of management accounting reality, studying the power relations and constitution embedded in the management control systems. It examines the situations in which particular management accounting techniques to develop into major elements of management accounting debates, as well as major elements of practice (Baxter and Chua, 2006). This frame provides clarifications about the ways accounting, as a social practice, directs individual's actions. This perspective draws on Foucault's historical method to describe the "archaeology" and "genealogy" of certain dimensions of management accounting; archaeology refers to "the way in which management accounting researchers use archival material to

map relationships between discourses and events surrounding and facilitating the emergence of various forms of management accounting" while genealogy refers to "the new historians' concern of portraying the discontinuities in practices and ideas about management accounting" (Baxter and Chua, 2006, p.57).

Latourian frame

This frame is inspired by the work of Latour (1987, 1993, and 1996), who studied the sociology of technology and their introduction. The core idea of this frame is that management accounting techniques are not ready-made formulae, but are made and formulated as a consequence of the interactions between humans and technology or hardware to become matters of facts by means of providing supporting facts during their experiment (Baxter and Chua, 2006). In short, the "Latourian frame configures management accounting practices as actions nets, rendered temporarily sensible by the translation and inter-assessment of various human and non-human interests" (Baxter and Chua, 2006, p.64)

On the one hand, ontology, asks what reality is, to understand the concept of reality. On the other hand, epistemology, asks what we know about it to broaden our understanding of the nature of knowledge about reality. However, in contrast to positivism, "the ways in which we know about it change over time: by using different lenses (or theories), we see different aspects of reality" (Micheli, 2008, p.2).

The word measure is referred to "comparison with an external standard to point to a universal sort of inner ratio or proportion, perceived through the sense and through the mind (Mari, 2003). Recently, measurement, "shifted to quantification of properties of objectives"

(Micheli, 2008, p.4). Therefore, "measurement ceased to be seen as forms of insight; rather, they started to appear to be absolute truths about reality as it is" (Micheli, 2008, p.4).

It is noted that performance measurement is concerned with social objects such as stakeholders and its subject is often social matters such as customer satisfaction, employee training, and quality which are all multifaceted and difficult to measure precisely and accurately. Performance measurement is considered an assignment rather than determination. Hence, objectivity is seen as a target rather than a condition for the performance measurement process since measurement will not reach complete certainty about the assigned value for particular measure. It is also noted that performance measurement is reduced to what is possible to be measured (Micheli, 2008). Thus, measurement is a model-based informational knowledge rather than experimental determination.

Based on the above discussion, and seeing the positivist philosophy limitations when applied to social sciences (e.g. impossibility of pure observation, full lack of subjectivity, and full lack of previous knowledge impact), the research philosophy adopted is objectivism in ontology and subjectivism in epistemology. The former implies that organisational performance exists as a reality, whilst the latter implies that our understanding of organisational performance is limited. Therefore, measurement of a firm's performance provides insights rather than "true knowledge" about its performance.

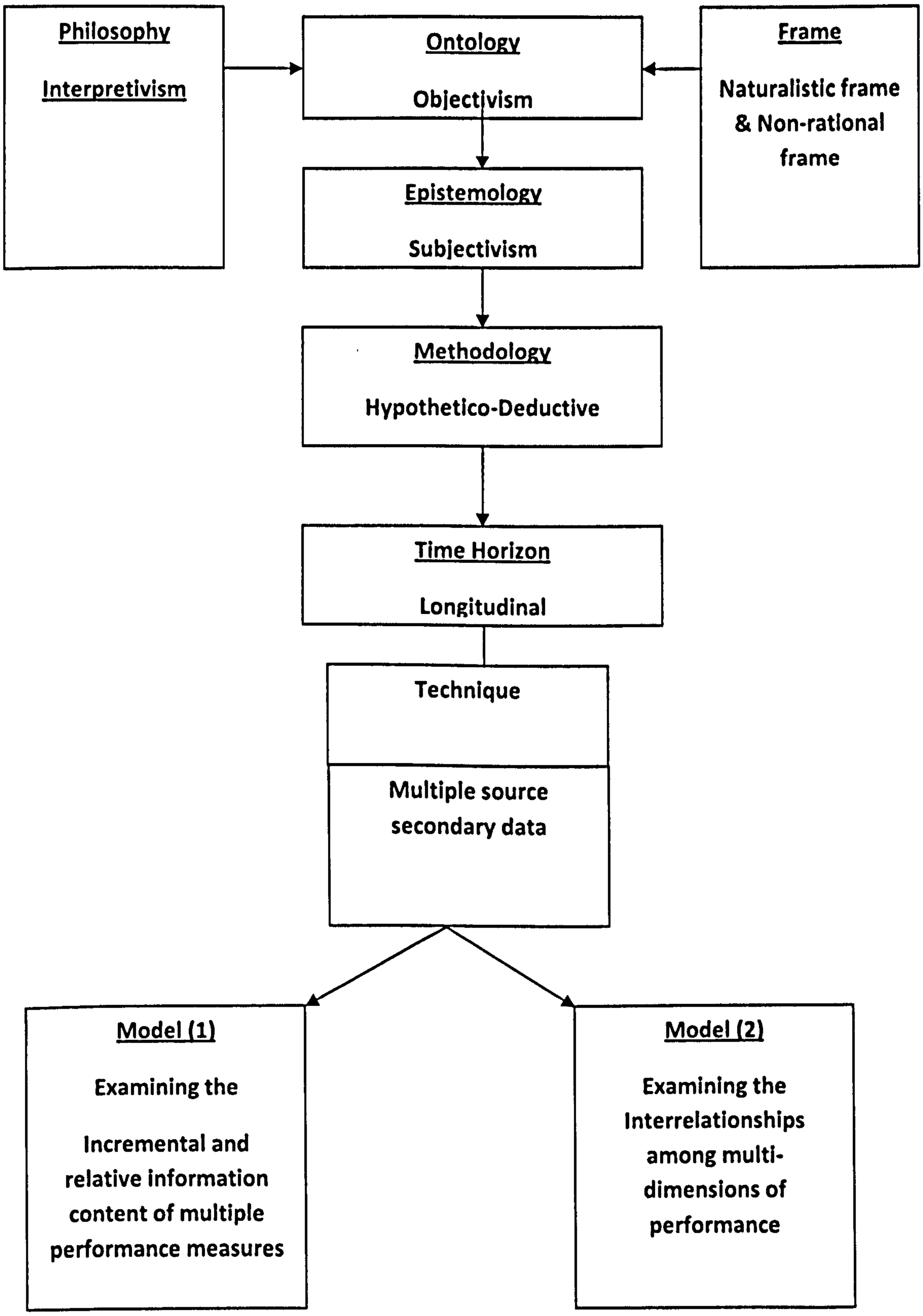
Consequently, hypothetico-deductive methodology has been utilised to carry out the first part of this research current research (Chapter Five). This method develops a set of hypotheses based on the literature, and tests them empirically. The hypothetico-deductive methodological approach requires that hypotheses are developed before data collection begins. Also, an inductive methodology has been employed in the second part of this research (Chapter Six) to

address its research questions. As a result this study adopts combination of deductive and inductive reasoning to tackle its research problem.

This research utilised secondary data from multiple sources; multiple source secondary data summarises the reports of many firms and therefore provides greater "coverage of the population surveyed" (Saunders et al., 2003, p.249). Databases comprise large and relatively objective data sets, which is useful in conducting longitudinal studies by providing comparative and contextual data about the population by the means of providing "objective picture of reality" (Saunders et al., 2003, p.262).

In terms of research frames, this research fits somewhere between the non-rational and naturalistic frames. On the one hand, consistent with the former, this research underlines the role of management accounting in helping organisations understand their goals. On the other hand, it emphasise the logic of established management accounting practices, studying performance measurement practice as it is rather than as it ought to be, consistent with the naturalistic frame as explained by Giere (2000) and by Baxter and Chua (2006).

To recap, objectivist ontology and a subjectivist epistemological position have been adopted. A hypothetico-deductive methodological approach has been used to formulate hypotheses and examine them empirically. Departing from an objectivist ontological position, multiple sources secondary data has been used to conduct a longitudinal (panel-data) study. "A longitudinal design allows some insight into the time order of variables and therefore may be more able to allow causal references to be made" (Bryman and Bell, 2003, p.52). This research approach is depicted in figure 4.1 as follows:



Research Philosophy and Models (figure 4.1)

4.6. Research Method

The following two sections demonstrate the data collection method and measurement of variables:

4.6.1 Sample and Data Collection

Mixing organisations across industries in this kind of study is problematic. The complications of constructing metrics that consider the same concept in different environments and the undesired noise in data might make the associations we are looking for indistinguishable. Therefore, the research setting has been limited to the airline industry in the USA to avoid such problems and to capitalise on the availability of published data. Although this specificity minimises the generalisability of the research results, most studies of non-financial measures focus on one case study industry rather than a variety of industries. For example, Amir and Lev (1996) argue that studies of non-financial information necessarily concentrate on a given industry, as such information is characteristically industry-specific (e.g., load factor in airlines, store capacity for retailers). In support of this, Kaplan and Norton (1996) argue that although firms have built up several new measurement systems, non-financial measures vary widely among industries. Each industry has distinctive business drivers that assist urge value formation. However, Devinney et al. (2005) argue that the different measures do not need to be consistent because, even within the same industry, organisations are more heterogeneous rather than homogeneous, as different companies stress different measures.

In order to achieve as representative a sample as possible, 31 airline companies in the United States were selected, representing more than 90% of total market share. This increases the likelihood that this sample of companies would make inferences drawn in this study applicable at the industry level. Moreover, the homogeneity of the organisations under

scrutiny provides a viable context for understanding the hypothesised associations between different perspectives of non-financial performance on the one hand, and financial performance on the other. The airline industry is suitable for non-financial access because of the availability of relatively homogenous non-financial data for different carriers. All data used in this study is available and published either on the companies' websites, Department of Transportation[1] website or the Edgar webpage of the SEC website[2]; hence this study makes use of actual financial and non-financial performance data rather than depending on self-declared measures of organisational performance. Firms were selected based on data availability from these sources. The data set comprises all airlines which have a greater than 1% of the market share, as well as another twenty airlines with less than 1% market share, yielding a representative sample of thirty one companies, together accounting for more than 90% of total market share and number of employees within the industry.

A panel data set of 19 quarters, ranging from the first quarter of 2003 to the third quarter of 2007 from all 31 companies was collected, and the observations mined from Bureau of Transportation Statistics databases/U.S Department of Transportation. These included information about the number of employees, trainers' and instructors' expenses, on-flight expenditures, enplaned passengers, amounts of fuel issued, departures performed, airtime flown, available seat miles, revenue passengers' miles and many other non-financial measures. This was in addition to quarterly financial data comprising operating revenues, operating expenses and operating cash flows. Aggregation has already occurred for non-

[1] Bureau of Transportation Statistics, *TranStats Aviation Database*, Data Library: Aviation, www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0

[2] www.sec.gov/edgar.shtml

financial measures as they were disclosed on a monthly basis, and accordingly a longitudinal method is employed in this study.

This research does not presume the use of non-financial measures in airlines' performance measurement systems. Instead, it examines whether non-financial measures of performance provide incremental and/or relative information beyond that provided by financial measures of performance, regardless of whether these measures are implicitly or explicitly employed for evaluation purposes consistent with Banker and Datar (1989), who argue that accounting performance measures do not represent all facets of firms' performance and hence non-financial metrics are expected to provide additional information about different aspects of performance.

As a result, this research is not limited to firms that explicitly release measures of non-financial performance, but includes firms that may use the information contained in these measures indirectly for subjective evaluations of managerial performance. In other words, our sample of firms is not limited to those firms that use non-financial measures in their performance measurement systems, as the consequences of such use is beyond the scope of this research. The purpose of this study is to examine the relative and incremental information content of multiple non-financial measures of performance, and to investigate the relationships between these measures and the financial performance of the firm.

In order to assess the methodology employed, this study examines the extent to which non-financial performance measures, in the period (t-i), are able to predict future accounting measures in the period (t), after controlling for accounting measures in (t-i), by identifying the relationship of non-financial measures with three financial measures: namely, operating revenues, operating expenses and operating cash flow. Our dataset serves this purpose

efficiently as it includes detailed information about measures of three non-financial performance perspectives coupled with the financial perspective of a suggested Balanced Scorecard.

4.6.2 Measurement of Variables

The airline industry is a capital- and competition-intensive industry. Airlines are very fuel-dependent, and are affected significantly by fuel price instability. Operations are labour intensive and subject to government control, although it is no longer a regulated industry. Moreover, political and weather circumstances have a significant impact on the industry. These variables and challenges, taken together, make measurement of an airline's performance problematic.

As a result, it is important to consider the multi-variables and challenges affecting this industry whilst examining its performance. It is necessary to consider multiple financial and non-financial measures of performance in order to capture the multi-dimensional nature of an airline performance.

Table (4-2) contains a condensed description of variables measurement. Dependent variables (i.e. operating revenues, operating expenses, and operating cash-flows) have been normalised by the size of the firm in total assets. Seasonality has been taken into account by defining the variables as the percentage change in the variables' value compared to the same quarter in year t-1. Figure (4-2) illustrates the suggested classification of the performance measures, along with the Balanced Scorecard notion (Kaplan and Norton, 1992; 1996).

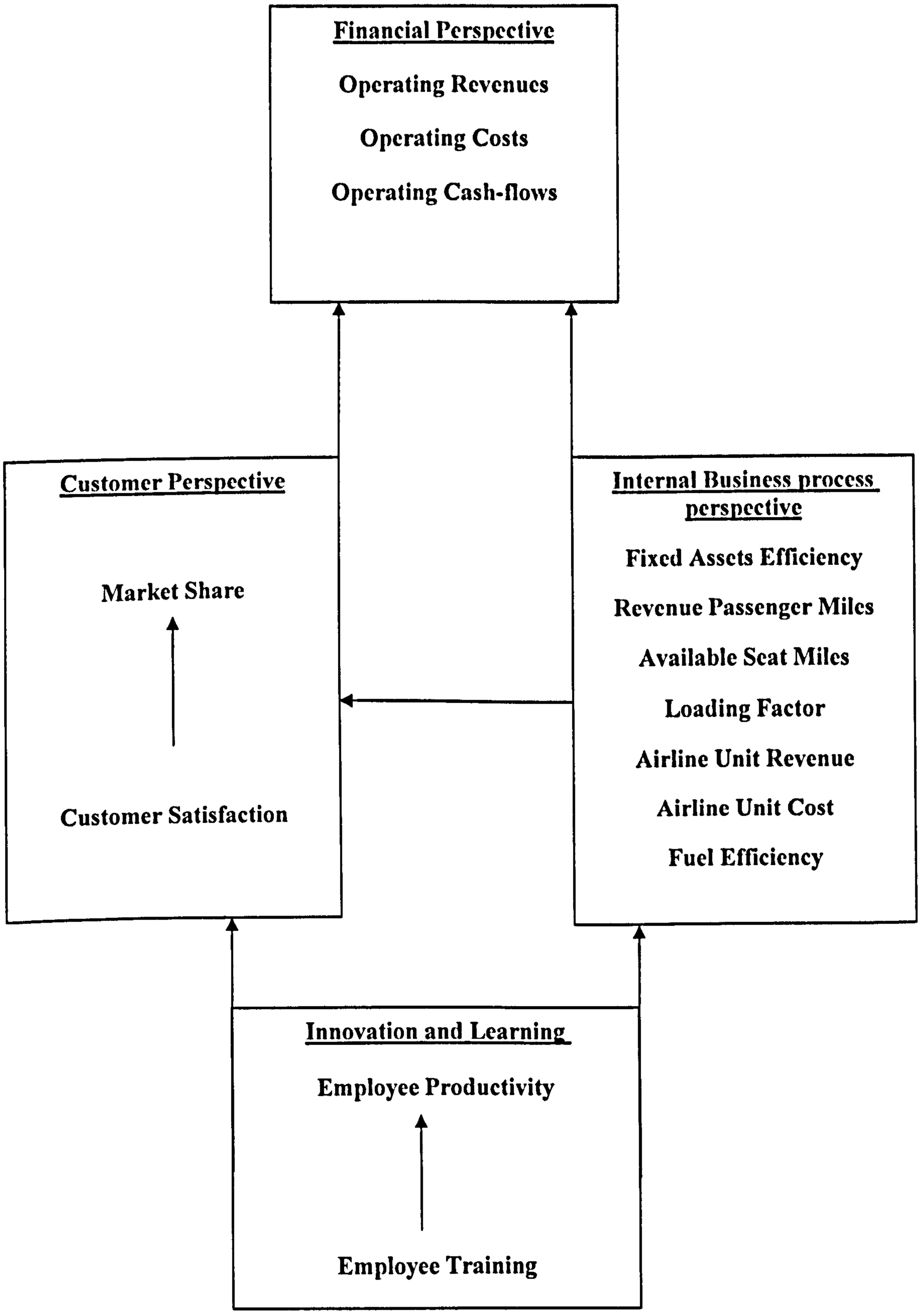


Figure (4-2): Suggested performance measurement system

Otley (1997), among others, suggests that founding a balanced portfolio of performance measures and reporting instruments is a significant means of overseeing performance in tomorrow's companies. He considers that the development of an information system that encompasses wide-ranging measures, including statistics on customer satisfaction, employee morale, and on-time delivery, coupled with financial aspects is the key strength of management accounting. He states "...The design of such an integrated performance report is important; we know that a picture is worth a thousand numbers" (Otley, 1997, p.2).

Dikolli and Sedatole (2007) acknowledge the importance of examining improvements in mediating variables to generate more comprehensive models of management and control that look at how different aspects of firms' performance are linked to their future financial performance. These mediations could be utilised to test the generalisability of theoretical structures such as the Balanced Scorecard that relate current nonfinancial performance to future financial performance.

Moreover, Dikolli and Sedatole (2007, p.82) state that, "In general, the NFPM literature does not fully explore potential mediating effects suggested by theory. Consequently, we currently have a less than complete understanding of the process by which investments in nonfinancial performance ultimately provide financial benefits". This study is an attempt to contribute to the current discussion by considering multiple nonfinancial measures in conjunction with the nonfinancial dimensions of the Balanced Scorecard, and, hence, we suggest the following nonfinancial measures to be leading indicators of the future financial performance in our research setting.

4.6.2.1 Innovation and Learning Perspective

Innovation is a key driver of value creation which has to occur on the operational level, where organisations deal with their customers, investors, and other stakeholders on daily basis through, for instance, new processes. It may also take place on the product development level through new technologies and new products development and introduction. Finally, it happens on the strategic level, where businesses decide how to align their intangible and tangible assets to create value. These three levels have to be knitted together to create growth and maximize value of businesses (Daum, 2001).

Organisational learning is a core competence of any organisation. Companies usually introduce their strategy as a theory, after which it is tested and modified as they go forward through a continuous learning process. However, it is critical for organisations to retain this learning within the organisation through interaction between stakeholders. One way to retain learning is to cascade knowledge by educating the lowest levels of the organisation's work force through investments in human capital in the form of skilled staff, and to boost their participation into the value creation process by encouraging them to contribute of knowledge, creativity, and time to the organisation in return for financial remuneration and their own development via training, which offers the opportunity to increase their own intellectual capital and hence to enhance their future occupational opportunities(Daum, 2001).

Human resources theorists have argued that employee training has a positive influence on job satisfaction, enthusiasm and aptitude for the job. Personal development enhances knowledge, improves self-confidence and efficiency, reduces the need for control, and increases employees' general satisfaction, raising motivation and decreasing employee turnover. All of

this acts to increase productivity and accordingly improve the organisation's financial performance (Jones and Wright (1992); Huselid (1995)).

Johnson, Ryan, and Schmit (1994) report that attitudes regarding training and development are considerably associated with customer satisfaction, this is consistent with Schlesinger and Zornitsky (1991), who argue that satisfied employees are more able to deliver outstanding service to customers, and with Schneider and Bowen (1992), who suggest that the quality of a service can be improved by investing in job training, which in turn leads to job satisfaction.

Furthermore, Molina and Ortega (2003) acknowledge that training can have a positive impact on a firm's performance, through aspects such as employee satisfaction and customer loyalty. Finally, Norton and Kaplan (2004) also support this argument, suggesting that investments in employee training have an indirect casual relationship with customer satisfaction by improving service quality.

As for the airline industry, labour is crucial element of operations, in the form of pilots, flight attendants, luggage handlers, customer service, call centre employees and others. According to the Air Transportation Association (ATA), labour is the number one cost for the airlines industry.

The innovation and learning perspective comprises two non-financial measures of performance: namely, employee training and labour productivity.

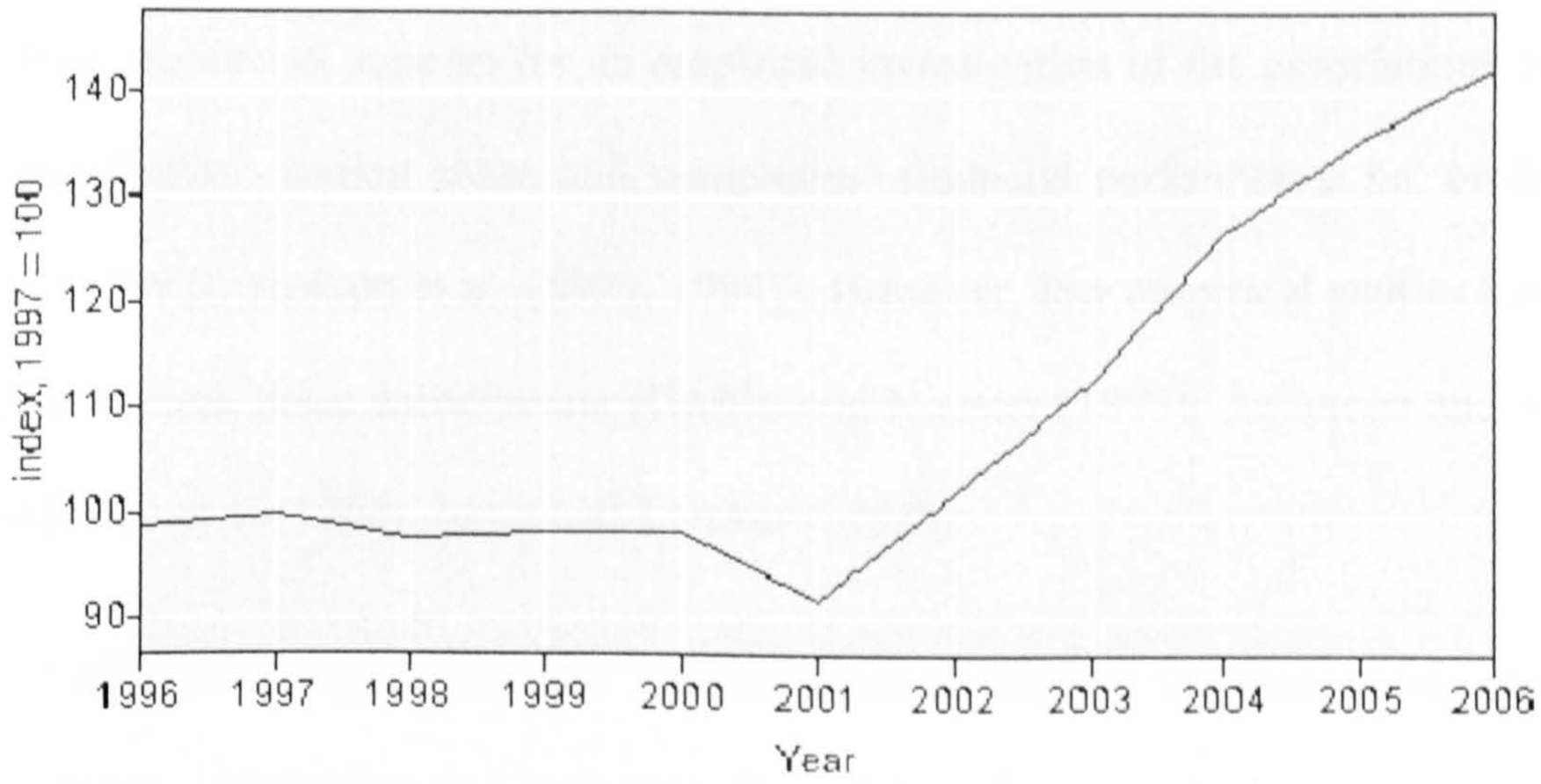
Employee training is measured by the employee's share of personnel expenses (excluding salaries and remuneration) and trainers' and instructors' expenses. It is expected that higher spend on training is linked with better training for employees. This measure aims to capture the competitive advantage created by having a well trained staff to deliver high quality service to firm's customers, as suggested by Otley (2005).

Labour efficiency usually is measured as output per employee. According to AICPA and Maisel's (2001) survey, labour efficiency is a regularly used non-financial measure that appears in 47% of performance measurement systems. For the purpose of this study it has been measured as an employee's share of revenue aircraft hours. This measure captures each employee's contribution to the generation of revenue hours and therefore to revenues. This measure was used by Fielding et al. (1978), who employed revenue vehicle hours per employee as an efficiency measure of labour productivity. It also used by the U.S. Department of Labour to gauge labour efficiency in the US airline industry.

US Department of Labour statistics show improved labour efficiency over years as illustrated in figure (4-3)

Figure (4-3): labour productivity over years in the airline industry:

Sector: Transportation
Industry: Air transportation
NAICS Code: 481
Measure: Output per worker
Duration: index, 1997 = 100
Base Year: 1997



Labour productivity, a measure of efficiency, is output resulting from labour input.
FIGURE 4-3 Labour efficiency of the airline industry: 1995–2006:
Output per full time equivalent worker.

4.6.2.2 Customer Perspective

Kaplan and Norton (2004, p.7) state that "success with targeted customers provides a principal component for improved financial performance". The Balanced Scorecard framework suggests that the customer perspective must incorporate indicators of customer success such as customer satisfaction, customer retention, and market share, as well as how the company intends to deliver value to its targeted customers (Kaplan and Norton, 1992; 1996).

Customer satisfaction could be defined as a state of mind that results from the customer's assessment of expectations proceeding to a purchase with impressions after utilising the service of the purchased service or goods (Oliver 1993; Oliver 1996).

A large number of studies in both marketing and management literature have argued that there is robust theoretical support for an empirical investigation of the associations between customer satisfaction, market share and companies' financial performance i.e. profitability (Nelson et al.(1992); Heskett et al. (1990, 1994)). However, few empirical studies have been conducted to explore these associations (Griffin and Hauster (1993); Anderson and Sullivan (1993); Anderson et al (1994); Ittner and Larcker (1998))

Anderson et al. (2004) suggest that the rationale that underlying the theoretical association between customer satisfaction and long-term financial performance is that customers are the main source of cash flow, and that customer satisfaction signifies the strength of the firm's relationship with its customers relationships and hence the timing, level, and constancy of cash flows.

In short, the literature has shown a common assumption of such a positive association between customer satisfaction, market share and economic consequences.

For the purposes of this study, customer satisfaction is been represented by a passenger's share of in-flight expenditures (In-flight expenditures / enplaned passengers). In-flight expenditures include food, beverage, entertainment and any other in-flight spend. The logic behind this proxy is that in-flight expenditure is related to a better quality of service provided to passengers in the form of higher quality food and drink, higher quality entertainment, greater cleanliness and better overall in-flight service, which in turn contributes to passengers' satisfaction, as these factors function to meet passengers' expectations and

therefore to enhance their travel experience, which in turn is likely to affect their future purchase decisions. This argument is supported by the literature: for example, Alamdari's (1999) passenger survey suggest that food and drink, cleanliness, seat comfort, entertainment, and safety and reliability are the main sources of customer satisfaction in the airline industry; providing these services help passengers to relax and entertain themselves during flights, and enhances airlines' image - which is an influential factor in the purchasing decision - and accordingly contributes to future revenues.

Most companies do not disclose their customer satisfaction survey results, and where they do, it is likely that these results are biased. Previous literature on the airline industry has used different proxies such as on-time arrival, mishandled luggage and number of complaints (Behn and Riley (1999); Lidetka (2002)). However, consistent with controllability concept as explained by Otley (2005, p.92) – that when designing performance measures, a measure should "reflect a controllable performance" - researchers should differentiate between factors controlled by the airlines themselves, and companies managing airports and take into account factors influenced by extraneous causes such as the weather and security procedures. In addition, these proxies are available only for few companies (only the 7 largest companies are required to disclose this data to the regulator), which would reduce the sample size.

Previous studies utilise on-time arrival and number of complainants as measures of customer dissatisfaction in the airline industries. However, on-time arrivals and departures are not accurate measures, as variables such as the weather, airport complications and aviation system jams mean that they are usually is out of airline's control. Table (4-1) shows that airlines are accountable only for 5.87% of the delays for the period of study, while the rest are caused by other factors such as security, severe weather conditions, and national aviation systems.

The number of complaints is also an unsatisfactory measure of customer dissatisfaction, since not every dissatisfied-customer complains. In fact, only a small percentage of passengers have the time and the will to exert effort to register a complaint if they are unhappy about the service. In the airline industry, most the complaints would be concern mishandled luggage, which is mainly the airport's rather than the airline's responsibility. Therefore, it is believed that a passenger's share of in-flight expenditure is a better measure to capture passenger satisfaction with the airlines' services. Consequently, this study uses in-flight expenditure per passenger as a proxy for customer satisfaction, and measures customer satisfaction as in-flight expenditures / enplaned passengers.

Table 4-1: Airlines On-Time Arrival Performance[3]
National (June, 2003 - December, 2007)

	Number of Operations	% of Total Operations	Delayed Minutes	% of Total Delayed Minutes
On Time	25,056,667	76.67%	N/A	N/A
Air Carrier Delay	1,919,881	5.87%	101,923,671	27.53%
Weather Delay	303,941	0.93%	22,337,511	6.03%
National Aviation System Delay	2,536,894	7.76%	114,199,082	30.84%
Security Delay	21,467	0.07%	798,702	0.22%
Aircraft Arriving Late	2,178,813	6.67%	131,018,441	35.38%
Cancelled	597,156	1.83%	N/A	N/A
Diverted	68,228	0.21%	N/A	N/A
Total Operations	32,683,043	100.00%	370,277,407	100.00%

- Air Carrier: The cause of the cancellation or delay was due to circumstances within the airline's control (e.g. maintenance or crew problems, aircraft cleaning, baggage loading, fuelling, etc.).
- Extreme Weather: Significant meteorological conditions (actual or forecasted) that, in the judgment of the carrier, delays or prevents the operation of a flight such as tornado, blizzard or hurricane.
- National Aviation System (NAS): Delays and cancellations attributable to the national aviation system that refer to a broad set of conditions, such as non-extreme weather conditions, airport operations, heavy traffic volume, and air traffic control.
- Late-arriving aircraft: A previous flight with same aircraft arrived late, causing the present flight to depart late.
- Security: Delays or cancellations caused by evacuation of a terminal or concourse, re-boarding of aircraft because of security breach, inoperative screening equipment and/or long lines in excess of 29 minutes at screening areas.

A flight is considered delayed when it arrived 15 or more minutes than the schedule.

[3] source: Bureau of Transportation Statistics, Airline Service Quality Performance as of 15th of April 2009

4.6.2.3 Internal Process Perspective

The internal process perspective identifies key areas that are expected to dramatically effect an organisation's strategy by aligning an organisation's tangible and intangible assets to create value by converting the potential value of its intangible assets into realised value in the form of customers' value and financial improvements as presented in the financial perspective in conventional financial terms (Kaplan and Norton, 2004).

This perspective uses seven performance measures to answer the question: what must a company excel in as required by Kaplan and Norton (1992) as follows:

- Fixed asset efficiency: For the purposes of this study is defined as the percentage change in airline (departures performed divided by fixed assets) in (quarter $_t$) compared to (quarter $_{t-4}$). This ratio aims to measure fixed assets utilisation while controlling for seasonality. We expect that improved assets utilisation i.e. allowing more departures with the same fixed assets, will allow more revenues to be generated by the same fixed assets, and hence an indirect link between improved operations and enhanced financial performance exists. As a result, it is expected that higher asset utilisation would be linked to higher operating revenues as well as to higher operating expenses.

- Fuel Efficiency: The airline industry is exceptionally sensitive to fuel costs. According to the Air Transportation Association (ATA), fuel is an airline's second biggest expense. Fuel forms a major proportion of an airline's total operating costs. Efficiency among different carriers can vary widely, and short-haul airlines usually get poorer fuel efficiency, since take-offs and landings consume especially high quantities of fuel. As a result, fuel efficiency as an important nonfinancial measure of

performance. For the purposes of this study, fuel efficiency is measured as the percentage change in airline (revenue aircraft miles flown / Aircraft fuel issued (gallons) to capture carriers' ability to generate revenues by maximising fuel efficiency. A previous study by Liedtka (2002) used available seat miles per gallon of fuel, aircraft miles per gallon of fuel and departures per gallon of fuel as measures of fuel efficiency. However, this study assumes that "revenue aircraft miles flown" is a better measure of fuel efficiency, since this ratio describes the relationship between gallons of fuel consumed and revenues generated.

- Available Seat Miles (ASM): in the airline industry, this measure indicates the seat supply for an airline. It is calculated by multiplying the number of seats available by the number of miles flown.

- Revenue Passenger Miles (RPM): this measure provides information about the number of seat miles that contribute to an airline's revenues. It is calculated by multiplying the number of seats filled by passengers by the number of miles flown.

- Load factor: The passenger load factor of an airline is a measure of how much of an airline's passenger haulage facility is used. According to the Bureau of Transportation website it is "passenger miles flown as a percentage of seat-miles available". This is a measure of capacity utilisation. As airlines often have significant fixed costs and are capital intensive, the efficiency of asset exploitation is crucial. The airline business is very seasonal, and so it is important to compare the passenger load factor with figures taken from the same time of the year, and so, for the purposes of this study, loading factor is taken to be the percentage change in an airline's load factor in (quarter $_t$) compared to (quarter $_{t-4}$). Analysts often refer to load factor in their reports: for

example; an analyst in the Airline Industry Information Journal (June, 2008) <http://www.allbusiness.com/company-activities-management/company-structures-ownership/10558491-1.html> states: "Frontier's revenue passenger miles increased by 2.5% compared with May 2007, while available seat miles decreased by 0.8%. This resulted in a mainline load factor for the month of 82.2%, up 2.6 percentage points from May last year"

- Measure of unit cost/revenue in the airline industry (yield): This is calculated by dividing all of an airline's operating expenses/revenue by the total number of available seat miles. Airline companies tend to report their cost unit in their annual reports, and airline unit cost and revenue have always been of great interest by financial analysts as well as the companies themselves. We expect that a higher unit of revenue and a lower unit of cost would be associated with improved current and future financial performance.

Kaplan and Norton (2004) suggest that value creation is an indirect process. Improvements in the non-financial aspects of organisational performance improve financial results, leading to enhanced revenues, decreased costs, and higher profits through a series of causal relationships. For instance, employee training could improve internal process quality, and such improvements are expected to enhance customer satisfaction and loyalty, which in turn boost market share. Ultimately, developments in customer perspective indicators lead to better sales, reduced costs and consequently higher profits in the future.

4.6.2.4 Financial perspective

Superiority in the operations evaluated by the above perspectives is expected to have an indirect link with the financial measures in the financial perspective of our proposed

dashboard through enhanced revenue growth, reductions in the cost of future operations, and improvements in future cash flows which link directly to a company's overall financial performance. Therefore, growth in operating revenues, operating expenses, and operating cash flows will be appropriate indicators of such improvements.

Accordingly, this research investigates whether non-financial metrics are leading indicators of three financial outcomes - operating revenues, operating expenses, and operating cash flows - and therefore have incremental information content beyond current accounting numbers. This link was tested with a lag of one, two, three and four quarters to explore any significant associations between these lagged non-financial measures and current financial performance.

Operating financial measures were used in preference to stock prices and returns for the following reasons:

- Most of the studied firms are subsidiaries for holding companies and therefore stock prices and stock returns information are not available.

- Contract theory provides general agreement that stock-based performance measurement may not be the most suitable for performance measurement and rewarding managers because the market aggregates the publicly available financial information e.g. annual and interim reports for price setting in a different way than that used by the organisation for performance measurement and remuneration purposes (Baiman, 2006)

- Baiman (2006, p.31) lists several arguments supporting the above point of view, and questioning the dependence on stock prices and returns for measuring performance and deciding on remuneration for managers: "...there are several arguments against

the assertion that stock-based performance evaluation and compensation is always optimal:

"First, except for top management, a manager's action is only tangentially related to stock price both because the latter is affected by the actions of many different managers and because it is affected by information not necessarily relevant to evaluating a manager. Second, stock price excludes information that is privately held by the firm that may be informative about the manager's performance. Third, as has been demonstrated in the last few years, management can influence stock price, at least in the short term, through earnings manipulation."

- Furthermore, Biddle et al. (1995) support the idea that when examining for incremental and relative information content for evaluating different performance measures for internal control purposes, it is useful to assess these specifications for dependent variables different than stock prices and returns.

The airline industry depends mainly on capital intensity due to the huge investments needed in aeroplanes, infrastructure and other capital expenditure. Consequently, this research gauges financial performance by measures of operating revenues, expenses, and cash-flows rather than stock price or aggregated profitability. The purpose of this measurement is to split the effect of non-financial performance on different elements of financial performance to avoid possible distortions caused by high depreciation expense and other capital expenditures. This also aims to neutralise the effects of other financial policies such as leasing policy. This is expected to provide a better understanding of the associations between different non-financial metrics of firms' performance and their financial performance from different angles.

Table 4-2: Measurement of variables:

Variable	Measurement (proxy)
Operating Revenues (Rev)	Total Operating Revenues / Total Assets
Operating Expenses (Cost)	Total Operating Expenses / Total Assets
Operating Cash Flows (Cash)	Total Operating cash flows / Total Assets
Employee Training (ET)	Personnel expenses + trainers and instructors expenses / full time equivalent employees.
Labour efficiency /productivity (LE)	Revenue aircraft hours /full time equivalent employees[4]
Loading Factor (LF)	Revenue passengers miles / available passengers miles Revenue ton miles / available ton miles for cargo airlines.
Customer Satisfaction (CS)	In-flight expenditures / enplaned passengers
Market Share (MS)	Revenue passengers miles / Total revenue passengers miles
Full Time Equivalent Employees	Consistent with the literature; this study considered every two part time employees as one full time employee.
Fuel Efficiency (FE)	Revenue aircraft miles flown / Aircraft fuel issued (gallons).
Fixed Assets Efficiency (FAE)	airline's departures performed divided by fixed assets
Ton Mile	One ton (2,000 pounds) transported one statue mile
Seat Mile	The aircraft miles flown in each inter-airport segment multiplied by the number of seats available on that segment for revenue passenger use
Available Seat miles (ASM)	The aircraft miles flown in each inter-airport segment multiplied by the number of seats available on that segment for revenue passenger use.
Revenue Passenger Miles (RPM)	Revenue passenger miles is used to measure paid traffic of an airlines It is calculated by multiplying the number of paying passengers by the number of travelled miles
Airline Unit Revenue	passenger revenue per available seat mile
Airline Unit Cost	Operating expenses/ Available seat miles

[4] * Two part time employees are equivalent to one full time employee.

The intention of these tests is to investigate the timing of these effects as well as the persistence of these improvements over the four tested lag periods, in order to enhance our understanding of the amount of information about future performance that can be obtained from nonfinancial performance measures as recommended by Dikolli and Sedatole (2007).

The literature provides mixed results on this issue. For instance, Amir and Lev (1996), Kaplan and Norton (1996), Ittner and Larcker (1998), and Liedtka (2002) acknowledge that non-financial metrics are the leading indicators for financial measures and that non-financial measures have incremental information content beyond that supplied by financial measures; while Behn and Riley (1999) and Wiersma (2008) present contradictory results. However, while earlier studies have examined the relationship between nonfinancial measures and financial performance, they have largely ignored the fact that, in practice, firms use multiple measures of performance rather than depending on one or a few nonfinancial measures, and therefore they overlook the tradeoffs as well as the interactions between these measures of performance. Also, although these studies imply the incremental information content of these measures, they disregard the relative information content of multiple competing measures.

The preceding debate provides a strong incentive for this research to conduct three types of tests to investigate the potential associations between nonfinancial measures and current and future financial performance, as follows:

4.7 Incremental information content

As explained in chapter two, incremental information content tests whether an accounting measure or set of measures present information beyond that given by another measure. Hence: "incremental comparisons apply when one or more accounting measures are viewed as given and an assessment is desired regarding the incremental contribution of another"

(Biddle et al., 1995, p.2). According to Biddle et al. (1995), the criteria of incremental information content tests is based on the notion that if we have two performance measures, X and Y, then measures X and Y have incremental information content beyond each other if the information provided by X and Y together is greater than information provided by measure X or measure Y solely. This relationship has been depicted in (Biddle et al., 1995, p.3) as follows:

Information content (X, Y) ≥ Information content (Y)?

Information content (X, Y) ≥ Information content (X)?

This research aims to investigate the incremental information content of multiple non-financial measures of performance. In particular, it examines whether current non-financial measures of performance help explain current financial performance to a greater extent than the information contained by the lagged financial measures.

This question will be tackled through the contemporaneous model to test hypothesis number one:

Hypothesis 1: Multiple current non-financial measures of performance have incremental information content beyond that provided by past financial measures of performance to explain contemporaneous financial performance.

For this purpose, the following three basic models have been examined:

Operating costs contemporaneous model[5]:

$$Cost_{it} = \alpha_{ci} + \beta_{c1}Cost_{t-1} + \beta_{c2}ASM_t + \beta_{c3}CS_t + \beta_{c4}ET_t + \beta_{c5}FAE_t + \beta_{c6}FE_t + \beta_{c7}LE_t + \beta_{c8}LF_t + \beta_{c9}MS_t + \beta_{c10}RPM_t + \beta_{c11}CU_t + \varepsilon_{cit}$$

Operating revenues contemporaneous model[6]:

$$Rev_{it} = \alpha_{it} + \beta_{r1}Rev_{t-1} + \beta_{r2}ASM_t + \beta_{r3}CS_t + \beta_{r4}ET_t + \beta_{r5}FAE_t + \beta_{r6}FE_t + \beta_{r7}LE_t + \beta_{r8}LF_t + \beta_{r9}MS_t + \beta_{r10}RPM_t + \beta_{r11}RU_t + \varepsilon_{rit}$$

Operating cash-flows contemporaneous model[7]:

$$Cash_{it} = \alpha_{cft} + \beta_{cf1}Cash_{t-1} + \beta_{cf2}ASM_t + \beta_{cf3}CS_t + \beta_{cf4}ET_t + \beta_{cf5}FAE_t + \beta_{cf6}FE_t + \beta_{cf7}LE_t + \beta_{cf8}LF_t + \beta_{cf9}MS_t + \beta_{cf10}RPM_t + \beta_{cf11}CU_t + \beta_{cf12}RU_t + \varepsilon_{cfit}$$

Additionally, incremental information tests investigate whether current non-financial measures of performance are able to provide additional information about future financial performance beyond the information contained within the lagged financial measures. This question will be tackled through multiple lag-models to test hypothesis number two:

Hypothesis 2: Multiple current non-financial measures of performance have incremental information content beyond that provided by financial measures of performance to predict future financial performance.

For this purpose, the following three basic models have been examined over one quarter, two quarters, three quarters, and four quarters lags:

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5 Cost denotes operating expenses, ASM: Available Seat Miles, CS: Customer Satisfaction, ET: Employee Training, FAE: Fixed Assets Efficiency, FE: Fuel Efficiency, LE: Labour Efficiency, LF: Load Factor, MS: Market Share, RPM: Revenue Passenger Miles, CU: Airline Unit Cost.

6 Revenue denotes Operating Revenues, RU: Airline Unit's Revenue.

7 Cash denotes Operating Cash-flows.

Operating costs lag models:

$$Cost_{it+q} = \alpha_{ci} + \beta_{c1}Cost_t + \beta_{c2}ASM_t + \beta_{c3}CS_t + \beta_{c4}ET_t + \beta_{c5}FAE_t + \beta_{c6}FE_t + \beta_{c7}LE_t + \beta_{c8}LF_t + \beta_{c9}MS_t + \beta_{c10}RPM_t + \beta_{c11}CU_t + \varepsilon_{cit}$$

Operating revenues lag models:

$$Rev_{it+q} = \alpha_{it} + \beta_{r1}Rev_t + \beta_{r2}ASM_t + \beta_{r3}CS_t + \beta_{r4}ET_t + \beta_{r5}FAE_t + \beta_{r6}FE_t + \beta_{r7}LE_t + \beta_{r8}LF_t + \beta_{r9}MS_t + \beta_{r10}RPM_t + \beta_{r11}RU_t + \varepsilon_{rit}$$

Operating cash-flows lag models:

$$Cash_{it+q} = \alpha_{cft} + \beta_{cf1}Cash_t + \beta_{cf2}ASM_t + \beta_{cf3}CS_t + \beta_{cf4}ET_t + \beta_{cf5}FAE_t + \beta_{cf6}FE_t + \beta_{cf7}LE_t + \beta_{cf8}LF_t + \beta_{cf9}MS_t + \beta_{cf10}RPM_t + \beta_{cf11}CU_t + \beta_{cf12}RU_t + \varepsilon_{cfit}$$

Where (q) in the last three models can be 1, 2, 3, or 4 quarters' lag from quarter (t), these four lags were examined because there was no support in the literature for the time lag between non-financial indicators and financial outcomes and to investigate the persistence of the effect that non-financial measures might have on the financial performance. The purpose of these tests is to check the importance of non-financial information, specifically its utility in predicting changes in the financial performance of firms. This is realized through an examination of the incremental information content of multiple non-financial measures in line with the Balanced Scorecard categories compared to financial perspective measures to explain future financial performance measures, namely: operating revenues, operating expenses, and operating cash flows

This research utilises the Time Series Cross Section Regression (TSCCR) procedure. TSCCR analyses linear econometric models that usually occur when time series and cross-sectional data are pooled. It deals with panel data sets that consist of time series observations on each of several cross-sectional units, one way fixed affect estimation method has been utilised as

explained by F specification results which provide sufficient evidence to reject the hypothesis of no fixed effect. This suggests that the fixed effect method is more appropriate, and therefore that Ordinary Least Squares (OLS) regression is considered to be unbiased regression (SAS institute, 2009). One way specification has been used as a (one-way) model includes dummy variables for firm, suggesting that we believe every firm has its own characteristics which have not been captured by our independent variables.

Following Biddle et al. (1995; 1997) a standard methodology to test for incremental information content has been employed. Thereby, incremental information content is evaluated by investigating the statistical significance of regression slope coefficients. Thus, incremental information content is evaluated by looking at *t*-tests of the individual coefficients and *F* tests of the joint null hypotheses.

4.8 Relative information content

Relative information content tests investigate if particular individual or groups of performance measures provide greater information compared to a benchmark of measures.

According to Biddle et al. (1995), the criteria of incremental information content tests is based on the notion that if we have two performance measures, X and Y, then measure X has relative information content compared to measure Y if the information provided by X is greater than information provided by measure Y. This relationship has been depicted in Biddle et al. (1995, p.3) as follows:

Information content (X) ≥ Information content (Y)

Or

Information content (X) ≤ Information content (Y)

Biddle et al. (1995, p. 6) state, "relative information content comparisons also could be useful when evaluating alternative performance measures for internal evaluation and control. In applications such as these, it may be useful to assess relative information content for a dependent variable other than stock prices or returns. For example, managers may be interested in evaluating the relative usefulness of alternative personnel screening or performance indicators".

Therefore, this research tests whether multiple non-financial measures of performance have relative information content compared to the lagged financial performance measure in predicting and/or explaining future financial performance as measured by operating revenues, operating costs and operating cash-flows. In other words, it examines whether multiple non-financial measures of performance have greater information content compared to lagging financial performance in predicting future financial performance to test hypothesis number three:

Hypothesis 3: Multiple current non-financial measures of performance have relative information content compared to that provided by financial measures of performance to predict future financial performance.

Voung (1989) suggests a statistical test to examine the relative information content of competing models. The idea behind this test is based on Kullback-Leibler's (1951) Information Criterion (KLIC) which compares a competing model's distribution against the true distribution by calculating the distance between the model's distribution and the true distribution. Voung (1989, p.308) states, "it is natural to define the "best" model among a collection of competing models to be the model that is closest to the true distribution". Therefore, the model that has the minimum distance from the true distribution is considered

to have greater information content and therefore it has relative information content. Voung (1989, p.326) states that this test is "probabilistic and is based on testing if the competing models are as close to the true distribution against the hypothesis that one model is closer than the other. Since the maximum log-likelihood of a model is a natural estimator of the distance between the model and the true distribution as measured by the KLIC, all our model selection tests are based on the LR statistic". The outcome of this test is the likelihood ratio (z value). A positive z value implies that multiple non-financial measures model has relative information content as a benchmark compared to the lagged financial measure.

Considering Voung (1989) and Biddle et al. (1995), this research tests the third hypothesis by building competing models to predict operating costs, operating revenues, and operating cash-flows for three different lags (one, two, and three quarters lags) where in the non-financial model it predicts the financial performance depending on the non-financial performance measures for the last quarter, the last two quarters, and finally the last three quarters in lag 3 to assess their relative information content against the financial model that depends on the lagged financial measure (financial measure at quarter $_{t-1}$). This research examines the relative information content of non-financial measures in predicting three dependent financial measures of performance for three different lags (q= 1, 2, and 3 quarters) as follows:

4.8.1 Operating Cost Relative Information Content Models

Operating cost: we assess the relative information content of multiple non-financial measures in predicting future operating cost by comparing Voung's test z value of the two competing models for three different lags as follows:

Lag 1: One quarter period was considered for this lag

$$Cost_{it} = \alpha_{ci} + \sum_{k=1}^{1} \beta_{c1k} ASM_{it-k} + \sum_{k=1}^{1} \beta_{c2k} FAE_{it-k} + \sum_{k=1}^{1} \beta_{c3k} FE_{it-k} + \sum_{k=1}^{1} \beta_{c4k} CS_{it-k} + \sum_{k=1}^{1} \beta_{c5k} MS_{it-k} + \sum_{k=1}^{1} \beta_{c6k} LF_{it-k} + \sum_{k=1}^{1} \beta_{c7k} RPM_{it-k} + \sum_{k=1}^{1} \beta_{c8k} CU_{it-k} + \sum_{k=1}^{1} \beta_{c9k} ET_{it-k} + \sum_{k=1}^{1} \beta_{c10k} LE_{it-k} + \varepsilon_{Cit}$$

And

$$Cost_{it} = \alpha_{ci} + \beta_1 Cost_{it-1} + \varepsilon_{cit}$$

Lag 2: Two quarters period was considered for this lag

$$Cost_{it} = \alpha_{ci} + \sum_{k=1}^{2} \beta_{c1k} ASM_{it-k} + \sum_{k=1}^{2} \beta_{c2k} FAE_{it-k} + \sum_{k=1}^{2} \beta_{c3k} FE_{it-k} + \sum_{k=1}^{2} \beta_{c4k} CS_{it-k} + \sum_{k=1}^{2} \beta_{c5k} MS_{it-k} + \sum_{k=1}^{2} \beta_{c6k} LF_{it-k} + \sum_{k=1}^{2} \beta_{c7k} RPM_{it-k} + \sum_{k=1}^{2} \beta_{c8k} CU_{it-k} + \sum_{k=1}^{2} \beta_{c9k} ET_{it-k} + \sum_{k=1}^{2} \beta_{c10k} LE_{it-k} + \varepsilon_{Cit}$$

And

$$Cost_{it} = \alpha_{ci} + \beta_1 Cost_{it-1} + \varepsilon_{cit}$$

Lag 3: Three quarters period was considered for this lag

$$Cost_{it} = \alpha_{ci} + \sum_{k=1}^{3} \beta_{c1k} ASM_{it-k} + \sum_{k=1}^{3} \beta_{c2k} FAE_{it-k} + \sum_{k=1}^{3} \beta_{c3k} FE_{it-k} + \sum_{k=1}^{3} \beta_{c4k} CS_{it-k} + \sum_{k=1}^{3} \beta_{c5k} MS_{it-k} + \sum_{k=1}^{3} \beta_{c6k} LF_{it-k} + \sum_{k=1}^{3} \beta_{c7k} RPM_{it-k} + \sum_{k=1}^{3} \beta_{c8k} CU_{it-k} + \sum_{k=1}^{3} \beta_{c9k} ET_{it-k} + \sum_{k=1}^{3} \beta_{c10k} LE_{it-k} + \varepsilon_{Cit}$$

And

$$Cost_{it} = \alpha_{ci} + \beta_1 Cost_{it-1} + \varepsilon_{cit}$$

4.8.2 Operating Revenues Relative Information Content Models

Operating revenues: we assess the relative information content of multiple non-financial measures in predicting future operating revenues by checking Voung's test z value for the following competing models:

Lag 1: One quarter period was considered for this lag

$$Rev_{it} = \alpha_{ri} + \sum_{k=1}^{1} \beta_{r1k} ASM_{it-k} + \sum_{k=1}^{1} \beta_{r2k} FAE_{it-k} + \sum_{k=1}^{1} \beta_{r3k} FE_{it-k} + \sum_{k=1}^{1} \beta_{r4k} CS_{it-k} + \sum_{k=1}^{1} \beta_{r5k} MS_{it-k} + \sum_{k=1}^{1} \beta_{r6k} LF_{it-k} + \sum_{k=1}^{1} \beta_{r7k} RPM_{it-k} + \sum_{k=1}^{1} \beta_{r8k} RU_{it-k} + \sum_{k=1}^{1} \beta_{r9k} ET_{it-k} + \sum_{k=1}^{1} \beta_{r10k} LE_{it-k} + \varepsilon_{rit}$$

And

$$Rev_{it} = \alpha_{ri} + \beta_{r1} Rev_{it-1} + \varepsilon_{rit}$$

Lag 2: Two quarters period was considered for this lag

$$Rev_{it} = \alpha_{ri} + \sum_{k=1}^{2} \beta_{r1k} ASM_{it-k} + \sum_{k=1}^{2} \beta_{r2k} FAE_{it-k} + \sum_{k=1}^{2} \beta_{r3k} FE_{it-k} + \sum_{k=1}^{2} \beta_{r4k} CS_{it-k} + \sum_{k=1}^{2} \beta_{r5k} MS_{it-k} + \sum_{k=1}^{2} \beta_{r6k} LF_{it-k} + \sum_{k=1}^{2} \beta_{r7k} RPM_{it-k} + \sum_{k=1}^{2} \beta_{r8k} RU_{it-k} + \sum_{k=1}^{2} \beta_{r9k} ET_{it-k} + \sum_{k=1}^{2} \beta_{r10k} LE_{it-k} + \varepsilon_{rit}$$

And

$$Rev_{it} = \alpha_{ri} + \beta_{r1} Rev_{it-1} + \varepsilon_{rit}$$

Lag 3: Three quarters period was considered for this lag

$$Rev_{it} = \alpha_{ri} + \sum_{k=1}^{3} \beta_{r1k} ASM_{it-k} + \sum_{k=1}^{3} \beta_{r2k} FAE_{it-k} + \sum_{k=1}^{3} \beta_{r3k} FE_{it-k} + \sum_{k=1}^{3} \beta_{r4k} CS_{it-k} + \sum_{k=1}^{3} \beta_{r5k} MS_{it-k} + \sum_{k=1}^{3} \beta_{r6k} LF_{it-k} + \sum_{k=1}^{3} \beta_{r7k} RPM_{it-k} + \sum_{k=1}^{3} \beta_{r8k} RU_{it-k} + \sum_{k=1}^{3} \beta_{r9k} ET_{it-k} + \sum_{k=1}^{3} \beta_{r10k} LE_{it-k} + \varepsilon_{rit}$$

And

$$Rev_{it} = \alpha_{ri} + \beta_{r1} Rev_{it-1} + \varepsilon_{rit}$$

4.8.3 Operating Cash-flows Relative Information Content Models

Operating cash-flows: we assess the relative information content of multiple non-financial measures in explaining the current operating cash-flow by checking Voung's test z value of the following competing models:

Lag 1: One quarter period was considered for this lag

$$Cash_{it} = \alpha_{cfi} + \sum_{k=1}^{1} \beta_{cf1k} ASM_{it-k} + \sum_{k=1}^{1} \beta_{cf2k} FAE_{it-k} + \sum_{k=1}^{1} \beta_{cf3k} FE_{it-k} + \sum_{k=1}^{1} \beta_{cf4k} CS_{it-k} + \sum_{k=1}^{1} \beta_{cf5k} MS_{it-k} + \sum_{k=1}^{1} \beta_{cf6k} LF_{it-k} + \sum_{k=1}^{1} \beta_{cf7k} RPM_{it-k} + \sum_{k=1}^{1} \beta_{cf8k} RU_{it-k} + \sum_{k=1}^{1} \beta_{cf9k} CU_{it-k} + \sum_{k=1}^{1} \beta_{cf10k} ET_{it-k} + \sum_{k=1}^{1} \beta_{cf11k} LE_{it-k} + \varepsilon_{cfit}$$

And

$$Cash_{it} = \alpha_{cfi} + \beta_{cf1} Cash_{it-1} + \varepsilon_{cfit}$$

Lag 2: Two quarters period was considered for this lag

$$Cash_{it} = \alpha_{cfi} + \sum_{k=1}^{2} \beta_{cf1k} ASM_{it-k} + \sum_{k=1}^{2} \beta_{cf2k} FAE_{it-k} + \sum_{k=1}^{2} \beta_{cf3k} FE_{it-k} + \sum_{k=1}^{2} \beta_{cf4k} CS_{it-k} + \sum_{k=1}^{2} \beta_{cf5k} MS_{it-k} + \sum_{k=1}^{2} \beta_{cf6k} LF_{it-k} + \sum_{k=1}^{2} \beta_{cf7k} RPM_{it-k} + \sum_{k=1}^{2} \beta_{cf8k} RU_{it-k} + \sum_{k=1}^{2} \beta_{cf9k} CU_{it-k} + \sum_{k=1}^{2} \beta_{cf10k} ET_{it-k} + \sum_{k=1}^{2} \beta_{cf11k} LE_{it-k} + \varepsilon_{cfit}$$

And

$$Cash_{it} = \alpha_{cfi} + \beta_{cf1} Cash_{it-1} + \varepsilon_{cfit}$$

Lag 3: Three quarters period was considered for this lag

$$Cash_{it} = \alpha_{cfi} + \sum_{k=1}^{3} \beta_{cf1k} ASM_{it-k} + \sum_{k=1}^{3} \beta_{cf2k} FAE_{it-k} + \sum_{k=1}^{3} \beta_{cf3k} FE_{it-k} + \sum_{k=1}^{3} \beta_{cf4k} CS_{it-k} + \sum_{k=1}^{3} \beta_{cf5k} MS_{it-k} + \sum_{k=1}^{3} \beta_{cf6k} LF_{it-k} + \sum_{k=1}^{3} \beta_{cf7k} RPM_{it-k} + \sum_{k=1}^{3} \beta_{cf8k} RU_{it-k} + \sum_{k=1}^{3} \beta_{cf9k} CU_{it-k} + \sum_{k=1}^{3} \beta_{cf10k} ET_{it-k} + \sum_{k=1}^{3} \beta_{cf11k} LE_{it-k} + \varepsilon_{cfit}$$

And

$$Cash_{it} = \alpha_{cfi} + \beta_{cf1} Cash_{it-1} + \varepsilon_{cfit}$$

A standard methodology is used to assess the relative information content of multiple non-financial measures of performance by examining the z value of Voung's (1989) test of three alternatives of non-financial models:

Model 1 includes the following non-financial measures: customer satisfaction, employee training, fixed assets efficiency, fuel efficiency, labour productivity, market share, cost unit, revenue unit, and the lagged financial measure.

Model 2 includes revenue passenger miles, available seat miles, customer satisfaction, employee training, labour productivity, market share, and the lagged financial measure.

Model 3 includes all the variables as follows: revenue passenger miles, available seat miles, customer satisfaction, employee training, fixed assets efficiency, fuel efficiency, labour productivity, market share, cost unit, revenue unit, and the lagged financial measure.

These previous three models were compared to financial measurement models based on lagged financial measures (as explained above) as a benchmark. In these tests, a positive z-

value indicates that the non-financial performance measures model have more information content (relative content) than the benchmark model that is based on financial measures.

4.9 Interrelationships among Balanced Scorecard perspectives and measures

A general argument in the literature is that high-quality operational actions will produce better financial performance as financial performance (i.e. profitability) is a coherent consequence for rational managerial behaviour in taking action (Ittner and Larcker, 1998).

Kaplan and Norton (1996) introduce the Balanced Scorecard as a measurement system that comprises performance measures from four different perspectives to capture managerial actions that are expected to result in financial outcomes that can be measured by a single or by several financial measures.

It could be concluded from the above arguments that better financial performance in the form of higher operating revenues or reduced operating costs is the result of managerial actions captured in lower level perspectives of the Balanced Scorecard.

Kaplan and Norton (1996) argue that measures of organisational learning and growth are the drivers of measures of the internal business processes, which in turn drive measures of the customer perspective, which then lead the financial measures. This position implies that improvements in learning and growth measures are prerequisites of improvements in internal business process, which will be followed by improvements in measures of customer perspective and finally will result in enhanced financial performance. Therefore, Balanced Scorecard perspectives can be understood as four sequential or hierarchical layers (perspectives), starting with the measures of the learning and growth perspective, and ending with measures of the financial perspective. It is to be expected, therefore, that improvements in measures of the lowest level (learning and growth measures; e.g. employee training)

precede improvements in the second level (internal process perspective measures e.g. load factor), which in turn pave the way for improvements in customer perspective measures e.g. market share, which themselves lead eventually to enhanced performance in the top level (financial performance measures e.g. operating revenues).

The Balanced Scorecard underlines the notion of causal relationships between measures in the same perspective and amongst different perspectives. If these causal associations exist, then companies will understand how improvements in particular non-financial measure may result in improvements in financial outcomes and will be more likely to embrace them in their strategies.

Kaplan and Norton (1996, p.15) state, "The emphasis on cause and effect in constructing a balanced scorecard introduces dynamic systems thinking. It enables individuals in various parts of an organisation to understand how pieces fit together, how their role influences others, and eventually the entire organisation". Additionally, they affirm that scorecards must be underpinned implicitly by sequences of causal relationships stemming from corporate strategy, considering assessment of the response times i.e. time lag between cause and effect, as well as the extent to which measures affect each other. For example, how long does it take before improvements in customer satisfaction lead to improvements in sales? To what extent do improvements in customer satisfaction affect sales? Kaplan and Norton confirm that such quantifications of the relationship between measures in different perspectives of the Balanced Scorecard in terms of the time lag between cause and effect and magnitude can be tested in the form of hypothesis testing.

Kaplan and Norton (1996, p.149) state, "a strategy is a set of hypotheses about cause and effect. Cause and effect relationships can be expressed by a sequence of if-then statements".

They provide the following example to illustrate the if-then statement: "if we increase employee training about products, then they will become more knowledgeable about the full range of products they can sell; if employees are more knowledgeable about products, then their sales effectiveness will improve. If their sales effectiveness improves, then the average margins of the products they sell will increase"

Anthony and Govindarajan (2007, p.465) also provide an example of how measures can be causally related to one another: "better selection, training, and development of manufacturing employees lead to better product quality and better on-time delivery. These improvements in turn lead to improved customer loyalty, which leads to enhanced sales in the form of sales growth"

The previous arguments indicate that performance measurement systems must assume relationships between the different aspects of performance in the form of chains of hypotheses, and ought to communicate these hypotheses through electing key performance drivers which are expected to be leading indicators of outcome measures (lagging measures) in the form of improved financial outcomes.

Furthermore, Norton and Kaplan (1996, p.149) state, "all balanced scorecards use certain generic measures. These generic measures tend to be core outcome measures, which reflect the common goals of many strategies, as well as similar structures across industries and companies. These generic outcome measures tend to be lag indicators, such as profitability, market share, customer satisfaction, customer retention, and employee skills." They define such generic measures (1996, p.43) as "measures that show up in most organisations scorecards". This justifies our suggested performance measurement framework, which depends on generic measures that reflect many strategies among airline companies and

therefore represent common objectives in the airline industry. As argued by Norton and Kaplan, these measures need not be tailored to firm's strategy, since they reflect firms' common goals among all firms. In this section, the current research aims to examine these supposed relationships between different generic measures within the Balanced Scorecard. In other words, it examines whether different non-financial measures are directly related to financial performance or are instead indirectly related, as Norton and Kaplan argue, via a chain of cause and effect relationships. In particular, it examines whether the relationships between non-financial measures are mediated by other non-financial measures in the same or different perspectives, and examines whether static or dynamic Balanced Scorecard models capture managerial activities more effectively.

The results of the first part of this research show that measures of employee training, labour productivity, fixed assets efficiency, load factor, customer satisfaction, market share, available seat miles, revenue unit, and revenue passenger miles have a positive and significant association with future operating revenues within four quarters' lag. Measures of available seat miles, revenue passenger miles, customer satisfaction, employee training, market share, load factor, and unit cost have a significant negative association with future operating costs within four quarters' lag. Therefore, the following variables commonly affect both revenues and costs: employee training, labour productivity, revenue passenger miles, available seat miles, load factor, fixed assets efficiency, customer satisfaction, and market share. These measures are thus expected to influence the value of the firm, either by increasing revenues, or by reducing operating expenses. Consistent with previous literature (e.g. Ittner and Larcker, 1998), results of incremental information content show that several non-financial measures are leading indicators of financial performance with different lags, ranging from one quarter to four quarters. However, where previous studies have focused on

contemporaneous analysis rather than lag analysis (e.g. Kekre and Srinivasan, 2002; Bryant et al., 2004), this research goes further by investigating the timing of the interrelationships of different perspectives' measures in order to capture the interplay between different measures of performance and how they are linked to the financial performance.

This research intends to examine these questions by building several competing structural models, and exploring which of these models best fits the data, and investigating the mediating role of different measures of performance. It also intends to examine the nature of performance measurement systems, specifically, whether a static or dynamic model better fits the data. For this purpose, the suggested models are:

4.9.1 The First Model: Direct Relationships Model

This model assumes that a direct relationship exists between each non-financial measure at quarter $_t$ and the financial performance at quarter $_t$. This model can be represented as follows:

$$COST_i = p_0 + p_1 ET_i + p_2 LE_i + p_3 FAE_i + p_4 LF_i + p_5 ASM_i + p_6 RPM_i + p_7 CS_i + p_8 MS_i + e_1;$$

$$REVENUE_i = r_0 + r_1 ET_i + r_2 LE_i + r_3 FAE_i + r_4 LF_i + r_5 ASM_i + r_6 RPM_i + r_7 CS_i + r_8 MS_i + e_1;$$

4.9.2 The Second Model: A Static [Fully Mediated Indirect Relationships Model]

This model assumes that measures from the learning perspective influence measures from internal process perspectives, which in turn affect measures from the customer perspective, which themselves are reflected in measures of the financial perspective in the same quarter $_t$. This model departs from the both Balanced Scorecard (Kaplan and Norton, 1996) and service profit chain (Hessket et al., 2008). "Balanced Scorecard" and "service profit chain" both assume an indirect causal relationship between actions and outcomes. This model can be depicted through the following equations:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 RPM_{it} + e_6;$$

$$MS_{it} = h_0 + h_1 CS_{it} + e_7;$$

$$COST_{it} = p_0 + p_1 MS_{it} + e_8;$$

$$REVENUE_{it} = r_0 + r_1 MS_{it} + e_9;$$

In this model, LE denotes Labour Efficiency; ET, Employee Training; FAE, Fixed Assets Efficiency; LF, Load Factor; ASM, Available Seat Miles; RPM, Revenue Passenger Miles; CS, Customer Satisfaction; MS, Market Share; COST, Operating Expenses; and REVENUE, Operating Revenues.

4.9.3 The Third Model, A Static [Partially Mediated Indirect Relationships Model]

This model allows nonfinancial measures in the lower perspectives to link with measures from all the upper perspectives within the hierarchy.

The following model is designed to capture relationships within this scenario:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 ET_{it} + b_2 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 ET_{it} + c_2 LE_{it} + c_3 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 ET_{it} + d_2 LE_{it} + d_3 FAE_{it} + d_4 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ET_{it} + f_2 LE_{it} + f_3 FAE_{it} + f_4 LF_{it} + f_5 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 ET_{it} + g_2 LE_{it} + g_3 FAE_{it} + g_4 LF_{it} + g_5 ASM_{it} + g_6 RPM_{it} + e_6;$$

$$MS_{it} = h_0 + h_1 ET_{it} + h_2 LE_{it} + h_3 FAE_{it} + h_4 LF_{it} + h_5 ASM_{it} + h_6 RPM_{it} + h_7 CS_{it} + e_7;$$

$$COST_{it} = p_0 + p_1 ET_{it} + p_2 LE_{it} + p_3 FAE_{it} + p_4 LF_{it} + p_5 ASM_{it} + p_6 RPM_{it} + p_7 CS_{it} + p_8 MS_{it} + e_8;$$

$$REVENUE_{it} = r_0 + r_1 ET_{it} + r_2 LE_{it} + r_3 FAE_{it} + r_4 LF_{it} + r_5 ASM_{it} + r_6 RPM_{it} + r_7 CS_{it} + r_8 MS_{it} + e_9;$$

4.9.4 Dynamic [Fully Mediated interrelationships Models]

These models introduce the time effect to the fully mediated model i.e. they assume a time lag between means in a particular performance perspective and ends in the following perspective or perspectives. There are four different versions of the dynamic model:

4.9.4.1 Chronological Fully Mediated Model

This model assumes a chronological relationship between performance measures, with a one quarter lag between each perspective and the next in the hierarchy, as follows:

$$LE_{i\,t-3} = a_0 + a_1\, ET_{i\,t-3} + e_1;$$

$$FAE_{i\,t-2} = b_0 + b_1\, LE_{i\,t-3} + e_2;$$

$$LF_{i\,t-2} = c_0 + c_1\, FAE_{i\,t-2} + e_3;$$

$$ASM_{i\,t-2} = d_0 + d_1\, LF_{i\,t-2} + e_4;$$

$$RPM_{i\,t-2} = f_0 + f_1\, ASM_{i\,t-2} + e_5;$$

$$CS_{i\,t-1} = g_0 + g_1\, RPM_{i\,t-2} + e_6;$$

$$MS_{i\,t-1} = h_0 + h_1\, CS_{i\,t-1} + e_7;$$

$$COST_{i\,t} = p_0 + p_1 MS_{i\,t-1} + e_8;$$

$$REVENUE_{i\,t} = r_0 + r_1 MS_{i\,t-1} + e_9;$$

4.9.4.2 Fully Mediated Model with One Quarter Lag between Non-Financial Measures and Financial Outcomes

Model 2 assumes that the financial outcomes are one quarter lagged compared with the non-financial measures, but that there is no chronological relationship between the non-financial measures themselves, as follows:

$$LE_{i\,t-1} = a_0 + a_1\, ET_{i\,t-1} + e_1;$$

$$FAE_{i\,t-1} = b_0 + b_1\, LE_{i\,t-1} + e_2;$$

$$LF_{i\,t-1} = c_0 + c_1\, FAE_{i\,t-1} + e_3;$$

$$ASM_{i\,t-1} = d_0 + d_1\, LF_{i\,t-1} + e_4;$$

$RPM_{i\,t-1} = f_0 + f_1\, ASM_{i\,t-1} + e_5;$

$CS_{i\,t-1} = g_0 + g_1\, RPM_{i\,t-1} + e_6;$

$MS_{i\,t-1} = h_0 + h_1\, CS_{i\,t-1} + e_7;$

$COST_{i\,t} = p_0 + p_1 MS_{i\,t-1} + e_8;$

$REVENUE_{i\,t} = r_0 + r_1 MS_{i\,t-1} + e_9;$

4.9.4.3 Fully Mediated Model with Two Quarters Lag between Non-Financial Measures and Financial Outcomes

This model assumes that the financial outcomes are two quarters lagged compared with the non-financial measures, but that there is no chronological relationship between the non-financial measures, as follows:

$LE_{i\,t-2} = a_0 + a_1\, ET_{i\,t-2} + e_1;$

$FAE_{i\,t-2} = b_0 + b_1\, LE_{i\,t-2} + e_2;$

$LF_{i\,t-2} = c_0 + c_1\, FAE_{i\,t-2} + e_3;$

$ASM_{i\,t-2} = d_0 + d_1\, LF_{i\,t-2} + e_4;$

$RPM_{i\,t-2} = f_0 + f_1\, ASM_{i\,t-2} + e_5;$

$CS_{i\,t-2} = g_0 + g_1\, RPM_{i\,t-2} + e_6;$

$MS_{i\,t-2} = h_0 + h_1\, CS_{i\,t-2} + e_7;$

$COST_{i\,t} = p_0 + p_1 MS_{i\,t-2} + e_8;$

$REVENUE_{it} = r_0 + r_1 MS_{it-2} + e_9;$

4.9.4.4 Fully Mediated Model with Three Quarters Lag between Non-Financial Measures and Financial Outcomes

This model assumes that the financial outcomes are three quarters lagged compared with the non-financial measures, but that there is no chronological relationship between the non-financial measures. This model can be depicted as follows:

$LE_{it-3} = a_0 + a_1 ET_{it-3} + e_1;$

$FAE_{it-3} = b_0 + b_1 LE_{it-3} + e_2;$

$LF_{it-3} = c_0 + c_1 FAE_{it-3} + e_3;$

$ASM_{it-3} = d_0 + d_1 LF_{it-3} + e_4;$

$RPM_{it-3} = f_0 + f_1 ASM_{it-3} + e_5;$

$CS_{it-3} = g_0 + g_1 RPM_{it-3} + e_6;$

$MS_{it-3} = h_0 + h_1 CS_{it-3} + e_7;$

$COST_{it} = p_0 + p_1 MS_{it-3} + e_8;$

$REVENUE_{it} = r_0 + r_1 MS_{it-3} + e_9;$

4.9.5 Dynamic [Partially Mediated interrelationships Models]

These models quantify the magnitude and timing of the relationships between performance measures, and thereby introduce the time effect to the partially mediated model; it assumes a

time lag between changes in a particular performance perspective and results in the following perspective or perspectives. These models can be broken down into four, as follows:

4.9.5.1 Chronological Partially Mediated Interrelationships Model

This model assumes that the outcome measures of each perspective are associated with the outcome measures of all higher level perspectives. In addition, it assumes a chronological relationship, with a one quarter lag between one perspective and the next:

$$LE_{i\,t-3} = a_0 + a_1\, ET_{i\,t-3} + e_1;$$

$$FAE_{i\,t-2} = b_0 + b_1\, ET_{i\,t-3} + b_2\, LE_{i\,t-3} + e_2;$$

$$LF_{i\,t-2} = c_0 + c_1\, ET_{i\,t-3} + c_2\, LE_{i\,t-3} + c_3\, FAE_{i\,t-2} + e_3;$$

$$ASM_{i\,t-2} = d_0 + d_1\, ET_{i\,t-3} + d_2\, LE_{i\,t-3} + d_3\, FAE_{i\,t-2} + d_4\, LF_{i\,t-2} + e_4;$$

$$RPM_{i\,t-2} = f_0 + f_1\, ET_{i\,t-3} + f_2\, LE_{i\,t-3} + f_3\, FAE_{i\,t-2} + f_4\, LF_{i\,t-2} + f_5\, ASM_{i\,t-2} + e_5;$$

$$CS_{i\,t-1} = g_0 + g_1\, ET_{i\,t-3} + g_2\, LE_{i\,t-3} + g_3\, FAE_{i\,t-2} + g_4\, LF_{i\,t-2} + g_5\, ASM_{i\,t-2} + g_6\, RPM_{i\,t-2} + e_6;$$

$$MS_{i\,t-1} = h_0 + h_1\, ET_{i\,t-3} + h_2\, LE_{i\,t-3} + h_3\, FAE_{i\,t-2} + h_4\, LF_{i\,t-2} + h_5\, ASM_{i\,t-2} + h_6\, RPM_{i\,t-2} + h_7 CS_{i\,t-1} + e_7;$$

$$COST_{i\,t} = p_0 + p_1 ET_{i\,t-3} + p_2\, LE_{i\,t-3} + p_3\, FAE_{i\,t-2} + p_4\, LF_{i\,t-2} + p_5\, ASM_{i\,t-2} + p_6\, RPM_{i\,t-2} + p_7 CS_{i\,t-1} + p_8 MS_{i\,t-1} + e_8;$$

$$REVENUE_{i\,t} = r_0 + r_1 ET_{i\,t-3} + r_2\, LE_{i\,t-3} + r_3\, FAE_{i\,t-2} + r_4\, LF_{i\,t-2} + r_5\, ASM_{i\,t-2} + r_6\, RPM_{i\,t-2} + r_7 CS_{i\,t-1} + r_8 MS_{i\,t-1} + e_9;$$

4.9.5.2 Partially Mediated Model with One Quarter Lag between Non-Financial Measures and Financial Outcomes

This model assumes that financial outcomes are one quarter lagged related with non-financial measures, but that there is no chronological relationship between the non-financial measures. It also assumes that the outcome measures of each non-financial perspective are associated with the outcome measures of all higher level perspectives, as illustrated in the following model:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 ET_{it} + b_2 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 ET_{it} + c_2 LE_{it} + c_3 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 ET_{it} + d_2 LE_{it} + d_3 FAE_{it} + d_4 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ET_{it} + f_2 LE_{it} + f_3 FAE_{it} + f_4 LF_{it} + f_5 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 ET_{it} + g_2 LE_{it} + g_3 FAE_{it} + g_4 LF_{it} + g_5 ASM_{it} + g_6 RPM_{it} + e_6;$$

$$MS_{it} = h_0 + h_1 ET_{it} + h_2 LE_{it} + h_3 FAE_{it} + h_4 LF_{it} + h_5 ASM_{it} + h_6 RPM_{it} + h_7 CS_{it} + e_7;$$

$$COST_{it+1} = p_0 + p_1 ET_{it} + p_2 LE_{it} + p_3 FAE_{it} + p_4 LF_{it} + p_5 ASM_{it} + p_6 RPM_{it} + p_7 CS_{it} + p_8 MS_{it} + e_8;$$

$$REVENUE_{it+1} = r_0 + r_1 ET_{it} + r_2 LE_{it} + r_3 FAE_{it} + r_4 LF_{it} + r_5 ASM_{it} + r_6 RPM_{it} + r_7 CS_{it} + r_8 MS_{it} + e_9;$$

4.9.5.3 Partially Mediated Model with Two Quarters Lag between Non-Financial Measures and Financial Outcomes

This model assumes a two quarter lagged chronological relationships between financial outcomes and all non-financial measures, as follows:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 ET_{it} + b_2 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 ET_{it} + c_2 LE_{it} + c_3 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 ET_{it} + d_2 LE_{it} + d_3 FAE_{it} + d_4 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ET_{it} + f_2 LE_{it} + f_3 FAE_{it} + f_4 LF_{it} + f_5 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 ET_{it} + g_2 LE_{it} + g_3 FAE_{it} + g_4 LF_{it} + g_5 ASM_{it} + g_6 RPM_{it} + e_6;$$

$$MS_{it} = h_0 + h_1 ET_{it} + h_2 LE_{it} + h_3 FAE_{it} + h_4 LF_{it} + h_5 ASM_{it} + h_6 RPM_{it} + h_7 CS_{it} + e_7;$$

$$COST_{it+2} = p_0 + p_1 ET_{it} + p_2 LE_{it} + p_3 FAE_{it} + p_4 LF_{it} + p_5 ASM_{it} + p_6 RPM_{it} + p_7 CS_{it} + p_8 MS_{it} + e_8;$$

$$REVENUE_{it+2} = r_0 + r_1 ET_{it} + r_2 LE_{it} + r_3 FAE_{it} + r_4 LF_{it} + r_5 ASM_{it} + r_6 RPM_{it} + r_7 CS_{it} + r_8 MS_{it} + e_9;$$

4.9.5.4 Partially Mediated Model with Three Quarters Lag between Non-Financial Measures and Financial Outcomes

This model assumes a three quarter lagged chronological relationships between financial outcomes and all non-financial measures, this is depicted is follows:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 ET_{it} + b_2 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 ET_{it} + c_2 LE_{it} + c_3 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 ET_{it} + d_2 LE_{it} + d_3 FAE_{it} + d_4 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ET_{it} + f_2 LE_{it} + f_3 FAE_{it} + f_4 LF_{it} + f_5 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 ET_{it} + g_2 LE_{it} + g_3 FAE_{it} + g_4 LF_{it} + g_5 ASM_{it} + g_6 RPM_{it} + e_6;$$

$$MS_{it} = h_0 + h_1 ET_{it} + h_2 LE_{it} + h_3 FAE_{it} + h_4 LF_{it} + h_5 ASM_{it} + h_6 RPM_{it} + h_7 CS_{it} + e_7;$$

$$COST_{it+3} = p_0 + p_1 ET_{it} + p_2 LE_{it} + p_3 FAE_{it} + p_4 LF_{it} + p_5 ASM_{it} + p_6 RPM_{it} + p_7 CS_{it} + p_8 MS_{it} + e_8;$$

$$REVENUE_{it+3} = r_0 + r_1 ET_{it} + r_2 LE_{it} + r_3 FAE_{it} + r_4 LF_{it} + r_5 ASM_{it} + r_6 RPM_{it} + r_7 CS_{it} + r_8 MS_{it} + e_9;$$

Probably the most suitable statistical method of examining these relationships is structural equation modelling, due to its ability to "estimate multiple and interrelated dependent relationships" (Hair et al. 1995, p.584). The reasoning behind this selection is explained below.

4.10 Structural Equation Modelling

Structural Equation Modelling (SEM) is a statistical method that accommodates measurement error into the estimation of a series of dependence relationships (Hair et al., 1995, p.584). SEM is unique in two ways: firstly in its "estimation of multiple and interrelated dependence relationships", and secondly in "the ability to represent unobserved concepts in these

relationships and count for measurement error in the estimation process". In other words, SEM combines factor analysis with multiple regression hypotheses testing in one operation, and includes measurement error as an important part of the model used to test a series of interrelationships.

Moreover, SEM assesses the causal relationships between a group of dependent and independent constructs. It evaluates the measurement model loading of observed measurements on their expected constructs (i.e. the model that identifies indicators for each construct as well as evaluating the reliability of each latent variable (construct) for estimating the casual relationships (Hair et al., 1995; Gefen et al, 2000).

Hair et al. (1995, p.584) state, "SEM estimates a series of separate, but interdependent, multiple regression equations simultaneously by specifying the structural model used by the statistical program". To build a structural model, theory is used to identify independent variables which predict each dependent variable, and hence some independent variables become dependent variables in subsequent associations, leading to the interdependent character of the structural model. Furthermore, in a structural model environment, many variables would affect dependent variables at the same time but on different levels; structural models capture these relationships between dependent and independent variables, including situations when a dependent variable turns out to be an independent variable in subsequent relationships. SEM transforms these suggested relationships into a chain of structural equations for every independent variable (Hair et al., 1995).

This research applies competing models strategy to compare different models in order to test the research hypotheses. Four well-known indices are used to compare these competing models: first, the Goodness of Fit (GFI), which must be greater than or equal to 90% for the

model to be accepted; second, the Chi-square value, which should not be significant if there is a good model fit (Kline, 1998); third, Akaike's Information Criterion (AIC); and fourth, the Bayesian Information Criterion (BIC). According to Hair et al. (1995) the model that, yields the smallest AIC and BIC values, is considered the best. The results of these analyses are demonstrated in detail in chapter six.

4.11 Conclusion

From the previous discussion it can be concluded that the employed methodology is justified by the objectivist ontological position and the subjectivist epistemology. This position is considered to be a consequence of the stakeholder-agency theory employed by the research (illustrated in chapter 3). The stakeholder-agency theory is accepted as a positive theory comprises the objective ontology. Therefore, the hypothetico-deductive approach (testing theory) would be the appropriate methodology to conduct this research. Consequently, the research utilised multiple sources secondary data to answer the current study research questions as explained in chapter five and chapter six of this thesis. Chapter five utilises multiple regression models to examine three different hypotheses regarding the information content of multiple non-financial performance measures. Whilst chapter six utilises competing models strategy as a systematic approach to assess different proposed competing models that represent different theories in regard to interrelationships among financial and non-financial measures of performance.

Chapter Five

Incremental and Relative Information Content Tests

Statistical Results and Discussion

5.1 Introduction

As explained in chapter four, this research utilises Cross-Sectional Time–Series (CSTS) regressions to answer the first two research questions: whether multiple non-financial measures of performance have incremental information content beyond that provided by lagged financial performance measures to explain the current financial performance in a contemporaneous model; and whether they have incremental information content beyond that provided by current financial performance measures to predict future financial performance.

This research employs a standard methodology to evaluate the incremental information content, as recommended by Biddle et al. (1995, 1997), investigating the statistical significance of regression slope coefficients. Incremental information content is evaluated by looking at *t*-tests of individual coefficients and the *F*-tests of joint null hypotheses.

This research measures financial performance by three different dependent variables: operating revenues, operating expenses, and operating cash-flows. It introduces a broad set of non-financial measures to capture the multidimensional nature of performance within the airline industry. These performance measures are categorised into four groups, consistent with the structure of the Balanced Scorecard: the learning and innovation perspective includes measures

of employees training and labour efficiency; the internal business process perspective incorporates measures of cost unit, revenue unit, load factor, fuel efficiency, fixed assets efficiency, available seat miles, and revenue passenger miles; the customer perspective includes measures of customer satisfaction and market share; and finally, the financial perspective comprises measures of operating revenues, expenses, and cash-flows.

This research also employs a statistical test introduced by Voung (1989) to answer the third research question: whether a broad set of non-financial measures of performance provide greater information about a firm's performance than financial measures. In other words, this test is employed to examine if multiple non-financial measures of performance have relative information content compared to the financial measures of performance.

This chapter demonstrates the results of the tests described above, providing statistical evidence relating to the current research hypotheses, along with tests for normality, tests of outliers, correlation matrix, and other important diagnostic tests to analyse the data and pinpoint any potential problems that may affect the analysis.

This chapter begins, in section 5.2, by describing the sample and the study variables. Section 5.3 deals with normality assessment and outliers. Section 5.4 provides a discussion of the correlation matrix between variables of concern. Section 5.5 illustrates Akaike's Information Criterion (AIC) specification search as a means of lag search. Principal Component Analysis (PCA) analysis is reported in section 5.6. Section 5.7 contains analyses of incremental information content, and section 5.8 explains and discusses relative information content analyses. Finally, this chapter concludes with a summary and conclusion in section 5.9.

5.2 Description of the Sample and the Study Variables

A panel data set of 19 quarters (from the first quarter of 2003 till the fourth quarter of 2007) of thirty one US airline companies was collected (listed in table 5-1). The sample comprises data for eleven non-financial variables, three financial variables and one indicator variable for local and major airlines. The carrier is considered a major airline if it has at least one percent of total domestic scheduled-service passenger revenues, as defined by U.S. Department of Transportation, and is otherwise considered to be a local airline.

The mean, median, minimum, maximum and standard deviations of the variables used in the study are presented in Table 5-2. It is striking that there are so few extreme observations in operating cash-flows. Two companies have extreme values in operating cash-flows and operating cost (company id =19690, 20312), and descriptive statistics after removing these two companies from the analysis are shown in Table 5-3. It can be seen that the mean of cash drops dramatically from 3.166 to -0.48, which is more representative of the sample as a whole. It is noted, however, that observations should be dropped with caution. Since subsequent models would be based on a normal assumption of dependent variables, it is important to examine how these outliers would affect this assumption before deleting these observations.

Table 5-1: *Airlines included in the sample:*

Airline Code	Major/ Local	Airline
20437	M	AirTran Airways Corporation
19930	M	Alaska Airlines Inc.
19805	M	American Airlines Inc.
20366	M	Atlantic Southeast Airlines
20417	M	Comair Inc.
19704	M	Continental Air Lines Inc.
19790	M	Delta Air Lines Inc.
20436	M	Frontier Airlines Inc.
19386	M	Northwest Airlines Inc.
19393	M	Southwest Airlines Co.
19977	M	United Air Lines Inc.
20355	M	US Airways Inc.
20374	L	ExpressJet Airlines Inc.
20409	L	JetBlue Airways
19991	L	America West Airlines Inc.
20398	L	American Eagle Airlines Inc.
20312*	L	ATA Airlines d/b/a ATA
20204	L	Champion Air
20017	L	Continental Micronesia
20414	L	Executive Airlines
20046	L	Air Wisconsin Airlines Corp
19690*	L	Hawaiian Airlines Inc
19687	L	Horizon Air
19678	L	Aloha Airlines Inc.
20170	L	Mesaba Airlines
20314	L	Midwest Airline, Inc.
20415	L	North American Airlines
20344	L	Ryan International Airlines
20304	L	SkyWest Airlines Inc.
20416	L	Spirit Air Lines
20237	L	Trans States Airlines

*Excluded from the analysis due to outlier values for cash flows and operating cost.

Description of Study Variables[1]

Table 5-2: *Descriptive statistics of variables for all samples*

Variable	N	Median	Mean	Minimum	Maximum	Std Dev
cost	465	0.023	0.073	-0.938	6.251	0.496
rev	465	0.031	0.054	-0.935	2.662	0.344
cash	465	-0.195	3.166	-34.194	944.699	51.118
CS	465	0.006	0.081	-1.000	4.208	0.476
CU	465	0.042	0.069	-0.746	1.453	0.199
ASM	465	0.049	0.052	-0.628	0.816	0.183
ET	465	0.056	0.102	-5.892	4.430	0.518
FAE	465	-0.043	0.002	-0.972	9.849	0.677
FE	465	0.003	0.023	-0.743	2.927	0.258
LE	465	0.033	0.042	-0.479	1.258	0.184
LF	465	0.012	0.026	-0.628	1.290	0.179
MS	465	0.006	0.016	-0.685	0.783	0.179
RPM	465	0.069	0.072	-0.680	0.955	0.202
RU	465	0.044	0.060	-0.392	1.221	0.151

Table 5-3 *Descriptive statistics of variables for samples after dropping outliers*

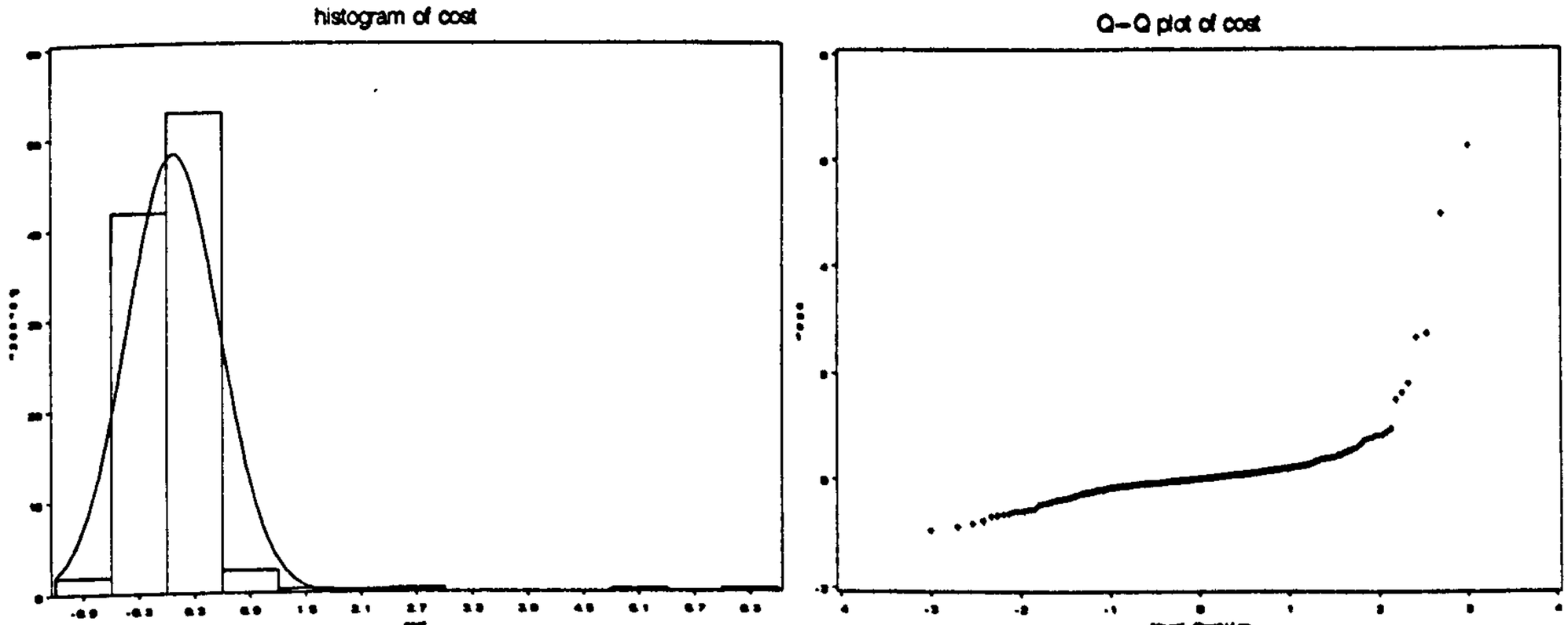
Variable	N	Median	Mean	Minimum	Maximum	Std Dev
cost	435	0.028	0.052	-0.675	2.666	0.280
rev	435	0.037	0.050	-0.675	2.662	0.279
cash	435	-0.176	-0.480	-34.194	74.981	5.478
CS	435	0.006	0.080	-1.000	4.208	0.487
CU	435	0.041	0.061	-0.314	1.371	0.160
ASM	435	0.050	0.059	-0.628	0.816	0.179
ET	435	0.051	0.092	-5.892	4.430	0.520
FAE	435	-0.040	-0.001	-0.886	9.849	0.671
FE	435	0.003	0.025	-0.743	2.927	0.265
LE	435	0.033	0.040	-0.479	1.258	0.183
LF	435	0.014	0.028	-0.628	1.290	0.184
MS	435	0.007	0.024	-0.685	0.783	0.176
RPM	435	0.071	0.080	-0.680	0.955	0.199
RU	435	0.045	0.058	-0.392	1.034	0.142

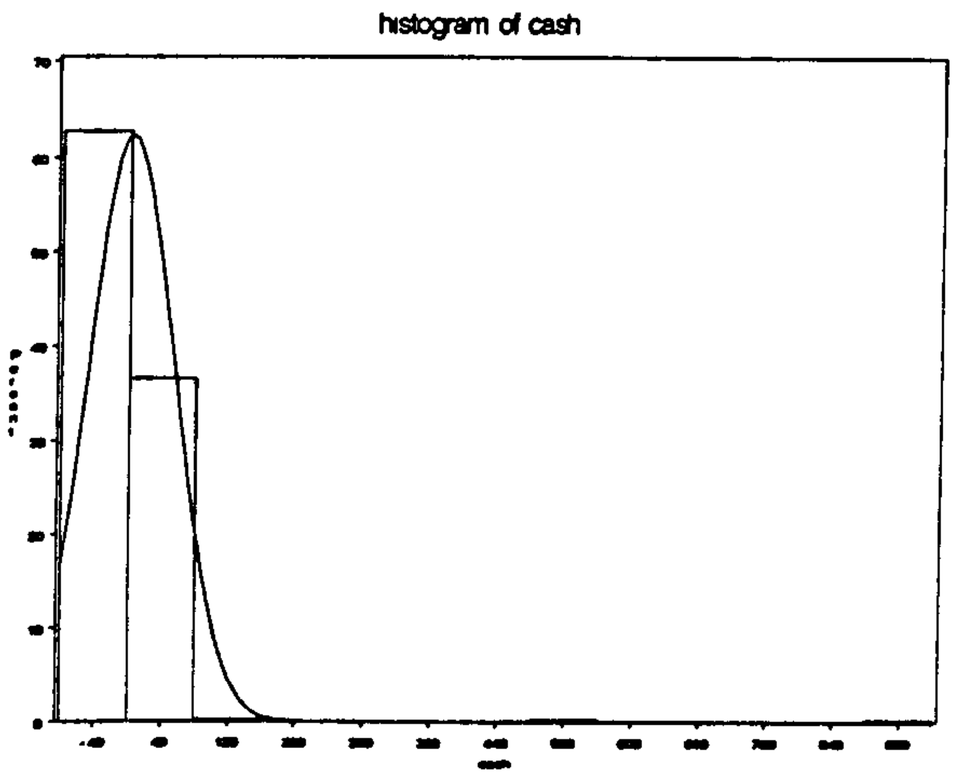
5.3 Normality Assessment and Outliers

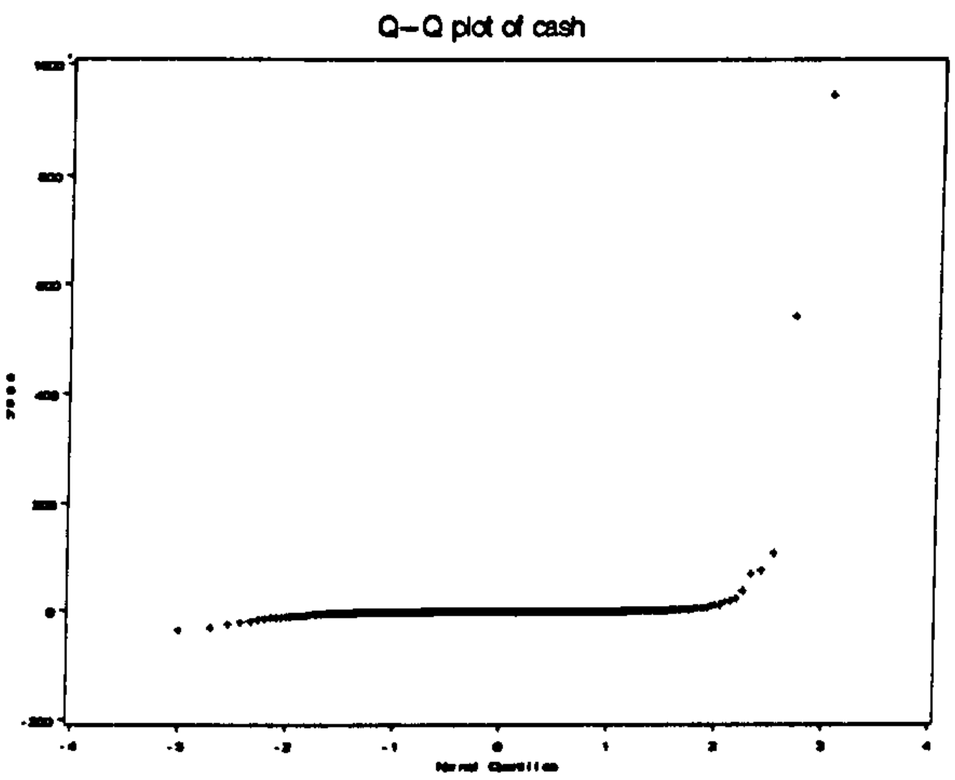
[1] Cost denotes operating expenses, rev: operating revenues, cash: operating cash-flows, CS: customer satisfaction, CU: airline unit cost, ASM: available seat miles, ET: employee training, FAE: fixed assets efficiency, FE: fuel efficiency, LE: labour efficiency, LF: load factor, MS: market share, and RPM: revenue passenger miles.

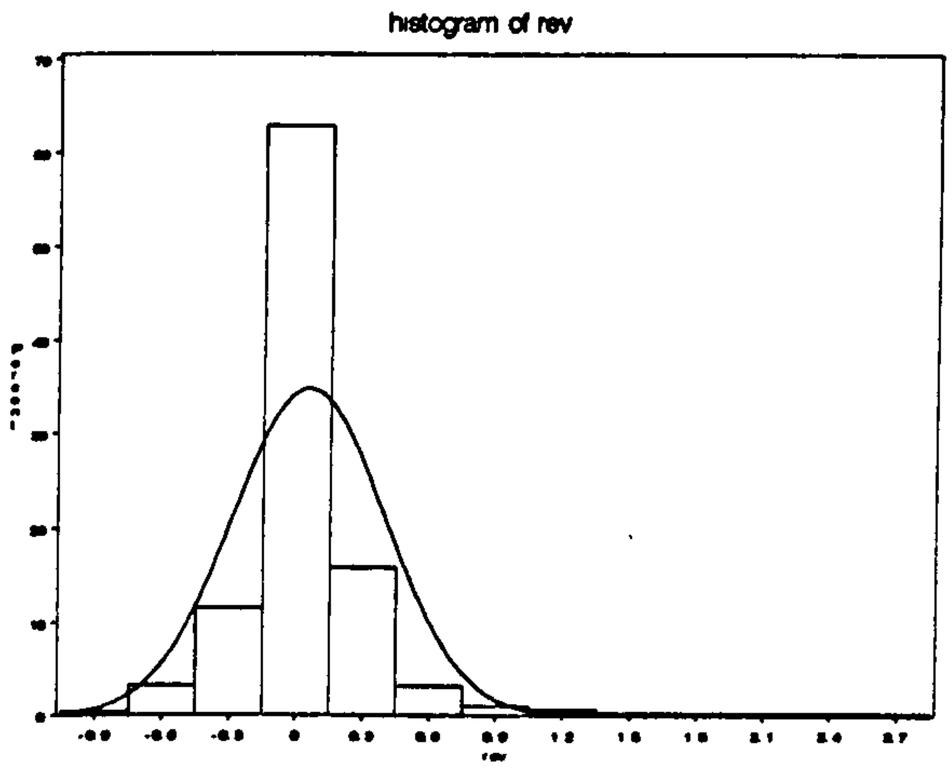
Following the descriptive analysis, the normality assumption of dependent variable is checked by histograms and QQ plots. As presented in Figure 5-1, the histograms and QQ plot of the dependent variables (operating cost, operating cash-flows and operating revenues) show that all the three dependent variables are right-skewed due to several very large values as can be expected from the above descriptive statistics. It is also noted that there are two very large cash values, which may become quite influential in estimation procedure. Usually, a log transformation is preferred for right-skewed datasets, because it stabilizes variance and makes the distribution more normal. However, since log transformation only applies to positive variables and our variables are not of this nature, no transformation seems to be appropriate here. This examination supports the idea of dropping the two outlier companies to further our analysis, so we proceed by using 29 instead of 31 companies.

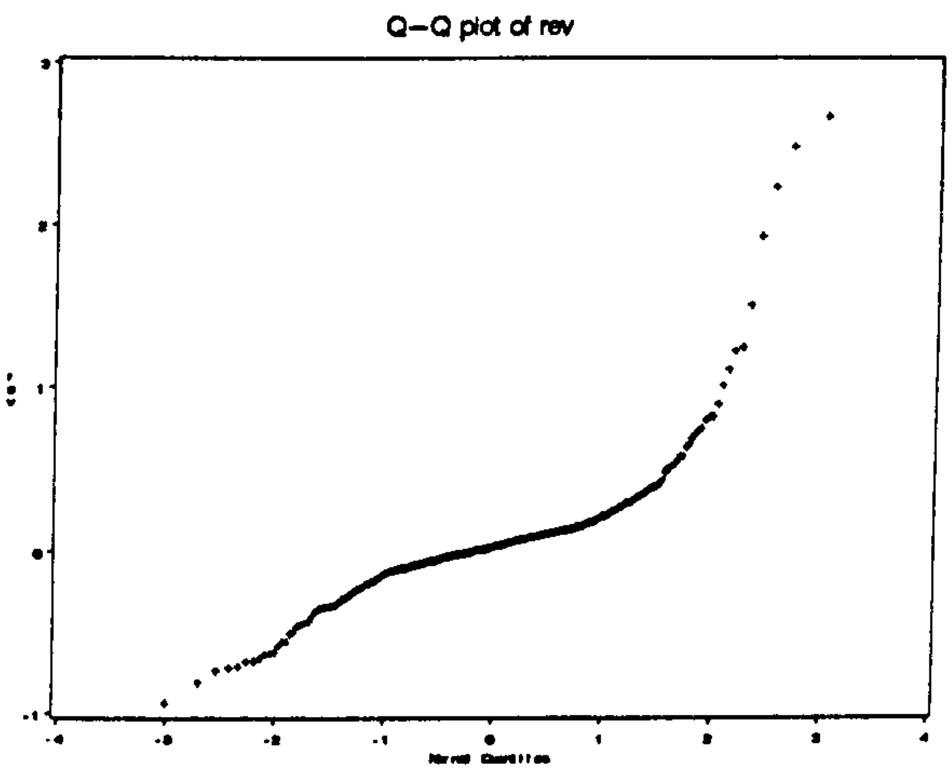
Figure 5-1: *Histograms and QQ plots of financial measures (costs, cash, and revenues)*











5.4 Correlation Analysis

Table 5-4 provides the correlation matrix of all variables. Because this data already controls for seasonality as it represents the change from the same quarter in the last year, significant correlation indicates a strong linear association between two variables. The correlation between revenue passenger miles (RPM) and market share (MS), revenue passenger miles (RPM) and available seat miles (ASM) is quite high (0.978 and 0.954 respectively). Customer satisfaction (CS) and market share (MS) are not significantly correlated with all financial measures.

The correlation matrix reveals interesting relationships between the variables. Operating cash-flows, operating costs, employee training, fixed assets efficiency, load factor, and labour efficiency are positively related to operating revenues. Available seat miles as a measure of capacity has a positive relationship with market share, indicating that airlines with higher capacity may have a higher market share. Moreover, employee training is positively associated with labour-efficiency, load factor and fixed assets efficiency. Finally, employee training is positively associated with market share.

Table 5-4: Correlation matrix of all variables[2]

	rev	cost	cash	RU	CU	ET	FAE	FE	LF	CS	MS	LEE	ASM	RPM
rev														
cost	.855**													
cash	.129**	.288**												
RU	.215**	.110*	-0.04											
CU	.269**	.492**	.167**	.670**										
ET	.209**	.129**	0.01	0.082	0.052									
FAE	.740**	.592**	0.077	.133**	.167**	.361**								
FE	.093*	0.067	-0.02	-.109*	-0.06	0.04	.154**							
LF	.113*	0.047	-0.03	0.061	-0.01	.111*	.270**	0.066						
CS	0.04	0.047	-0.01	0.051	0.064	0.03	0.05	-0.01	-.106*					
MS	0	-0.06	-0.03	-.32**	-.32**	.153**	0.09	0.075	.239**	-.17**				
LE	.245**	.188**	0.032	-.18**	-.13**	.400**	.444**	.101*	.159**	-0.06	.609**			
ASM	0.03	-0.01	-0.01	-.39**	-.33**	.182**	.132**	0.089	.191**	-.107*	.941**	.659**		
RPM	0.02	-0.03	-0.03	-.34**	-.32**	.142**	.100*	.101*	.253**	-.14**	.978**	.617**	.954**	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

[2] Cost denotes operating expenses, rev: operating revenues, cash: operating cash-flows, CS: customer satisfaction, CU: airline unit cost, ASM: available seat miles, ET: employee training, FAE: fixed assets efficiency, FE: fuel efficiency, LE: labour efficiency, LF: load factor, MS: market share, and RPM: revenue passenger miles.

5.5 Lag Search: AIC specification search

On the one hand, Banker et al. (2000, p.67) aver that a key rationalization for the use of non-financial measures is that they are "leading indicators of financial performance". On the other hand, Kaplan and Norton (1996) underline the importance of understanding the timing and magnitude of the associations between different non-financial indicators and future financial performance. Despite the general belief in the literature about the long term impact of non-financial measures on financial performance, there is no agreement on the time frame of this relationship. Thus, this research (following previous studies in this vein e.g. Ittner and Larcker, 1998; Banker et al., 2000; Wiersma, 2008) deploys the Akaike Information Criteria (AIC) specification to ascertain the length of the time lag.

Table 5-5 illustrates the most appropriate lags of each non-financial measure for operating cost, operating cash-flows and operating revenue according to the Akaike Information Criteria (AIC). Akaike's Information Criterion (AIC) is a tool which measures the quality of a model by testing it on a different data set. After computing alternative models, the AIC can be used to compare them, and the most precise model is that with the smallest AIC value (Akaike, 1973). The purpose of this step is to explore the time lag between non-financial performance and its impact on financial performance. In addition, the lag time is used in the following step to conduct the principal component analysis in order to reduce the different lags of non-financial measures to one construct (variable).

From table 5-5, it can be seen that the lag between market share (MS) and the other three financial variables is two quarters. Short lags, as exhibited in table 5-5, are consistent with the findings of previous studies in different service industries. Previous studies reveal mixed results

in their lag search tests. Ittner and Larcker (1998) find a six month lag between customer satisfaction measures and financial performance in the retail banking industry. Banker, Potter, and Srinivasan (2000) find a similar lag within the hospitality industry. In contrast, Nagar and Rajan (2001) find a one quarter lag between changes in a measure of on-time delivery and operating revenues in the electronic control devices industry, and Wiersma (2008) finds a five month lag between on-time delivery and future revenues in the postal firm setting. Our lag search suggests that non-financial measures have different lags with different financial measures of performance in the airline industry setting.

Table 5-5: AIC statistics for models with different lags of non-financial measure[3]

	RU	CU	ET	FAE	FE	LF	CS	MS	LE	ASM	RPM
cost	4	4	1	4	2	2	2	2	2	4	2
cash	1	1	4	1	2	1	2	2	4	2	1
rev	4	4	2	4	4	2	4	2	2	4	2

5.6 Principal Component Analysis

After finding the appropriate lags, principal component analysis (PCA) is used to reduce the different lags of non-financial measures to one variable. "The central idea of principal component analysis (PCA) is to reduce the dimensionality of a data set consisting of a large number of interrelated variables, while retaining as much as possible of the variation present in the data set. This is achieved by transforming to a new set of variables, the principal components (PCs), "which are uncorrelated so that the first few retain most of the variation present in all of

[3] Cost denotes operating expenses, rev: operating revenues, cash: operating cash-flows, CS: customer satisfaction, CU: airline unit cost, ASM: available seat miles, ET: employee training, FAE: fixed assets efficiency, FE: fuel efficiency, LE: labour efficiency, LF: load factor, MS: market share, and RPM: revenue passenger miles.

the original variables" (Jolliffee, 2002, p.1). PCA has the advantage of bypassing multicollinearity between the lagged variables. Table 5-6 presents the variance of original lagged variables explained by the first principle component. However, comparison of the power of this first principle component should be made cautiously, because there is different number of variables for each principle component. Within the cost model, the first component of Av RU (Revenue Unit) explains 43.85% of the variance by reducing 4 lagged terms to one PC construct, which is then used as a variable in the incremental information content model to estimate the relationship between operating cost, cash-flows or revenue and the lagged non-financial performance measures. Using the PC as an independent variable makes it possible to test the effect of moving average of the non-financial measures among their lag-length as specified in the lag search, rather than including multiple lags in the models which might cause multicollinearity within these lags.

Table 5-6: Variance explained by first component[4]

	AvRU	AvCU	AvET	AvFAE	AvFE	AvLF	AvCS	AvMS	AvLE	AvASM	AvRPM
Cost	0.44	0.42	0.42	0.31	0.52	0.63	0.66	0.81	0.64	0.67	0.80
Cash-flows	0.70	0.69	0.69	0.57	0.52	0.77	0.66	0.81	0.49	0.80	0.88
Revenues	0.44	0.42	0.49	0.31	0.41	0.63	0.52	0.81	0.64	0.67	0.80

5.7 Incremental Information Content Analysis

These analyses aim to investigate the incremental information content of multiple non-financial measures in explaining contemporaneous financial performance and predicting future financial

[4] Cost denotes operating expenses, rev: operating revenues, cash: operating cash-flows, AvCS: first component of customer satisfaction, AvCU: first component of airline unit cost, AvASM: first component of available seat miles, AvET: first component of employee training, AvFAE: first component of fixed assets efficiency, AvFE: first component of fuel efficiency, AvLE: first component of labour efficiency, AvLF: first component of load factor, AvMS: first component of market share, and AvRPM: first component of revenue passenger miles.

performance in terms of operating revenues, operating cost, and operating cash flows. In establishing what incremental information content such measures have, this study hopes to demonstrate how they may provide managerial information about business challenges and opportunities (Clark, 2002).

Following a standard methodology, as used by Biddle et al. (1995; 1997), incremental information content is evaluated by investigating the statistical significance of regression slope coefficients. Thus incremental information content is evaluated by looking at *t*-tests of the individual coefficients and *F*-tests of the joint null hypotheses.

This research employs the SAS statistical package to run Time Series Cross Section Regression (TSCCR procedure). TSCCR analyses linear econometric models that usually occur when time series and cross-sectional data are pooled. It deals with panel data sets that consist of time series observations on each of several cross-sectional units, one way fixed affect estimation method has been utilized as explained by F specification results which provide sufficient evidence to reject the hypothesis of no fixed effect. This suggests that the fixed effect method is more appropriate, and therefore that Ordinary Least Squares (OLS) regression may be considered as unbiased regression (SAS institute, 2009). One way specification has been used as a (one-way) model which includes dummy variables for firms, suggesting that we believe every firm has its own characteristic which has not been captured by our independent variables, while a (two-way) model considers two sets of dummy variables (i.e. firm and quarter) and we think each quarter has its own characteristic. The results of an examination by line charts (depicted in figure 5-2) indicate that there is no evidence that each quarter is significantly different from the other: rather,

all quarters' lines are intertwined with each other. This suggests that there is no need for specifying a two way model in this situation.

The basic model can be viewed as follows:

$$Y_{it} = \alpha_{it} + \sum_{k=0}^{k} \beta_k X_{itk} + u_{it}$$

Where:

$u_{it} = v_i + \epsilon_{it}$: Error term.

i = 1. . . N, N is the number of cross sections

t = 1. . . T, T is the length of time series of each cross section.

K is the number of independent variables.

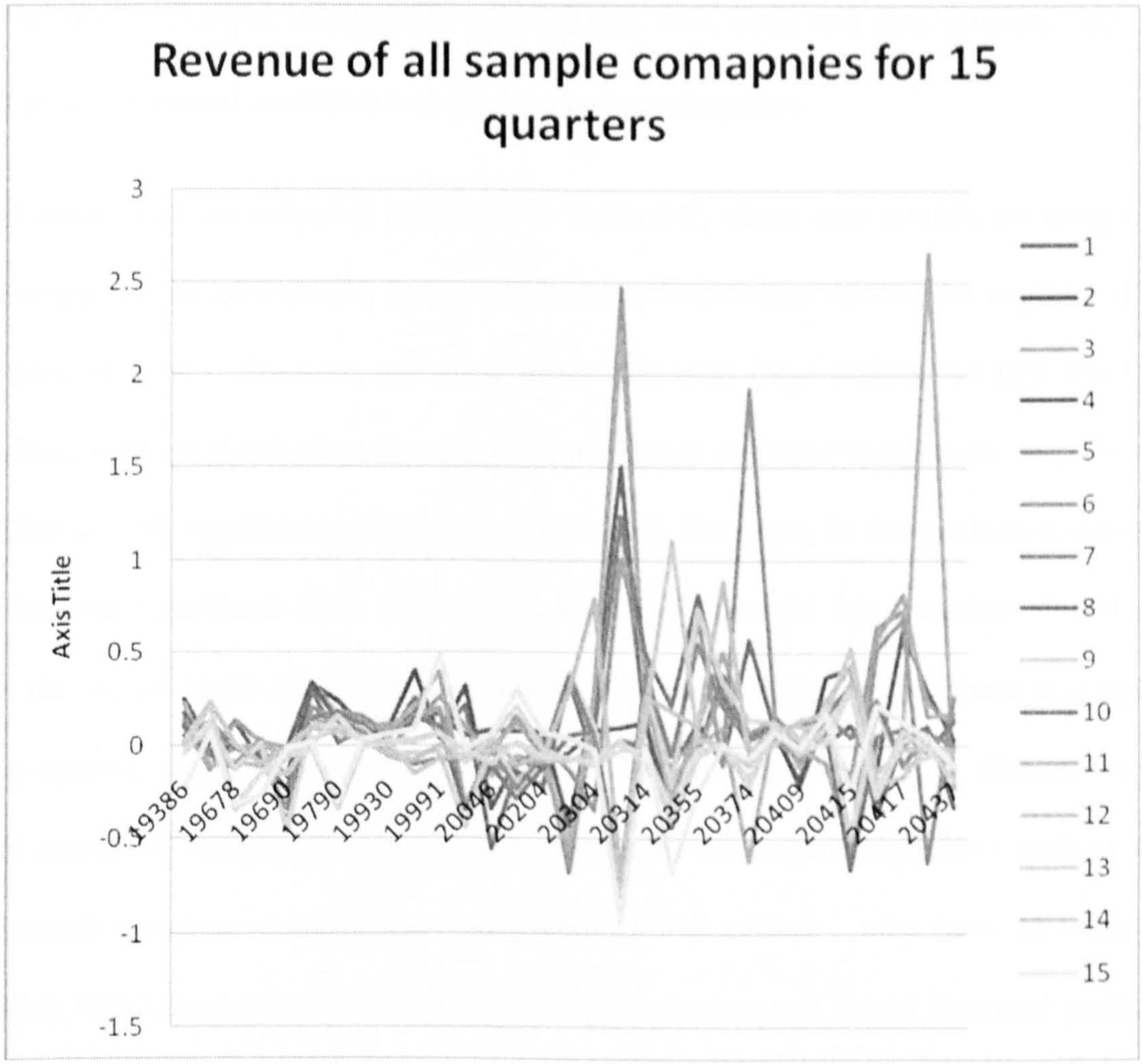


Figure 5-2: shows that there is no quarters-effect among data.

5.7.1 Operating costs model: in this model we investigate the incremental information content of multiple non-financial measures (employee training, labour efficiency, load factor, fixed assets efficiency, fuel efficiency, cost unit, revenue passenger miles, available seat miles, customer satisfaction and market share) in explaining operating costs, while controlling for the lagged operating cost measure itself. We run this test for a contemporaneous model where we attempt to explain the relationship between changes in these non-financial measures and changes in the operating cost in the same quarter. We also run this test for lagged models where we

attempt to predict changes in operating cost for one, two, three and four quarters' lag between changes in non-financial measures and changes in operating costs.

The cost model analysis output is presented in Table 5-7, where cost models are compared. For the contemporaneous cost model, R-square=0.434 indicates that this model explains 43.4% of the variation in Cost t. Since we are using panel data with fixed effects, we first test for fixed effects. Results of the F test show that there is insufficient evidence to reject the hypothesis of no fixed effect at 0.05 significance level (p-value=0.156). However, in the prediction model, fixed effects become significant from 2 quarters' lag to 4 quarters' lag (p-value <0.001), which justifies the use of panel data in this situation. This result suggests that there is a significant company-specific impact on costs which cannot be explained by lagged financial and non-financial measures. This implies that other firm-specific contingent variables - such as strategy, organizational structure, competition, and organizational culture - may have an effect on the relationship between non-financial measures of performance and future financial performance, and therefore affect the value relevance of the different measures.

5.7.1.1 Operating costs contemporaneous model

This model can be formed as follows:[5]

$$Cost_{it} = \alpha_{ci} + \beta_{c1}Cost_{t-1} + \beta_{c2}ASM_t + \beta_{c3}CS_t + \beta_{c4}ET_t + \beta_{c5}FAE_t + \beta_{c6}FE_t + \beta_{c7}LE_t + \beta_{c8}LF_t + \beta_{c9}MS_t + \beta_{c10}RPM_t + \beta_{c11}CU_t + \varepsilon_{cit}$$

[5] Cost denotes operating expenses, CS: first component of customer satisfaction, CU: first component of airline unit cost, ASM: first component of available seat miles, ET: first component of employee training, FAE: first component of fixed assets efficiency, FE: first component of fuel efficiency, LE: first component of labour efficiency, LF: first component of load factor, MS: first component of market share, and RPM: first component of revenue passenger miles

The first panel in table (5-7) shows the results of the contemporaneous model. The contemporaneous cost T tests of individual parameter suggest that Customer Satisfaction (CS)(p-value <0.01), Market Share (MS)(p-value<.01), Cost Unit (CU)(p-value <0.01), Revenue passenger miles as measure of traffic (RPM)(p-value<.01), Fixed Assets Efficiency (FAE)(p-value <0.01), Labour Efficiency (LE)(p-value<.1), and Employee Training (ET) (p-value <0.01) have a significant impact on Cost t. Significant coefficients signify incremental information content from these non-financial measures in explaining current operating costs beyond that provided by the financial measure of last quarter operating costs. Interestingly, the contemporaneous model results also indicate that an inverse relationship exists between customer satisfaction, market share, and labour efficiency measures, on one hand, and operating costs on the other, indicating that improvements in customer satisfaction, higher market share and higher labour efficiency compared to the same quarter of the previous year are related to lower operating costs in the same quarter compared to the previous year. Increases in employee's share of training expense is linked with increases in operating costs in the same quarter, but this is expected to pay off in subsequent quarters in the form of increased revenues and cash flow, as well as lower operating costs. Besides, this indicates an indirect relationship between employees training and reduced operating cost via improving their productivity.

5.7.1.2 Operating costs lag models

These tests aim to investigate the incremental information content of multiple non-financial measures in predicting future operating costs for 1, 2, 3, and 4 quarters lag models, as follows:

5.7.1.2.1 Operating costs one quarter lag model

The following equation represents this model:

$$Cost_{it+1} = \alpha_{ci} + \beta_{c1}Cost_t + \beta_{c2}ASM_t + \beta_{c3}CS_t + \beta_{c4}ET_t + \beta_{c5}FAE_t + \beta_{c6}FE_t + \beta_{c7}LE_t + \beta_{c8}LF_t + \beta_{c9}MS_t + \beta_{c10}RPM_t + \beta_{c11}CU_t + \varepsilon_{cit}$$

The second panel of Table (5-7) shows the results of two quarters lag model. Within this model, R-square=0.346 indicates that this model predicts 34.6% of the variation in $Cost_{t+1}$. The results of the one quarter lag model show that the customer satisfaction measure (p-value< 0.1), the fixed assets efficiency measure (p-value <0.01), revenue passenger miles as a measure of traffic (p-value <0.01), the measure of load factor (p-value <0.01), and the measure of market share (p-value <0.01) have incremental information content beyond that provided by the lagged cost (p-value= <.0001) in predicting operating cost for the following quarter and are, therefore, leading indicators for future operating cost i.e. they have the predictive ability to forecast the future cost (in one quarter lag model).

The results of the one quarter lag model show a positive and significant relationship between current and future operating costs. The model also reveals a negative and significant relationship between customer satisfaction, market share, and fixed assets efficiency on the one hand, and one quarter lag operating cost on the other, implying that improvements in these measures will result in reduced operating costs in the near future

5.7.1.2.2 Operating costs two quarters lag model

$$Cost_{it+2} = \alpha_{ci} + \beta_{c1}Cost_t + \beta_{c2}ASM_t + \beta_{c3}CS_t + \beta_{c4}ET_t + \beta_{c5}FAE_t + \beta_{c6}FE_t + \beta_{c7}LE_t + \beta_{c8}LF_t + \beta_{c9}MS_t + \beta_{c10}RPM_t + \beta_{c11}CU_t + \varepsilon_{cit}$$

The third panel in Table (5-7) shows the results of the two quarters lag model. In this model, R-square = 0.286 indicate that this model predicts 28.6% of the variation in $Cost_{t+2}$. T test results show that traffic measure (RPM), fixed assets efficiency measure, load factor measure, market share measure, and cost unit measure provide incremental information content beyond that provided by the lagged operating cost measure in predicting operating costs one quarter in the future. All of these measures' coefficients are significantly different than zero at (p-value= <.0001). Load factor and revenue passenger miles are found to have a positive and significant relationship to operating costs; this is probably due to the fact that additional passengers add their associated costs in the form of hospitality cost, luggage handling, and other expenses, as well as to the higher cost associated with greater miles flown. However, load factor and revenue passenger miles are also found to have a positive relationship with operating revenues as explained, in the discussion of operating revenues model.

Moreover, customer satisfaction, market share, and fixed assets efficiency continue to have negative and significant associations with future operating costs, signifying an inverse relationship between improvements in these measures and two quarters lag operating costs $_{t+2}$.

5.7.1.2.3 Operating costs three quarters lag model

$$Cost_{it+3} = \alpha_{ci} + \beta_{c1}Cost_t + \beta_{c2}ASM_t + \beta_{c3}CS_t + \beta_{c4}ET_t + \beta_{c5}FAE_t + \beta_{c6}FE_t + \beta_{c7}LE_t + \beta_{c8}LF_t + \beta_{c9}MS_t + \beta_{c10}RPM_t + \beta_{c11}CU_t + \varepsilon_{cit}$$

The fourth panel in Table (5-7) shows the results of three quarters lag model. For the three quarters lag cost model, R-square=0.346 indicates that this model predicts 34.6% of the variation in $Cost_{t+3}$. T test results reveal that available seat miles (ASM) as a measure of capacity (p-value <0.05), fixed assets efficiency (FAE) (p-value <0.01), labour efficiency (p-value <0.01), load factor (p-value <0.01), mark share (p-value <0.01), cost unit (p-value <0.01), and fuel efficiency (p-value <0.05) all have an impact on future operating costs $_{t+3}$. Of these factors, fuel efficiency, market share and customer satisfaction measures have a negative relationship with future operating cost, and capacity and load factor measures have a positive relationship with future operating cost at quarter $_{t+3}$. These significant coefficients, regardless of their sign, indicate their ability to predict future operating cost more accurately than the cost measure itself, which does not show significance in this prediction model (p-value = 0.6655).

5.7.1.2.4 Operating costs four quarters lag model

$$Cost_{it+4} = \alpha_{ci} + \beta_{c1}Cost_t + \beta_{c2}ASM_t + \beta_{c3}CS_t + \beta_{c4}ET_t + \beta_{c5}FAE_t + \beta_{c6}FE_t + \beta_{c7}LE_t + \beta_{c8}LF_t + \beta_{c9}MS_t + \beta_{c10}RPM_t + \beta_{c11}CU_t + \varepsilon_{cit}$$

The fifth panel in Table (5-7) shows the results of the three quarters lag model. For the three quarters lag cost model, R-square=0.46 indicates that this model predicts 46% of the variation in $Cost_{t+4}$. The results of this model are comparable to shorter lag models: capacity and load factor continue to show positive and significant associations with cost at quarter$_{t+4}$ (p-value <0.01), and fixed assets efficiency measure (p-value <0.01), market share measure (p-value <0.01), labour

efficiency measure (p-value <0.05) all provide incremental information content beyond that provided by the lagged cost at quarter $_t$ for predicting cost at quarter$_{t+4}$. Among these measures, market share and fixed assets efficiency continue to show a negative relationship with future operating cost, again implying that an increased market share and better fixed assets utilisation entail enhanced financial performance in the form of reduced operating costs.

Taken together, the results from this cost model show that multiple non-financial measures of performance can contain incremental information to explain and predict both current and future operating costs for one, two, three, and four quarters lags. Many of these show persistence of this quality over time. For example; load factor, market share, and fixed assets efficiency measures have significant impact in all models i.e. they have incremental information content for predicting operating costs up to four quarters in the future; traffic measure has a significant impact until two quarters lag; and customer satisfaction has a significant impact up to one quarter lag. Other measures begin to have an impact after a particular lag; for example, capacity as measured by available seat miles appears to have an impact after three quarters lag.

These results suggest that traffic measure, customer satisfaction, employee training, fixed assets efficiency, labour efficiency, market share and cost unit measures have incremental information content beyond lagged cost in contemporaneous model. Most of these measures have an ability to predict long-term costs. However, the customer satisfaction measure is not significantly related with future operating costs after one quarter lag. This result seems to be consistent with Banker et al. (2000), who found no evidence that increased customer satisfaction is linked with higher future operating costs.

We also test whether these results differ between major airlines and local airlines (an airline is considered major if it has at least 1% of the market share or a billion dollars of operating revenues, and otherwise local, according to the Department of Transportation definition), and the results of this test are illustrated in Table 5-8. The results from the two subsamples are similar, albeit with minor differences. For example, the contemporaneous model results (panel 1) show that several non-financial measures (traffic, fixed assets efficiency, market share and cost unit) have incremental information content for both samples. However, the customer satisfaction measure (passenger's share of in-flight expenditure) seems to be more important for the major carriers, showing little significance for local companies. This is to be expected, since local carriers tend to have low-cost strategies, competing on minimizing costs rather than providing in-flight services. This result is consistent with Anderson et al.'s 2004 study, which found that customer satisfaction is positively associated with shareholders' value, although this association varies significantly across industries and firms. Available seat miles also appear to be more important to the major carriers, so this measure has incremental information content for major but not for local carriers. Again, this result is unsurprising, as major airlines control more than 70% of total capacity in the airlines industry, as they run international flights while local airlines tend to focus on domestic flights. The fuel efficiency measure, by contrast, exhibited incremental information content for local carriers but not for major airlines, implying that fuel cost has a greater impact on the local airlines and therefore more significance for the operating costs of these carriers, likely as a result of tendency of such firms to focus on cutting costs strategies.

Table 5-7: Panel Data comparison of operating expenses (cost) model (all companies)

cost Model	contemporaneous		1 Quarter Lag		2 Quarters Lag		3 Quarters Lag		4 Quarters Lag	
Variable	Estimate	t Value	Estimate	t Value	Estimate	t Value	Estimate	t Value	Estimate	t Value
Intercept	0.047	0.71	0.064	0.89	0.112	1.41	0.057	0.81	0.004	0.06
lagged Cost	0.072	1.24	0.435***	7.88	0.222***	3.7	0.023	0.43	-0.329***	-6.54
ASM	0.025	0.88	0.012	0.41	-0.016	-0.48	0.064**	2.23	0.109***	3.96
RPM	0.155***	3.69	0.131***	2.84	0.144***	2.76	0.05	1.06	0.066	1.47
CS	-0.034***	-3.44	-0.020*	-1.86	-0.015	-1.25	0.009	0.77	0.002	0.22
ET	0.034***	2.83	0.009	0.66	0.025	1.63	0.013	0.81	0.012	0.82
FAE	0.108***	5.72	-0.052***	-2.87	-0.101***	-5.02	-0.105***	-5.86	-0.068***	-4.07
FE	0.018	1.62	-0.01	-0.85	-0.011	-0.85	-0.019*	-1.79	-0.016	-1.57
LE	-0.028*	-1.66	0.006	0.31	0.03	1.47	0.047***	2.59	0.034*	1.96
LF	0.006	0.57	0.035***	3.09	0.045***	3.46	0.047***	4.1	0.043***	3.98
MS	-0.166***	-4.09	-0.181***	-4.05	-0.204***	-4.09	-0.177***	-3.86	-0.205***	-4.6
CU	0.063***	3.89	-0.017	-1.06	-0.052***	-2.72	-0.050***	-2.78	-0.01	-0.61
R-Square	0.434		0.346		0.286		0.346		0.46	
Pr > F	0.156		0.104		<.0001		<.0001		<.0001	

All variables represent the change from the same quarter in the last year to control for seasonality, and control for size. ASM denotes Available Seat Miles, CS: Customer Satisfaction, ET: Employee Training, FAE: Fixed Assets Efficiency, FE: Fuel Efficiency, LE: Labour Efficiency, LF: Load Factor, MS: market share, RPM: Revenue Passenger Miles, RU: Airline Revenue Unit, CU: Airline Cost Unit

***, **, * indicates significant at 0.01, 0.05, and .1 levels (two-tailed test).

Table (5-8) Cost model for all airlines compared to major and local airlines:

Cost model for all airlines compared to major and local airlines															
	contemporaneous model			One quarter lag model			Two quarter lag model			Three quarter lag model			Four quarter lag model		
Variable	All	Major	Local	All	Major	Local	All	Major	Local	All	Major	Local	All	Major	Local
Intercept	0.047	-0.11	0.044	0.064	0.064	0.064	0.112	0.112	0.112	0.057	0.057	0.057	0.004	0.004	0.004
lagged Cost	0.072	-0.266***	0.196***	0.435***	0.435***	0.435***	0.222***	0.222***	0.222***	0.023	0.023	0.023	-0.329***	-0.329***	-0.329***
ASM	0.025	0.125**	-0.007	0.012	0.012	0.012	-0.016	-0.016	-0.016	0.064**	0.064**	0.064*	0.109***	0.109***	0.109***
RPM	0.155***	0.264***	0.097*	0.131***	0.131***	0.131***	0.144***	0.144***	0.144***	0.05	0.05	0.05	0.066	0.066	0.066
CS	-0.034***	-0.119***	-0.01	-0.020*	-0.020*	-0.020*	-0.015	-0.015	-0.015	0.009	0.009	0.009	0.002	0.002	0.002
ET	0.034***	0.046***	0.027*	0.009	0.009	0.009	0.025	0.025*	0.025*	0.013	0.013	0.013	0.012	0.012	0.012
FAE	0.108***	0.183***	0.087***	-0.052***	-0.052***	-0.052***	-0.101***	-0.101***	-0.101***	-0.105***	-0.105***	-0.105***	-0.068***	-0.068***	-0.068***
FE	0.018	-0.119	0.021*	-0.01	-0.01	-0.01	-0.011	-0.011	-0.011	-0.019*	-0.019*	-0.019*	-0.016	-0.016	-0.016
LE	-0.028*	-0.057	-0.021	0.006	0.006	0.006	0.03	0.03	0.03	0.047***	0.047**	0.047***	0.034*	0.034*	0.034*
LF	0.006	-0.007	0.014	0.035***	0.035***	0.035***	0.045***	0.045***	0.045***	0.047***	0.047***	0.047***	0.043***	0.043***	0.043***
MS	-0.166***	-0.273***	-0.096*	-0.181***	-0.181***	-0.181***	-0.204***	-0.204***	-0.204***	-0.177***	-0.177***	-0.177***	-0.205***	-0.205***	-0.205***
CU	0.063***	0.160***	0.042*	-0.017	-0.017	-0.017	-0.052***	-0.052***	-0.052***	-0.050***	-0.050***	-0.050***	-0.01	-0.01	-0.01
R-Square	0.434	0.346	0.414	0.346	0.285	0.346	0.286	0.285	0.286	0.346	0.345	0.346	0.46	0.46	0.46

All variables represent the change from the same quarter in the last year to control for seasonality, and control for size. ASM denotes Available Seat Miles, CS: Customer Satisfaction, ET: Employee Training, FAE: Fixed Assets Efficiency, FE: Fuel Efficiency, LE: Labour Efficiency, LF: Load Factor, MS: market share, RPM: Revenue Passenger Miles, RU: Airline Revenue Unit, CU: Airline Cost Unit

***, **, * indicates significant at 0.01, 0.05, and .1 levels (two-tailed test).

On the whole, the results of these operating costs models are consistent with the literature. Customer satisfaction is found to have a negative and significant association at 1% level with current and future operating expenses; this confirms findings from marketing literature that established a link between customer satisfactions and enhanced economic returns (Anderson et al 1994), and verifies the service profit chain proposition that higher customer satisfaction is related to higher customer loyalty and therefore higher profitability (Heskett et al., 1994). This result is consistent with other marketing work. For instance, Hallowell (1996) showed that customer satisfaction, loyalty, and profitability are linked to each other. However, Hallowell (1996) did not examine the relationship between customer satisfaction and profitability, while this study demonstrates the causal relationship between enhanced customer satisfaction and reduced operating expenses, leading to greater profitability.

Market share as a non-financial measure reveals a negative and significant relationship at 1% level with current operating expenses and future operating expenses up to four quarters lag. This result has four implications. Firstly, that market share measure is helpful in predicting and explaining future financial performance. Secondly, that market share has incremental information content over that provided by the lagged financial measure. Thirdly, these findings support Demsetz's (1973) efficiency theory that firms with higher market share have cost efficiencies and hence superior profits. Fourthly, it offers support to Schroeter's (1988) market power theory that organisations with higher market share apply their market power to negotiate prices with their suppliers, and hence to acquire inputs at lesser rates, allowing them to generate better financial outcomes.

Load factor (the ratio of seat miles sold to seat miles actually flown), a popular measure in the airline industry, exhibits a significant relationship at 1% level with future operating expenses up to four quarters lag. This result is consistent with previous studies of the airline industry. Schefczyk (1993) suggests that higher load factor predicts higher profitability, and Behn and Riley (1999) find that load factor has incremental information content beyond that provided by traditional financial measures. This result, combined with the previous research results, implies that load factor is a significant element in airlines' performance and for this reason is remunerated in the form of cash rewards in managers' rewarding schemes, as suggested by Davila and Tachalam (2004), who find a positive and significant relationship between airline load factor and executives' cash rewards.

5.7.2 Operating revenues model

This model investigates the incremental information content of multiple non-financial measures (employee training, labour efficiency, load factor, fixed assets efficiency, fuel efficiency, revenue unit, revenue passenger miles, available seat miles, customer satisfaction and market share) in explaining operating revenues, while controlling for the lagged operating revenues measure itself. We run this test for a contemporaneous model in an attempt to explain the relationship between changes in these non-financial measures and changes in operating revenues in the same quarter. We also run this test for lagged models, attempting to predict changes in operating revenues for one, two, three and four quarters lag between changes in non-financial measures and changes in operating revenue. The operating revenues model analysis output is presented in Table 5-9.

5.7.2.1 Contemporaneous operating revenues model[6]

$$Rev_{it} = \alpha_{it} + \beta_{r1}Rev_{t-1} + \beta_{r2}ASM_t + \beta_{r3}CS_t + \beta_{r4}ET_t + \beta_{r5}FAE_t + \beta_{r6}FE_t + \beta_{r7}LE_t + \beta_{r8}LF_t + \beta_{r9}MS_t + \beta_{r10}RPM_t + \beta_{r11}RU_t + \varepsilon_{rit}$$

The first panel in Table (5-9) demonstrates the results of the contemporaneous revenues model. The contemporaneous revenues T test of individual parameters suggests that customer satisfaction (CS) (p-value <0.01), market share (MS) (p-value<.05), revenue unit (RU) (p-value <0.05), revenue passenger miles (RPM) (p-value<.05), fixed assets efficiency (FAE) (p-value <0.01), and employee training (ET) (p-value <0.01) have significant impacts on operating revenues t. Significant coefficients suggest incremental information content from these non-financial measures in explaining current operating revenues beyond that provided by last quarter operating revenues financial measure. These results also indicate a positive relationship between fixed assets efficiency, revenue passenger miles, market share, customer satisfaction measure, and revenue unit with current operating revenues. These positive relations imply that improvements in these measures are related to increased operating revenues, and consequently to greater profitability.

Taken together, these results confirm the results of the contemporaneous operating costs model, namely that multiple non-financial measures have incremental information content beyond that provided by financial measures to explain current financial performance.

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[6] Rev denotes operating revenues, CS: first component of customer satisfaction, RU: first component of airline unit revenue, ASM: first component of available seat miles, ET: first component of employee training, FAE: first component of fixed assets efficiency, FE: first component of fuel efficiency, LE: first component of labour efficiency, LF: first component of load factor, MS: first component of market share, and RPM: first component of revenue passenger miles

Table (5-9): Panel Data comparison of revenue model (all companies)

Revenue Model	contemporaneous		1 Quarter Lag		2 Quarters Lag		3 Quarters Lag		4 Quarters Lag	
Variable	Estimate	t Value	Estimate	t Value	Estimate	t Value	Estimate	t Value	Estimate	t Value
Intercept	0.049	0.71	0.058	0.78	0.095	1.19	0.054	0.75	0.025	0.36
lagged Rev	0.022	0.39	0.370***	6.59	0.229***	3.85	0.032	0.6	0.314***	5.98
ASM	0.007	0.23	0.004	0.13	-0.028	-0.81	0.044	1.43	0.067**	2.2
CS	0.030***	2.8	0.019*	1.67	-0.017	-1.29	0.003	0.26	0.002	0.17
ET	0.030**	2.32	0.024*	1.7	0.032**	2.01	0.023	1.46	0.006	0.38
FAE	0.125***	6.47	0.045**	2.38	0.094***	4.55	0.098***	5.27	0.067***	3.71
FE	0.006	0.49	0.005	0.4	-0.011	-0.82	-0.018	-1.57	0.019*	1.71
LE	-0.021	-1.17	0.005	0.27	0.031	1.49	0.046**	2.45	0.045**	2.47
LF	0.002	0.23	0.032***	2.72	0.036***	2.72	0.036***	2.97	0.040***	3.43
MS	0.097**	2.27	0.136***	2.87	0.161***	3.07	0.164***	3.33	0.158***	3.2
RPM	0.109**	2.47	0.090*	1.85	0.109**	2.04	0.056	1.12	0.046	0.93
RU	0.028**	2.04	-0.021	-1.43	0.050***	3.06	0.040***	2.63	-0.024	-1.54
R-Square	0.393		0.29		0.271		0.321		0.427	
Pr > F	0.183		0.11		<.0001		<.0001		<.0001	

All variables represent the change from the same quarter in the last year to control for seasonality and control for firms' size. ASM denotes Available Seat Miles, CS: Customer Satisfaction, ET: Employee Training, FAE: Fixed Assets Efficiency, FE: Fuel Efficiency, LE: Labour Efficiency, LF: Load Factor, MS: market share, RPM: Revenue Passenger Miles, RU: Airline Revenue Unit, CU: Airline Cost Unit

***, **, * indicates significant at 0.01, 0.05, and .1 levels (two-tailed test).

5.7.2.2 Operating Revenues lag models

In order to investigate the incremental information content of multiple non-financial measures in predicting future operating revenues, this research utilizes four lags models ranging from one quarter lag to four quarter lags as follow:

5.7.2.2.1 Operating revenues one quarter lag model

$$Rev_{it+1} = \alpha_{it} + \beta_{r1}Rev_t + \beta_{r2}ASM_t + \beta_{r3}CS_t + \beta_{r4}ET_t + \beta_{r5}FAE_t + \beta_{r6}FE_t + \beta_{r7}LE_t + \beta_{r8}LF_t + \beta_{r9}MS_t + \beta_{r10}RPM_t + \beta_{r11}RU_t + \varepsilon_{rit}$$

The second panel in table (5-9) shows the results of the one quarter's lag model. R-square=0.29 indicates that this model predicts 29% of the variation in Revenues $_{t+1}$. The results show that measures of customer satisfaction measure (p-value< 0.1), fixed assets efficiency (p-value <0.05), revenue passenger miles (p-value <0.10), load factor (p-value <0.01), and market share (p-value <0.01) have incremental information content beyond that provided by the lagged operating revenues (p-value= <.0001) in predicting operating revenue for one quarter ahead and that, therefore, they are leading indicators for future operating revenues i.e. they have the predictive ability to forecast the future revenue (in one quarter lag model).

The results of the one quarter lag model show a positive and significant relationship between current operating revenues and future operating revenues. The model also reveals a positive and significant relationship between customer satisfaction, market share, load factor, revenue passenger miles, employee training and fixed assets efficiency measures on the one hand, and one quarter lag operating revenues on the other, implying that enhancements in these measures will result in improved operating revenues in one quarter time. Linking these results with the results of one quarter lag cost model gives an interesting conclusion, as follows:

Table 5-10: linking operating revenues model with operating costs model (one quarter lag).

Variable	Operating Revenues	operating Costs
Customer Satisfaction	Positive impact	Negative impact
Market Share	Positive impact	Negative impact
Available Seat Miles	Positive impact	Insignificant
Revenue Passenger Miles	Positive impact	Positive impact
Load Factor	Positive impact	Positive impact
Fuel Efficiency	Insignificant	Insignificant
Fixed Assets Efficiency	Positive impact	Negative impact
Employee Training	Positive impact	Insignificant
Labour Efficiency	Insignificant	Insignificant

From table (5-10) above, it could be expected that most of the variables investigated have a positive impact on profitability in the one quarter lag model due to their positive impact on operating revenues or negative impact on operating expenses. Thus, these measures can be important success factors in the airline industry.

5.7.2.2.2 Operating revenues two quarters lag model

$$Rev_{it+2} = \alpha_{it} + \beta_{r1}Rev_t + \beta_{r2}ASM_t + \beta_{r3}CS_t + \beta_{r4}ET_t + \beta_{r5}FAE_t + \beta_{r6}FE_t + \beta_{r7}LE_t + \beta_{r8}LF_t + \beta_{r9}MS_t + \beta_{r10}RPM_t + \beta_{r11}RU_t + \varepsilon_{rit}$$

The third panel in table (5-9) illustrates the results of the two quarters lag model. R-square=0.271 indicates that this model predicts 27.1% of the variation in Operating Revenues $_{t+2}$. T test results show that measures of traffic (RPM) (p-value= <.05), fixed assets efficiency (p-value= <.01), load factor (p-value= <.01), revenue unit (p-value= <.01), market share (p-value= <.01), employee training (p-value= <.05), and labour efficiency (p-value= <.01) provide incremental information content beyond that provided by the lagged operating revenues measure to predict one quarter ahead operating revenues. The coefficients of all of these measures coefficients are

positive and significantly different than zero, indicating that they have a positive and significant relationship with operating revenues. Therefore, improvements in these aspects of performance can be expected to lead to better future financial performance. Moreover, in terms of the persistence of the incremental information content quality, multiple non-financial measures (employee training, fixed assets efficiency, load factor, market share, and traffic) continue to have value relevance for predicting operating revenues for two quarters, while the customer satisfaction measure shows value relevance in explaining current operating revenues model as well as predicting one quarter lag operating revenues.

5.7.2.2.3 Operating revenues three quarters lag model

$$Rev_{it+3} = \alpha_{it} + \beta_{r1}Rev_t + \beta_{r2}ASM_t + \beta_{r3}CS_t + \beta_{r4}ET_t + \beta_{r5}FAE_t + \beta_{r6}FE_t + \beta_{r7}LE_t + \beta_{r8}LF_t + \beta_{r9}MS_t + \beta_{r10}RPM_t + \beta_{r11}RU_t + \varepsilon_{rit}$$

The fourth panel in table (5-9) demonstrates the results of the three quarters lag model. R-square=0.321 indicates that this model predicts 32.1% of the variation in Operating Revenues $_{t+3}$. T test results demonstrate that fixed assets efficiency (FAE) (p-value <0.01), labour efficiency (p-value <0.05), load factor (p-value <0.01), market share (p-value <0.01), and revenue unit (p-value <0.01) have a positive impact on future operating revenues $_{t+3}$. These significant coefficients also indicate the ability of these measures to predict future operating revenues: in other words, these measures are leading indicators for future financial performance.

5.7.2.2.4 Operating revenues four quarters lag model

$$Rev_{it+4} = \alpha_{it} + \beta_{r1}Rev_t + \beta_{r2}ASM_t + \beta_{r3}CS_t + \beta_{r4}ET_t + \beta_{r5}FAE_t + \beta_{r6}FE_t + \beta_{r7}LE_t + \beta_{r8}LF_t + \beta_{r9}MS_t + \beta_{r10}RPM_t + \beta_{r11}RU_t + \varepsilon_{rit}$$

The fifth panel in table (5-9) shows the results of the four quarters lag model. R-square=0.427 indicates that this model predicts 42.7% of the variation in Operating Revenues $_{t+4}$. The results of this model show comparable results to shorter lag models: measures of capacity (p-value <0.05), load factor (p-value <0.01), fixed assets efficiency (p-value <0.01), market share (p-value <0.01), labour efficiency (p-value <0.05), and fuel efficiency (p-value <0.1) all possess incremental information content beyond that provided by the lagged operating revenues measure at quarter $_t$ to predict operating revenues at quarter$_{t+4}$. These measures continue to show a positive relationship with future operating revenues, implying that improvements in these measures will result in enhanced financial performance up to a year after the changes.

Taken together, the results from the operating revenues model show that multiple non-financial measures of performance offer additional information for explaining and predicting current and future operating revenues for one, two, three and four quarters lags. Many of these shows that improvements persist over time: load factor, market share, and fixed assets efficiency measures have a significant impact in all models i.e. they have incremental information content to predict operating revenues up to four quarters lag. The traffic measure (revenue passenger miles) has a significant impact for up to two quarters lag, and customer satisfaction has significant impact up to one quarter lag. Other measures have an impact only after a particular lag: capacity (measured by available seat miles), and fuel efficiency measures appear to have a positive impact on operating revenues after four quarters lag.

To conclude, these results suggest that customer satisfaction, employee training, fixed assets efficiency, market share, traffic measure and revenue unit measures have incremental information content beyond information provided by last quarter operating revenues (Operating $Revenues_{t-1)}$ when they are combined together in the same model. Collectively, they explain 39.3% of the variance in operating revenues of the same quarter. Most of these measures have significant ability to predict operating revenues for up to four quarters. Moreover, lagged revenues are found to have a positive and significant relationship with future operating revenues in one, two and four quarters' lag models.

The above results are consistent with Haskett et al.'s service value chain (1994, p.165). They state: "Profit and growth are stimulated primarily by customer loyalty. Loyalty is a direct result of customer satisfaction. Satisfaction is largely influenced by the value of services provided to customers. Value is created by satisfied, loyal, and productive employees. Employee satisfaction, in turn, results primarily from high-quality support services and polices that enable employees to deliver results to customers". The results are also consistent with Molina and Ortega's (2003) findings that employee training can have a positive effect on a firm's performance. They are also consistent with Ittner and Larcker (1998) and Banker et al. (2000) who find that customer satisfaction measures are related to future revenues. However, these results also show a significant relationship between customer satisfaction measures and the current operations in the contemporaneous model.

We have also tested whether these results vary between major and local airlines. The results of this step are demonstrated in (table 5-11). Results from the two subsamples are similar, albeit with some minor differences. The contemporaneous model results (panel 1) show that the fixed

assets efficiency measure has incremental information content for explaining the current operating revenues for both subsamples, while controlling for their previous operating revenues. However, for measures of customer satisfaction, employee training, and revenue passenger miles this result is more pronounced for the major airlines (trunks) than for the local carriers. On the other hand, load factor and revenue unit measures seem to have a greater impact on future revenues for the local carriers. The four quarters lag model for the major airlines has most predictive power where R square is 68.6%, indicating that our model explains up to 68.6% of variation in operating revenues in a lag of four quarters.

Taken together, the results of this operating revenue model confirms our hypothesis that multiple non-financial measures have incremental information content beyond that provided by lagged operating income to explain and predict current and future operating revenues.

Table (5-11) Operating revenues model for all airlines compared to major and local airlines:

Operating revenues models for all airlines compared to major and local airlines															
	contemporaneous			1 Quarter Lag			2 Quarters Lag			3 Quarters Lag			4 Quarters Lag		
Variable	All	Major	Local	All	Major	Local	All	Major	Local	All	Major	Local	All	Major	Local
Intercept	0.049	-0.073	0.052	0.058	0.174*	0.084	0.095	-0.066	0.148*	0.054	0.185**	0.168*	0.025	0.204***	0.192**
lagged Rev	0.022	0.231***	0.122	0.370***	0.144	0.425***	0.229***	0.173	0.183**	0.032	0.054	-0.043	0.314***	0.364***	0.349***
ASM	0.007	0.055	-0.032	0.004	0.186**	-0.034	-0.028	0.046	-0.065	0.044	0.130**	-0.023	0.067**	0.072	0.033
CS	0.030***	0.125***	-0.004	0.019*	0.066**	-0.011	-0.017	-0.051	-0.011	0.003	-0.011	-0.005	0.002	0.042**	0.002
ET	0.030**	0.055**	0.023	0.024*	0.079***	0.014	0.032**	0.057*	0.025	0.023	0.021	0.023	0.006	0.003	0.003
FAE	0.125***	0.194***	0.112***	0.045**	0.049	0.041*	0.094***	0.123***	0.078***	0.098***	0.124***	0.100***	0.067***	0.068***	0.063**
FE	0.006	0.190**	0.012	0.005	0.036	0.003	-0.011	0.005	-0.006	-0.018	0.094	-0.011	0.019*	0.081	-0.016
LE	0.021	0.035	0.012	0.005	0.108**	0.012	0.031	0.018**	0.035	0.046**	0.063	0.044*	0.045**	0.061*	0.03
LF	0.002	-0.035	0.017	0.032***	0.036	0.034*	0.036***	0.014	0.055**	0.036***	0.005	0.050**	0.040***	-0.005	0.03
MS	0.097**	0.232***	-0.049	0.136***	0.326***	-0.074	0.161***	0.264***	0.120*	0.164***	0.143**	0.162**	0.158***	0.188***	-0.122
RPM	0.109**	0.262***	0.063	0.090*	0.258**	0.05	0.109**	0.237*	0.085	0.056	0.076	0.086	0.046	0.217***	0.034
RU	0.028**	0.118***	0.013	-0.021	0.04	0.032*	0.050***	0.007	0.063***	0.040***	-0.028	0.047**	-0.024	0.006	-0.026
R-Square	0.393	0.533	0.38	0.29	0.326	0.306	0.271	0.296	0.263	0.321	0.572	0.3	0.427	0.686	0.384

All variables represent the change from the same quarter in the last year to control for seasonality and are controlled for the size of firms. ASM denotes Available Seat Miles, CS: Customer Satisfaction, ET: Employee Training, FAE: Fixed Assets Efficiency, FE: Fuel Efficiency, LE: Labour Efficiency, LF: Load Factor, MS: market share, RPM: Revenue Passenger Miles, RU: Airline Revenue Unit, CU: Airline Cost Unit

***, **, * indicates significant at 0.01, 0.05, and .1 levels (two-tailed test).

5.7.3 Operating Cash Flow Model

This model examines the incremental information content of the same non-financial measures in explaining operating cash flows, while controlling for the lagged operating cash flows measure itself. We run this test for a contemporaneous model in an attempt to explain the relationship between changes in these non-financial measures and changes in the operating cash flows in the same quarter. We also we run this test for multiple lag models, where we attempt to predict changes in operating cash flows for one , two, three and four quarters lag between changes in non-financial measures and changes in operating cash flows.

The cash flows model analysis output is presented in Table 5-12, where model comparison is made between various cash flows models with different lags.

5.7.3.1 Operating Cash Flows Contemporaneous Model[7]

$$Cash_{it} = \alpha_{cft} + \beta_{cf1}Cash_{t-1} + \beta_{cf2}ASM_t + \beta_{cf3}CS_t + \beta_{cf4}ET_t + \beta_{cf5}FAE_t + \beta_{cf6}FE_t + \beta_{cf7}LE_t + \beta_{cf8}LF_t + \beta_{cf9}MS_t + \beta_{cf10}RPM_t + \beta_{cf11}CU_t + \beta_{cf12}RU_t + \varepsilon_{cfit}$$

For the contemporaneous cash flows model, R-square = 0.121 indicates that this model explains only 12.1% of the variation in Cash flows t. The first panel in table (12) shows the results of cash flows contemporaneous model.

[7] Cash denotes operating cash-flows, CS: first component of customer satisfaction, CU: first component of airline unit cost, RU: first component of airline unit revenue, ASM: first component of available seat miles, ET: first component of employee training, FAE: first component of fixed assets efficiency, FE: first component of fuel efficiency, LE: first component of labour efficiency, LF: first component of load factor, MS: first component of market share, and RPM: first component of revenue passenger miles

T tests of individual parameters in the operating cash flows contemporaneous model suggest that only available seat miles and revenue passenger miles measures have significant coefficients (p-value <0.1). This indicates that only capacity and traffic measures have incremental information content for explaining current operating cash flows beyond that provided by last quarter operating cash flows financial measure. The huge financial investment required to enlarge an airline's capacity explains the negative coefficient of the capacity measure [ASM]. The positive coefficient of revenue passenger miles indicates the in-cash-flows from utilizing this capacity in the form of revenue passenger miles. In addition, the lagged cash flow measure is found to have a positive impact on current cash flows.

Table (5-12) Panel Data comparison of cash flows model (all companies)

Cash Model	contemporaneous		1 Quarter Lag		2 Quarters Lag		3 Quarters Lag		4 Quarters Lag	
Variable	Estimate	t Value	Estimate	t Value	Estimate	t Value	Estimate	t Value	Estimate	t Value
Intercept	0.660	0.410	0.711	0.440	0.005	0.000	0.042	0.030	0.447	0.410
lagged Cash flows	0.096*	1.850	0.091*	1.760	-0.049	-1.330	-0.019	-0.500	-0.008	-0.240
ASM	-1.462*	-1.810	-1.715**	-2.100	-0.009	-0.010	0.036	0.060	-0.489	-0.880
CS	0.179	0.730	0.271	1.100	0.105	0.580	0.136	0.670	-0.258	-1.430
ET	-0.244	-0.800	-0.352	-1.110	-0.216	-0.910	-0.269	-1.010	0.211	0.910
FAE	0.379	1.080	0.163	0.470	0.043	0.170	0.032	0.120	0.255	1.090
FE	0.128	0.480	0.150	0.560	-0.077	-0.410	0.071	0.370	-0.061	-0.370
LE	0.445	1.160	0.249	0.630	-0.202	-0.710	-0.200	-0.640	-0.272	-1.010
LF	-0.095	-0.360	0.020	0.070	-0.138	-0.650	-0.121	-0.510	-0.276	-1.340
MS	-0.055	-0.060	0.850	0.990	0.267	0.420	0.630	0.930	0.107	0.180
RPM	1.383*	1.890	0.583	0.820	-0.238	-0.460	-0.695	-1.240	0.394	0.810
RU	-0.135	-0.240	-0.502	-0.900	0.429	1.050	0.183	0.400	0.142	0.350
CU	0.100	0.160	0.379	0.590	-0.379	-0.810	-0.219	-0.390	-0.574	-1.150
R-Square	0.121		0.115		0.111		0.120		0.171	
Pr > F	0.046		0.068		0.295		0.327		0.235	

All variables represent the change from the same quarter in the last year to control for seasonality, and are controlled to allow for firms' size. ASM denotes Available Seat Miles, CS: Customer Satisfaction, ET: Employee Training, FAE: Fixed Assets Efficiency, FE: Fuel Efficiency, LE: Labour Efficiency, LF: Load Factor, MS: market share, RPM: Revenue Passenger Miles, RU: Airline Revenue Unit, CU: Airline Cost Unit

***, **, * indicates significant at 0.01, 0.05, and .1 levels (two-tailed test).

5.7.3.2 Operating Cash-flows Lag Models

In order to investigate the incremental information content of multiple non-financial measures in predicting future operating cash-flows, this research utilizes four lag models ranging from one to four quarters lag, as follow:

5.7.3.2.1 Operating Cash-flows One Quarter Lag Model

$$Cash_{it+1} = \alpha_{cft} + \beta_{cf1}Cash_t + \beta_{cf2}ASM_t + \beta_{cf3}CS_t + \beta_{cf4}ET_t + \beta_{cf5}FAE_t + \beta_{cf6}FE_t + \beta_{cf7}LE_t + \beta_{cf8}LF_t + \beta_{cf9}MS_t + \beta_{cf10}RPM_t + \beta_{cf11}CU_t + \beta_{cf12}RU_t + \varepsilon_{cfit}$$

The second panel in Table (5-12) shows the results of the one quarter lag model. R-square=0.115 indicates that this model predicts only 11.5% of the variation in Cash-flows $_{t+1}$. The results show that only the available seat miles measure (p-value <0.01) has incremental information content beyond that provided by current operating cash flows in predicting the operating cash flows of one quarter ahead. This result is probably due to the indirect relationship between non-financial perspectives of performance on one hand and operating cash flows on the other. The capacity measure continues to have a negative parameter, signifying the inverse relationship between changes in capacity and near future operating cash flows. The current cash flow measure reveals a positive association with future operating cash flows (p-value <0.1).

5.7.3.2.2 Operating cash-flows two quarters lag model

$$Cash_{it+2} = \alpha_{cft} + \beta_{cf1}Cash_t + \beta_{cf2}ASM_t + \beta_{cf3}CS_t + \beta_{cf4}ET_t + \beta_{cf5}FAE_t + \beta_{cf6}FE_t + \beta_{cf7}LE_t + \beta_{cf8}LF_t + \beta_{cf9}MS_t + \beta_{cf10}RPM_t + \beta_{cf11}CU_t + \beta_{cf12}RU_t + \varepsilon_{cfit}$$

5.7.3.2.3 Operating cash-flows three quarters lag model

$$Cash_{it+3} = \alpha_{cft} + \beta_{cf1}Cash_t + \beta_{cf2}ASM_t + \beta_{cf3}CS_t + \beta_{cf4}ET_t + \beta_{cf5}FAE_t + \beta_{cf6}FE_t + \beta_{cf7}LE_t + \beta_{cf8}LF_t + \beta_{cf9}MS_t + \beta_{cf10}RPM_t + \beta_{cf11}CU_t + \beta_{cf12}RU_t + \varepsilon_{cfit}$$

5.7.3.2.4 Operating cash-flows four quarters lag model

$$Cash_{it+4} = \alpha_{cft} + \beta_{cf1}Cash_t + \beta_{cf2}ASM_t + \beta_{cf3}CS_t + \beta_{cf4}ET_t + \beta_{cf5}FAE_t + \beta_{cf6}FE_t + \beta_{cf7}LE_t + \beta_{cf8}LF_t + \beta_{cf9}MS_t + \beta_{cf10}RPM_t + \beta_{cf11}CU_t + \beta_{cf12}RU_t + \varepsilon_{cfit}$$

The third, fourth, and fifth panels of table 5-12 illustrate the results of the two, three, and four quarter lags models. None of the non-financial measures of performance show significant parameters, suggesting that none of them have incremental information content in predicting these lagged operating cash flows. This result is probably due to difficulty of predicting cash flow in the airlines industry, on account of its heavy reliance on capital expenditures.

Further analysis has been conducted to examine whether these results deviate from earlier results for the two subsamples of major and local carriers. The results of this step are shown in Table (5-13).

Table (5-13) Operating cash-flows model for all airlines compared to major and local airlines:

Operating Cash-flows models for all airlines compared to major and local airlines															
	Contemporaneous			1 Quarter lag			2 Quarters lag			3 Quarters lag			4 Quarters lag		
Variable	All	Major	Local	All	Major	Local	All	Major	Local	All	Major	Local	All	Major	Local
Intercept	0.66	0.065	-1.173	0.711	-0.199	-0.683	0.005	-0.01	-0.238	0.042	0.261	-0.094	0.447	0.25	-2.397*
lagged Cash flows	0.096*	0.093	0.124*	0.091*	0.107	0.113*	-0.049	-0.032	-0.07	-0.019	-0.083	-0.001	-0.008	-0.03	0.015
ASM	-1.462*	-1.554	-1.415	-1.715**	-0.604	-2.022*	-0.009	-0.517	0.014	0.036	-0.251	0.054	-0.489	-0.297	-0.674
CS	0.179	-0.631	0.542	0.271	-0.327	0.556	0.105	-0.268	0.249	0.136	0.011	0.165	-0.258	0.138	-0.642**
ET	-0.244	0.042	-0.326	-0.352	0.074	-0.4	-0.216	-0.217	-0.269	-0.269	-0.311	-0.262	0.211	-0.268	0.365
FAE	0.379	0.171	0.488	0.163	0.286	0.086	0.043	-0.303	0.252	0.032	0.012	0.081	0.255	0.565	-0.106
FE	0.128	-0.692	0.128	0.15	-3.017	0.203	-0.077	-0.365	-0.127	0.071	0.191	0.06	-0.061	1.151	-0.026
LE	0.445	0.197	0.7	0.249	-0.089	0.456	-0.202	0.307	-0.296	-0.2	0.009	-0.285	-0.272	-0.042	-0.229
LF	-0.095	-0.011	-0.083	0.02	0.101	0.118	-0.138	-0.174	-0.059	-0.121	-0.199	-0.032	-0.276	-0.543	0.009
MS	-0.055	2.106	-0.729	0.85	1.508	0.706	0.267	0.935	0.324	0.63	0.422	0.922	0.107	0.36	-0.349
RPM	1.383*	-0.868	1.944**	0.583	-1.098	0.846	-0.238	-0.725	-0.283	-0.695	-0.434	-0.961	0.394	0.088	0.835
RU	-0.135	-1.071	-0.049	-0.502	-0.821	-0.474	0.429	-0.581	0.810*	0.183	-0.59	0.555	0.142	0.929	-0.151
CU	0.1	1.902	-0.035	0.379	1.527	0.247	-0.379	1.358	-0.910*	-0.219	0.547	-0.619	-0.574	-1.578**	-0.338
R-Square	0.121	0.159	0.144	0.115	0.146	0.127	0.111	0.135	0.127	0.12	0.138	0.119	0.171	0.258	0.19

***, **, * indicates significant at 0.01, 0.05, and .1 levels (two-tailed test). All variables represent the change from the same quarter in the last year to control for seasonality. And also they are normalised by firm's size to neutralise the size effect. ASM denotes Available Seat Miles, CS: Customer Satisfaction, ET: Employee Training, FAE: Fixed Assets Efficiency, FE: Fuel Efficiency, LE: Labour Efficiency, LF: Load Factor, MS: market share, RPM: Revenue Passenger Miles, RU: Airline Revenue Unit, CU: Airline Cost Unit

5.8 Relative Information Content Analyses

Voung (1989) introduced a statistical test to examine the relative information content of competing models. The test is based on Kullback-Leibler's (1951) Information Criterion (KLIC), which compares competing models' distribution against the true distribution by calculating the distance between the two models distribution and the true distribution. Voung (1989, p.308) states: "it is natural to define the "best" model among a collection of competing models to be the model that is closest to the true distribution". The model with the least distance from the true distribution is considered to have greater information content and therefore it offers relative information content. As Voung (1989, p.326) makes clear, this test is "probabilistic and is based on testing if the competing models are as close to the true distribution against the hypothesis that one model is closer than the other. Since the maximum log-likelihood of a model is a natural estimator of the distance between the model and the true distribution as measured by the KLIC, all our model selection tests are based on the LR statistic". The outcome of this test is the likelihood ratio (z value). A positive z value implies that the multiple non-financial measures model has relative information content compared to the lagged financial measure as a benchmark.

The results of the relative information content analysis are reported in Table 5-14. The results of all three models of operating costs, operating cash-flows and operating revenues show that non-financial measures do not have relative information content compared to three financial measures as benchmarks. Since lagged financial performance measures were used as the benchmark here, a positive z-value indicates that the non-financial performance measures have more information content than the financial measures, but as no z-values are positive, this suggests that lagged

financial measures have more information content than the non-financial measures. However, this result should be interpreted with caution, as no results are significant at the 5% level. The data also supports the idea that when predicting financial performance for a shorter lag, the information content of non-financial measures increase: this is supported by a decreasing trend of z value over time as explained in Table 5-14 below:

Table 5-14: *Relative information content of non-financial performance measures*

		Rev-model		Cash-model		Cost-model	
		z-value	p-value	z-value	p-value	z-value	p-value
model1	lag1	0	1	0	1	0	1
	lag2	-0.39365	0.69384	-0.11238	0.91052	-0.52671	0.59839
	lag3	-0.42635	0.66985	-1.3946	0.16314	-1.07684	0.28155
model2	lag1	0	1	0	1	0	1
	lag2	-0.40041	0.68885	-0.1154	0.90813	-0.54022	0.58904
	lag3	-0.43	0.6672	-1.4268	0.15364	-1.07582	0.28201
model3	lag1	0	1	0	1	0	1
	lag2	-0.43288	0.6651	-0.11732	0.90661	-0.5418	0.58796
	lag3	-0.47497	0.63481	-1.42067	0.15541	-1.11716	0.26393

These results suggest that financial measures of performance have relative information content to explain current financial performance as well as to predict future financial performance. This is consistent with Wiersma's (2008) findings that financial measures (i.e. cost) have the upper hand in predicting financial performance, and is also consistent with the notion that traditional financial measures may be suitable for organisations that depend on traditional physical assets where financial accounting statements are not designed to report for intangibles like human resources capabilities (Kaplan and Norton, 1996; Widener, 2005).

Taken together, the results of incremental and relative information content tests are consistent with the existing literature in many ways. Firstly, they show that some non-financial measures

may be leading indicators of financial performance, and may have incremental information content beyond that provided by financial performance measures (Amir and Lev, 1996; Ittner and Larcker, 1998;; Najar and Rajan, 2001; Liedtka, 2001).

The results are also consistent with the lag search conducted by previous studies, indicating that the consequences of improvement in non-financial measures take place in the short term, more specifically, within one year, and therefore that non-financial measures could be included in managers' compensation plans in order to encourage better performance. This is consistent with Ittner and Larcker (1998), Najar and Rajan (2001) and Wiersma (2008), and also with the informativeness principle which states that managers' compensation plans ought to comprise non-financial measures if they furnish information beyond that provided by traditional financial accounting measures (Widener, 2005). These results also confirm Gjerde and Hughes' argument (2007, p.12) that "employees should see the link between achieving the key lead measures and their compensation". These arguments, taken together with our results, strength the case for including non-financial measures in management control systems and remuneration systems (Kaplan and Norton (1996 a, b) and Ittner, Larcker, and Rajan (1997))

Ittner and Larcker (2001) argue that managers perceive non-financial and financial measures to be essential in performance appraisal, but they cast doubts on the quality of non-financial measures and hence put less emphasis on these measures. However, managers are not required to depend exclusively on short-term non-financial metrics, but to employ these measures to aid the development of multidimensional organisational performance as well as mitigating the financial measures noise (Kaplan and Norton, 1996). That is consistent with Shank, (1996) who illustrated the need of strategic cost management to inter-link financial and non-financial information to

enable a comprehensive and balanced assessment of the key strategic issues. This is particularly important when considering stock prices: Said et al., (2005) in their study of the retention of non-financial measures, argued that firms which continue to use non-financial measures sustain continuous growth in stock price returns.

Furthermore, our results indicate that investments in human capital and customers relations will eventually be reflected in improved financial performance, and therefore highlighting that such investments encourage a longer term perspective. This is consistent with Ittner et al., (1997) who argue that non-financial measures have incremental information and make the longer time horizon the centre of attention. This is also consistent with Widener's (2005, p.202) statement that "It is well accepted that non-financial measures provide better information regarding long-term health". Companies should strive to find the right key performance indicators by understanding the cause-effect relationships that link these measures together to ensure better performance. However, it is important to guarantee that tracking multiple performance measures does not unnecessarily divert employees' efforts from the main goals of an organisation (i.e. increased income, enhanced positive cash flow, better revenues) (Gjerde and Hughes, 2007).

5.9 Summary and Conclusion

This chapter examined the incremental and relative information content of multiple non-financial measures of performance in the airline industry, including a search for the time lag between improvements in such measures and improvements in the financial outcomes (illustrated in Table 5-5). It also investigated the persistence of the value relevance of these non-financial measures over time.

The empirical results of these tests have been used to answer the current study's key research questions: first, do current non-financial measures of performance provide additional information beyond that provided by lagged financial measures to explain current financial performance? Second, do current non-financial measures of performance provide additional information beyond that provided by current financial measures to predict future financial performance? Third, do non-financial measures have greater information content compared to financial measures in evaluating firms' performance?

Data was taken from a representative sample of US airline firms. The primary data set comprised quarterly data about eleven non-financial measures and three financial measures of performance from thirty one airline companies. Further tests of the data resulted in the elimination of two companies from the sample due to outlier values of the dependent variables, and so the final sample of firms included twenty nine companies for the multivariate analysis to examine the incremental as well as the relative information content of these independent variables (non-financial indicators) in explaining and predicting the dependent variables (financial performance metrics).

This chapter began with descriptive analyses of the variables and the sample, which indicated extreme values in dependent variables namely cash-flows and operating cost for two companies. Further scrutiny of the data suggested that dropping these two firms from the data resulted in a more representative data set sample. This was confirmed by the histograms and Q-Q plots, which demonstrated that the data from these two firms resulted in a right-skewed data set, while omitting them from the sample produced stabilized variance and made the distribution more normal (as showed in the analysis in section 5.3). As a result, subsequent analyses were carried out using data from twenty nine rather than thirty one firms.

This chapter utilised Akaike's Information Criterion (AIC) to conduct the lag search to find the most appropriate lags of each non-financial measure for operating cost, operating cash-flows and operating revenue. The Principal Component Analysis (PCA) was used to reduce different lags of non-financial measures to one construct, to reduce the dimensionality of our data set, as recommended by Jolliffee (2002). AIC results indicated that lag between non-financial measures and financial results ranges from one quarter to four quarters. However, one and two quarter lags seem to be the most frequent, as illustrated in Table 5-5.

The first component constructs which were created using the Principal Component Analysis (PCA) appear to explain the variance of original lagged variables, as described in Table 5-6. It could, therefore, be used as a proxy for the original lagged variables in subsequent tests of incremental and relative information content.

After calculating the first components, multivariate analyses were conducted to test the incremental information content of multiple non-financial measures of performance. The multivariate analyses were based on time-series cross-sectional regression, and T tests were used

to evaluate the incremental information content of different non-financial measures in explaining current operating revenues, expenses, and cash-flows, as well as in predicting future operating revenues, expenses, and cash-flows for one, two, three, and four quarters lags. The results of this step are illustrated in tables 5-7, 5-9, 5-10, 5-12, and 5-14.

The results of the incremental information content tests provide evidence that several non-financial measures of performance provide information beyond that offered by traditional accounting measures to explain and predict current and future financial performance, and that, therefore, they are leading indicators of future financial performance. Specifically, revenue passenger miles, customer satisfaction, market share, employees training, labour efficiency, fixed assets efficiency, load factor measures have statistically significant associations with current and future operating costs after controlling for previous operating cost, size and seasonality. These associations appear to persist over time, and their value relevance is expected to last up to four quarters lag. Statistically, these relationships seem to be more valid in the lag models compared to the contemporaneous model. Similarly, available passenger miles, revenue passenger miles, customer satisfaction, market share, employees training, labour efficiency, fixed assets efficiency, revenue unit, load factor measures all have statistically significant and positive associations with current and future operating revenues after controlling for previous operating revenues, size and seasonality. These associations appear to have the persistence quality over time, continuing to show significance and consequently value relevance for up to four quarters lag. In addition, the signs of the coefficient estimates had the logical signs providing additional evidence on the fit of this research models.

The results of the cash-flow models show that only revenue passenger miles and available seat miles have incremental information content beyond that provided by previous operating cash-flows for explaining current cash-flows, and only available seat miles measure has the ability to predict one quarter lag operating cash-flows after controlling for previous cash-flows, size, and seasonality. None of the non-financial measures of performance has incremental information content beyond that provided by accounting measures to predict future operating cash-flows after a one-quarter lag.

Further, this chapter tested whether the above results varied among two clusters of airlines, namely major and local airlines, in order to examine whether a firm's characteristics affect the relationship between non-financial aspects of performance and financial outcomes. For this purpose, the primary sample was split into two subsamples (twelve major airlines and nineteen local airlines). All of the previous tests were conducted for the two subsamples and the results are illustrated in Tables 5-8, 5-11, and 5-13. The findings suggest that the associations between non-financial measures of performance and financial outcomes differ to some extent among the two subsamples of airline companies, indicating that company-specific characteristics (e.g. strategy) may moderate the relationship between non-financial aspects of performance and the financial outcomes. It could be concluded that a non-financial measure of performance may have incremental information content in one group of firms with particular characteristics in common but not in a different group which does not share those characteristics.

Finally, this chapter provided empirical evidence regarding the question of whether or not multiple non-financial measures of performance offer greater information content than financial, using Voung's (1989) test to examine whether three different sets of non-financial metrics have

relative information content compared to three financial measures of performance (operating costs, operating revenues, and operating cash-flows) for three different lags (one, two, and three quarters lags). The results in Table 5-14 show that our non-financial measures do not provide relative information content compared to the accounting measures. This result confirms the need to integrate contemporary performance measurement systems (e.g. balanced scorecard) with traditional control systems (e.g. budgets) to create the holistic control system proposed by Otley, (1999, p.376) who argued that "it seems unlikely that an organization can survive using just the balanced scorecard without the normal budgetary apparatus". These results suggest that current financial and managerial reporting may be improved by including these forward looking indicators that are expected to assist in creating firms' sustainable value in the long term, as suggested by AICPA (1993). They also underline the importance of performance measurement systems that enhance employees' awareness of their actions consequences, and improve managers understanding of the drivers of the long term financial accomplishment for their businesses, as argued by Kaplan and Norton (1996).

Overall, the empirical results presented in this chapter support hypotheses one and two, implying that multiple non-financial measures of performance have incremental information content beyond that provided by financial measures in both current and predictors' models. However, they do not seem to support the third hypothesis regarding the relative information content of multiple non-financial measures of performance compared with traditional accounting measures.

Chapter Six

Interrelationships among Measures of Performance: Exploratory Tests

Statistical Results and Discussion

6.1 Introduction

Previous management accounting studies have focused on the relationship between only one or two individual non-financial measures (e.g. customer satisfaction, employee satisfaction) and financial performance (e.g. Amir et al. 1996, Ittner and Larcker, 1998, Banker et al., 2000). These studies often investigate these relationships in simultaneous models, assuming a contemporaneous relationship between the non-financial measure of performance and the financial outcome, while in fact non-financial indicators are likely to lead future performance as well as explaining current financial performance. As a result, these studies have not captured the interplay between different measures of performance and therefore have overlooked the unavoidable tradeoffs between these measures when employed for different managerial purposes, or when included in performance measurement frameworks such as the balanced scorecard. Kaplan and Norton (1996, p.17) call for quantification of the linkages between performance measurements, writing "...the balanced scorecard should be based on a series of cause and effect relationships derived from the strategy, including estimates of the response times and magnitudes of the linkages among the scorecard measures. For example, "how long before improvements in product quality and on time delivery will lead to an increased share of

customers' business and higher margins on existing sales, and how large the effect will be". However, previous studies appear to ignore the time lag between the managerial actions captured by non-financial measures of performance and financial outcomes as gauged by accounting numbers, tending to use contemporaneous models rather than lags models. In addition, previous studies of the balanced scorecard repeatedly deal with it as a static system, despite Kaplan and Norton's (1996; 2001) assertions of its dynamic nature.

This chapter is an attempt to overcome these shortfalls by investigating multiple non-financial measures of performance to explain contemporaneous financial performance as well as to predict future financial performance in multi-lags models. Further, it tests the time dimension effect and the dynamic nature of the balanced scorecard by examining several potential scenarios of the interaction between non-financial measures and financial performance to test how multiple non-financial measures interact to provide incremental information beyond that provided by the financial figures over time.

The tests undertaken in this chapter endeavour to investigate the interrelationships between multiple non-financial performance measures in order to provide information about current and future financial performance, as recommended by Banker et al. (2000, p.90) who assert "we believe it will be fruitful to direct future research to enhancing our understanding of this complex interplay between knowledge of links between non-financial and financial measures, structure of incentive plans, and performance along those different dimensions".

Numerous previous studies of management control underline the importance of adopting multiple measures of performance in management control systems to capture additional information on different aspects of performance beyond the financial aspect. Otley (2008, p.236) asserts, "The concept of "performance" is inherently multi-dimensional, and it is profoundly misleading to expect that there will ever be a single over-arching measure of it". The multiple regression results explained in chapter five support this conclusion, confirming that several non-financial measures of performance are leading indicators for future financial performance. These results suggest that multiple non-financial measures have predictive value and therefore feed-forward value, as defined by Otley (1999, p.369): "feed-forward (or planning) information may be used to predict the need for corrective action before adverse consequences are observed". This is consistent with AICPA's (1993) definition of forward looking information as "information that aids prediction". The current research's results also suggest that these non-financial measures of performance provide incremental information beyond that provided by the lagged financial measures.

Taken together with previous studies, these results highlight the need for further analyses of the interactions of non-financial measures. Are these non-financial measures directly or indirectly associated with financial performance? In other words, are these associations intervened by other measures of performance in the same or other perspectives of the Balanced Scorecard?

This chapter tests multiple possible scenarios to investigate the interplay between non-financial measures of performance and current and future financial performance.

The first test examines the interrelationships between current non-financial performance measures and contemporaneous financial performance within two models, namely the operating revenues and operating costs models. Three alternative scenarios are tested: the first scenario assumes direct relationships between current non-financial performance measures and the financial performance. The second scenario assumes that learning perspective measures are leading indicators for internal business process perspective measures; which in turn are leading indicators of customer perspective measures; which themselves are leading indicators of operating revenues or operating costs within the financial perspective. The third scenario suggests more complicated interactions between the different performance measures, permitting links between measures in the lower rank perspectives and all upper-level perspective measures in the balanced scorecard hierarchy.

The second test introduces the time effect into the complicated interplay of measures to investigate whether this process is chronological in the sense that change starts in the learning perspective and culminates in the financial perspective, with a one quarter lag between each perspective and the next one, or whether there is a single lag (e.g. one, two, or three quarters lag) between multiple leading indicators and financial performance?

The third test introduces the time effect into the relationship between measures within the simple interaction model to investigate whether the process of change is sequential, beginning in the learning perspective, and concluding in the financial perspective, with a one quarter lag between each perspective and the next one, or whether it is a process with

a single lag (e.g. one or two quarters lag) between nonfinancial indicators and the financial outcomes.

This chapter employs competing models strategy within the Structural Equation Modelling technique (SEM) to test these relationships, comparing several competing models to see which best fits the data. The reasons for using SEM are explained in chapter four. This chapter also employs SEM to investigate which timing scenario best fits the data and to determine whether a simple or a complex model better capture the value creation process.

This research utilizes generic outcome measures which all are considered to be vital indicators for all the airline companies, i.e. those measures which are common among all airlines, regardless of their performance measurement systems. Therefore, this research aims to provide evidence on how these measures work jointly to provide information about current and future financial performance. Consequently, the results of these investigations will be valid for any performance measurement system that utilizes a multiple measures approach (e.g. balanced scorecard).

For the purpose of this study, as explained in chapters three and four, this study uses the balanced scorecard to examine both simultaneous and chronological interaction between different non-financial measures within four hierarchical perspectives, in order to gain understanding of current and future performance, and thus to enable greater control of the value creation process. As Otley (2008, p.233) states, "Management of an activity, not surprisingly, requires some knowledge and understanding of the activity being managed".

This understanding is also crucial to help forecasting future financial performance, as suggested by AICPA Jenkins' committee's report, (chapter 3) which asserts that "Understanding the linkage between events and activities and the financial impact on a company of those events and activities often is necessary to forecast future financial performance". Further, information systems have a vital role in highlighting the links between the four hierarchical perspectives within the balanced scorecard for strategy implementation purposes. Otley (2005, p.87) asserts that "a clear link must be maintained between hierarchical levels (and between organizational units) to ensure that the means targeted at one level lead to the results required at the next level. Information systems can play a vital part in helping managers to disaggregate the summary measures". This argument is consistent with Kaplan and Norton's (1996, p.8) argument that leading metrics within the balanced scorecard's non-financial perspectives can predict future financial performance.

Taken together, these discussions suggest that understanding the relationships between different aspects of performance is important for developing effective measures of performance, and consequently the exploration of these relationships is the focus of this chapter. The motive of this chapter is to explore these relationships among performance measures to understand how changes in one perspective's measures affect changes in others.

6.2 Research Questions

This chapter addresses several research questions: How are non-financial measures related to each other and to financial measures of performance? How complex are these relations? Do relatively simple relations among the measures or more complex relations appear to be more consistent with the data? Do dynamic or static measurement models better fit the data? Are non-financial measures directly associated with financial performance? Or are these associations mediated by other intervening measures of performance in the same or other perspectives of performance?

6.3 Statistical Tests

To address these research questions, the following tests were conducted:

1. Test of simple or complex value-creation process: Competing models are: the outcome measure of each perspective is associated with the outcome measure of the next perspective in the hierarchy, but not with the outcomes beyond the next perspective, versus the outcome measure is associated with the outcome measures of all higher level perspectives.
2. Test of multiple linear regression model versus the structural equation model
3. Test of chronological relationships between perspectives.
4. Test of more general cases, assuming different chronological relations among the non-financial perspectives

The fourth test indicated the optimal model with the best chronological relations. This is presented in Generalized Model Selection section (6.9).

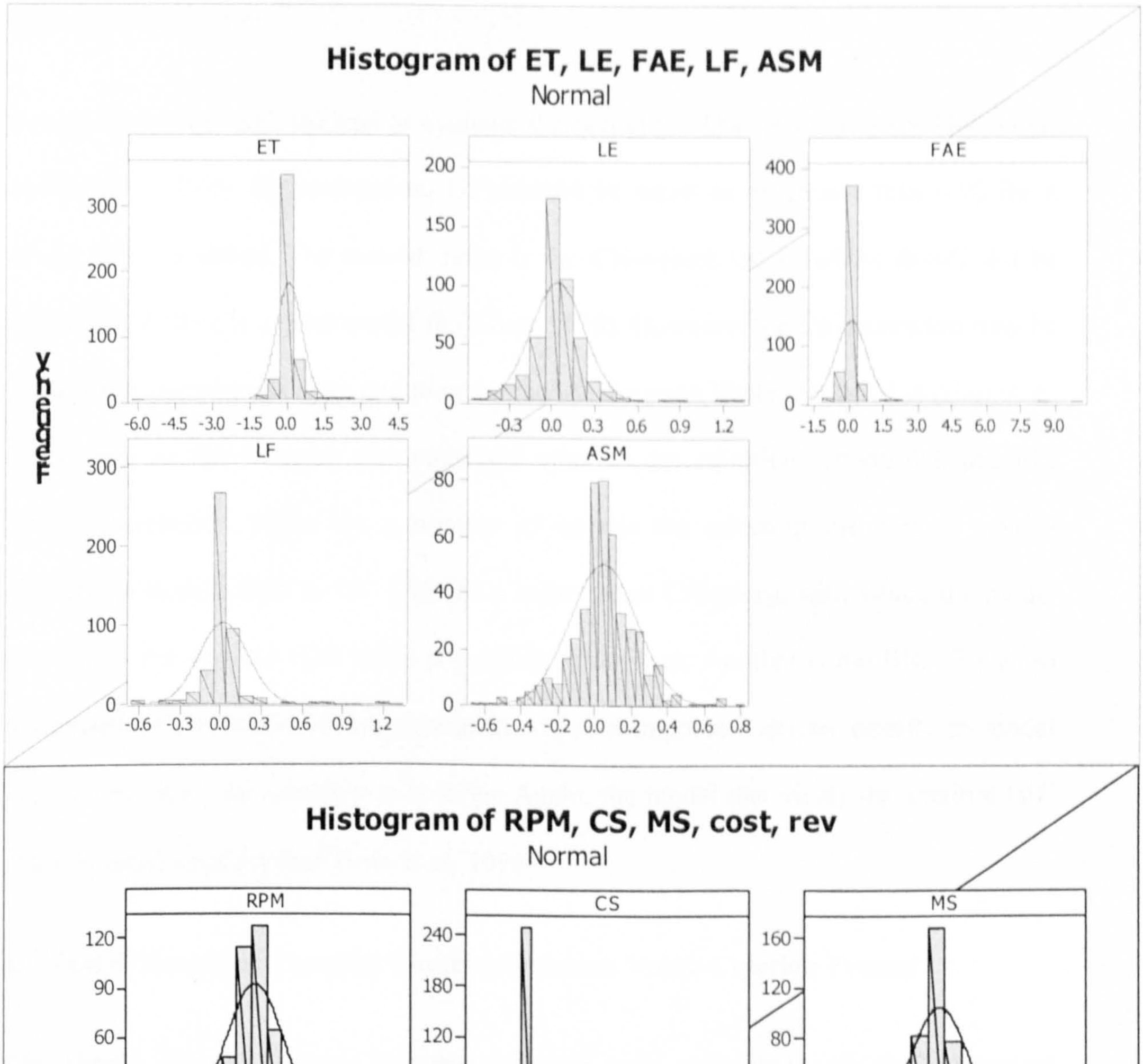
6.4 Structural Equation Modeling

This research utilises SEM. Due to the presence of endogenous variables, the disturbances are correlated with the model predictors, and the model estimated using the two-stage least square method (Maximum Likelihood) instead of the ordinary least square method.

6.4.1 Normality Tests

SEM requires multivariate normality. To test for normality, histograms of all measures were plotted (see Figure 6-1). No gross violation of the normality assumption was detected, and so no data transformation procedure was required to apply the maximum likelihood method for estimations. However, five outliers have been removed (two in the Fixed Assets Efficiency measure (FAE), one in the Customer Satisfaction measure (CS) and two in operating costs (COST)) to make the data more symmetric.

Figure 6-1: Histograms of the non-financial and financial measures


Histogram of ET, LE, FAE, LF, ASM
Normal
ET
LE
FAE
LF
ASM
Frequency
Histogram of RPM, CS, MS, cost, rev
Normal
RPM
CS
MS
cost
rev
Frequency

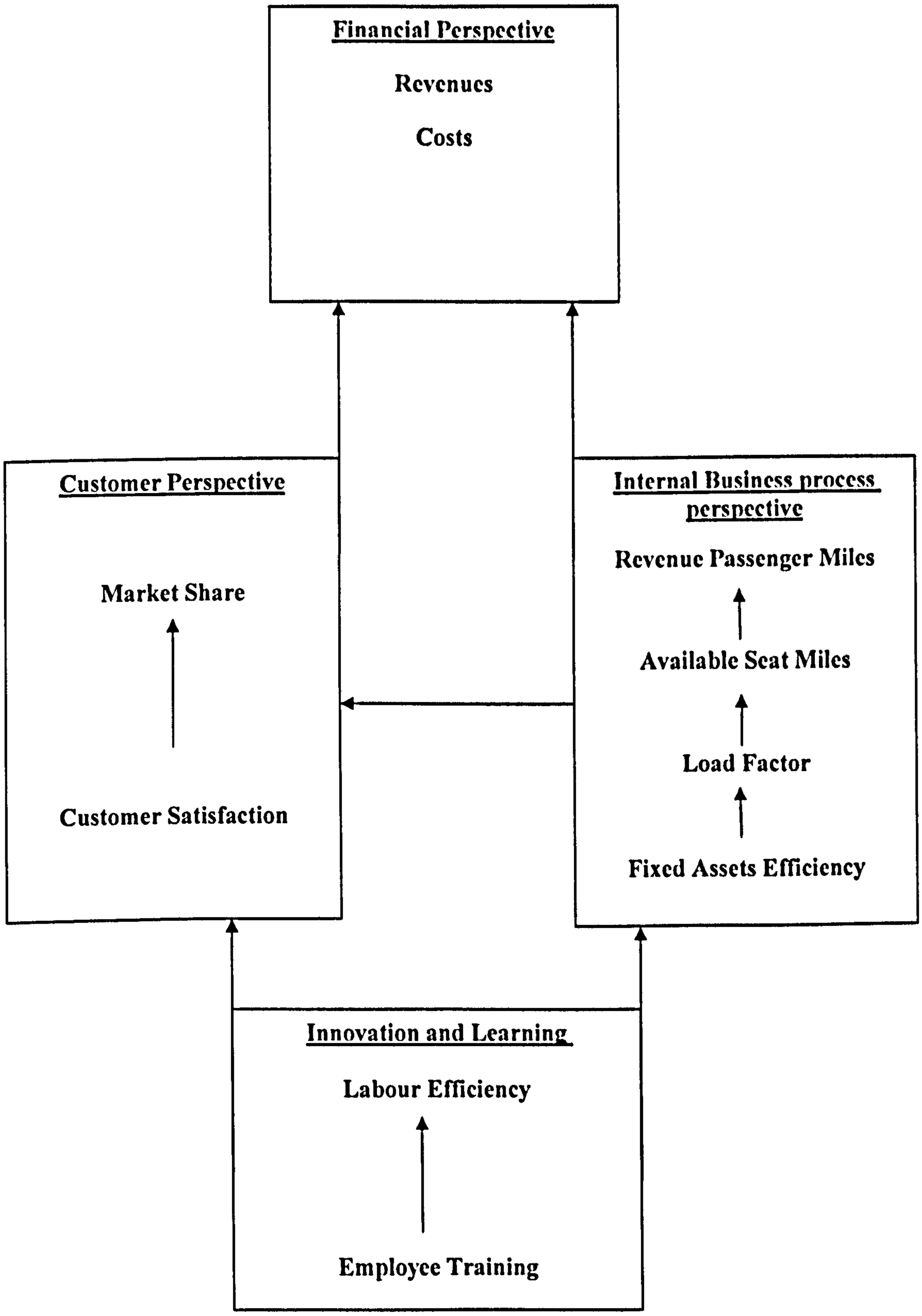
6.4.2 Model Selection

Two indices have been utilized to evaluate the model fit. The first one is the Goodness-of-Fit Index (GFI). By convention, GFI should be equal to or greater than 0.90 for a model to be accepted. The second index is the Chi-square value, which should not be significant if there is a good model fit (Kline, 1998). However, the chi-square test may be misleading, because the more complex the model, the more likely a good fit is (Hair et al. 1995), and so this research also considers other model selection criteria that penalize model complexity. There are a number of criteria for selecting the best of several alternative models. One is AIC (Akaike's Information Criterion), with which the model that yields the smallest AIC value is considered the best. Another is the BIC (Bayesian Information Criterion), which is similar to AIC, but imposes a stricter penalty on model complexity when the sample size is large. Again, the model that yields the smallest BIC value is considered the best (Hair et al. 1995).

6.5 Test of Simple or Complex Contemporaneous Value-Creation Process

The simple process assumes that measures are only associated with the subsequent perspective in a time-ranked measurement model. The complex model allows for relationships between measures in the lower perspectives and all measures in all the higher perspectives to create shareholders' value and to communicate information about the firm performance.

Figure 6-2: Generic Performance Measurement Model.



6.5.1 Model 1: The Contemporaneous Fully Mediated Model

Kaplan and Norton (2001, p.88) state that "the value from intangible assets is indirect. Assets such as knowledge and technology seldom have a direct impact on revenue and profit. Improvements in intangible assets affect financial outcomes through chains of cause-and-effect relationships involving two or three intermediate stages". In particular, Kaplan and Norton (1996, p.31) argue that particular hierarchal causal relationships exist: "measures of organizational learning and growth...measures of internal business process...measures of customer perspective...financial measures". Heskett et al. (1994, p.164) describe the relationships between non-financial indicators and financial outcomes within the value chain as follows: "Profit and growth are stimulated primarily by customer loyalty. Loyalty is a direct result of customer satisfaction. Satisfaction is largely influenced by the value of services provided to customers. Value is created by satisfied, loyal, and productive employees. Employee satisfaction, in turn, results primarily from high-quality support services and policies that enable employees to deliver results to customers". Accordingly, this model assumes that the changes in one perspective measures are associated with changes in the next perspective within the hierarchy, but not with subsequent perspectives. One further point worth noting is Norreklit's (2000, p. 71) suggestion that "one argument for not measuring at different points of time could be that the time lag between an effort and its effect is very short". Consequently, simultaneous relationships have been assumed, and are depicted through the following structural equation model:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 RPM_{it} + e_6;$$

$$MS_{it} = h_0 + h_1 CS_{it} + e_7;$$

$$COST_{it} = p_0 + p_1 MS_{it} + e_8;$$

$$REVENUE_{it} = r_0 + r_1 MS_{it} + e_9;$$

Where LE denotes Labour Efficiency; ET, Employee Training; FAE, Fixed Assets Efficiency; LF, Load Factor; ASM, Available Seat Miles; RPM, Revenue Passenger Miles; CS, Customer Satisfaction; MS, Market Share; COST, Operating Expenses; and REVENUE, Operating Revenues

Lowercase letters denote the coefficients (intercepts and slopes). Slope coefficients identify the causal relationships between the endogenous variables (variables on the left hand sides). The subscript (i, t) denotes the measure of the i^{th} company at quarter t. Finally, e_i for i=1... 9 denotes the disturbance.

This model assumes that the outcome measure of each perspective is associated with the outcome measure of the next perspective in the hierarchy, but not with outcomes beyond

this perspective. We estimate this model separately for the two financial outcomes (operating expenses (COST) and operating revenues (REVENUE)). However, the coefficients on all paths between non-financial measures are the same whether COST or REVENUE is the financial outcome measure.

To fit this model, the data sets for all fifteen quarters were combined. The results are reported in Table 6-1. The overall model fit is poor across the two financial outcomes (chi-square>2000, GFI<0.90, p<0.001).

Table 6-1: Structural Equation Contemporaneous Fully Mediated Model

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	2424.9284	2633.9007
p-value	0.000	0.000
Goodness-of-fit (GFI)	0.6245	0.6184
AIC	2368.9284	2577.9007
BIC	2253.2541	2462.1656

6.5.2 Model Two: The Contemporaneous Partially Mediated Model

In contrast to model one (fully mediated model), the more complex partially mediated model, assumes that the outcome measure of each perspective is associated with the outcome measures of all higher level perspectives. Specifically, the following structural equation model was fitted:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 ET_{it} + b_2 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 ET_{it} + c_2 LE_{it} + c_3 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 ET_{it} + d_2 LE_{it} + d_3 FAE_{it} + d_4 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ET_{it} + f_2 LE_{it} + f_3 FAE_{it} + f_4 LF_{it} + f_5 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 ET_{it} + g_2 LE_{it} + g_3 FAE_{it} + g_4 LF_{it} + g_5 ASM_{it} + g_6 RPM_{it} + e_6;$$

$$MS_{it} = h_0 + h_1 ET_{it} + h_2 LE_{it} + h_3 FAE_{it} + h_4 LF_{it} + h_5 ASM_{it} + h_6 RPM_{it} + h_7 CS_{it} + e_7;$$

$$COST_{it} = p_0 + p_1 ET_{it} + p_2 LE_{it} + p_3 FAE_{it} + p_4 LF_{it} + p_5 ASM_{it} + p_6 RPM_{it} + p_7 CS_{it} + p_8 MS_{it} + e_8;$$

$$REVENUE_{it} = r_0 + r_1 ET_{it} + r_2 LE_{it} + r_3 FAE_{it} + r_4 LF_{it} + r_5 ASM_{it} + r_6 RPM_{it} + r_7 CS_{it} + r_8 MS_{it} + e_9;$$

The coefficients of LE, FAE, LF, and ASM in the equation with MS on the left hand side namely h_2, h_3, h_4, h_5, are close to zero (around 0.01). Due to model saturation, there was no degree of freedom left to compute Chi-square quintiles for the model. Hence, we restricted one of the coefficients (h_2, h_3, h_4, h_5) to zero. For this purpose, the model was fitted four more times with one of the (h_i) where ($i = 2, 3, 4, 5$) restricted to zero at each time. The AIC values of these restricted models were compared. The model with $h_2 = 0$

has the smallest AIC, which is believed to be the best of the four and subsequently h_2 was set to zero in all the partially mediated models.

Table 6-2 presents the results for Model Two with h_2 (the path from LE to MS) restricted to zero. This study estimated the model separately for each outcome measure of the financial perspective: COST and REVENUE. The fit of model is much improved over Model One: Chi-square is around 0.01, the p-value is greater than 0.80 and the GFI is 1. This conclusion is based on the fact that indicators of a good model fit would include an insignificant Chi-square, and GFI value greater than 0.90. Together, these indicate that Model One, where the outcome measure of each perspective is associated with only the outcome measure of the next perspective in the hierarchy, is over-simplified. Instead, the data are more suggestive of a more complex process of creating value in which each measure is related to all the above measures in the hierarchy within the performance measurement model.

Table 6-2: Structural Equation Model: Contemporaneous Partially Mediated Model, h_2 is restricted to zero.

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	0.0088	0.0196
p-value	0.9251	0.8885
Goodness-of-fit (GFI)	1.0000	1.0000
AIC	-1.9912	-1.9804
BIC	-6.1224	-6.1137

6.5.3 Model Three: The Contemporaneous Direct Relationship Model

Model Three assumes that all the non-financial measures have a direct effect on operating expenses and operating revenues, in other words, that there is no endogenous variable in the model (everything on the right hand sides is exogenous, and is uncorrelated with the error terms).

$$COST_i = p_0 + p_1 ET_i + p_2 LE_i + p_3 FAE_i + p_4 LF_i + p_5 ASM_i + p_6 RPM_i + p_7 CS_i + p_8 MS_i + e_1;$$

$$REVENUE_i = r_0 + r_1 ET_i + r_2 LE_i + r_3 FAE_i + r_4 LF_i + r_5 ASM_i + r_6 RPM_i + r_7 CS_i + r_8 MS_i + e_1;$$

This is in fact a multiple linear regression model instead of structural equation model. The key distinction of this model is that all the non-financial measures are considered exogenous explanatory variables, and so the non-financial measures are assumed to be uncorrelated with the error terms. Table 6-3 summarizes the ANOVA statistics.

Table 6-3: ANOVA table: Contemporaneous Direct Relationships Model

Source	DF	Sum of Square	Mean Square	F value	P-value
COST Model					
Model	8	31.637	3.954	169.66	0.000
Error	451	10.513	0.023		
Total	459	42.149			
REV Model					
Model	8	37.429	4.679	296.16	0.000
Error	452	7.141	0.016		
Total	460	44.570			

Table 6-3 shows that the model fit is poor, with a highly significant p-value of the Goodness-of Fit test.

6.5.4 Contemporaneous Models Comparison

Only the partially mediated model fitted the data well, and is therefore considered the best of the three competing models for capturing the contemporaneous interplay between multiple measures of performance in value creation. This result implies that for the contemporaneous models, the relationships between multiple performance measures and financial outcomes are complex rather than simple or direct.

6.6 Tests of Complex Value-Creation Process with the Time Effect

The results from preceding tests suggest that value creation is a complex and indirect process. Consistent with previous studies (e.g. Bryant et al., 2004), the tests assume contemporaneous relationships between non-financial measures of performance and financial outcomes. However, Kaplan and Norton (1996, p.17) call for quantification of the magnitude and timing of relationships between performance measures. Specifically, they assert "...the balanced scorecard should be based on a series of cause and effect relationships derived from the strategy, including estimates of the response times and magnitudes of the linkages among the scorecard measures". This indicates that there is a timing effect to be considered when investigating the associations between multiple measures of performance. Consequently, the following tests are designed to capture the timing effect by comparing four competing models with different time scales between means and ends.

6.6.1 Model One: Chronological partially mediated Interrelationships Model

This model assumes that the outcome measures of each perspective are associated with the outcome measures of all higher level perspectives. In addition, it assumes a one quarter lag between changes in one perspective and the next, i.e. that the measures of organizational learning and growth (employee training and labour efficiency) at quarter (t) are drivers of the measures of the internal business process (fixes assets efficiency, load factor, available seat miles and revenue passenger miles) at quarter (t+1), which in turn are drivers of the customer perspective measures at quarter (t+2), while these measures (customer satisfaction and market share) are drivers of the financial measures (operating revenue and operating expenses) at quarter (t+3). Therefore, the following structural equation model was fitted:

$$LE_{i\,t-3} = a_0 + a_1\, ET_{i\,t-3} + e_1;$$

$$FAE_{i\,t-2} = b_0 + b_1\, ET_{i\,t-3} + b_2\, LE_{i\,t-3} + e_2;$$

$$LF_{i\,t-2} = c_0 + c_1\, ET_{i\,t-3} + c_2\, LE_{i\,t-3} + c_3\, FAE_{i\,t-2} + e_3;$$

$$ASM_{i\,t-2} = d_0 + d_1\, ET_{i\,t-3} + d_2\, LE_{i\,t-3} + d_3\, FAE_{i\,t-2} + d_4\, LF_{i\,t-2} + e_4;$$

$$RPM_{i\,t-2} = f_0 + f_1\, ET_{i\,t-3} + f_2\, LE_{i\,t-3} + f_3\, FAE_{i\,t-2} + f_4\, LF_{i\,t-2} + f_5\, ASM_{i\,t-2} + e_5;$$

$$CS_{i\,t-1} = g_0 + g_1\, ET_{i\,t-3} + g_2\, LE_{i\,t-3} + g_3\, FAE_{i\,t-2} + g_4\, LF_{i\,t-2} + g_5\, ASM_{i\,t-2} + g_6\, RPM_{i\,t-2} + e_6;$$

$$MS_{i\,t-1} = h_0 + h_1\, ET_{i\,t-3} + h_2\, LE_{i\,t-3} + h_3\, FAE_{i\,t-2} + h_4\, LF_{i\,t-2} + h_5\, ASM_{i\,t-2} + h_6\, RPM_{i\,t-2} + h_7 CS_{i\,t-1} + e_7;$$

$$COST_{i\,t} = p_0 + p_1 ET_{i\,t-3} + p_2 LE_{i\,t-3} + p_3 FAE_{i\,t-2} + p_4 LF_{i\,t-2} + p_5 ASM_{i\,t-2} + p_6 RPM_{i\,t-2} + p_7 CS_{i\,t-1} + p_8 MS_{i\,t-1} + e_8;$$

$$REVENUE_{i\,t} = r_0 + r_1 ET_{i\,t-3} + r_2 LE_{i\,t-3} + r_3 FAE_{i\,t-2} + r_4 LF_{i\,t-2} + r_5 ASM_{i\,t-2} + r_6 RPM_{i\,t-2} + r_7 CS_{i\,t-1} + r_8 MS_{i\,t-1} + e_9;$$

The lagged variables were created by shifting forward one, two, or three quarters. Some observations of lagged variables are missing because there are no data available for quarter zero. I dropped the observations in quarter 15 for the Customer Perspective: MS and CS, dropped quarter 15 and 14 for the Internal Business Perspective: RPM, ASM, LF and FAE, and also dropped the observations in quarter 15, 14, and 13 for the Learning Perspective: LE and ET. This is because the latest observations of financial measures are up to quarter 15, which are not related to the dropped observations of non-financial measures under the chronological assumptions of Model One. After dropping these observations, the lagged variables have been used to fit the equations between non-financial measures.

Results are reported in Table 6-4. Again, due to the model saturation, the path from LE to MS (h2) was restricted to zero.

Table 6-4: Structural Equation Model: The Chronological Relationships Model (partially mediated)

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	0.8611	0.8756
p-value	0.3534	0.3494
Goodness-of-fit (GFI)	0.9995	0.9995
AIC	-1.1389	-1.1244
BIC	-5.0442	-5.0325

The model has also been fitted without dropping the "un-lagged" observations. The model fit is poor across the two financial outcomes (chi-square>1300, and p<0.001, results illustrated in table 6-5), which provides evidence of dropping these observations.

Table 6-5 Structural Equation Model: The Chronological Relationships Model with "un-lagged" observations:

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	1394.0126	1596.9062
p-value	0.000	0.000
Goodness-of-fit (GFI)	0.7845	0.7775

6.6.2 Model Two: Partially Mediated Model with One Quarter Lag between Non-Financial Measures and Financial Outcomes

Previous studies provided mixed evidence on the time lag between leading non-financial measures and financial outcomes. Therefore, three models with three different lags were specified. In this first model, all non-financial measures are at quarter t, while financial measures are at quarter t+1: in other words, we assume that financial outcomes are one quarter lagged related with the non-financial measures, but that there is no chronological relationship between the non-financial measures. In addition, we assume that outcome measures of each non-financial perspective are associated with the outcome measures of all higher level perspectives. The following structural equation model was fitted:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 ET_{it} + b_2 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 ET_{it} + c_2 LE_{it} + c_3 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 ET_{it} + d_2 LE_{it} + d_3 FAE_{it} + d_4 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ET_{it} + f_2 LE_{it} + f_3 FAE_{it} + f_4 LF_{it} + f_5 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 ET_{it} + g_2 LE_{it} + g_3 FAE_{it} + g_4 LF_{it} + g_5 ASM_{it} + g_6 RPM_{it} + e_6;$$

$$MS_{it} = h_0 + h_1 ET_{it} + h_2 LE_{it} + h_3 FAE_{it} + h_4 LF_{it} + h_5 ASM_{it} + h_6 RPM_{it} + h_7 CS_{it} + e_7;$$

$$COST_{i\,t+1} = p_0 + p_1 ET_{i\,t} + p_2 LE_{i\,t} + p_3 FAE_{i\,t} + p_4 LF_{i\,t} + p_5 ASM_{i\,t} + p_6 RPM_{i\,t} + p_7 CS_{i\,t} + p_8 MS_{i\,t} + e_8;$$

$$REVENUE_{i\,t+1} = r_0 + r_1 ET_{i\,t} + r_2 LE_{i\,t} + r_3 FAE_{i\,t} + r_4 LF_{i\,t} + r_5 ASM_{i\,t} + r_6 RPM_{i\,t} + r_7 CS_{i\,t} + r_8 MS_{i\,t} + e_9;$$

As before, "un-lagged" observations were dropped, which are the observations in quarter 15 of all the non-financial measures. The lagged variables were used for fitting the equations between non-financial measures. Table 6-6 reports the model fit statistics.

Table 6-6: Structural Equation Model: one quarter lag between non-financial indicators and financial outcomes.

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	0.0349	0.0440
p-value	0.8519	0.8339
Goodness-of-fit (GFI)	1.000	1.000
AIC	-1.9651	-1.9560
BIC	-6.0266	-6.0198

The model is a poor fit if no observations are dropped, with p-value less than 0.001 and GFI being 0.7128 for COST model and 0.7079 for REVENUE model (Table 6-7).

Table 6-7 Structural Equation Model: one quarter lag between non-financial indicators and financial outcomes (no observation of nonfinancial measures was dropped)

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	2308.5037	2500.4186
p-value	0.000	0.000
Goodness-of-fit (GFI)	0.7128	0.7079

6.6.3 Model Three: Partially Mediated Model with Two Quarters Lag between Non-Financial Measures and Financial Outcomes

This model differs from Model Two in assuming two quarter lagged chronological relationships between financial outcomes and all non-financial measures. Hence, the following structural equation model was fitted:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 ET_{it} + b_2 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 ET_{it} + c_2 LE_{it} + c_3 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 ET_{it} + d_2 LE_{it} + d_3 FAE_{it} + d_4 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ET_{it} + f_2 LE_{it} + f_3 FAE_{it} + f_4 LF_{it} + f_5 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 ET_{it} + g_2 LE_{it} + g_3 FAE_{it} + g_4 LF_{it} + g_5 ASM_{it} + g_6 RPM_{it} + e_6;$$

$$MS_{i\,t} = h_0 + h_1\,ET_{i\,t} + h_2\,LE_{i\,t} + h_3\,FAE_{i\,t} + h_4\,LF_{i\,t} + h_5\,ASM_{i\,t} + h_6\,RPM_{i\,t} + h_7 CS_{i\,t} + e_7;$$

$$COST_{i\,t+2} = p_0 + p_1 ET_{i\,t} + p_2\,LE_{i\,t} + p_3\,FAE_{i\,t} + p_4\,LF_{i\,t} + p_5\,ASM_{i\,t} + p_6\,RPM_{i\,t} + p_7 CS_{i\,t} + p_8 MS_{i\,t} + e_8;$$

$$REVENUE_{i\,t+2} = r_0 + r_1 ET_{i\,t} + r_2\,LE_{i\,t} + r_3\,FAE_{i\,t} + r_4\,LF_{i\,t} + r_5\,ASM_{i\,t} + r_6\,RPM_{i\,t} + r_7 CS_{i\,t} + r_8 MS_{i\,t} + e_9;$$

To use the lagged variables, observations in quarter 15 and 14 of all non-financial measures were dropped. The results are presented in Table 6-8.

Table 6-8: Structural Equation Structural Equation Model: Two quarters lag between non-financial indicators and financial outcomes

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	0.0360	0.1511
p-value	0.8495	0.6975
Goodness-of-fit (GFI)	1.000	1.000
AIC	-1.9640	-1.8489
BIC	-5.9504	-5.8378

Again, the model is not fitted well if no observation was dropped with significant Chi-square value.

6.6.4 Model Four: Partially Mediated Model with Three Quarters Lag between Non-Financial Measures and Financial Outcomes

Model Four assumes three quarter lagged chronological relationships between financial outcomes and all non-financial measures i.e. that interrelationships exist between non-financial measures at quarter (t) and the financial outcome at quarter t+3. This assumption is translated to the following structural equation model:

$$LE_{it} = a_0 + a_1 ET_{it} + e_1;$$

$$FAE_{it} = b_0 + b_1 ET_{it} + b_2 LE_{it} + e_2;$$

$$LF_{it} = c_0 + c_1 ET_{it} + c_2 LE_{it} + c_3 FAE_{it} + e_3;$$

$$ASM_{it} = d_0 + d_1 ET_{it} + d_2 LE_{it} + d_3 FAE_{it} + d_4 LF_{it} + e_4;$$

$$RPM_{it} = f_0 + f_1 ET_{it} + f_2 LE_{it} + f_3 FAE_{it} + f_4 LF_{it} + f_5 ASM_{it} + e_5;$$

$$CS_{it} = g_0 + g_1 ET_{it} + g_2 LE_{it} + g_3 FAE_{it} + g_4 LF_{it} + g_5 ASM_{it} + g_6 RPM_{it} + e_6;$$

$$MS_{it} = h_0 + h_1 ET_{it} + h_2 LE_{it} + h_3 FAE_{it} + h_4 LF_{it} + h_5 ASM_{it} + h_6 RPM_{it} + h_7 CS_{it} + e_7;$$

$$COST_{i\,t+3} = p_0 + p_1 ET_{i\,t} + p_2 LE_{i\,t} + p_3 FAE_{i\,t} + p_4 LF_{i\,t} + p_5 ASM_{i\,t} + p_6 RPM_{i\,t} + p_7 CS_{i\,t} + p_8 MS_{i\,t} + e_8;$$

$$REVENUE_{i\,t+3} = r_0 + r_1 ET_{i\,t} + r_2 LE_{i\,t} + r_3 FAE_{i\,t} + r_4 LF_{i\,t} + r_5 ASM_{i\,t} + r_6 RPM_{i\,t} + r_7 CS_{i\,t} + r_8 MS_{i\,t} + e_9;$$

The results are presented in Table 6-9. Again, the data are consistent with this model, but only if the non-financial observations in quarter 15, 14, and 13 are dropped.

Table 6-9: Structural Equation Model: Three quarters lag between non-financial indicators and financial outcomes

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	1.0329	1.5772
p-value	0.3095	0.2092
Goodness-of-fit (GFI)	0.9994	0.9990
AIC	-0.9671	-0.4228
BIC	-4.8724	-4.3309

6.6.5 Complex chronological (Partially Mediated) Value-Creation Process Models Comparison: It is observed that all the models fitted the data well when including the time effect into the model, with insignificant Chi-square values. These four competing models were also compared by looking at the corresponding model fit statistics. We summarize the AIC and BIC values in Table 6-10.

Table 6-10: Complex chronological Models Comparison:

Model	AIC	BIC
1 COST	-1.1389	-5.0442
REVENUE	-1.1244	-5.0325
2 COST	-1.9651	-6.0266
REVENUE	-1.9560	-6.0198
3 COST	-1.9640	-5.9504
REVENUE	-1.8489	-5.8378
4 COST	-0.9671	-4.8724
REVENUE	-0.4228	-4.3309

The model yielding the smallest value of AIC or BIC is considered the best. Therefore, both AIC and BIC favor Model Two, which assumes one quarter lag between nonfinancial and financial measures. As a result, model 2 appears to be the best in comparison with these four models.

The complex chronological models results have shown a better fit with the data than contemporaneous models. These results imply that dynamic performance measurement systems that consider the time effect are better than static performance measurement systems that assume only simultaneous relationships between different measures of performance.

6.7 Tests of Simple Value-Creation Process (Fully Mediated Model) with the Time Effect

These tests aim to investigate the fully mediated model while considering the time effect on relationships between measures. The following tests are designed to capture the timing

effect by comparing four competing models with different time scales between means and ends as explained in the subsequent four sections. Also, a comparison of the results of the four models is shown in section 6.7.5

6.7.1 Model One: Chronological Fully Mediated Model

This model assumes a chronological relationship between performance measures, with a one quarter lag between each perspective and the next in the hierarchy. This model assumes that the outcome measures of each perspective are associated only with the outcome measures in the next perspective. In addition, it assumes chronological relations with one quarter lag between the perspective and the upper one i.e. it assumes that the measures of organizational learning and growth (employee training and labour efficiency) at quarter (t) are drivers of the measures of the internal business process (fixed assets efficiency, load factor, available seat miles and revenue passenger miles) at quarter (t+1), which in turn are the drivers of the measures of the customer perspective at quarter (t+2) while these measures (customer satisfaction and market share) are the drivers of the financial measures (operating revenue and operating expenses) at quarter (t+3). Therefore, the following structural equation model was fitted:

$$LE_{i\,t-3} = a_0 + a_1\, ET_{i\,t-3} + e_1;$$

$$FAE_{i\,t-2} = b_0 + b_1\, LE_{i\,t-3} + e_2;$$

$$LF_{i\,t-2} = c_0 + c_1\, FAE_{i\,t-2} + e_3;$$

$$ASM_{i\,t-2} = d_0 + d_1\, LF_{i\,t-2} + e_4;$$

$$RPM_{i\,t-2} = f_0 + f_1\, ASM_{i\,t-2} + e_5;$$

$$CS_{i\,t-1} = g_0 + g_1\, RPM_{i\,t-2} + e_6;$$

$$MS_{i\,t-1} = h_0 + h_1\, CS_{i\,t-1} + e_7;$$

$$COST_{i\,t} = p_0 + p_1 MS_{i\,t-1} + e_8;$$

$$REVENUE_{i\,t} = r_0 + r_1 MS_{i\,t-1} + e_9;$$

Where t=1, 2..., 15. To fit this model, we used one quarter lagged MS and CS, two quarters lagged RPM, ASM, LF and FAE, and three quarters lagged LE and ET. In other words, these observations were dropped: quarter 15 of MS and CS, quarter 15 and 14 of RPM to FAE, and quarter 15, 14 and 13 of LE and ET. The results are reported in Table 6-11. As a result, the model does not fit the data well.

Table 6-11: Structural Equation Model: Chronological Fully Mediated Model

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	585.7950	625.0522
p-value	0.000	0.000
Goodness-of-fit (GFI)	0.7901	0.7799
AIC	529.7950	569.0522
BIC	420.4449	459.6259

6.7.2 Model Two: Fully Mediated Model with One Quarter Lag between Non-Financial Measures and Financial Outcomes

Model Two assumes that the financial outcomes are one quarter lagged related with the non-financial measures, but that there is no chronological relationship between the non-financial measures. To capture this scenario, the following structural equation model was fitted:

$$LE_{i\,t-1} = a_0 + a_1\, ET_{i\,t-1} + e_1;$$

$$FAE_{i\,t-1} = b_0 + b_1\, LE_{i\,t-1} + e_2;$$

$$LF_{i\,t-1} = c_0 + c_1\, FAE_{i\,t-1} + e_3;$$

$$ASM_{i\,t-1} = d_0 + d_1\, LF_{i\,t-1} + e_4;$$

$$RPM_{i\,t-1} = f_0 + f_1\, ASM_{i\,t-1} + e_5;$$

$$CS_{i\,t-1} = g_0 + g_1\, RPM_{i\,t-1} + e_6;$$

$$MS_{i\,t-1} = h_0 + h_1\, CS_{i\,t-1} + e_7;$$

$$COST_{i\,t} = p_0 + p_1 MS_{i\,t-1} + e_8;$$

$$REVENUE_{i\,t} = r_0 + r_1 MS_{i\,t-1} + e_9;$$

Observations in quarter 15 of all non-financial measures were dropped. Results are reported in Table 6-12. This model is also not consistent with the data.

Table 6-12 Structural Equation Model: One Quarter Lag Fully Mediated Model.

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	1825.0214	1856.8752
p-value	0.000	0.000
Goodness-of-fit (GFI)	0.6682	0.6627
AIC	1769.0214	1800.8752
BIC	1655.3006	1687.0892

6.7.3 Model Three: Fully Mediated Model with Two Quarters Lag between Non-Financial Measures and Financial Outcomes

Model Three assumes that the financial outcomes are two quarters lagged compared with the non-financial measures, but that there is no chronological relationship between the non-financial measures. The following structural equation model captures this interrelationship:

$$LE_{i\,t-2} = a_0 + a_1\, ET_{i\,t-2} + e_1;$$

$$FAE_{i\,t-2} = b_0 + b_1\, LE_{i\,t-2} + e_2;$$

$$LF_{i\,t-2} = c_0 + c_1\, FAE_{i\,t-2} + e_3;$$

$$ASM_{i\,t-2} = d_0 + d_1\, LF_{i\,t-2} + e_4;$$

$$RPM_{i\,t-2} = f_0 + f_1\, ASM_{i\,t-2} + e_5;$$

$$CS_{i\,t-2} = g_0 + g_1\, RPM_{i\,t-2} + e_6;$$

$$MS_{i\,t-2} = h_0 + h_1\, CS_{i\,t-2} + e_7;$$

$$COST_{i\,t} = p_0 + p_1 MS_{i\,t-2} + e_8;$$

$$REVENUE_{i\,t} = r_0 + r_1 MS_{i\,t-2} + e_9;$$

Observations in quarter 15 and 14 of all the non-financial measures were dropped. Results of this model are reported in Table 6-13.

Table 6-13: Structural Equation Model: Two Quarters Lag Fully Mediated Model.

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	1581.3568	1603.9427
p-value	0.000	0.000
Goodness-of-fit (GFI)	0.6905	0.6854
AIC	1525.3568	1547.9427
BIC	1413.7361	1436.2518

6.7.4 Model 4: Fully Mediated Model with Three Quarters Lag between Non-Financial Measures and Financial Outcomes

Model Four assumes that the financial outcomes are three quarters lagged related with the non-financial measures, but that there is no chronological relationship between the non-financial measures. Observations in quarter 15, 14 and 13 of all non-financial measures were dropped. This scenario can be translated to the following structural model:

$$LE_{i\,t-3} = a_0 + a_1\, ET_{i\,t-3} + e_1;$$

$$FAE_{i\,t-3} = b_0 + b_1\, LE_{i\,t-3} + e_2;$$

$$LF_{i\,t-3} = c_0 + c_1\, FAE_{i\,t-3} + e_3;$$

$$ASM_{i\,t-3} = d_0 + d_1\, LF_{i\,t-3} + e_4;$$

$$RPM_{i\,t-3} = f_0 + f_1\, ASM_{i\,t-3} + e_5;$$

$$CS_{i\,t-3} = g_0 + g_1\, RPM_{i\,t-3} + e_6;$$

$$MS_{i\,t-3} = h_0 + h_1\, CS_{i\,t-3} + e_7;$$

$$COST_{i\,t} = p_0 + p_1 MS_{i\,t-3} + e_8;$$

$$REVENUE_{i\,t} = r_0 + r_1 MS_{i\,t-3} + e_9;$$

Table 6-14: Structural Equation Model: Three Quarters Lag Fully Mediated Model.

Model Fit Statistics	COST Model	REVENUE Model
Chi-Square	1399.0501	1411.6734
p-value	0.000	0.000
Goodness-of-fit (GFI)	0.7110	0.7084
AIC	1343.0501	1355.6734
BIC	1233.7000	1246.2471

6.7.5 Simple Chronological (Fully Mediated) Value-Creation Process Models Comparison

The model comparison criteria for fully mediated models are summarized in Table 6-15. None of these models fits the data well, but Model One yields the smallest AIC and BIC values for both COST and REVENUE. As a result, it may be considered the best of the four competing models. Model One assumes chronological relationships between measures in perspective with one quarter lag between the perspective and the next one.

Table 6-15: Dynamic Fully Mediated Model Comparison

Model		AIC	BIC
1	COST	529.7950	420.4449
	REVENUE	569.0522	459.6259
2	COST	1769.0214	1655.3006
	REVENUE	1800.8752	1687.0892
3	COST	1525.3568	1413.7361
	REVENUE	1547.9427	1436.2518
4	COST	1343.0501	1233.7000
	REVENUE	1355.6734	1246.2471

6.8 Comparisons between Simple and Complex Chronological Value Creation Models

The results of the complex value-creation process with the time effect suggest that the best model is Model Two, which assumes that the outcome measures of each perspective are associated with the outcome measures of all higher level perspectives, with a one quarter lag between non-financial and financial measures. Tests of simple value-creation process suggest that the best model is Model One, which assumes that the outcome measure of each perspective is associated only with the outcome measure of the next perspective in the hierarchy, with a chronological relationship between measures and a one quarter lag between one perspective and the next. This section compares these two models to investigate which best fits the data, and hence whether a chronological complex value creation model or a chronological simple value creation model best

captures and communicates information about a firm's performance. The model fit statistics of the two models are summarized in Table 6-16.

Table 6-16: Simple and Complex Chronological Value Creation Models Comparison

Model		AIC	BIC	p-value
Complex: Model 2	COST	-1.9651	-6.0266	0.8519
	REVENUE	-1.9560	-6.0198	0.8339
Simple: Model 1	COST	529.7950	420.4449	0.000
	REVENUE	569.0522	459.6259	0.000

The comparison shows that Model Two in the partially mediated models with a time effect test (i.e. a complex value creation model with one quarter lag between the non-financial measures and the financial outcomes in the form of operating revenues or operating expenses) is significantly better than Model One in the fully mediated models with a time effect test (i.e. a simple value creation model with sequential relationships between each perspective and the following perspective in the order starting with the non-financial indicators the learning perspective and culminating in the financial perspective in the form of operating revenues or operating expenses), having significantly lower AIC and BIC values and highly non-significant p-value. This is consistent with the result we obtained in Section 6.5, where we concluded that the fully mediated model is over-simplified, and the more complex partially mediated model is more consistent with the data. This result appears to remain valid after including the time effect in the models.

Therefore, structural equation models results favor the complex partially mediated model for both static and dynamic performance measurement models.

We also compare two models which assume a chronological relationship between measures with a one quarter lag between one perspective and the next. The first is based on Model One, from the chronological complex value creation process models, which assumes that the outcome measure of each perspective is associated only with the outcome measure of the next perspective in the hierarchy (fully mediated). The second is based on Model One, from the chronological simple value creation process models, which assumes the outcome measures of each perspective are associated with the outcome measures of all higher level perspectives (partially mediated). The comparison statistics are summarized in Table 6-17. The results favor the first model (i.e. the chronological complex performance measurement model), with much lower AIC and BIC values and non-significant p-values. Again, this comparison result is consistent with the expectation that the partially mediated model is more suitable than the over-simplified fully mediated model.

Table 6-17: Model Comparison: Chronological Complex Model vs. Chronological Simple Model

Model		AIC	BIC	p-value
Complex Model 1	COST	-1.1389	-5.0422	0.3534
	REVENUE	-1.1244	-5.0325	0.3494
Simple Model 2	COST	529.7950	420.4449	0.000
	REVENUE	569.0522	459.6259	0.000

6.9 Generalized Model Selection

A partially mediated model seems to be better than a fully mediated model and so in this section, only partially mediated models were considered, and some models with various chronological relations that were not addressed above have been tested.

The three-digit combination (i, j, k) represents a model that assumes that measures of learning and growth at quarter (t) are the drivers of the measures of internal business processes at quarter (t+i), which in turn drive the customer perspective measures at quarter (t+j), which in turn drive the financial measures at quarter (t+k). If, for instance, (i,j,k)=(1,2,3), this means that the model assumes the outcome measures of each perspective are associated with the outcome measures of all higher level perspectives. In addition, it assumes chronological relations with a one quarter lag between one perspective and the next, i.e. that the measures of organizational learning and growth

(employee training and labour efficiency) at quarter (t) are drivers of the measures of the internal business process (fixes assets efficiency, load factor, available seat miles and revenue passenger miles) at quarter (t+1), which in turn are the drivers of the measures of the customer perspective at quarter (t+2) while these measures (customer satisfaction and market share) are the drivers of the financial measures (operating revenue and operating expenses) at quarter (t+3). Here 0<= (less than or equal to) i <= j <= k <=3. Using this notation, the tests conducted in previous sections can be depicted as follows:

Model Two, Section 6.5.2: the contemporaneous partially mediated model: (i = 0, j = 0, k = 0), no chronological relation is assumed.

Section 6.6 tests of complex value-creation process with the time effect: chronological model (i = 1, j = 2, k = 3), one quarter lag model (i = 0, j = 0, k = 1), two quarters lag model (i = 0, j = 0, k = 2), and three quarters model (i = 0, j = 0, k = 3).

This section investigates the remaining possible chronological relations. For instance, the model (i = 1, j = 1, k = 2), which assumes that the growth at quarter (t) is the driver of the internal business at (t+1), which in turn drives the customer perspective at (t+1), while the customer perspective is the driver of financial measures at (t+2). There are similar variations, all of which were tested. Only six passed the Goodness-of-Fit test, with non-significant p values under level 0.1. They are summarized in Table 6-18 below:

Table 6-18: Summary of well fitted models

Model	AIC	BIC	p-value
(1,1,3)	-1.5866	-5.4920	0.5202
(3,3,3)	0.5075	-3.4006	0.1133
(1,1,2)	-1.9739	-5.9604	0.8717
(1,2,2)	-1.2135	-5.2000	0.3752
(2,2,2)	-1.4061	-5.3926	0.4409
(1,1,1)	-1.9990	-6.0604	0.9742

These results were compared with those in Table 6-10, and Model (i = 1, j = 1, k = 1) proved to be the best model, with the lowest AIC and BIC. Model (i = 1, j = 1, k = 2) is as good as the partially mediated model with one quarter lag between non-financial measures and financial outcomes (illustrated in section 6.6.2). The fourth best model is the partially mediated model, with two quarters lag between non-financial measures and financial outcomes (illustrated in section 6.6.3). To be clearer, (i = 1, j = 1, k = 1) means: the measures of learning perspective (employee training and labour efficiency measures) at quarter (t) are associated with the measures of internal business process and customer perspectives at quarter (t+1) as well as the financial measures at quarter (t+1). Hence, only the learning and growth perspective is one quarter lagged in the structural equation model.

The number of lagged quarters in the best four models is summarized in Table 6-19. However, the variation in Goodness-of-Fit among these four models is very small, suggesting that care should be taken comparing them.

Table 6-19: Quarter lags for the four best models

Model	Number of quarter lags		
	Learning	Internal Business	Customer
(i = 1, j = 1, k = 1)	1	0	0
(i = 0, j = 0, k = 1)	1	1	1
(i = 1, j = 1, k = 2)	2	1	1
(i = 0, j = 0, k = 2)	2	2	2

Utilizing the estimated coefficients, these models can be written as follows:

6.9.1 Model (i = 1, j = 1, k = 1)

This fitted model can be written as follows, where t = 1, 2... 15, and (*) means significant path at 5% level:

$$LE_{t-1} = .412\ ET_{t-1}^{*} + e_1$$

$$FAE_t = .075ET_{t-1} - .002LE_{t-1} + e_2$$

$$LFt = .034ET_{t-1} + .109LE_{t-1}^{*} - .044FAE_t + e_3$$

$$ASM_t = -0.074ET_{t-1} + .459LE_{t-1}^{*} + .034FAE_t + .086\ LF_t^{*} + e_4$$

$$RPM_t = -0.017ET_{t-1} + .021LE_{t-1}^{*} + .02FAE_t^{*} + .074\ LF_t^{*} + .937ASM_t^{*} + e_5$$

$$CS_t = 0.038ET_{t-1} + .058LE_{t-1} - .005FAE_t - .12\ LF_t^{*} - .356ASM_t^{*} - .5\ RPM_t^{*} + e_6$$

$$MS_t = 0.021ET_{t-1}^{*} + 0.0LE_{t-1} + .02FAE_t^{*} + .01\ LF_t^{*} + .085\ ASM_t^{*} + .89\ RPM_t^{*} + .037\ CS_t^{*} + e_7$$

$$COST_t = -\ 0.017ET_{t-1} + 0.026LE_{t-1} - .086FAE_t^{*} - .001\ LF_t + .089\ ASM_t + .168\ RPM_t + .029\ CS_t + .138\ MS_t + e_8$$

$$REV_t = 0.009\ ET_{t-1} + 0.027LE_{t-1} + .919FAE_t^{*} + .007\ LF_t + .253\ ASM_t^{*} + .068\ RPM_t + .018\ CS_t + .138\ MS_t + e_9$$

Table 6-20 displays the standard errors of these estimated coefficients. These standard errors are used to calculate corresponding t-values, which can be used to identify significant coefficients (flagged with a star in the model above).

Table 6-20: standard errors for model (i = 1, j = 1, k = 1) where * means: a significant path at .05.

	ET	LE	FAE	LF	ASM	RPM	CS	MS
LE	.04*							
FAE	.05	.05						
LF	.05	.05*	.05					
ASM	.05	.05*	.04	.04*				
RPM	.02	.02	.01*	.01*	.02*			
CS	.05	.06	.05	.05*	.016*	.16*		
MS	.01*	NA	.01*	.01	.03*	.04*	.01*	
COST	.03	.03	.02*	.03	.08	.13	.03	.012
REV	.02	.02	.02*	.02	.07*	.11	.02	.09

The model that includes direct links between all outcome measures is fully saturated since it leaves no degrees of freedom. Therefore, the path from LE to MS has been

restricted to have zero value (this selection is based on AIC criterion as explained in the model discussion above and that path is non-significant)

The fitted model (i = 1, j = 1, k = 1) coefficients estimation indicates that Labour Efficiency (LE_{t-1}) and load factor LF_t are significantly associated with capacity, as measured by ASM_t. Also, load factor LF_t, Fixed Assets Efficiency FAE_t, Labour Efficiency LF_t, and Capacity ASM_t are associated with traffic measured by Revenue Passenger Miles (RPM_t). Load factor LF_t, Available Seat Miles (ASM_t), and Revenue Passenger Miles (RPM) are negatively associated with the passenger's share of in-flight expenditure as a proxy for Customer Satisfaction (CS_t). Moreover, one quarter lagged Employee Training (ET_{t-1}), Fixed Assets Efficiency (FAE_t), Load Factor (LF_t), Traffic (RPM_t) and Customer Satisfaction (CS_t) are all positively associated with the current Market Share (MS_t). Finally, Fixed Assets Efficiency (FAE_t) is negatively associated with operating expenses ($Cost_t$) while Fixed Assets Efficiency (FAE_t) and capacity ASM_t are positively associated with Operating Revenues (Rev_t). All of this is depicted in figure 6-3 in the end of this chapter.

6.9.2 Model (i = 0, j = 0, k = 1)

This fitted model can be written as follows, where t = 1, 2... 15 and (*) means significant path at 5% level:

$LE_{t-1} = .304\ ET_{t-1}^{*} + e_1$

$FAE_{t-1} = .08ET_{t-1} + .125LE_{t-1}^{*} + e_2$

$LFt\text{-}_1 = -.01ET_{t-1} + .035LE_{t-1} - .051FAE_{t-1} + e_3$

$ASM_{t-1} = 0.057ET_{t-1} + .683LE_{t-1}^{*} + .082FAE_{t-1}^{*} + .127\ LF_{t-1}^{*} + e_4$

$RPM_{t-1} = 0.025ET_{t-1}^{*} + .016LE_{t-1} - .017FAE_{t-1} + .080LF_{t-1}^{*} + .937ASM_{t-1}^{*} + e_5$

$CS_{t-1} = 0.035ET_{t-1} - .035LE_{t-1} - .018FAE_{t-1} - .123\ LF_{t-1}^{*} - .227\ ASM_{t-1} - .338\ RPM_{t-1}^{*} + e_6$

$MS_{t-1} = 0.015ET_{t-1} + 0.0LE_{t-1} - .018FAE_{t-1} + .01\ LF_{t-1} + .09\ ASM_{t-1}^{*} + .886\ RPM_{t-1}^{*} + .038\ CS_{t-1}^{*} + e_7$

$COST_t = 0.01ET_{t-1} - 0.092LE_{t-1} - .559FAE_{t-1}^{*} + .126\ LF_{t-1}^{*} + .078\ ASM_{t-1} + .65\ RPM_{t-1}^{*} + .053\ CS_{t-1} - .71\ MS_{t-1}^{*} + e_8$

$REV_t = 0.01ET_{t-1} - 0.042LE_{t-1} + .061FAE_{t-1}^{*} + .135\ LF_{t-1}^{*} + .063\ ASM_{t-1} + .405\ RPM_{t-1}^{*} - .031\ CS_{t-1} + .36\ MS_{t-1}^{*} + e_8$

These coefficients and their associated standard errors are displayed in table 6-21 below.

Table 6-21: Coefficients estimation and their related standard errors for model (i = 0, j = 0, k = 1)

	ET	LE	FAE	LF	ASM	RPM	CS	MS
LE	.304*							
	(.05)							
FAE	.08	.125*						
	(.05)	(.05)						
LF	.01	.035	-.051					
	(.05)	(.05)	(.05)					
ASM	-.057	.683*	.082*	.127*				
	(.04)	(.04)	(.04)	(.04)				
RPM	.025*	.016	-.017	.080*	.937*			
	(.01)	(.02)	(.01)	(.01)	(.02)			
CS	.035	-.035	-.018	-.123*	.227	-.338*		
	(.05)	(.07)	(.05)	(.05)	(.17)	(.17)		
MS	.015	.0	-.018	-.010	.090	.886*	.038*	
	(.01)	(NA)	(0.01)	(0.01)	(0.03)	(0.04)	(0.01)	
COST	.01	-.092	-.559*	.126*	.078	.650*	-.053	-.710*
	(.04)	(.05)	(.04)	(.04)	(.14)	(.22)	(.04)	(.19)
REV	.01	-.042	.610*	.135*	-.063	.405*	-.031	.360*
	(.04)	(.05)	(.04)	(.04)	(.14)	(.21)	(.04)	(.18)

These relationships are also depicted in Figure 6-4.

6.9.3 Model (i = 1, j = 1, k = 2)

This fitted model can be formed as follows, where t = 1, 2... 15, (*) means significant path at 5% level, and ** means significant at 10% level:

$LE_{t-2} = .32\ ET_{t-2}^{*} + e_1$

$FAE_{t-1} = .068ET_{t-2} - .001LE_{t-2} + e_2$

$LFt\text{-}_1 = .046ET_{t-2} + .09LE_{t-2} - .049FAE_{t-1} + e_3$

$ASM_{t-1} = -0.072ET_{t-2} + .432LE_{t-2}^{*} + .004FAE_{t-1} + .092\ LF_{t-1}^{**} + e_4$

$RPM_{t-1} = .0.015ET_{t-2} + .026LE_{t-2} + .02FAE_{t-1}^{*} + .07LF_{t-1}^{*} + .938ASM_{t-1}^{*} + e_5$

$CS_{t-1} = 0.038ET_{t-2} + .06LE_{t-2} - .026FAE_{t-2} - .117\ LF_{t-1}^{*} + .312\ ASM_{t-1}^{**} - .416\ RPM_{t-1}^{*} + e_6$

$MS_{t-1} = 0.022ET_{t-2}^{*} + 0.0LE_{t-2} + .021FAE_{t-1}^{*} - .013\ LF_{t-1} + .085\ ASM_{t-1}^{**} + .888\ RPM_{t-1}^{*} + .038\ CS_{t-1}^{*} + e_7$

$COST_t = -0.006ET_{t-2} - 0.001LE_{t-2} - .545FAE_{t-1}^{*} + .133\ LF_{t-1}^{*} + .053\ ASM_{t-1} + .608\ RPM_{t-1}^{*} - .053\ CS_{t-1} - .686\ MS_{t-1}^{*} + e_8$

$REV_t = 0.007ET_{t-2} - 0.026LE_{t-2} + .602FAE_{t-1}^{*} + .139\ LF_{t-1}^{*} + .062\ ASM_{t-1} + .36\ RPM_{t-1}^{**} - .035\ CS_{t-1} + .339\ MS_{t-1}^{**} + e_8$

The associated standard errors are displayed in table 6.22. These associations are also depicted in path graph form in Figure 6-5.

Table 6-22: standard errors for model (i = 1, j = 1, k = 2).

* Significant path at 5% level. ** Significant path at 10% level:

	ET	LE	FAE	LF	ASM	RPM	CS	MS
LE	.05*							
FAE	.06	.05						
LF	.06	.06	.05					
ASM	.05	.05*	.05	.05**				
RPM	.02	.02	.01*	.01*	.02*			
CS	.05	.06	.05	.05*	.017**	.17*		
MS	.01*	NA	.01*	.01	.04*	.04*	.01*	
COST	.05	.05	.04*	.04*	.14	.22*	.04	.019*
REV	.04	.05	.04*	.04*	.14	.21**	.04	.18**

6.9.4 Model (i = 0, j = 0, k = 2)

This fitted model can be written as follows, where t = 1, 2... 15 with starred significant coefficients (at 5% level):

$$LE_{t-2} = .323\ ET_{t-2}^{*} + e_1$$

$$FAE_{t-2} = .069ET_{t-2} + .132LE_{t-2}^{*} + e_2$$

$$LFt_{-2} = .04ET_{t-2} + .016LE_{t-2} - .042FAE_{t-2} + e_3$$

$$ASM_{t-2} = -0.053ET_{t-2} + .657LE_{t-2}^{*} + .087FAE_{t-2}^{*} + .126\ LF_{t-2}^{*} + e_4$$

$$RPM_{t-2} = .0.027ET_{t-2} + .021LE_{t-2} - .016FAE_{t-2} + .086LF_{t-2}^{*} + .935ASM_{t-2}^{*} + e_5$$

$$CS_{t-2} = 0.046ET_{t-2} - .046LE_{t-2} - .022FAE_{t-2} - .106\ LF_{t-2}^{*} + .156\ ASM_{t-2} - .272\ RPM_{t-1}^{*} + e_6$$

$MS_{t-2} = 0.017ET_{t-2} + 0.0LE_{t-2} - .018FAE_{t-2} - .014\ LF_{t-2} + .051\ ASM_{t-2} + .922\ RPM_{t-2}^{*} + .041\ CS_{t-2}^{*} + e_7$

$COST_t = -0.027ET_{t-2} - 0.088LE_{t-2} - .346FAE_{t-2}^{*} + .108\ LF_{t-2}^{*} + .403\ ASM_{t-2}^{*} + 1.094\ RPM_{t-2}^{*} - .090\ CS_{t-2} - .633\ MS_{t-2}^{*} + e_8$

$REV_t = 0.028ET_{t-2} - 0.023LE_{t-2} + .437FAE_{t-2}^{*} + .101\ LF_{t-2}^{*} + .0382\ ASM_{t-2}^{*} + .801RPM_{t-2}^{*} - .074\ CS_{t-2} + .427\ MS_{t-2}^{**} + e_8$

The associated standard errors are displayed in table 6.23. These associations are also depicted in the path graph (Figure 6-6).

Table 6-23: standard errors for model (i = 0, j = 0, k = 2).

	ET	LE	FAE	LF	ASM	RPM	CS	MS
LE	.05*							
FAE	.05	.05*						
LF	.05	.05	.05					
ASM	.04	.04*	.04*	.04*				
RPM	.02	.02	.01	.01*	.02*			
CS	.05	.07	.05	.05*	.018	.17		
MS	.01	NA	.01	.01	.04	.04*	.01*	
COST	.05	.06	.05*	.05*	.16*	.26*	.05	.22*
REV	.05	.06	.05*	.05*	.16*	.25*	.05	.21*

The results of this model are interesting. First, all the measures of the internal perspective namely, FAE, LF, ASM, and RPM (with two quarters lag) are significantly associated with both operating expenses and operating revenues in the financial perspective. Second, employee training is positively associated with labour efficiency, but not with

other measures in the upper perspectives. Third, the results confirm the hypothesis that the relationship between non-financial indicators and financial performance is mediated by other non-financial variables.

6.10 Summary of the statistical results

This chapter has utilized SEM to compare multiple competing models to investigate which model best fits the data. Five different tests have been conducted.

The first test compared three competing models: Model One, which assumes a simple relationship between measures through a contemporaneous, fully-mediated model; Model Two, which assumes complicated relationships between measures, allowing each measure to be associated with all upper measures through a contemporaneous, partially-mediated model; and Model Three, which assumes direct relationships between multiple non-financial measures in the non-financial perspectives and the financial outcome through a multivariate regression model. These tests show that the structural equation model better fits the data than the multivariate regression model, and that, Model Two correlates most closely with the data. Therefore, of the three contemporaneous models, the model that assumes that outcome measures of each perspective are associated with the outcome measures of all higher level perspectives best captures the value creation process among three contemporaneous models.

The second test introduces the time effect to the partially mediated model as it compares four competing models. Model One assumes complex interrelationships through a partially mediated model (in which the outcome measures of each non-financial

perspective are associated with the outcome measures of all higher level perspectives) with a chronological time effect (where a one quarter lag is assumed between each perspective and the following perspective); Model Two assumes complex chronological interrelationships with one quarter lag between the non-financial aspects and the financial outcome; Models Three and Four are similar to Model Two, but assume two and three quarters lag respectively. The results show that, of these four, Model Two best captures the value creation process. (Model Two is the model with one quarter lag between all the non-financial measures on one hand the financial measure on the other).

The third test introduces the time effect to the fully mediated model as it compares four competing models. Model One assumes simple form of interrelationships through a fully mediated model (in which the outcome measures of each non-financial perspective are only associated outcome measures in the subsequent perspective with the next perspective in the model) with chronological relationships between measures (a one quarter lag between each perspective and the next); Model Two assumes a simple chronological relationship with a one quarter lag between the non-financial indicators and financial outcomes. Models Three and Four are similar to model Two, but with two and three quarters lag respectively. The results of this test appear to favour Model 1, which is the fully mediated model that assumes chronological relationships between measures in perspective with one quarter lag between the perspective and the upper one. However, the model fit is poor, with a highly significant p value.

The fourth test compares the best models from the second test and third test. This comparison shows that the partially mediated model fits the data even after the time effect is included, indicating that the fully mediated model is over-simplified.

The fifth test compares the simple chronological model with the complex chronological model and again, the results favor the complex model.

In summary, four different models fit the data well, with only very small differences between them in terms of GFIs.

6.11 Discussion

Kaplan and Norton (2001, p.90) argue that the final goal for businesses is to maximize shareholders' value. They suggest that companies adopt two different methods to achieve maximum economic value, namely revenue growth and productivity. Revenue growth strategy entails increasing current revenues by sales to new customers or by increasing sales to existing customers. Productivity strategy consist of two elements: enhancing cost structure by reducing direct and indirect expenses, and boosting fixed assets utilization to generate greater efficiency.

Airline firms are profit-seeking enterprises, and so they are expected to seek to increase shareholders' value by adopting revenue growth and/or productivity strategies. Therefore, the two financial measures considered for the purposes of this research are the operating revenues measure, which aims to capture the revenue growth strategy, and the operating expenses measure, which aims to capture the productivity strategy.

Kaplan and Norton (2001, p.89) state that "intangible assets seldom have value by themselves. Generally, they must be bundled with other intangible and tangible assets". They also described the value creation process as "multiplicative". Better employee training, higher load factor, or even higher market share are not expected to create value to airline firms by themselves. Indeed, it is the interaction between these non-financial indicators, and between tangible and intangible assets that creates and maximize a firm's value. This is consistent with Kaplan and Norton's (2001, p.89) statement that "... investing in just one of these capabilities, or all of them but one, could cause the new sales strategy to fail. The value does not reside in any individual intangible asset. It arises from creating the entire set of assets along with strategy that link them together"

On one hand, the results illustrated above are consistent with this argument, as the complex interplay models show better goodness of fit than simple models, implying that complex interrelationships exist between non-financial performance metrics and financial outcomes. In other words, value (measured by financial measures) is created through complex interaction and complicated linkages among firms' capabilities (measured by non-financial indicators).

On the other hand, Kaplan and Norton (1996) emphasize the causal relationship between non-financial measures and financial outcomes. The results illustrated in this chapter do not appear to support this emphasis, as the analyses do not support the fully mediated models which represent causal chains.

The results from this chapter and Chapter Five establish that interrelationships exist between multiple non-financial measures of performance and financial outcomes in both contemporaneous models and the time-effect models. However, these relationships do not appear to be causal, especially if we apply the three strict conditions for causality as listed by Norreklit (2000) and Malina et al. (2007) i.e. independence, time precedence, and predictive ability, taking into consideration that the causality criteria implies that occurrence of an event X automatically entails the ensuing occurrence of event Y (Malina et al., 2007).

These results are consistent with Maline et al. (2007, p.936) who describe similar results and conclude that statistically viable causal relations may not be essential to reach required control efficacy. In fact, it is managers' beliefs about the relationships between measures that underpins the control climate and directs the design and adoption of balanced scorecards. In contrast, Kaplan and Norton (1996) suggest the dynamicity of balanced scorecard via a chain of cause and effect relationships. Nevertheless, these results still support the dynamicity of the balanced scorecard but not the alleged causality which remains an assumption without robust evidence.

Considering the above criteria, it is hard to prove the existence of cause and effect relationships statistically. Maline et al. (2007, p.945) assert that "despite the widespread belief in cause-effect relations in performance measurement models, statistical validation of causality is not trivial. Empirically verifying cause and effect requires effective experimental controls that rule out alternative explanations and permit cause and effect inferences". Causal relationships cannot be deduced on the basis of covariation between

variables, and so theoretical deliberation is needed to explain the relationships between measures (Norreklit, 2000; Maline et al. 2007). Disproving causality should provoke other explanations of the interrelationships between non-financial indicators and financial outcomes within performance measurement models.

Previous studies in the literature (e.g. Norreklit, 2000; Maline et al. 2007) have provided three alternative explanations, namely interdependency, finality, and logicality relationships between organizational capabilities (gauged by non-financial indicators) and organizational performance (gauged by financial measures).

The interrelationship between measures is probably one of interdependence. Norreklit (2000, pp.75-76) refutes the causal relationship between performance measures, asserting that "...the cause-and-effect relationship is problematic, since claiming that some factors are necessarily profitable is problematic". Instead, he suggests that the four perspectives of the balanced scorecard are interdependent. Specifically, he states that "the influence between measures is not unidirectional in the sense that learning and growth are drivers of internal business processes, which are the drivers of customer satisfaction, which in turn is the driver of financial results". For instance, the financial success of a company will affect its ability to provide high-quality training to its staff, but the quality of training will itself affect a company's financial success. Our results are consistent with this thesis, supporting interdependency between measures through our partially mediated models which entail circular interpretation rather than cause-and-effect reasoning.

The interdependency explanation is consistent with the stakeholder perspective. The American Law Institute (1992, p.72) asserts: "... the modern corporation by its nature creates interdependencies with a variety of groups with whom the corporation has a legitimate concern, such as employees, customers, suppliers, and members of the communities in which the corporation operates". However, according to Freeman and Evan (1990) these interdependencies create multipartite contracting arrangements which, in turn, need monitoring devices to minimize information asymmetry between contracted parties (Hill and Jones, 1992). Thereby, performance measurement systems which include multiple performance measures (financial and non-financial) can be effective tools for satisfying the informational needs of multiple stakeholders.

Another possible explanation for the interrelationships between performance measures is that they are logical relationships, which "exist by human construction or definition and may be common elements of performance measurement models" (Malina et al., 2007, p. 962). Norreklit (2000) argues that accounting, as a human construct, involves logical relationships depending on calculus similar to those appear in mathematics e.g. the logic that debts and credits have an even balance.

Similarly, Malina et al. (2007) consider that management accounting systems are logical frameworks that measure firms' performance through the logic implanted by financial accounting rules rather than cause and effect relationships. For example, satisfied customers are not necessarily profitable; they generate profits if they yield revenues higher than associated costs of making them satisfied i.e. if they generate positive contribution margin (Ittner and Larcker, 1997; Norreklit, 2000). It could, therefore, be

concluded that many factors influence firms' performance besides their contingencies. However, causal assumptions imply that satisfied customers are automatically profitable.

Malina et al. (2007, p.963) assert that "Performance measurement models appear to be simplified combinations of key performance indicators, not fully specified accounting models". Our results contribute to this debate by confirming that fully specified complicated models fit the data better and hence represent reality more accurately. However, logical relationships are hard to detect in actual performance measurement models and it is difficult to capture and explain these relationships statistically (Malina et al., 2007).

A further explanation for these interrelationships between measures is the concept of finality, which comes from contingency theory. Finality mainly implies that, in a certain context, a given action leads to a favourable end (Maline et al., 2007). Particularly, in the context of relationships among measures within a performance measurement model, they state: "the complexity of relations, in conjunction with a lack of independence of phenomena, is an indication of finality rather causality". Finality relationships can also be linked with the stakeholders' management perspective. Donaldson and Preston (1995, p. 77) state: "the view that stakeholder management and favourable performance go hand in hand has become commonplace in the m anagement literature, both professional and academic". This implies that stakeholders' management leads to enhanced financial performance.

To sum up, this research suggests that the relationships between non-financial and financial measures of performance in any performance measurement system are a blend of interdependence, logical, and finality, together with the effect of variables specific to individual firms. However, statistical tests are inappropriate for justifying logical relations validity and may be inadequate for the assessment finality relations (Malina et al, 2007).

Taken together, these results imply the importance of understanding the underlying links among non-financial and financial measures of performance. This understanding is crucial for successful implementation of performance measurement systems that integrate financial measures with multiple non-financial measures such as Balance Scorecard and service profit chain. Such an understanding entails knowledge of how value drivers interact to create the current financial performance and to develop future performance. This would be beneficial in many ways; for example, knowledge of the underlying associations may suggest that companies can improve future value by means of maintaining long term relations with the skilled workforce by offering them attractive retirement packages.

6.12 Conclusion

Itnner and larcker (2003) recommended examining the relationships between means and ends within performance measurement models and exploring the financial outcomes of different relationships embedded in these models. This chapter investigates this recommendation by conducting multiple statistical tests.

The results displayed in this chapter confirm the hypothesis that measures within measurement models are related to one another. They also show that the relationships between non-financial indicators and financial outcomes are mediated by other non-financial information. Further, the tests conducted on various models suggest that value is created through a complex rather than a simple value creation process, which implies complex interplay between different measures of performance. Therefore, multiple performance measures are required to capture these interrelationships, which are best captured by dynamic rather than static performance measurement models. Finally, these interrelationships consist of a mix of finality, logicality, and interdependence relationships, which in turn are affected by a firm's specific contingent variables.

Figure 6-3 Model (1, 1, 1)

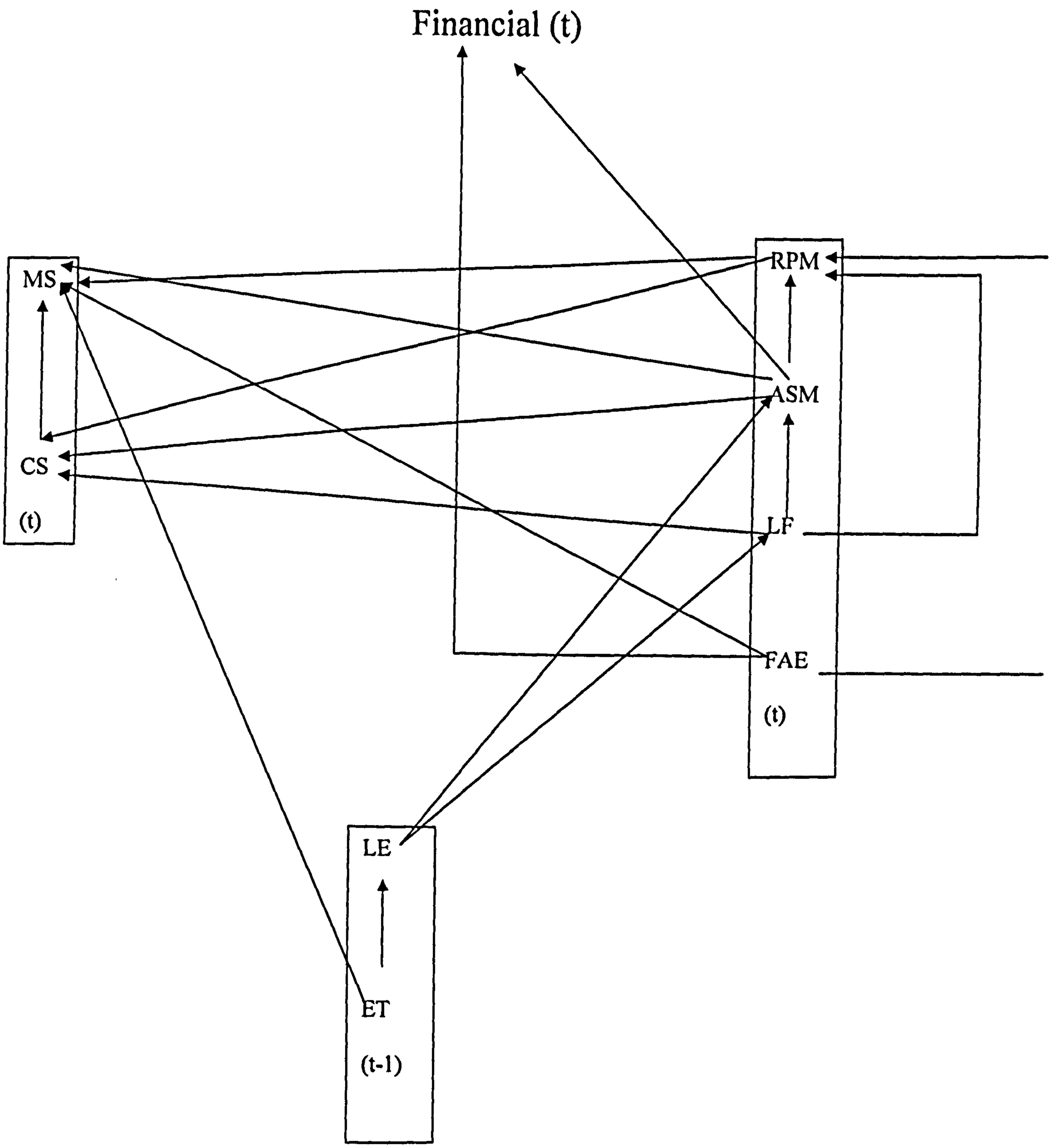


Figure 6-4 Model (0,0,1): significant paths

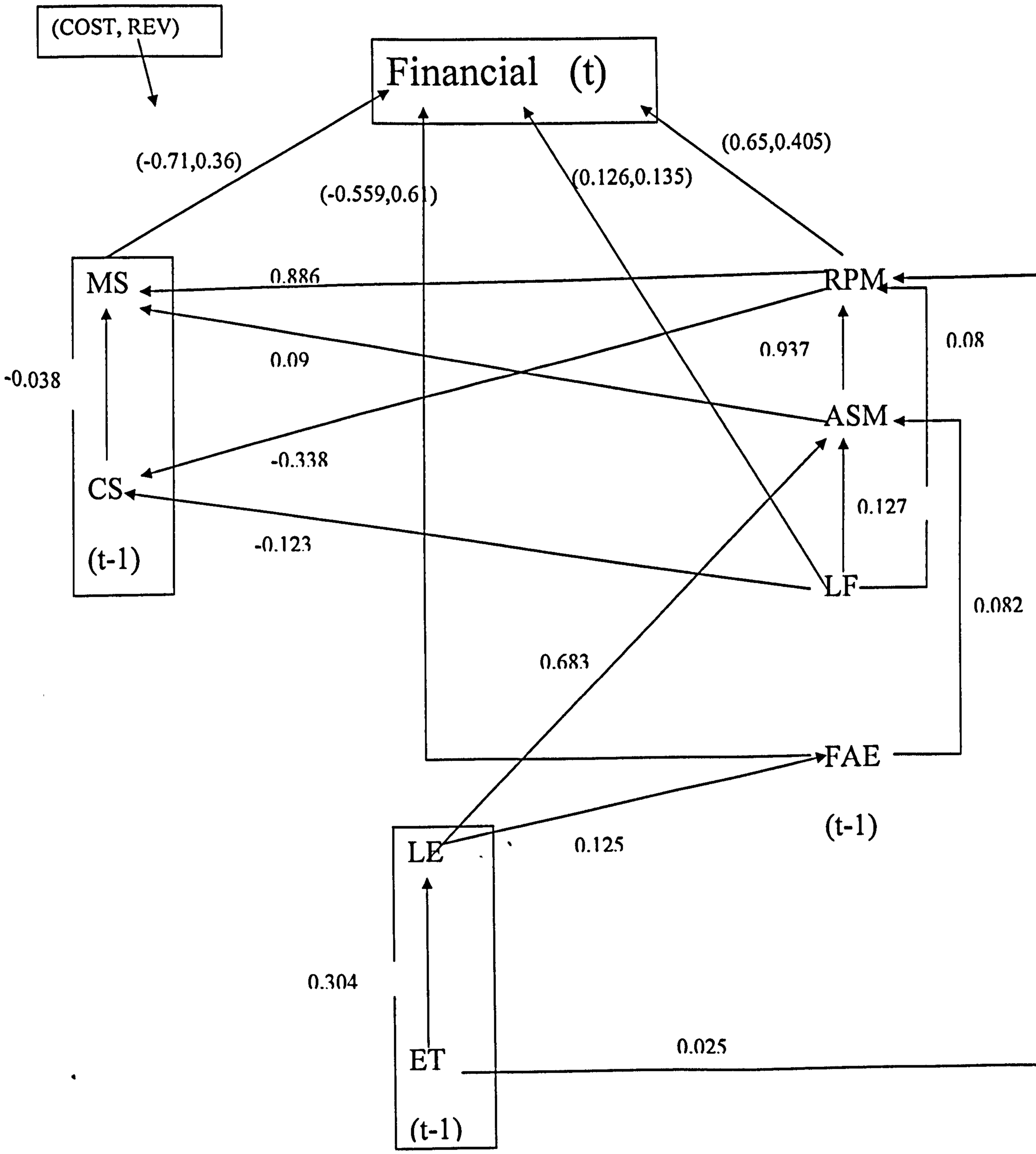


Figure 6-5: Model (1,1,2): significant paths

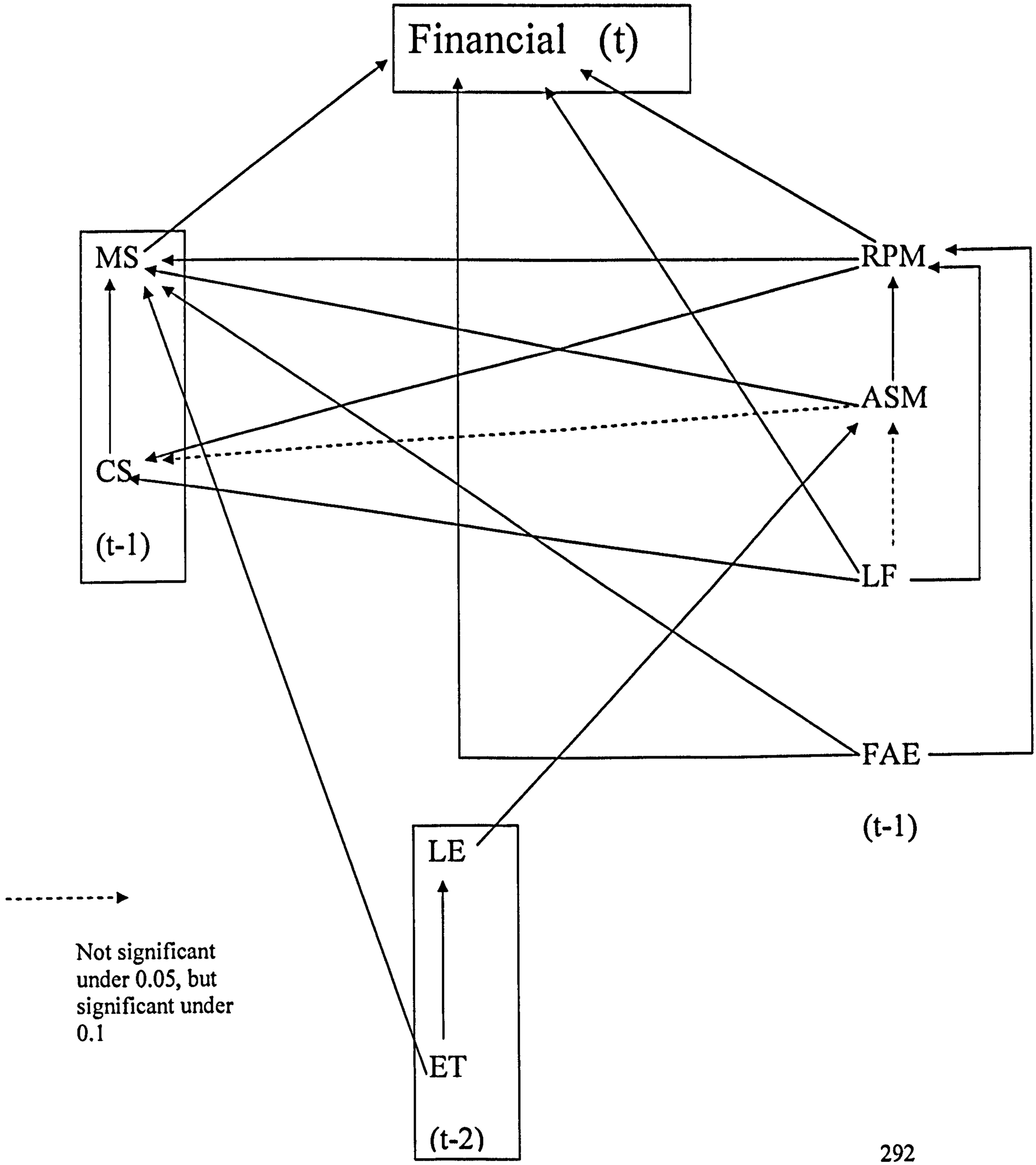
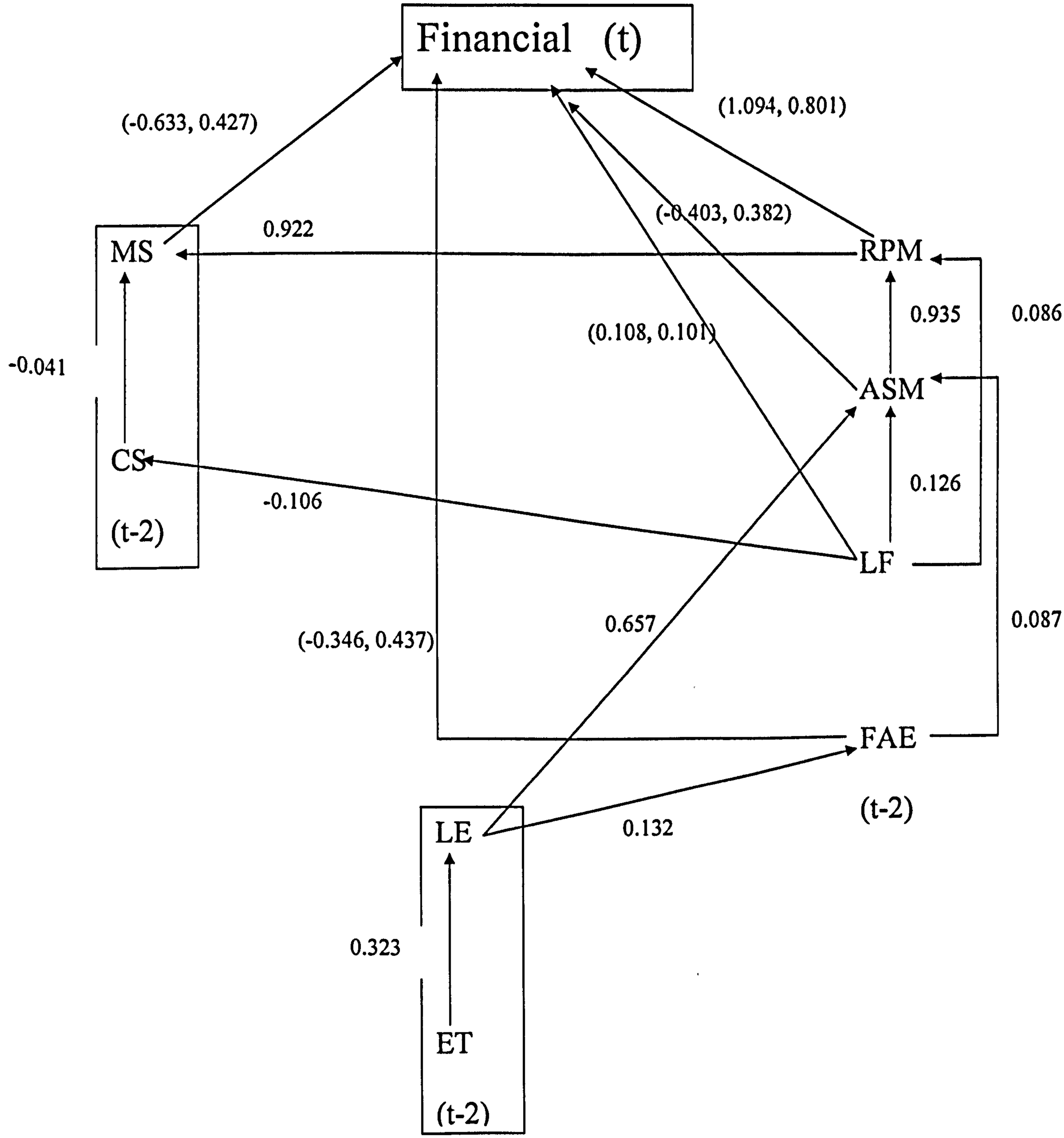


Figure 6-6: Model (0, 0, 2): significant paths



Chapter Seven

Conclusions

7.1 Introduction

It is clear that the actions managers take today affect the financial outcomes of tomorrow. Many of these actions are better captured by non-financial measures, which can be gathered and analysed much more quickly, allowing managers to take instantaneous corrective actions. They are also less exposed to managerial manipulation and inherent distortions.

Research has identified three criteria for high-quality measures of performance, namely: sensitivity, precision, and congruence (Banker et al., 2000). Non-financial metrics are sensitive insofar as they provide managers and organisations with early indications of what is happening before financial statements are prepared and precise insofar as they capture managerial actions and the controllable effects of these actions.

Contemporary businesses are increasingly competing on their intangible rather than their tangible capabilities. Non-financial performance measures are considered to be better indicators of these intangible assets, and they therefore provide more pertinent information to managers and directors and help to reduce myopic and dysfunctional behaviour.

Moreover, the concept of corporate performance has been broadened to include several goals beyond merely maximising shareholders' wealth. Organisations are held accountable to their stakeholders, and encouraged to generate sustainable value by maintaining good relations with these stakeholders. Accountability requires that organisations provide detailed information about their activities to a range of stakeholders to keep them informed.

Stakeholders, including stockholders, are keen to receive detailed forward-looking non-financial information rather than aggregated financial information to help them assess multifaceted organisational performance. Non-financial measures have the potential to minimise agency costs by reducing information asymmetry and providing more appropriate and timely information about managerial performance to enable more effective monitoring.

Marr et al. (2004, p. 312) state that "managers need to understand what are the key resources and drivers of performance and value in their organisations". However, if performance is measured using multiple measures without providing any indication of organisational priorities, subordinates may become confused about the critical value drivers. Therefore, it is important to understand the interplay between non-financial and financial measures of performance in order to grasp the roles they play in supplying information about firms' current and future performance and value creation process.

This research tests the information content of multiple non-financial measures, investigates the interactions between these measures, and seeks explanations of these interrelationships.

7.2 Study Overview

The literature review in Chapter Two revealed that, despite numerous studies urging the use of non-financial performance measures in management control systems, internal and external financial reporting, and managerial compensation, insufficient evidence is available on the relationship between financial and non-financial measures of performance. Previous studies have tended to oversimplify management control systems, investigating only a very small number of non-financial measures, and exploring their relationships with contemporaneous financial outcomes only in terms of bivariate relationships between these non-financial measures and financial performance. As a result, they overlook both the interplay between

different measures of performance within measurement models and the necessary tradeoffs that managers make between different performance measures. In addition, little evidence is available about the information content (as a selection criterion) of financial and non-financial measures of performance i.e. which measures contain more information, have most predictive value, and are the best indicators of future performance. Previous studies have tended to treat measurement models as static models, ignoring effect of time on the interaction between different performance measures despite the inevitable time lag between managerial actions and their consequences. Further, there is a lack of studies that address the relative information content of different performance measures. The lack of empirical studies in this area may be due to the lack of accessible primary data on non-financial perspectives of performance, which in turn is attributable to the fact that organisations do not report these measures of performance. Previous studies have either relied on self-reported measures of performance or limited the non-financial measures investigated to one or two measures such as customer or employee satisfaction. While these studies have provided valuable insights into the relationship between financial and nonfinancial measures of performance, they overlook the interrelation and multidimensional nature of performance. Therefore, management control systems comprising mu ltiple measures of performance, much more commonly used in practice, remain impenetrable, indicating the need to include more non-financial measures to accomplish better understanding of the performance measurement problem. A better understanding of the relationship between performance measures is crucial to enable the design of better performance and control systems by identifying the links between these non-financial measures and future financial performance. If particular measures show incremental information content and predictive ability to forecast future financial performance (e.g. predicting future revenues), they can be invaluable for the

managerial decision making process that requires such predictions to guide businesses' performance toward their favourable goals.

This research utilises quarterly secondary data from 31 American airline companies for nineteen quarters. The data set includes information on eleven nonfinancial metrics (employee training, labour efficiency, fixed assets efficiency, available seat miles (capacity), revenue passenger miles (traffic), load factor, airline's unit revenue, airline's unit cost, fuel efficiency, customer satisfaction, and market share) and three financial outcomes (operating revenue, operating expenses, and operating cash-flows). Consistent with Bruch (1994), these generic measures are presented in the form of ratios (percentage change compared to the same quarter of the last year). Ratios are also used to control for seasonality and size effects.

The measures are categorised according to the Balanced Scorecard, a widely accepted measurement model which has been chosen due to its multidimensional measurement as a reporting tool under stakeholder perspectives. Based on stakeholder-agency theory, these data are used to test two different although related concepts: information content and the interrelationships and interactions of multiple performance measures.

The information content section addresses two related concepts - incremental information content and relative information content of multiple performance measures - to answer three research questions: whether current non-financial measures provide information beyond that given by lagged financial measures in explaining current financial performance; whether current non-financial measures provide information beyond that given by current financial measures in predicting future financial performance; and whether non-financial measures have relative information content compared to financial measures in evaluating firms' performance.

To answer the first two research questions, this research adopts a standard methodology, as recommended by Biddle et al. (1995, 1997), investigating the statistical significance of regression slope coefficients. Incremental information content is evaluated by looking at *t*-tests of the individual coefficients and *F*-tests of the joint null hypotheses. The results of these tests suggest that multiple non-financial measures have incremental information content beyond that provided by financial measures for explaining contemporaneous financial outcomes. This quality appears to persist over time, and to reliably predict future operating revenues and operating expenses up to four quarters ahead, and operating cash-flows up to one quarter ahead.

Voung's (1989) test is deployed to answer the third research question by examining how close competing models are to the true distribution, and whether particular models are as close to the true distribution against the hypothesis that one model is closer than the other. However, the results of this test do not support the relative information content expectations: findings show that multiple non-financial measures of performance do not have relative information content compared to financial measures in explaining financial outcomes.

This research also conducts multiple lag tests, and utilises Akaike's Information Criteria (AIC) to carry out lag search. The lag search confirms the expectation of a time lag between actions captured by non-financial metrics and outcomes captured by financial measures. The lags range from one to four quarters, and vary between different non-financial metrics.

The interrelationships analysis examines relations within performance measurement models to explore the relationship between means and ends and to investigate the financial outcomes of this interaction between performance measures in accord with recommendations made by recent studies such as Malina et al. (2007) and Ittner and Larcker (2003). In particular, it

addresses four research questions: first, how non-financial measures are related to each other and to financial measures. Second, whether the data is more consistent with relatively simple or more complex relationships between non-financial and financial measures. Third, whether dynamic or static measurement models better fit the data. Fourth, whether non-financial measures are directly associated with financial performance, or whether other measures of performance from the same or other perspective mediate these relationships.

This research makes use of competing models strategy analysis, comparing different structural equation models to address these research questions. This analysis reveals that the interrelationships between non-financial and financial measures of performance are best captured by a complex partially mediated model that allows measures in lower rank to interact with measures in all higher perspectives in the balanced scorecard hierarchy, rather than an oversimplified fully mediated model that allows measures in one Balanced Scorecard perspective to be associated only with the subsequent perspective in the hierarchy. The results also support dynamic rather than static interaction within the Balanced Scorecard. The model which best captures the interplay between multiple non-financial measures and financial outcomes is found to be the model with a one quarter lag between multiple nonfinancial measures and financial outcomes. The complex interrelationships imply that relationships between non-financial measures financial outcomes are indirect and mediated by other non-financial information. These interrelationships between non-financial and financial measures of performance can best be described as a mix of interdependency, logical and finality associations rather than causal associations, as described by Kaplan and Norton (1996), which these models appear to refute.

This conclusion is consistent with mainstream management accounting research as summarized by Norreklit et al. (2006, p.53): "The paradigm is realism and the dimensions

applied relate to fact and logic. The fact dimension is included through measurements, particularly performance measurements, which are incorporated to direct attention to stakeholder demands, where different stakeholders have different demands. The accounting models and concepts, however, are logical constructs. The dimension of logic also governs the structure and response of the organization to the performance demanded by the environment. The relationships do not involve causality but finality". It is also consistent with principal-agent and positive accounting approaches where a rationalist paradigm entails logical constructions, where principals and agents utilize logical reasoning to optimize their contracts' outcomes and taking rational actions towards multi-dimensional stakeholders' interests. In other words, logicality implies that managers tend to steer their actions towards the achievement of rational goals, and therefore to apply rational/logical economic calculations in choosing between different potential decisions (Norreklit et al., 2006). Managerial rationality is believed to lead to better performance, given that rewards are linked to performance.

Finally, these results are consistent with earlier statements in the literature that organisational assets in general and intellectual knowledge based in particular are dynamic (Roos and Roos, 1997), bundeled together and interdependent (Wernerfelt, 1984), and interact with each other to create value (Lev, 2001).

7.3 Implications of the Study

It is important to consider the implications of this study's contribution both for academic understanding and for future research. This section discusses the implications for academic understanding; implications for future research are discussed in section 7.5.

This research seeks to improve our understanding of particular characteristics of non-financial measures of performance, in order to increase the quality of business reporting and of the design of performance measurement models.

The 1992 AICPA Jenkins Committee (chapter 1) made three recommendations for enhancing current business reporting to meet users' informational needs more effectively:

- Provide more information with a forward-looking perspective, including managerial plans, opportunities, risks, and measurement uncertainties.

- Focus more on the factors that create longer term value, including nonfinancial measures indicating how key business processes are performing.

- Better align information reported externally with the information reported to senior management.

After two decades, these recommendations appear to be still valid. The results of the current study suggest that numerous non-financial measures of performance can provide forward-looking information, that several non-financial measures are capturing the value creation process by integrating performance information with operational processes, and that, therefore, including these non-financial measures of performance in business reporting will provide incremental information to help different stakeholders understand the firm's performance, and to align external and internal reporting to allow different stakeholders to see the firm in the same way the management see it and consequently reducing the gap between management accounting and financial accounting reports.

Above and beyond the Jenkins Committee's recommendations, this research clearly demonstrates the importance of the incremental and relative information content of different

performance measures, giving a better understanding of their value to assist in decisions about th e inevitable tradeoffs between competing performance measures in performance measurement model design, performance evaluation, and managerial rewards systems.

The results indicate that non-financial measures of performance offer incremental information content beyond that provided by financial performance measures, implying that these non-financial measures can be used to mitigate the noise in the financial measures for contracting, evaluating, and rewarding managers. The results also confirm the interplay and interdependence between different measures of performance implying the need to incorporate more non-financial measures (subject to their information content) to capture these interactions.

The current research confirms the findings of previous studies such as Ittner and Larcker (1998) and Banker et al. (2000) that lags between non-financial measures and financial performance are short (less than a year). This has two implications: first, that these measures can be used for compensating managers by incorporating them in the managerial contracts. Second, that improvement in non-financial measures will pay off in the form of enhanced financial performance within a year. Therefore, managers do not need to compromise non-financial aspects by taking short term financial oriented decisions to enhance their compensation.

The current research highlights the multidimensional nature of performance, and hence the importance of using and reporting on multiple measures of performance. It confirms the value of emerging holistic business reporting systems which address a wider range of elements of a business's performance than financial reporting, and stresses the importance of considering the interests of all stakeholders rather than stockholders alone. Finally, this research has

demonstrated the interrelationships between measures and the effect of time on the interplay between non-financial performance measures and financial outcomes. This underlines that the value relevance of a particular measure of performance does not depend only on its own characteristics but also on its interaction with other measures. A clear understanding of these interactions informs managers about how, where, and when to intervene if performance begins to decline. These two elements [interrelationships and time effect] must be taken into consideration for performance measurement and management purposes, and can be used to reduce problems of moral hazard and adverse selection by enforcing measurement models that compel agents to act, based on the information they have, in the best interests of different stakeholders, and to provide the right feedback at the right time to guarantee goals congruence between different parties. This is consistent with goal-feedback theory (Locke et al., 1981), which contends that feedback is most valuable when it is related to particular goals, as this reduces the ambiguity of certain tasks and improves commitment to strategic objectives. If these non-financial measures capture strategic priorities then they will be able to provide effective feedback that assists managers to focus on the right activities for achieving organisation goals and enabling organisational learning which eventually leads to enhanced organisational performance.

7.4 Limitations of the Study

This research utilised cross-sectional archival data to surrogate generic measures of performance rather than actual measures of performance; these data are limited to the airline industry which allows findings to be generalized amongst similar firms. As a result, though, it is difficult to generalize these findings to other research settings, as the non-financial measures and their value relevance are industry specific. Also, measures adopted in this study (however important) are not necessarily used by all airlines.

The non-financial measurement methodology used in this study is based on generic measures that are not necessarily used in practice. Our sample included firms that may or may not use Balanced Scorecard, and hence these measures are not linked to firms' strategy as required by Kaplan and Norton (1996; 2001). However, Kaplan and Norton (1996) also argued that all Balanced Scorecards use generic measures (i.e. measures that appear in most organisations' scorecards (Kaplan and Norton 1996, p. 43)) that have a propensity to be outcome measures mirroring similar goals, structures and strategies among companies in the same industry or even across different industries. This accords with evidence provided by Lipe and Selterio (2001) that managers tend to rely on generic measures rather than customised measures.

This research is limited by the quarterly archival data, which may overlook effects that take place within shorter lag times, i.e. with less than three months between leading and lagging measures of performance. Also, although our lag search findings are comparable to the findings of previous studies in service industries such as hospitality (Anderson et al. 1994, Banker et al. 2000) and retail banking (Ittner and Larcker, 1998), these finding may not be valid for different settings where longer lags may exist due to less repetitive purchases.

This study investigated whether results differ between two subsamples (major and local airlines) to investigate whether characteristics such as the firms' size have an impact on the information content of different measures. However, other contingent variables (such as organisational structure, strategy, environmental uncertainty, and competition intensity) have not been investigated.

Finally, the findings of the SEM analyses are limited to this research model specification and there is no guarantee that this is the best model. However, it is a good model among many possible ones.

Despite the above limitations, this thesis, together with those previous investigations discussed in the literature review chapter presents an evaluation of the incremental information content of financial and non-financial measures of performance and interrelationships among multiple nonfinancial and financial performance measures.

7.5 Directions for future research

This study highlights many possible avenues for future research. There is much scope for examining different performance measures within different industries to explore whether the results of this study are still valid in different environments, and if its inferences apply to different non-financial measures of performance. Future research could also adopt a case study approach combined with interviews to tackle softer, more subjective issues. It would also be valuable to explore how the concepts of incremental and relative information might be linked with managerial remuneration.

This research has found that different lags exist between different non-financial measures and financial performance. As a result, future research could investigate the potential reasons for this variation.

It would also be fruitful to direct future research to investigate the relationship between different contextual variables and the incremental value of different performance measures. Also, future research could investigate the links between non-financial measures of performance and problems in corporate governance and earnings management.

Finally, this research addresses the importance of introducing the time dimension into the balanced scorecard. Therefore, future research could take this contribution further by building an interactive performance measurement models.

7.6 Concluding Remarks

This research shows that - after controlling for previous financial performance, seasonality and size - multiple current non-financial performance measures, in its research setting, are significantly associated with current financial performance, as measured by operating revenues, operating expenses, and operating cash flows. It demonstrates that multiple current non-financial performance measures are significantly associated with future financial performance as measured by operating revenues and operating expenses, but not with operating cash-flow. As a result, these non-financial measures seem to offer incremental information content for explaining current financial performance, and predictive value for predicting future operating revenues and expenses.

Previous studies have suggested that non-financial performance measures are better indicators of future financial performance than financial measures; justifying this argument on the basis of causality. However, this research appears to refute this explanation, suggesting instead that the value creation process and the interaction between non-financial measures and financial outcomes can best be understood as the result of logicality and finality relationships (subject to firms' contingences), alongside interdependency between measures.

This study has shown that several non-financial measures are also related to each other, with time lag between means and ends. The complex interplay models show better goodness of fit than simple models, implying that complex interrelationships exist between non-financial performance metrics and financial outcomes. In other words, value (measured by financial measures) is created through complex interaction and complicated linkages among firms' capabilities (measured by non-financial indicators). These interrelations highlight the existence of interactions between performance measures within measurement models,

implying that different stakeholders can jointly participate in the value creation process. The study also suggests that measurement models are dynamic rather than static. These findings should be taken into consideration in the design of measurement systems, in order that they might encourage superior performance by selecting the right measures and understanding the interplay between these indicators and long-term financial outcomes.

To conclude, it is important that more non-financial performance measures be introduced into contemporary reporting systems. Non-financial measures have to be linked to the financial outcomes by logical and finality relationships, which in turn must be validated through significant statistical associations between the non-financial measures themselves and with financial performance by significant path models. These significant non-financial measures, which matter to superior performance, can help to clarify what drives organisational performance, and consequently can be used to align managerial behaviour with organisational goals by linking performance in these measures with their remuneration. They can also be used to predict future performance besides assessing current performance. However, high quality performance measurement systems will not guarantee high quality performance unless accompanied by a strong organisational culture and infrastructure, and a proper alignment between employees and the system (McNamara and Mong, 2005).

Taken as a whole, and in contrast with with Jensen (2002), this research suggests that organisations should have multiple scorecard-value objectives rather than a single-valued objective in order to satisfy different stakeholders, whose final objective should be to create value and maximise long term sustainability. These scorecard objectives can be represented by multiple performance measures in order to capture the interrelationships between multiple objectives. However, it is important to differentiate between measures of performance and drivers that affect them. It is also important to understand the links between these drivers and

performance, so that managers can create structures that enable them to function optimally in the contemporary dynamic business environment. Understanding the links between performance measures and performance is crucial in helping managers to make unavoidable decisions about the tradeoffs between the interests of different stakeholders, while the ultimate goal/criteria is value creation/maximisation for the sake of all stakeholders.

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