MULTIPLE PERFORMANCE MEASUREMENT AND MANAGEMENT SYSTEMS IN AUSTRALIAN BUSINESS ORGANISATIONS

BY

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Abstract

There has been widespread adoption of the performance measurement and management systems (PMMS) including both financial and non-financial measures. Despite the literature advocating the benefits of PMMS, the empirical work is insufficient, and the synthesis of the findings is minimal. Based on the findings of prior case studies, survey research, and the normative guidelines about the design and implementation of the multiple perspectives performance measurement and management systems (PMMS), mainly the Balanced Scorecard, a questionnaire-based study was conducted to explore PMMS on the following: (1) types and extent of PMMS benefits; and (2) identification and evaluation of primary determinants of PMMS success, and complementary organisational, PMMS champion, use and design determinants. Responses were received from 135 business organisations, listed on the Australian Stock Exchange.

The research clearly identifies the usefulness of PMMS in strategic uses and financial improvements, and demonstrates wide use of PMMS in business functions and processes. The relevance of twenty-nine itemised primary determinants of PMMS success has been strongly supported, as well as the paramount importance of properly established causal links between drivers and outcomes of performance. Further, the degree of PMMS integration with other managerial tools, and PMMS organisational pervasiveness, or scope of PMMS use, have also been found to be highly important for PMMS success. Based on these findings, appropriate suggestions were formulated to assist practitioners in developing and refining PMMS in organisations.

I, Zdenko Miholcic, declare that the DBA thesis entitled ***Multiple performance measurement and management systems in Australian business organisations*** is no more than 65,000 words in length, exclusive of tables, figures, appendices, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Signature [redacted] Date 24/8/06

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Chapter 1 Introduction

1.1 Emergence of PMMS

Substantial changes, often characterized as 'revolutionary' (Eccles, 1991), in methods of performance measurement and management have occurred during the past decade, resulting in enormous development of methods of management control based on non-financial performance measurement. It is held in almost universal agreement among researchers that, to a considerable degree, these changes have been driven by changes in the business environment, resulting in increased globalisation and stiffening competition (Kald and Nillson, 2000; Chenhall and Langfield-Smith, 1998a; Kaplan and Norton, 1996c). Increased competition is forcing companies to review ways of becoming more efficient and effective. These challenges have imposed new demands on business, including broader product lines, higher quality, on-time delivery, and lower prices. As a consequence, companies have increased their investment in research and development, new technology, and new processes (Kaplan and Norton, 1996c; Bromwich and Bhimani, 1994).

In the face of these new challenges, serious deficiencies of traditional methods of management control have been recognized, particularly the inability of traditional financially oriented systems and measures to present a complete picture of corporate performance (Kald and Nilsson, 2000; Kaplan and Norton, 1996c). Subsequently, numerous academics and practitioners have discussed and criticized the use of traditional financial performance measurement in planning and monitoring organisational performance. Early critics have pointed out a number of shortcomings of traditional financial management control systems. In particular, performance measurement was alleged to 'concentrate too much on the past', to 'focus excessively on the short run', and to 'overemphasize the financial aspects of the business' (Eccles, 1991; Johnson and Kaplan, 1987). Changes in business environment, together with the debate on inadequacies in financial performance measurement, acted as a catalyst for the development of managerial innovations for organising and managing performance,

encompassing a wide range of concepts and frameworks. Organisations were prompted to expand the measures used to evaluate execution of business strategy, and to complement traditional measurement practices. This has led to increased recognition of customer, employee, process, and other non-financial measures, and their relevance for organisational performance, and to the development and design of the 'Balanced Scorecard' and other systems and frameworks of integrated financial and non-financial measures (Ittner and Larcker, 2000).

In recent years, the topics of non-financial organisational performance measurement and management in general and the Balanced Scorecard in particular have been frequently discussed in the professional and academic literature. At this point of time, the idea of the Balanced Scorecard, set forth and developed by Kaplan and Norton (1996a,b,c, 1993, 1992) has gained significant acceptance in managerial circles in a number of countries. Estimates have put the number of the 1000 largest listed companies in the U.S.A, using the Balanced Scorecard, to approximately 60 percent (Silk, 1998), and the worldwide estimate by Rigby (2001) was 44 percent.

On the supply side, these changes have been paralleled by a proliferation of theoretical concepts, models, and frameworks, and subsequent commercialization of innovative management tools and software packages, by management consultants, software developers, conference organisers and other vendors. The topic has become increasingly prominent in popular managerial press, and has been promoted and discussed on numerous internet sites. The Balanced Scorecard computer packages and similar systems are provided by several software vendors, who also may provide training and other consultancy services related to the installation and maintenance of their systems.

1.2 Rationale for research

In parallel with the development in many other economies, in Australia there has been a particular interest in ways to improve performance measurement, resulting in wide adoption of the performance measurement and management systems (PMMS),

comprising several non-financial performance perspectives populated with various measures of performance, in addition to traditional financial measures. An increasing number of organisations have adopted performance measurement systems with non-financial metrics, such as Telstra, Carter Holt Harvey, Australia Post, Westpac, Australian Central Credit Union, Unilever Foods, BASF, ATSIC, Colgate-Palmolive, Bicentennial Park, Sydney Theatre Company (Creating the Strategy-focused Organisation with the Balanced Scorecard, conference, 2000), Ansett Australia, Meadow Lea Foods, Qantas Airways, Ericsson Australia, Nestle, AMP Society, TNT Australia, St George Bank, Arnotts, Uncle Toby's, National Mutual, Commonwealth Bank, Toll Logistics, Whirlpool Australia, Western Power Corp, Zurich, Polygram Australia, KPMG, NCR Australia, O'Brien Glass, Integral Energy, Ampol, CSR Emoleum, DHL International, ICI Pharmaceuticals, Pioneer International, Citibank, Orica and CSR (Watty, 2001; How to use the Balanced Scorecard as a Strategic Management System, conference, 1998)

High rates of adoption of the Balanced Scorecard and other similar non-financial systems in a variety of settings, including corporate, governmental, non-profit and other organisations, have been reported (Walsh, 2000). PMMS are being widely deployed throughout industry, government, and other types of institutions. Applications within business organisations proliferate (Hoque and James, 2000; Chenhall and Langfield-Smith, 1999a & b; 1998a & c), and many organisations have now developed PMMS across various organisational processes and managerial levels.

As PMMS are being widely applied in Australian business organisations, and investment in PMMS grows, the need to investigate and report a number of PMMS issues becomes apparent. The rapid commercial development and diffusion of ideas and practices of the multiple performance measurement and management systems have not been paralleled with the scientific research into the true value and usefulness of such systems. In contrast to wide adoption of PMMS, chiefly the Balanced Scorecard, neither comprehensive literature nor large-scale empirical research exists on the topic of PMMS in Australian

business organisations, except for the universally acknowledged survey studies by Chenhall and Langfield-Smith (1998a & c) and Hoque and James (2000).

Despite the case studies and conferences promoting the virtues and alleged benefits of PMMS, the literature is fragmented, and weighs heavily towards anecdotes and conceptual frameworks, with insufficient empirical work and minimal synthesis of findings. As the number of organisations implementing PMMS increases and applications within organisations proliferate, identification and empirical confirmation of the determinants and the complementary factors important to success becomes essential.

1.3 Contribution to knowledge

In contrast to a relatively large body of scientific research into other managerial tools and innovations developed in the last ten to fifteen years, much of the research concerned with the Balanced Scorecard and other multiple performance perspectives systems is anecdotal. It is motivated by business generating interests of participating consultancies, software vendors and other interested parties, and mainly focused on conceptual frameworks to encourage and assist managers in PMMS implementation. In consequence, the majority of the reported research is biased in favour of presenting only highly successful cases. The professional sources, including consultancies, PMMS networks (e.g., bsconline.com) and discussion forums assert that the large number of PMMS in itself is an indication of the systems' successful implementation. The PMMS case studies and vignettes, such as those on Mobil Oil, CIGNA, Metro Bank and National Insurance (Kaplan and Norton, 1996c) report successful implementation of specific PMMS, predominantly the Balanced Scorecard and its variants, and the significant, and sometimes "phenomenal" (Kaplan and Atkinson, 1998, p. 395), benefits from the system. The narrative typically emphasizes the capacity of PMMS to produce a significant sustainable competitive advantage to the organisation using the system, and the ability to turn around the previously abysmal organisational performance to hugely successful (Kaplan and Norton, 1996b & c). In contrast, in Australia Chenhall and Langfield-Smith (1999a & b) have provided far more informative and impartial reports on the adoption

and implementation of innovative management accounting systems, including the Balanced Scorecards and key performance indicators, in five manufacturing companies.

As noted by several authors (Chenhall, 2004; Davis and Albright, 2004; Ittner and Larcker, 1998b), very few studies have attempted to provide the objective evidence of the impact of the PMMS on the 'bottom line' and other organisational outcomes, that is, the causal relationship has not been documented and elaborated upon. In Australia, the Balanced Scorecard software vendors (Penny, 1998) have so far delivered only one presentation paper on calculating the actual financial returns from implementing the Balanced Scorecard, which is conspicuously insufficient given that the Balanced Scorecard packages have been intensely promoted and solicited for the last nine to ten years. Conference and seminar presenters have elaborated on an array of other Balanced Scorecard aspects.

Despite "the balanced scorecard buzz, propelled by the ceaseless proselytising of its creators" (Schatz, 2000, p.40) and numerous consulting firms, apart from the studies mentioned in the preceding paragraphs, no other systematic critical analyses of the PMMS efficiency in Australian organisations have been conducted so far. Consequently, existing literature provides little evidence of a relationship between the use of PMMS and changes in organisational performance. Thus, by achieving the aims of the research, an original contribution to the body of knowledge on the PMMS has been made.

The confirmatory and exploratory research reported in this dissertation attempts to redress this imbalance, and was undertaken as a step towards developing an empirical basis covering many different aspects of PMMS in Australian business organisations. The findings of empirical study in the Australian top 500 organisations listed on the ASX enhance the general knowledge and understanding of the implementation issues, design, use and benefits of PMMS. This has been achieved through collection and analysis of survey data on the status of PMMS in organisations, determinants, and performance consequences of the multiple non-financial performance measurement and management in Australian business organisations. The focus of the study was the PMMS at a strategic

level. The broad research objectives were to carefully evaluate the benefits of PMMS, to better understand the factors related to success or failure when applying the PMMS, and to ascertain why some organisations are more successful than others with PMMS applications.

1.4 Research aims

The primary aim of the research was to systematically identify and empirically test and evaluate the comprehensive set of determinants, i.e., the success factors and barriers, of PMMS benefits in Australian business organisations. The likely determinants and PMMS benefits were identified in the literature. This study draws from several bodies of literature, predominantly the general normative and prescriptive literature on the design and implementation of the Balanced Scorecard, and other PMMS conceptual frameworks, and, to a lesser extent, case studies and survey-based empirical investigations. Data on primary determinants and benefits of PMMS were collected from a national survey of top 500 organisations listed on the Australian Stock Exchange, and were used to ascertain the actual relevance and extent of identified determinants and benefits, as well as the degree of association between the determinants and benefits.

In addition, the broad set of data on the design and use of PMMS was collected, to illustrate the PMMS practices, and to investigate any differences in the extent of benefits that may be associated with the different PMMS structures and applications, and with the use of other innovative managerial tools. The differences in perceived benefits were also investigated on the basis of the demographic information on the respondents and their organisations.

The research hypotheses about the differences in the perceived benefits of the PMMS were non-directional, with a few exceptions. For the most part, the testing of the hypotheses was conducted for exploratory purposes, as no conclusive direction of the differences could be ascertained in the phase of the review of the literature on the PMMS use and design, as well as the respondent/PMMS champion and organisational

characteristics. Based on the findings by Hoque and James (2000), the size of organisation was assumed to be positively associated with the extent of PMMS benefits, and the variables of size were correlated with the PMMS benefits grouped into four distinct variables. Time in use of PMMS was also assumed to be positively correlated with the PMMS benefits. Direction of association between the primary determinants of PMMS benefits and the PMMS benefits was determined in accordance with the broad character of particular determinants, such that all success factors were assumed to be positively associated with the PMMS benefits, and all PMMS barriers negatively.

The entire set of the primary determinants of PMMS benefits, and other potential factors effecting the extent of PMMS benefits, as well as PMMS benefits, is presented in Table 1.4.1, as are the directions of the tested hypotheses.

Table 1.4.1 Constructs, variables and hypotheses

Constructs	Operational definitions	Direction of research hypothesis (association b/w independent and dependent variable)
	Dependent variables	
1. PMMS benefits	1. PMMS use for strategic purposes	
	2. Functional/managerial use of PMMS	
	3. PMMS use in specific decision areas	
	4. PMMS dollar benefits estimate	
	Independent variables	
1. PMMS success determinants	1. Success factors	Positive
	2. Barriers	Inverse
2. Organisational complementarities of PMMS success	1. Organisation industry	Not specified
	2. Organisation size - no. of employees	Positive
	3. Organisation size - market capitalisation	Positive
3. Use complementarities of PMMS success	1. Time PMMS in use	Positive
	2. PMMS use status relative to competitors	Positive
	3. Number of org. levels PMMS used	Not specified
	4. Use of other innovative managerial tools	Not specified
4. Design complementarities of PMMS success	1. PMMS type	Not specified
	2. Number of performance perspectives	Not specified
	3. Number of performance measures	Not specified
	3. PMMS software source	Not specified
	4. Cause - effect link b/w drivers and outcomes	Not specified
5. PMMS champion complementarities of PMMS success	1. Position in organisation	Not specified
	2. Primary area of expertise	Not specified
	3. Position tenure	Not specified
	4. Organisation tenure	Not specified
	5. Formal responsibility for PMMS	Not specified
	6. Level of education	Not specified

1.5 Overview of the dissertation

The dissertation is structured as follows. Chapter 1 is an introductory section, presenting the rationale for the study and the research aims. Chapter 2 gives a review of the scholarly and professional literature regarding the types of PMMS, their principal uses and organisational benefits, as well as the primary and complementary factors effecting the success of PMMS. Research design and methodology is explained in Chapter 3, including the sampling considerations, data collection, measures, variables, and selection of statistical tests. The findings of the study are presented and discussed in Chapter 4. The study conclusion is given in Chapter 5, with a summary of the study contribution and limitations, and recommendations for future research.

Chapter 2 Literature Review

2.1 Operationalisation of the PMMS

2.1.1 Introduction

The baseline definition of the PMMS in this study refers to systems that comprise a set of performance measures that are multi-dimensional (Kennerley and Neely, 2002), with at least one performance measurement area, in addition to the financial measures and indicators. Such a definition corresponds to the concept of "a mixture of financial and non-financial measures" (Kaplan and Norton, 2001a, p. 94), or "collections of financial and non-financial measures organized into three to five perspectives" (Kaplan and Norton, 2001a, p. 97). Such 'measurement diversity' is characterized by the supplementary, rather than integrative, use of the non-financial measures. The approach was identified in the early works of Kaplan and Norton (1993, 1992), by Ittner et al. (2003), and has been categorized as 'key performance indicators', or 'key result areas' by Chenhall and Langfield-Smith (1999a & b). A more complete definition has been formulated by Sinclair and Zairi (1995, p. 50), who point at the organisational pervasiveness and the purpose of PMMS: "A PMMS measurement system can be defined as a system which integrates the measurement of non-financial performance at all levels within the organisation with a view to the continuous improvement of performance against organizational objectives". The use of financial and non-financial measures at all levels of organisation has been emphasized by Gautreau and Kleiner (2001), who note that, in the past, financial measures were used primarily to evaluate senior management's performance, while non-financial measures were used at lower levels.

Apart from the simple and straightforward commonality of comprising of measures in several performance areas, there are several other similarities in PMMS frameworks and models. Various models propose different numbers and structure of distinct performance dimensions as important to the organisation's success. The notion of 'balance' among the measures is another feature of contemporary PMMS models, most notably in works

of Kaplan and Norton (2001c, 1996c, 1992) on the Balanced Scorecard, who suggest that the measures should provide a 'balanced' picture of the business.

Although the review of the literature suggests a certain level of agreement about PMMS, manifest through a shared set of concepts about the way PMMS are classified and their features, different models or frameworks of PMMS place varying emphasis on the extent to which they "...consider multiple stakeholders; measure efficiency, effectiveness and equity; capture financial and non-financial outcomes; provide vertical links between strategy and operations and horizontal links across the value chain; provide information on how the organization relates to its external environment and its ability to adapt" (Chenhall, 2003, p. 136). In consequence, expected benefits and satisfaction are likely to vary depending on the different configurations of controls (Otley, 1999), i.e., the concrete type of PMMS used (Speckbacher et al., 2003).

As pointed by Kennerley and Neely (2002), and Bititci et al. (2000), the need for more integrated, strategic and balanced PMMS has been identified in mid and late 1980s, most notably in the work of Johnson and Kaplan (1987) and McNair and Masconi (1987). This has been followed by the enormous development of frameworks, models, methodologies, tools and techniques to implement and support new performance measurement systems such as the Balanced Scorecard (Kaplan and Norton, 1992), Performance Pyramid (McNair et al., 1990; Lynch and Cross, 1991) and Performance Measurement Questionnaire (Dixon et al., 1990).

With regard to the possible inherent advantages of a particular PMMS, it has been suggested that each PMMS framework or model has merits, and that no single framework, or simple approach to developing performance metrics (Chenhall and Langfield-Smith, 1999b) is sufficiently robust in today's constantly changing conditions (Miller and Israel, 2002). Given that different models are used for different purposes, it is important to select the PMMS model in accordance with the organisation's specific strategic needs (Olve et al., 1999).

2.1.2 PMMS frameworks

Balanced Scorecard

The most popular PMMS system is the Balanced Scorecard. It has been steadily gaining in popularity for the last ten years, and has been intensely promoted by a number of consultants and software vendors. According to Neely and Bourne (2000), between 40 and 60 percent of large US firms have adopted the Balanced Scorecard, while in Australia the scorecard software vendor Renaissance Worldwide estimated in early 2000 that about 30 percent of largest companies have introduced the Balanced Scorecard. Kennerley and Neely (2002) attributed the Balanced Scorecard's widespread adoption to the framework's alleged simplicity and intuitive logic, which has made it easily understood and applied by users in organisations. Tiwana and Ramesh (2000) emphasized the robustness of the Balanced Scorecard, which has enabled the successful application in many industries, as elaborated on in several case studies (Kaplan and Norton, 1996b & c).

According to Olve et al. (1999), the concept of the Balanced Scorecard has taken differing forms in different organisations, as a result of the way the scorecard is used in the organisation. This makes the Balanced Scorecard difficult to define in a concise manner. Banker et al. (2002, p. 1) have defined the Balanced Scorecard as a "comprehensive performance measurement system designed to systematically link a firm's vision and strategy to a set of performance measures related to current and ongoing actions and decisions". Olve et al. (1999) have pointed at a more basic use of the Balanced Scorecard, as a means of showing a thorough and meaningful picture of a business, with the ultimate purpose of creating a learning organisation.

The Balanced Scorecard concept was introduced by Kaplan and Norton in 1992, as a measurement tool for translating organisational vision into a set of measurable strategic and tactical objectives. The concept focuses equally on the performance results, and on the processes of arriving at successful results (Gautreau and Kleiner, 2001). The measures in the Balanced Scorecard are viewed cross-functionally, in order to avoid

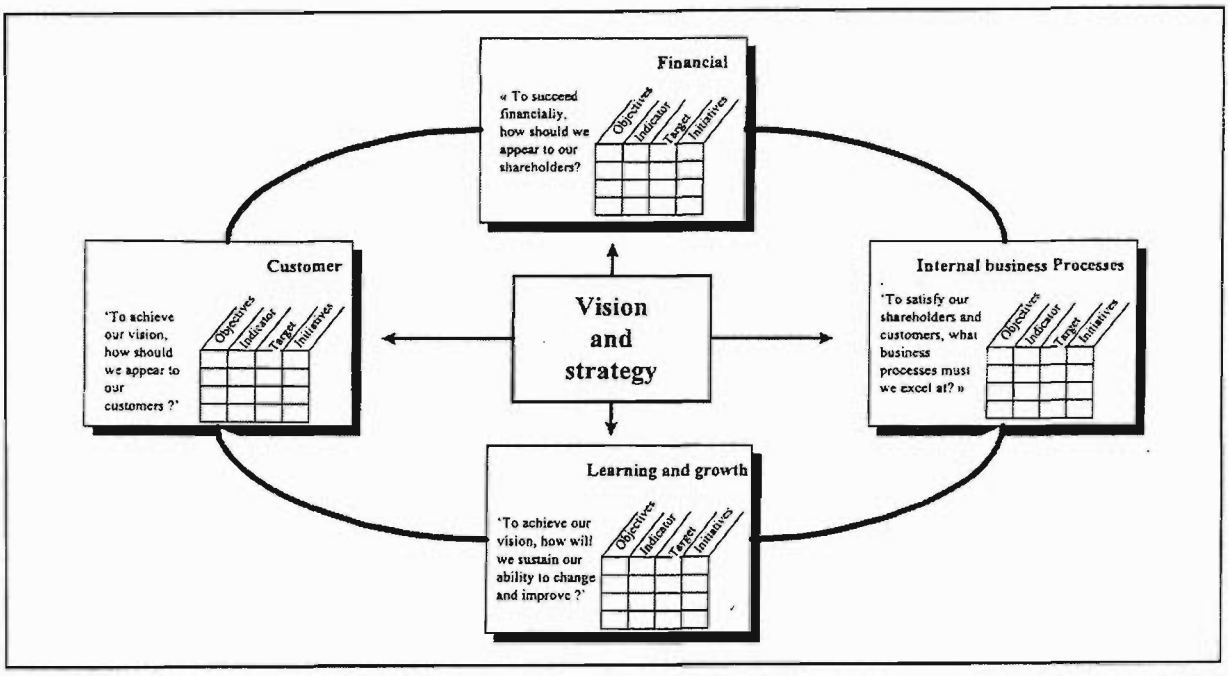
measures of performance which make the one function look good while deflating another. The concept requires the users to limit the number of measures to a limited number of critical key measures in performance target areas, so that managers can obtain a quick and comprehensive assessment of the organisation in a single report, to communicate a view of the organisation's strategy, and to track whether improvement in one area is being achieved at the expense of another area (Kaplan and Norton, 1992).

The Balanced Scorecard model disaggregates and measures overall organisational performance and well-being from four interconnected strategic business perspectives, namely the financial, customer, internal business process and learning and innovation (Kaplan and Norton, 1996c, 1992). The four perspectives of the scorecard permit a balance (Kaplan and Atkinson, 1998, p. 375):

1) between short and long-term objectives;
2) between external measures – for shareholders and customers – and internal measures of critical business processes, innovation, and learning and growth;
3) between desired outcomes and the performance drivers of those outcomes; and
4) between hard objective measures and softer, more subjective measures.

For each of the four performance perspectives, or dimensions, the organisation must specify objectives, indicators, and targets, and also describe specific initiatives or activities that match the targets. Performance objectives and measures for each perspective are selected and specified following the identification of the main drivers of performance (Kaplan and Norton, 1992). Each perspective is directly tied to organisational strategy, and strategically linked performance objectives and measures flow from these perspectives, which ensures that short-term operational control is linked to the long-term vision of the organisation (Olve et al., 1999), as shown in Figure 2.1.2.1.

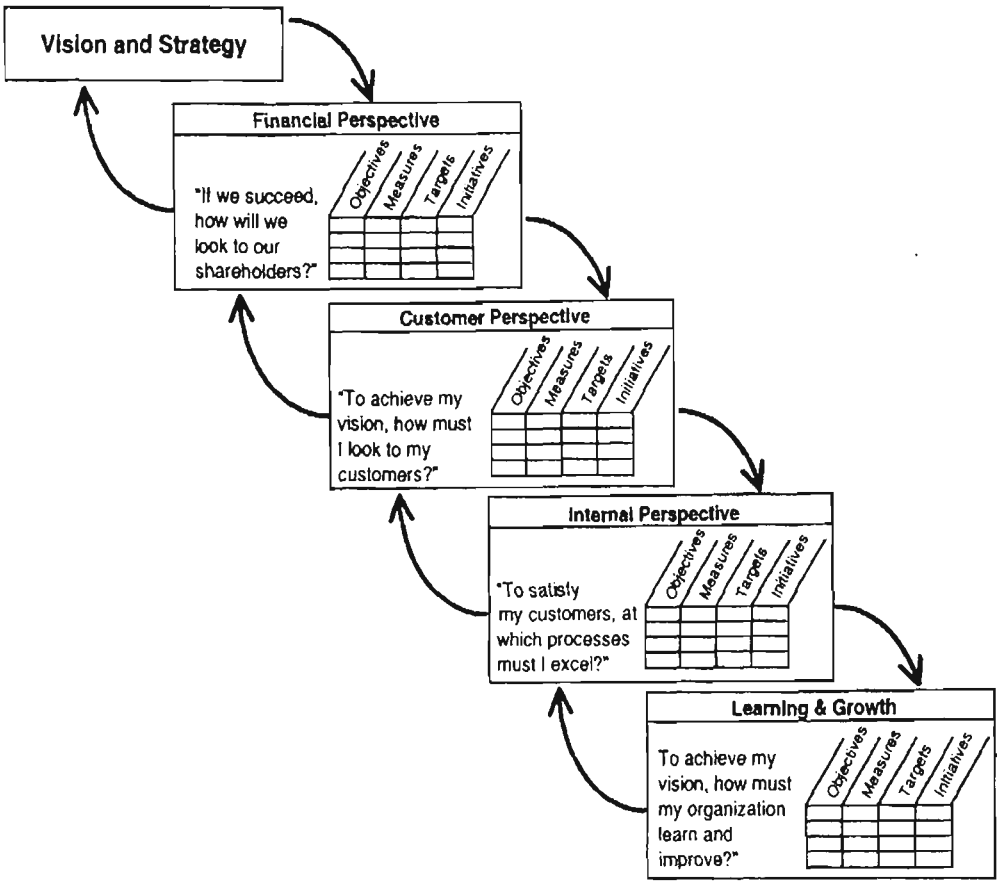
Figure 2.1.2.1 Balanced Scorecard



Source: Kaplan and Norton, 1996b, p. 76

In the Balanced Scorecard, the financial perspective becomes the leading perspective as organisations first identify their strategic financial objectives. These objectives then facilitate the identification of objectives and measures for the other three perspectives that influence financial outcomes. The framework assumes the hierarchy, or causal links, among performance dimensions, where customer satisfaction drives financial success; effective and efficient business processes ensure high levels of customer satisfaction; and sustained, continuous improvement enhances the organisation's operational performance, as presented in Figure 2.1.2.2.

Figure 2.1.2.2 Causal links in the Balanced Scorecard



Source: Kaplan and Norton, 2001a, p. 91

As pointed out by Tiwana and Ramesh (2000), components of the Balanced Scorecard are designed in an integrative fashion such that they reinforce each other in indicating both the current and future prospects of the company, so that the scorecard can be used as a means of organisational planning and control.

Evolution of the Balanced Scorecard concept

Since the initial publication in the Harvard Business Review in January 1992, the concept of the Balanced Scorecard has been interpreted in many different ways. As suggested by Andersen (2001), the Balanced Scorecard was originally proposed (1992) as an approach to performance measurement that combined traditional financial measures with non-financial measures to provide managers with richer and more relevant information about

organisational performance, particularly with regard to key strategic goals. By encouraging managers to focus on a limited number of measures drawn from four 'perspectives', the original Balanced Scorecard aimed to encourage clarity and utility. Despite the prescriptive suggestion that performance measures should be closely linked to strategic priorities, the early scorecards appeared to be poorly aligned with the strategy. Kaplan and Norton wrote that many companies "claim to have a Balanced Scorecard because they use a mixture of financial and non-financial measures" (2001a, p. 94). As reported by Walsh (2000), early scorecards in Australian organisations were interpreted as a simple diverse set, or mix, of financial and supplementary non-financial measures, or key performance indicators, grouped into focus areas. According to Ittner and Larcker (2000), such "measurement diversity" was considered useful in preventing managers from sub-optimising by ignoring relevant performance dimensions at the expense of others. The cause-and-effect linkages between the drivers and outcomes in various performance areas were largely absent in the early Balanced Scorecard applications, and the scorecards were perceived as performance management systems, not strategic management systems (Walsh, 2000). McJorrow and Cook (2000b), in their report on the use of the Balanced Scorecard in New Zealand, also identified the organisations in which measures were merely 'scattered' in different performance perspectives, and referred to as the Balanced Scorecard. Speckbacher et al. (2003) have identified three main types of the Balanced Scorecard, which reflect the evolution of the concept in Kaplan and Norton's writings over time. The classification corresponds to the phases of implementation of the Balanced Scorecard in organisations, which often starts with a simple and rudimentary scorecard (Kaplan and Norton, 2000b). Type I, or the 'minimum-standard' Balanced Scorecard, has been defined as a specific multidimensional framework for strategic performance measurement that combines financial and non-financial strategic measures. The primary use of the Type I Balanced Scorecard was in identifying and measuring intangibles, by non-financial strategic measures rather than by their financial value, within the four performance perspectives described previously (Speckbacher et al., 2003).

As opposed to the simple Balanced Scorecards with a limited scope of application, which often did not measure how employees performed in relation to corporate strategy, the contemporary Balanced Scorecards are most frequently defined as performance measurement systems driven by strategy (Kaplan and Norton, 1996c, 2001c), to a varying extent. The Renaissance Group, the Balanced Scorecard software vendor, claims (http://www.rens.com/viewpoint) that the Balanced Scorecard must not be simplistically interpreted as a focused set of financial and non-financial measures. Instead, the PMMS must be used as a cornerstone of a successful growth strategy, enabling optimisation and acceleration of the business process performance, and the building of a learning organisation to achieve continuous improved performance. The Balanced Scorecards are designed to assist work units in developing objectives and measures that contribute to achieving strategic objectives (Artley and Stroh, 2001). The idea that there must be direct linkages between strategic objectives set by the organisation and the objectives, action plans and measures of each of its work units, which forms the basis of the contemporary Balanced Scorecard framework, is often expressed as the principle of 'alignment'. Strategic alignment has been described (Ittner et al., 2003; Langfield-Smith, 1997) as a second general approach for developing multiple perspectives performance measurement systems, the other approach being the development of relatively simple, 'minimum-standard' systems described in previous paragraphs. Every measure in a Balanced Scorecard should address an aspect of organisation's strategy, ultimately creating a blend of strategic measures (Speckbacher et al., 2003; Kaplan and Norton, 2001 a, b, c). The Scorecard attempts to link the strategy into some form of measurement (Kaplan and Norton, 1996), and endorses the idea that employees should be observed on how they are performing with respect to organisation strategy (Olve et al., 1999).

The concept of the Balanced Scorecard as a crucial component of strategic management has developed over the period between 1996 and 2001, from being only partially integrated with strategic management to the 'full strategic integration' (McJorrow and Cook, 2000a). The functions of the Balanced Scorecard have been expanded in 1996 (Kaplan and Norton, 1996c), with the emphasis of the use of the Balanced Scorecard as a management tool used by executives to assist strategic policy formulation (Artley and

Stroh, 2001) and in fulfillment of the strategic plan. The principal aspect of the Balanced Scorecard were hypotheses about the causes of desired performance outcomes, i.e., earnings and growth in the long term. Similarly, Olve et al. (1999, p. 19) identified the twofold strategy role of the Balanced Scorecard, as follows:

- the concept provides a compact structure for communicating strategy, and
- the cause-and-effect relationships among different factors grouped into the performance perspectives, required to articulate the strategic hypotheses underlying organisation's course of action.

The latter role is the most significant feature of the Type II Balanced Scorecard, which has been defined as a strategic multidimensional performance measurement system that describes strategy via a sequential, unidirectional cause-and-effect relationships (Speckbacher et al., 2003). Incomplete strategy role of the Balanced Scorecard has also been described by McJorrow and Cook (2000b), who reported on organisations in which the Balanced Scorecard was implemented with reference to vision and strategy, inasmuch the choice of measures was representative of the strategy, but the performance targets and initiatives were poorly integrated with the Balanced Scorecard. At that, the Balanced Scorecards with partial strategic integration were reviewed infrequently, and were not used for strategic learning (McJorrow and Cook, 2000b). The role of the Balanced Scorecard as a centre-piece of strategic communication, used by the management team to articulate, communicate and monitor implementation of strategy was also elaborated on in several case studies (Kaplan and Norton, 1996c).

In the period from 1996 to 2000, a more advanced model of the Balanced Scorecard has been developed. It has been termed the Type III Balanced Scorecard (Speckbacher et al., 2003), and defined as a strategic management system that additionally implements strategy by defining objectives, action plans and connecting incentives to the Balanced Scorecard measures. Such an integrated Balanced Scorecard allows for better understanding of relations among various strategic objectives, communicates the association between employees' actions and the chosen strategic goals, and enables allocation of resources and determination of action plans so that they are maximally

conducive to the accomplishment of long-term strategic objectives (Kaplan and Norton, 1996c).

Most recently, owing to the introduction of the concept of 'strategy mapping' (Kaplan and Norton, 2001a, b &c; 2000), which was described as a flowchart of a completed business/strategic plan (Kaplan and Norton, 2001a), the Balanced Scorecard can be characterized as a strategic management, reporting and learning system, which is based on the company's overall goal to create value in the long term. In a 'strategy map', the cause-and-effect links between actions in the non-financial performance perspectives and the financial results are given visual form, which should enable organisations to use the Balanced Scorecard as a tool for strategic performance management and organisational change (Kaplan and Norton, 2000, 2001a, b &c).

Balanced Scorecard related and similar PMMS

Tableau de Bord

The idea of having some form of balanced picture of company performance is not new. The Tableau de Bord is a performance measurement concept that has been used in Europe, particularly France, for more than 50 years (Epstein and Manzoni, 1998), or, according to Kennerley and Neely (2002), since the early twentieth century. Tableau de Bord is a dashboard of key indicators of organisational success (Artley and Stroh, 1999), that contains essentially operational and forward looking data (Mevellec, 1995). It establishes a hierarchy of interrelated measures and cascading measures to different organisational levels, forcing functions and divisions of an organisation to position themselves in the context of the company's overall strategy, and promotes the congruence, or alignment, of strategic goals and initiatives and action. (Kennerley and Neely, 2002).

The Tableau de Bord was developed by process engineers with a purpose of improving the production process by identifying key success factors of performance, as well as

cause – effect relationships between actions and process performance (Epstein and Manzoni, 1998). Nowadays, it is mainly used at the top-level management level, where it provides a set of non-financial and financial indicators to monitor the progress of the business. These indicators are compared to the goals set in the context of the business unit mission, and corrective actions are taken, which is analogous to the principles and process of the Balanced Scorecard. The conceptual similarity of Tableau de Bord with the Balanced Scorecard has lead some French authors to regard the Balanced Scorecard as a special case of Tableau de Bord (Epstein and Manzoni, 1998).

Other PMMS concepts

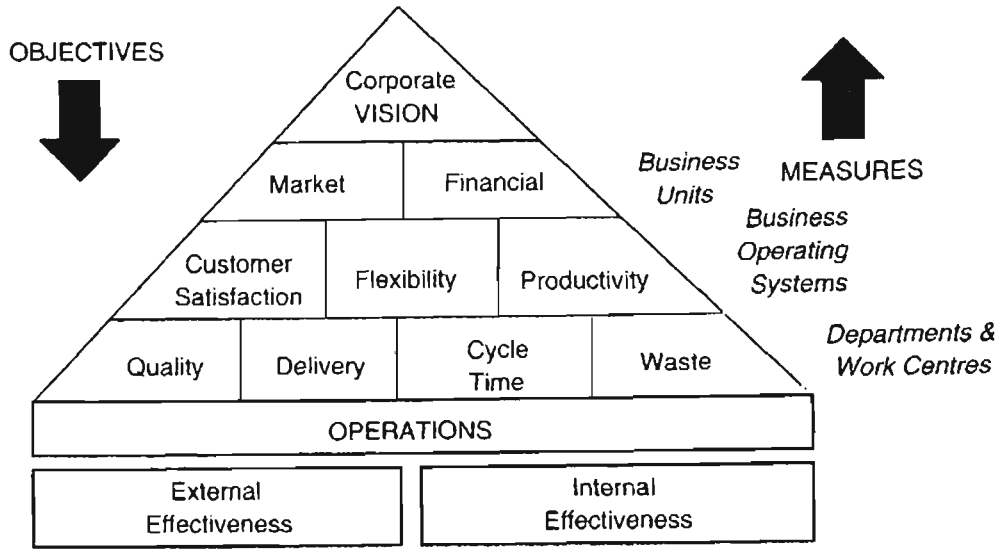
The review of the literature on the models and approaches similar to the Kaplan and Norton's Balanced Scorecard identifies a number of alternative frameworks, of which the majority link the measures used by organisation to the overall strategy. Given the similarities between the PMMS frameworks, and the fact that the use of the Balanced Scorecard framework, and its variants, are reported in virtually all case studies and surveys, reviewed for this study, the alternative PMMS frameworks are discussed only briefly.

Performance Pyramid

Another approach to measuring performance is called the Performance Pyramid. McNair et al. introduced the concept in 1990. This methodology defines interrelated objectives and metrics for different levels within the business, and reflects a performance measurement hierarchy (Langfield-Smith, 1997). It begins at the top level of the business and then cascades down through the business units, departments and individuals, as shown in Figure 2.1.2.3. As pointed by Kald and Nillson (2000), the Performance Pyramid assumes a one-direction causal chain linking various aspects of performance at different levels, similar to the Balanced Scorecard. The alleged advantage of this approach over the Balanced Scorecard model is that it provides the measures that are

relevant for all managers and organisational units, from business unit managers to the top executive team, i.e., from the operational level to senior management level.

Figure 2.1.2.3 Performance Pyramid diagram



Source: McNair et al., 1990, p. 30

The pyramid shows how each organisational group is linked to others to achieve the company's goals and the responsibility of each group. Each level of the organisation uses their own combination of performance measures which support the goals of the higher level. Information flows up, down and across levels meaning managers at each level must agree on the measures, goals and potential barriers to success.

The Performance Pyramid approach splits measurement into external and internal performance groups. Internal measures reflect the company's performance in normal production against its income statement. External measures show the performance that directly affects customers and external stakeholders or which is directly dependent on external factors. The tip of the pyramid represents top management's stated mission, vision and critical success factors. As strategy and objectives are the keys to the success of an organisation, this level measures performance against the success of the company strategy (Lynch and Cross, 1991).

Results and Determinants Framework

The Results and Determinants Framework (Fitzgerald et al., 1991), depicted below, consists of six dimensions, or perspectives of performance, the two of which measure the results of implementing business unit competitive strategy, and comprise of financial and competitiveness measures, and four perspectives which determine those results. This approach is similar to the Balanced Scorecard model, as it consists of leading, or determinants, and lagging performance indicators, or results, i.e., the concept reflects the "concept of causality, indicating that results are a function of past business performance in relation to specific determinants" (Neely et al., 2000, p. 34).

Figure 2.1.2.4 Results and Determinants Framework

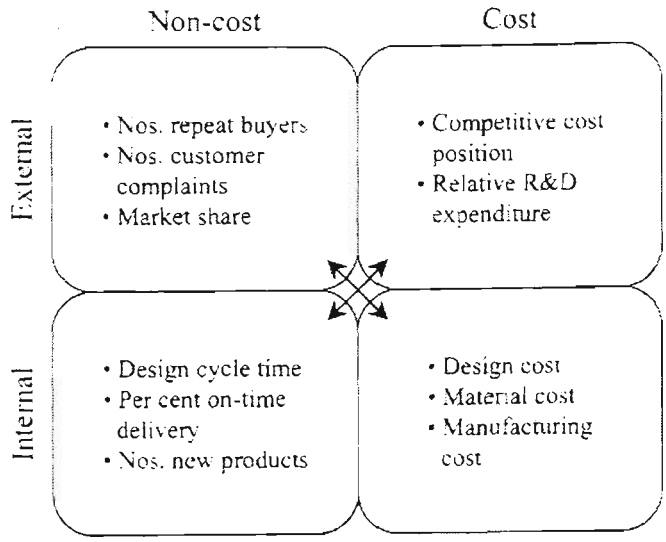
Results	Financial performance
	Competitiveness
Determinants	Quality
	Flexibility
	Resource utilisation
	Innovation

Source: Fitzgerald et al., 1991, p. 116

Performance Measurement Matrix

The Performance Measurement Matrix was proposed in 1989 by Keegan et al. The matrix is presented in Figure 2.1.2.5. Similar to the Balanced Scorecard, the Performance Measurement Matrix integrates financial and non-financial aspects of performance. However, it does not make explicit the links between the different dimensions of business performance (Neely et al., 2000), and it provides little indication of the different dimensions of performance that should be measured (Kennerley and Neely, 2002).

Figure 2.1.2.5 Performance Measurement Matrix



Adapted from Keegan et al., 1989, p. 48

2.2 Success factors and barriers to PMMS design and implementation

2.2.1 Introduction

This section lists the factors critical to successful implementation of PMMS, which had been identified through a focused literature search. With regard to the referenced literature, several types of sources were used to identify the determinants critical in affecting the success of PMMS, which were subsequently operationalised as measurable variables.

A number of determinants of PMMS success have been found in the literature on the conceptual frameworks of PMMS, mainly concerning the recommendations and guidelines in the design, development and implementation of performance measurement systems. In addition, several determinants have been identified in cases studies on PMMS in organisations, and in the surveys of PMMS practices in Australia, New Zealand and other countries. Finally, the determinants related to the success of other types of information systems, such as expert systems, which were deemed applicable to the PMMS, were also included for subsequent empirical testing.

The literature search has resulted in compilation of a comprehensive list of factors proposed in the literature as important determinants of PMMS success. The selection highlights several critical factors related to the design of PMMS, their development and implementation. Given the cross-sectional sample of organisations in the survey, only generic determinants, which could be described in a generalised way (Chenhall, 2003), irrespective of the particular industry, were collated.

2.2.2 Success factors

Support by senior executives

Among the numerous critical factors, the single most often discussed determinant appears to be support provided by senior executives in designing, deploying and use of PMMS in organisations. Organisation's top management involvement, support and commitment have been described as 'critical element' by Arley and Stroh (2001) and a key predictor (Powell and Dent-Micaleff, 1997) for the success of PMMS. The importance of top-management commitment and motivation have also been emphasized by Kald and Nilsson (2000).

According to Powell and Dent-Micallef (1997), senior executives' commitment is required in articulating the need for information technology, and communicating its functionality within the context of the organisation's strategy, structure and systems, which requires a top executive to act as 'business visionary' and 'prioritiser'. It is extremely important to obtain the top management's commitment prior to any PMMS initiative in organisation, and communicate the commitment throughout the organisation (Chenhall and Langfield-Smith, 1999a & b), for the program to be 'taken seriously' (Artley and Stroh, 2001), and given high priority by the entire organisation (Kald and Nillson, 2000). As suggested by Olve et al. (1999), at the outset of developing a PMMS, top management must be committed to elaborating the vision and must send that message

to the rest of the organisation, and in addition the CEO must take an active part in developing the first basic elements of the PMMS.

Support and sustained commitment by senior executives is manifested in top level risk-taking support, and reduces the risk of PMMS failure by making the personnel and monetary resources available (Rai and Bajwa, 1997; Yoon et al., 1995), and in particular sufficient time and training to implement the PMMS (Olve et al., 1999).

The importance of top-management support is also emphasised in integrating PMMS with business strategy and processes (Chenhall, 2003), and ensuring continuity in PMMS investment and improvement over time (Yoon et al., 1994).

According to Andersen (2001), successful PMMS implementation in any organisation requires sustained management commitment to using the system, and ensuring that it drives the necessary behavioural changes within the top management and the rest of organisation. As suggested by McJorrow and Cook (2000a), articulating the intangible benefits of implementing a strategic PMMS framework like the Balanced Scorecard is difficult and may require a 'leap of faith', which in turn necessitates a high degree of involvement and support by senior managers to ameliorate resistance from vested interest groups in organisation (Rai and Bajwa, 1997).

Full acceptance at all levels of organisation

With respect to the organisational scope of the PMMS implementation, it has been suggested (Paladino, 2000, Kaplan and Norton, 1996a) that a well-conceived PMMS application presents different measures for different departments, as well as different managerial levels in the organisation. To accomplish a maximum acceptance of a PMMS at all levels of an organisation, a PMMS must be viewed as valuable by the people involved with metrics in the organisation. In consequence, as PMMS is implemented progressively throughout an organisation, it becomes necessary to develop and establish standard definitions of performance measures, indicators and reporting methods, in order

to ensure translation and comparison of measures between and across multiple organisational units, departments and organisational levels (Artley and Stroh, 2001).

The recommendations concerning the methods to ensure full acceptance of PMMS at all levels of organisation unequivocally state that the PMMS design activity should be undertaken as a collective and collaborative effort (Andersen, 2001; Artley and Stroh, 2001; Chenhall and Langfield-Smith, 1998b).

Thus, Artley and Stroh (2001) suggest that the measurements should be developed using a collaborative process including both the people whose work will be measured and the people who will implement important parts of the measurement process. According to Andersen (2001), best practice in large organisations reveals that PMMS design activity should be a collective effort drawing upon the combined operational and strategic insights of key employees involved with running the business. The process of PMMS design should adopt a bottom-up approach to reviewing proposed performance objectives, measures, expectations, and results. Input from the operating personnel should be actively sought, and that input should be consolidated through successively higher levels of management, or otherwise the value and importance of organisational strategy may be undermined due to lack of support from those accountable for executing it.

In addition to enhancing the commitment to organisational strategy, having work groups at lower organisational levels develop their own measures also encourages experiments with new measures and methods of monitoring performance, with the interests of the entire company in mind (Kald and Nilsson, 2000).

In a study on management accounting practices in Australian organisations, Chenhall and Langfield-Smith (1998b) also report on management innovations which involve a high degree of employee involvement through work-based teams. The result is that much of the responsibility for managing change associated with the implementation of management innovations lies with the shop-floor employees.

PMMS successfully delegated to staff and consultants

Although the active participation of top management in the process of development and implementation of PMMS has been strongly recommended at the overall level (Olve et al., 1999), it has also been recognised that in most organisations the process will be undertaken with varying degrees of actual involvement of top management, who will not have the time to participate in the project (McJorrow and Cook, 2000). In addition to being overworked, in many cases top management may not have the necessary expertise, which design and implementation of PMMS may require (Yoon et al., 1995).

Given the scope and complexity of the process of design and implementation of a PMMS, top managers should be made responsible for instilling a sense of direction combined with focus and prioritization (Andersen, 2001). Correspondingly, detailed development and maintenance of a PMMS naturally promotes goal and task delegation (Andersen, 2001). According to Olve et al. (1999), it is also essential to involve as many opinion leaders as possible in the initial phases of PMMS development. In the subsequent stages of the process, most employees in all parts of the organisation should take part in the discussions on how overall PMMS goals will affect day-to-day operations, and on the ways the individual employee or team can contribute towards the accomplishment of strategic goals. In practice, to ensure involvement and commitment of managers to the newly introduced PMMS, meetings and reviews of achievement and problems associated with the implementation of PMMS were held in Australian organisations (Chenhall and Langfield-Smith, 1999b).

The process of design and development of PMMS has been assigned to a project-management team in numerous organisations, and has been recommended for large and complex organisations, in which the entire process may take as long as two years, as reported by Olve et al. (1999). The role of management accountants, as a part of the team to implement the innovative management accounting systems was described by Chenhall and Langfield-Smith (1999b; 1998b).

The decision on whom to include in project management is critical for success, and management should ensure that a project-management team is representative of component parts of the entire organisation in order to coordinate activities with reference to a clearly articulated corporate strategy (Anderson, 2001). The roles of a PMMS project management team were broadly described by Olve et al. (1999) as being to: "continually follow the progress of the work, offer advice, and suggest adjustments which will facilitate an understanding of the process as a whole as well as guarantee the consistency of the scorecard" (p. 46).

By enabling the development and implementation of PMMS in an organisation through delegation of the management of functional and tactical issues to a project-management team, senior managers can reduce the time spent on detailed operational control, and apply management resources to coordinate further development of the organisation (Anderson, 2001).

Individual accountability for results

It has been recognised that in order for a PMMS to be deployed efficiently, organisations must develop a successful system of accountability. Managers and employees must commit themselves to performance measurement by assuming responsibility for some part of the performance measurement process (Artley and Stroh, 2001).

The importance of the 'ownership' of each measure in a PMMS has been reported by Artley and Stroh (2001), Olve et al. (1999), McJorrow and Cook (2000a), and Manoochehri (1999). The purpose of assigning 'ownership' of the components of a PMMS is to clearly establish overall individual accountability for each initiative in order to avoid confusion over responsibilities (McJorrow and Cook, 2000a). The accountability system must be communicated to and understood by all concerned parties in the organisation (Artley and Stroh, 2001). The system is used to identify an 'owner' responsible for planning, managing, recording, and improving the measure, achievement and reporting of the results, and assuming liability for those results.

Personal accountability at the individual level should be ascertained during the phase of developing measures. The most important consideration in assigning accountability is relatedness of the measure to a particular organisational role or responsibility (Olve et al., 1999), and specifically the degree to which the measures can be influenced and affected by the individual.

Another important requirement in establishing a system of responsibilities for the measures in PMMS is to ensure that the system is not being used for punitive purposes, instead of diagnostic and corrective purposes (Artley and Stroh, 2001).

PMMS allows realistic target-setting

The ability of PMMS to affect goal achievement has been recognised as an important determinant of efficient use of the system, particularly with respect to promoting strategic alignment of activities in organisation, and affecting the employee motivation (Chenhall, 2003; Malina and Selto, 2001).

According to Miller and Israel (2002), one of the main reasons for failure of PMMS in organisations is the inability to link individual performance targets to corporate goals. The absence of an explicit link with the PMMS targets results in lower performance than could be reasonably achieved (Malina and Selto, 2001).

Therefore, PMMS should establish reliable standards and benchmarks of performance (Chenhall, 2003), explicit performance targets (Malina and Selto, 2001), or other alternative frames of reference for interpreting the selected performance indicators (Artley and Stroh, 2001). The most frequent qualification describing the setting of performance standards, targets or benchmarks is that they should be 'realistic', or considered realistic and attainable by the employees responsible for achieving them (Malina and Selto, 2001; Olve et al., 1999), as the PMMS targets that are too difficult to achieve may cause frustration and withdrawal.

Conversely, to promote effective motivation, standards of performance should not be too easy to meet, as they may not provide sufficient challenge (Chenhall, 2003). The risk of setting goals that are too easily attainable has been associated (Artley and Stroh, 2001) with the difficulties encountered during the process of PMMS design and implementation, which in turn may result in a tendency to measure the trivial or the obvious.

Drivers of future performance easy to identify

As pointed out by Ittner and Larcker (2000), the starting point in the process of developing a PMMS is understanding an organisation's value drivers, or the factors that create stakeholders value, because these factors determine the choice of measures used to document the progress towards the long-term success. Identification of value drivers, or key success factors covering the areas for monitoring which are particularly important for the successful implementation of strategy (Kald and Nillson, 2000), is required so that organisational objectives can be translated into measures that guide managers' actions (Ittner and Larcker, 2000).

In practice, several methods related to articulation of value drivers have been identified. According to Ittner and Larcker (2000), the most common method is the executives' ranking of value drivers, based on intuition, which often results in the erroneous perception of actual importance of certain value drivers, which may be compounded by excessive focus on short-term operational and financial data. The executives often do not focus on the longer-term measures, the very ones on which the long-term sustainable success depends: customer satisfaction, employee satisfaction, product/service quality, and public responsibility (Artley and Stroh, 2001). For example, environmental performance and quality are often perceived as relatively unimportant, although there is ample statistical evidence that these dimensions are associated with organisation's market value (Ittner and Larcker, 2000).

Many organisations use standard classification of performance areas proposed by the Balanced Scorecard framework, comprising financial, internal business process, customer, and learning and growth categories. Such practice may be appropriate in some organisations, while in other organisations other non-financial dimensions may be more important, depending on the organisation's strategy, competitive environment and objectives (Ittner and Larcker, 2000).

The least used method to identify drivers of future performance is statistical analysis of the leading and lagging indicators of financial performance in determining value drivers. The resulting 'causal business model' (Kaplan and Norton, 1996b & c) can help determine which measures predict future financial performance and can assist in assigning weightings to measures based on the strength of the statistical relationship.

Good fit between objectives and measures easy to establish

The ability to measure performance in relation to company goals or strategy has also been described as very important, and also very difficult (Gautreau and Kleiner, 2001). Ideally, a PMMS should provide information to measure inputs, outputs, and outcomes for each business area, and should contain long-term, multiyear measures related to each objective (McJorrow and Cook, 2000a), for the purpose of monitoring long-term performance (Artley and Stroh, 2001).

With reference to objectives, Andersen (2001) emphasised the importance of clearly articulated objectives, in order to avoid what is being termed 'fuzzy objectives' as a frequent cause of unsuccessful implementation of PMMS. Artley and Stroh (2001) have warned against the practice of taking the 'high road' of impossibility, resulting in establishment of unmeasurable objectives and setting unreachable goals.

According to Epstein and Manzoni (1998), good fit between objectives and measures is not easy to establish. Measurement may not be developed because of the difficulties in identifying reliable and satisfactory measures of key success factors. In addition, the

links between the key success factors and future company profitability may not have been ascertained and clarified (Epstein and Manzoni, 1998).

The final set of indicators and measures covering the major goals and objectives should be evaluated against the following quantitative criteria, reported by Artley and Stroh (2001, p. 39):

- the measures should provide a clear understanding of progress toward objectives and strategy as well as the current status, rate of improvement, and probability of achievement;
- the measures should identify gaps between current status and performance aspirations, and highlight improvement opportunities.

These criteria may be difficult to meet in development of non-financial measures, given that non-financial data are measured in many ways, and there is no common denominator, as opposed to accounting measures. Evaluating performance or making trade-offs between attributes is difficult when some are denominated in time, some in quantities or percentages, and some in arbitrary ways (Artley and Stroh, 2001).

Many organisations attempt to overcome this problem by rating each performance measure in terms of its strategic importance and then evaluating overall performance based on weighted average of the measures. Others assign arbitrary weightings to various goals. However, like all subjective assessments, these methods can lead to considerable error (Ittner and Larcker, 2000).

Can be implemented in increments

A significant problem with the development and implementation of performance management projects is that managers often underestimate the magnitude of the required organisational change (Powell and Dent-Micallef, 1997). Development can consume considerable time and expense, depending on the size and complexity of the organisation. According to Gautreau and Kleiner (2001), PMMS are difficult to implement, and a

typical scorecard may take five or six months to implement, to which an additional number of months may be needed to fine-tune the structure, resulting in total development time of one year or longer. Olve et al. have reported (1999) that the development phase of the overall scorecard took approximately six to nine months, and have emphasised that the development of PMMS is the most important part of the whole process, since the results would greatly affect the subsequent work of implementation. The company has had a project manager working full-time with the project for two years, assisted by a project group (Olve et al., 1999). In another example of an actual development of a Balanced Scorecard, Neely et al. (2000) described the three stages of the process, which in all took seventeen months. The entire process of adopting, creating and implementing the Balanced Scorecard requires about two years (Kaplan and Norton, 1996c).

Obviously, the main obstacle to a complete and comprehensive PMMS process is the time and resource required. A balanced set of measures cannot be established overnight (Artley and Stroh, 2001). If a PMMS project is too broad in coverage or involves too many people, there is a danger that the work will excessively consume the organisation's resources, including too much of the time of key personnel, and the project may be perceived as difficult to finish, resulting in the loss of support for the project (Gautreau and Kleiner, 2001).

Given that it may be too ambitious and expensive to deploy a performance measurement system in the entire organisation, some organisations seek to avoid this danger by starting with a pilot project at a subsidiary or department (Averson, 2000; Chenhall and Langfield-Smith, 1999b), instead of deploying PMMS across the organisation all at once. The organisation can avoid large-scale effort by starting a PMMS project in a business unit, or a part of it, and developing a PMMS incrementally. Such phasing in of the PMMS project will allow the participants to learn and gain experience before organisation-wide deployment of PMMS is considered. This reduces cost, risk, and disruption, and allow for the development of skills in a controlled situation (Chenhall and Langfield-Smith, 1999b).

However, the recommendation that a PMMS should be implemented incrementally may counter the very rationale for development and implementation of a PMMS. Consistent with the alleged profound benefits (Kaplan and Norton, 1996c) of the most popular PMMS, the Balanced Scorecard, some companies believe in organisation-wide implementation of the concept from the very outset, reasoning that the scorecard concept raises issues with broader ramifications. This approach forces the entire organisation to change its philosophy of management control, and to look ahead to its goals for the future. Withrow (1995) reported on the results of a major PMMS implementation, and suggested that a better overall result and satisfaction levels were achieved through one major effort, rather than through several smaller initiatives. The drawback is that the process of gaining support, spreading the message, and instilling appropriate attitudes may take a very long time (Gautreau and Kleiner, 2001).

Surprisingly, recently the development of the Balanced Scorecard has been delivered online on bscol.com, offering organisations a dramatic reduction of the cost and time to build their Balanced Scorecard. The Balanced Scorecard 'tool' has been automated, and the Balanced Scorecard Collaborative (BSC Online Member's Briefing, 2001) consultants would spend a day with the organisation's team to transfer the knowledge and skills needed in building a scorecard. The scorecard would then be completed in only twelve weeks, and be made ready to apply to organisational units on an accelerated basis.

PMMS easy to manage

Among desirable characteristics of decision support systems, required for successful implementation, are simplicity, ease of management, ease of understanding and manageable size (Powell and Dent-Micallef, 1997). According to Olve et al. (1999), for PMMS to be usable in practice throughout the organisation, the procedure for handling measurements must be user-friendly and not overly complicated.

According to Artley and Stroh (2001), establishing and implementing a PMMS is an in-depth and continuous process. In consequence, it is allegedly easy for personnel to get

absorbed by the process of developing and perfecting the PMMS, which may result in proliferation of charts, graphs and meetings to design and redesign the system. Such practice may lead to the design process taking over overall project to improve performance (Artley and Stroh, 2001).

PMMS should not impose a large overhead, and the system should be easy to initiate and use (Miller and Israel, 2002). Accordingly, data should be extracted in a cost-effective and usable manner, without the need for manual intervention.

As Neely and Bourne (2000) point out, the PMMS is not likely to be adopted by employees, unless the system is efficient, which is associated with simplicity, automation, and the ability to measure as little as possible, but to ensure that only the 'things that matter' are measured.

Manoochehri (1999) has also elaborated on the desirable characteristics of information technology platforms for managing the performance systems, and has found that a number of software tools, such as IPM, Ithink analyst, PerformancePlus, and Pb views, provide the benefit of the simple maintenance of the information contained within the system. In addition, commonly quoted widely by suppliers of such systems are the following desirable features:

- The information is presented in a communicative manner, in numbers, figures, diagrams, or multimedia which facilitate an overview;
- The information is presented in a user-friendly environment by using a simple, familiar interface;
- The information is easy to access by the person who needs the information.

2.2.3 PMMS Barriers

PMMS not supportive of strategy

The importance of the PMMS in supporting the strategic priorities has been highlighted by several authors. According to Langfield-Smith (1997), management control systems

should be tailored explicitly to support the strategy of the business to lead to competitive advantage and superior performance. In their review of the literature on the Balanced Scorecard, Malina and Selto (2001) emphasise the role of the Balanced Scorecard for strategy implementation, and stress the alignment and links of the scorecard measures with strategy. Miller and Israel (2002) report the results of a survey by KPMG, which points at the non-alignment of the PMMS measures with strategic business objectives as a reason for PMMS implementation failure.

The requirement of the PMMS providing support for the organisational strategy has been formalised by Artley and Stroh (2001, p. 39), in suggesting that a PMMS should be subjected to a test to examine whether the system satisfies a strategic criterion, or specifically:

- "Do the measures enable strategic planning and then drive the deployment of the actions required to achieve objectives and strategies?
- Do the measures align behaviour and initiatives with strategy, and focus the organisation on its priorities? "

PMMS contains too many measures and is too complex

Among the factors which may impede the use of a PMMS and consequently lead to the failure of the system are the proliferation of the measures and the excessive complexity. These factors have been reported by Miller and Israel (2002), in the analysis of the results of a survey by KPMG, where the respondents have indicated that the PMMS in use were too complicated and measured too many things. Such practice is in direct contrast with the principle by Simons (1995), where the information contained in a control system must be simple to understand. Similarly, Manoochehri (1999) pointed at a misconception about performance measures that 'the more is better', and stated that the overriding principle regarding performance measures is to use fewer rather than more.

The set of PMMS measures should completely describe the organisation's critical performance variables (Malina and Selto, 2001). Having too many measures, and

therefore generating a large amount of routine data, could distract senior management's focus from those measures that are the most critical to an organisation's success (Artley and Stroh, 2001). The process of simplifying and distilling a large number of performance measures across the organisation to select a critical few that drive strategic success should be viewed as part of the performance measurement process itself (Kaplan and Norton, 1996b & c). It helps enhance understanding of the strategic plan and its supporting objectives. Even though compiling an exhaustive set of performance measures may accurately reflect the complexity of the organisation's tasks, eventually a point may be reached at which any addition of measures would be distracting, confusing, and costly to administer. The problem with having too many measures is that the high number of measures confuses the users who may not know the relative importance of the measures and, therefore, may not focus on the most important ones (Manoochehri, 1999).

According to Epstein and Manzoni (1998), as well as Ittner and Larcker (1998), some companies measure so many dimensions that capture so many trade-offs, that people reach a state of 'information overload' and learn to disregard most of the data they receive, or use the data ineffectively (Artley and Stroh, 2000). The number of measures should be limited to keep the measurement system cognitively and administratively simple, as people can only act upon a limited amount of information, and can take very seriously only a limited number of performance indicators (Epstein and Manzoni, 1998). Using too many performance measures is wasteful, as most of them will not be used (Manoochehri, 1999).

Interestingly, Lipe and Salterio (2000) have found, in an experimental study, that the cognitive difficulties were principally assocatied with the use of unique measures, as opposed to the use of common measures, which were organised within the standard Balanced Scorecard performance perspectives.

According to Ittner and Larcker (2000), implementing an evaluation system with too many measures can lead to 'measurement disintegration'. This occurs when an

overabundance of measures dilutes the effect of the measurement process, which has been explained by Epstein and Manzoni (1998) as: "increasing the number of performance indicators probably involves decreasing marginal returns" (p. 202). Managers collect a variety of measures simultaneously, while achieving little gain in the main drivers of success.

Neely et al. (2000) have attributed the increased complexity of PMMS in organisations to the poor updating practices of PMMS, resulting in new measures being added to the system, while obsolete measures are rarely deleted. It is also important to avoid duplication of measures and indicators, so that the information conveyed by one indicator or measure is not provided by another (Artley and Stroh, 2001).

PMMS is not understood by employees

It has been claimed that the process of the PMMS design in itself is extremely important, and everyone involved must be given enough time to gain necessary understanding (Olve et al., 1999). Before implementing any new performance measures, the users are to be educated to understand: What are the new measures? What do they measure? Why are they needed? How do measures impact them? How do their decisions and actions impact the performance measures? How can they control the performance and the outcome? (Manoochehri, 1999, p. 228). Lack of understanding about the purpose of PMMS will probably lead to a failure of the system (Miller and Israel, 2002). It is particularly important that the causal relationships and the priorities which emerge in the discussions on the design of PMMS be well understood and widely supported (Olve et al., 1999), or the process will prove very frustrating, with a very high risk of failure of the whole undertaking.

McJorrow and Cook (2000b) suggest that there should be a considerable amount of promotional work explaining the PMMS, how organisations are using the system, how the use of PMMS will affect the results, and communicating the benefits of PMMS.

Above all, the use of non-financial measures might require users' education and training (Chenhall and Langfield-Smith, 1999b), as their use is new to many managers (Manoochehri, 1999). Additionally, development of new strategies, organisation restructuring, or deployment of new technologies may require the use of new performance measures, which will in turn require users to be educated.

PMMS not adopted by employees

It is critical that the PMMS is actually used throughout the organisation in the everyday aspects of management (Olve et al., 1999). If it provides the foundation for the daily agenda of each unit, it will have a natural function in current reporting and control through its impact on day-to-day operations. According to Andersen (2001) and Tonchia (2000), a PMMS needs to be used to realize its full value. PMMS fail when, having developed strategic goals and identified relevant performance measures an enterprise does not use the information provided to drive changes in the way the organisation works (Schneiderman, 1999).

Neely and Bourne (2000) related the issue of non-adoption to the degree of effectiveness in use of PMMS. They asserted that many organisations fail to extract value from the performance measurement data, even when they have been through the process of designing a good measurement system and then implemented it successfully. A growing number of businesses have put in place superb infrastructures to support their performance reporting systems (Neely and Bourne, 2000), however, the managers are not aware of the tools and techniques that are available to help them to understand the messages inside the performance data. Manoochehri (1999) has reported on the findings of a survey of the Fortune 500 companies, which clearly point to a measurement-use gap. For example, 84 percent of the respondents indicated that they measure delivery performance and customer service, but only 71 percent of those firms actually used the information in the planning process, while 29 percent of organisations collected the data to no useful purpose.

Several methods may assist in ensuring the actual use of PMMS in organisations. The first is participation in the design and development of PMMS to achieve full acceptance by managers and other employees. Without employee 'buy-in', an organisation's achievements will be minimal (Artley and Stroh, 2001).

For the users to have control over the resources, inputs, and processes to take required action, it is also crucial that the performance measures crafted for each unit of the organisation be consistent with the level of authority, responsibility and skills of the person overseeing that unit (Manoochehri, 1999).

Finally, according to Olve et al. (1999), an appropriate incentive structure and practical arrangements for handling the information generated by PMMS are needed for employees to use the data after they are collected.

Organisational culture not performance oriented

Among the factors that often impede the implementation of PMMS are the human factors, which may cause the measurement process to degenerate into mechanistic exercises that add little to reaching strategic goals (Artley and Stroh, 2001). The tendency of CEOs to perpetuate commitments to the status quo, and to develop successors who share their own repertoires and frames of reference has been discussed by Powell and Dent-Micallef (1997), creating cultural and structural barriers to release of the PMMS information throughout the organisation.

Malina and Selto (2001) have elaborated on the top-down and ambiguous nature of the communication, which may impede the immediacy and effectiveness of the Balanced Scorecard, and may contribute to a climate of distrust and alienation with regard to the use of the Balanced Scorecard. They have also pointed at the conflict and tension caused by the top-down method of enforcing the PMMS measures and benchmarks, without seeking input of all concerned parties (Malina and Selto, 2001).

Zuboff (1988) urged firms to embrace an open philosophy, allowing employees access to operating information traditionally controlled by upper management, and repudiating traditional hierarchies, top-down communications and autocratic command and control.

Further, the reason why multiple perspectives PMMS are not being used is the traditional financial/accounting mindset (Manoochehri, 1999), which might hinder the use of non-financial measures. These measures might be considered as 'nice to know' but not be perceived as significant and critical to managers' decision making.

Resistance due to vested interests

The resistance motivated by a desire to protect one's power base (Epstein and Manzoni 1998) has also been identified as an important determinant of PMMS success in achieving the system's desired outcomes. Given that the choice of performance measures may have a substantial impact on employees' careers and pay (Ittner and Larcker, 2000), and has the potential of modifying the balance of power (Epstein and Manzoni, 1998), controversy is bound to emerge about the appropriateness of the measures.

According to Epstein and Manzoni (1998), employees' resistance is motivated by a desire to themselves from scrutiny and questioning by their boss, thus taking power from upper levels.

Artley and Stroh (2001) point at the resistance where one person or a group will not relinquish control to anyone else, and state that the resistance prevents the total organisational involvement necessary for establishing and implementing the PMMS. Accordingly, the resistance can be overcome by giving control to those responsible for performance and improvements, and by involvement of all interested parties in the process.

Resistance due to anxiety

A particularly important factor which may impede PMMS development and implementation phases is associated with the psychological impact brought on by PMMS (Yoon et al., 1995). Employees' fears about their jobs and the perception of negative consequences (Tonchia, 2000) frequently generate resistance against PMMS making its success very difficult.

Performance measurement may expose employee's weak areas and shortcomings, and also carries an accountability factor (Artley and Stroh, 2001; Neely et al., 2000). Furthermore, measurement is related to evaluation (Tonchia, 2000), and compensation, rewards, and recognition are linked to performance measurement, typically after managing with the PMMS for a year (Kaplan and Norton, 2001c).

It has been suggested that some organisations use their PMMS as a punitive measurement system, to catch employees doing something wrong and to punish them (Artley and Stroh, 2001; Kaplan and Norton, 2001c). In turn, employees do not get committed to the PMMS, which may contribute to a failure of the project.

System prone to managerial and employee manipulation

The requirement that the PMMS should have measures which are not easily manipulated has been discussed by Kaplan and Norton (2001c), Artley and Stroh (2001), Knight (2000), and Olve et al. (1999),.

The risk of measures being manipulated has been attributed to absence of valid and reliable data collection process to support measures (Kaplan and Norton, 2001c). To be effective, PMMS measures should be accurate, objective, and verifiable (Artley and Stroh, 2001). If there are biases, exaggerations, omissions, or errors in data, then the measures will most likely be inaccurate and or misleading, and will not reflect performance. If managers can achieve good measured performance by cheating, then the

system quickly will lose credibility and desired motivational effect (Artley and Stroh, 2001).

The most obvious reason for employees to turn to 'playing the system' (Knight, 2000) is to exploit the deficiencies of an incentive plan in organisations. For example, salespeople may be rewarded for acquiring new customers, rather than for customer retention. The challenge is to pick meaningful data, which can be measured, which are tied to the financial well-being of the business, and which minimize the risk of employee gaming. This usually involves competing goals such as revenue growth and rate of return, or speed of production and product quality (Knight, 2000).

According to Stone and Banks (1997), the PMMS may be inherently susceptible of manipulation by employees due to inclusion of 'soft' measures, which allegedly pertain to the areas considered to be generally difficult to measure and assess. This view has not been confirmed by Kald and Nillson (2000), who report the results of a survey of performance measurement in Nordic companies, and indicate that the respondents had not perceived the performance measurement as imprecise or open to manipulation, despite a high proportion of measures relevant to operations.

The assertion that greater openness may lead to manipulation has been dismissed by Olve et al. (1999), who suggested that the risk is also present with financial measures at the end of accounting year. Olve et al. (1999) suggested that the risk is reduced with the Balanced Scorecard, since the more comprehensive view provided by the scorecard will make it harder for everyone to deceive him/herself or others by manipulating measures.

Fear of sensitive information being revealed

Security and confidentiality of data in PMMS has been also discussed as a concern that may inhibit the use of PMMS in organisations (Olve et al., 1999; Kaplan and Norton, 1996a). According to Olve et al. (1999), a PMMS may contain information on important investments, such as superior processes, control over a customer base, IT capability, and

other assets, which may be sensitive from a strategic standpoint, and would reveal organisation's strategy to a competitor (Kaplan and Norton, 1996a).

In a case study on the Balanced Scorecard in Phillips Electronics, Gumbus and Lyons (2002) report on the need for a balance between the requirement that PMMS should be accessible to employees, while ensuring confidentiality of company results that are sensitive and proprietary. The access to confidential data is normally restricted on the basis of job title and responsibility of employees. It appears that the right balance between the need for user's access to data in PMMS and confidentiality can be comparatively easily reached by simply installing a flexible security system, based on individual user profiles, with multiple levels of security, which permits individualised access. For example, some employees' may have full access to all data, while other users might have their access limited to certain levels, certain measures, or even certain products (Paladino, 2000).

Wrong configuration of physical resources, human resources, systems and procedures

Poor integration of PMMS with other information systems has been identified as a reason for failure by several authors. Neely et al., (2000) claim that lack of appropriate infrastructure to support PMMS is a major issue in many organisations. Poor integration with other internal and external information systems has also been indicated by the participants in a KPMG survey reported by Miller and Israel (2002).

Powell and Dent-Micallef (1997) have emphasised the costs of integrating information systems, and noted that high-performers appeared to focus on strengthening the organisation's structural and systems infrastructures, and not adding technologies per se. Given that PMMS do not merge automatically with human and business resources, a system architecture has to be developed, and the supporting technologies, together with the procedures and rules to regulate the flow of information, have to be put in place (Manoochehri, 1999).

According to Artley and Stroh (2001), a greater number of diverse performance measures frequently requires significant investment in information systems from multiple, and often incompatible, databases. The data may be held in unrelated databases, and in inconsistent formats (Neely et al., 2000). For example, it is not uncommon for organisations that operational data are held in the operations function, the sales data are collected in the sales department, while financial performance data are held by the finance department. Certain data, such as the customer and employee satisfaction surveys data, may also be held by an external party.

While the required data may exist in most organisations, the ability to integrate these diverse data sets into a single database that can be mined effectively, does not exist in many organisations (Neely et al., 2000). The existing information system may not be capable of collecting, analysing and reporting the data efficiently (Manoochehri, 1999). As reported by Kald and Nillson (2000) and Chenhall and Langfield-Smith (1999a), the data needed for performance measurement were collected from different and incompatible environments, after which the data were processed in a PC-based PMMS models, which indicates that the PMMS applications were capable of only limited interface with existing systems (Chenhall and Langfield-Smith, 1999a; Yoon et al., 1995). Consequently, the data needed for performance measurement had to be acquired and entered in an interactive manner, i.e., manually, which was described as tedious and inconvenient (Yoon et al., 1995), discouraging users from utilising the PMMS, and decreasing its usefulness.

On the whole, to encourage end users to use the PMMS, Paladino (2000, p. 52) suggested that any automated PMMS solution "must use existing data from within the enterprise's different operational systems, and must support a consistent and easy-to-use interface, as well as distribution methods that are easy to maintain such as an Internet or Intranet-based architecture".

Insufficient resources

According to Artley and Stroh (2001), time and cost has been a problem for some organisations. They have found the costs of a system that tracks a large number of financial and non-financial measures can be greater than its benefits (Artley and Stroh, 2001), i.e, the collection of data may not be cost-effective, and the costs of comprehensive PMMS may not be justified (Chenhall and Langfield-Smith, 1999b). Extensive resources needed to compile the PMMS data were also reported in a KPMG survey, as a reason for failure of PMMS (Miller and Israel, 2002).

By contrast, Banker et al. (2002, p. 1) suggested that "the high proportion of satisfied relative to dissatisfied Balanced Scorecard users is significant given the resource commitment required and the complexity of properly implementing the methodology".

The recent developments in information technology have resulted in dramatic cost reduction of hardware and major breakthroughs in software, and have made the PMMS technologies, combining financial accounting information with non-financial information (Chenhall and Langfield-Smith, 1999b), available to even small organisations (Manoochehri, 1999).

Important stakeholders excluded

One of the important characteristics which should be considered in the process of design of PMMS is the extent to which the system generates relevant information needed by multiple external and internal stakeholders (Chenhall, 2003; Miller and Israel, 2002), so that they can make decisions concerning their relations with the organisation. Stakeholder's points of view and expectations should be considered in developing strategic goals and objectives (Artley and Stroh, 2001).

The most popular PMMS, the Balanced Scorecard, has been described as a poor strategic management tool by Artley and Stroh (2001), because it ignores certain

stakeholders, such as suppliers, public authorities, and institutional stakeholders, and it does not incorporate their perspectives on the performance. Moreover, the normative model of the Balanced Scorecard allegedly does not allow for a sufficient influence of operating personnel in the choice of performance measures (Kald and Nilsson, 2000). However, such criticism disregards the recommendations by Kaplan and Norton (2001a) on the measures and performance perspectives expressing the interests of constituents such as suppliers and community, and especially the employees, through the learning and growth perspective (Kaplan and Atkinson, 1998).

The use of innovative non-financial performance reporting, exceeding the requirement of statutory external reporting, in order to enable informed investor decision-making, has also been emphasized (Chenhall, 2003; Miller and Israel, 2002).

The improvements in the quality and breadth of external reporting have also been called by regulators, and have been advocated by key industry and professional standard setting bodies (Miller and Israel, 2002), such as CIMA (Chenhall and Langfield-Smith, 1998a). According to Chenhall (2003, p. 136), these requirements have been recognised by "accountants who have responded by refining triple bottom line reporting, environmental accounting, social corporate reporting and corporate sustainability".

Hierarchical top-down method

An open and participative approach to the development and use of PMMS can have marked impact on acceptance and success of the system (Malina and Selto, 2001). It has been suggested that a large number of employees should take part in jointly analysing and discussing the organisation's situation and capabilities (Olve et al., 1999), with the subsequent analysis of strategic perspectives and specific key success factors.

In addition to the discussion and understanding of the vision itself, a central part of the work consists of further analysis to identify strategic activities, factors for success, and strategic objectives, required for the vision to be achieved. For this reason as many

employees as possible should be actively involved in the process, which to the extent possible should be conducted with some form of consensus (Olve et al., 1999). To increase the likelihood that the objectives will be pursued, the PMMS calls for a team building (Anderson, 2001), whereby it is possible for employees to contribute their ideas and knowledge (Olve et al., 1999).

With reference to the Balanced Scorecard, the control method has been described as hierarchical and top-town both in the formulation of measures and the breakdown and distribution of these to teams and employees by Artley and Stroh (2001). Shank et al. (1995) also list the top-down perspective as a serious limitation of the Balanced Scorecard. Kaplan and Norton have described the refining and communicating of the strategy by means of the Balanced Scorecard as an iterative two-way process, with top-down communication of the preliminary strategy from the headquarters to the business units, which in turn quantify and communicate their long-term strategies back to the headquarters (1996b).

Malina and Selto (2001) have elaborated on the top-down design of the Balanced Scorecard, which reflected the company's traditional approach to management. The top-down approach was qualified as a major barrier to effective communication, and had a negative impact on acceptance of the Balanced Scorecard and the subsequent performance.

Data availability and reliability

Data collection has been described as a vital element of any performance measurement system (Stone and Banks, 1997), and it has been recognised that data availability and reliability can impact the selection and development of PMMS (Artley and Stroh, 2001). While in some organisations up to a 75 percent of data may be available in existing management information sources (Olve et al., 1999), significant gaps in availability have been reported for some of the measures selected.

According to Manoochehri (1999), the information systems to collect, analyse and report financial measures are well defined and established, and it is the data collection for non-financial measures that can pose a problem. Thus, according to a study of Fortune 500 organisations, although 'morale and corporate culture' was rated as highly important by 76 percent of respondents, it was measured by only 37 percent. Innovation was considered highly important in 63 percent of organisations, while being measured in only 22 percent of organisations (Manoochehri, 1999). One explanation for this gap is the lack of the information system's capability to collect data, as discussed.

According to Ittner and Larcker (2000), another problem with the availability of non-financial measures is their poor statistical reliability. For example, given that studying employee and customer attitudes is often both expensive and difficult (Olve et al., 1999), measures are often based on surveys with few respondents and with few questions. Poor statistical reliability of such measures generally reduces their usefulness in predicting future results, and in providing information on performance (Ittner and Larcker, 2000).

2.3 Complementarities to PMMS outcomes

2.3.1 Introduction

One of the research objectives of the study was to assess the extent of differences in PMMS outcomes in organisations, contingent to several organisational and contextual PMMS factors. As suggested by Olve et al. (1999), there are no standard solutions in design and implementation of PMMS. PMMS are likely to differ systematically with corporate direction and environment (Paladino, 2000), and a number of organisational factors such as size (Hoque and James, 2000; Chenhall and Langfield-Smith, 1998a), leadership, and information sources (Krumwiede, 1998).

The contextual factors, selected for inclusion in this study, and believed to influence the extent of PMMS outcomes or benefits, have been broadly categorised as follows:

- Organisational factors of industry, operationalised through standard industry classification, and size, which has been measured by number of employees and market capitalisation.
- Aspects of PMMS design, namely the PMMS type or framework in use, number of distinct performance areas or perspectives, number of measures in each performance area, the source of PMMS design and application software, and the character of causal links among the perspectives and measures in the PMMS.
- Characteristics of the PMMS in use, such as the time since the initiation of the existing PMMS in the organisation, perceived status of PMMS use in comparison with industry competitors, the number of organisational levels PMMS was used, and the extent of use of other management tools and techniques.
- PMMS champion characteristics of managerial level, functional background, position tenure, organisation tenure, formal responsibility for performance measurement, and the level of education.

Consistent with the availability of the relevant literature on complementary factors, the review has been conducted to a varying extent. A more comprehensive review is provided for the design aspects of PMMS, the use characteristics of PMMS, organisation size and the PMMS champion primary area of expertise. The other complementary factors, which had not been researched previously, were tested for exploratory purposes.

2.3.2 Size of organisation

The size of organisation has been frequently cited as important organisational factor which may influence organisational adoption and implementation of management innovations. According to Chenhall and Langfield-Smith (1998a & c), innovative management practices are more likely to be adopted by large organisations due to the greater availability of resources. Similar rationale is suggested by Rai and Bajwa (1997), i.e., larger organisations have more resources to absorb the costs associated with the

adoption of innovations. De Toni and Tonchia (2001) hypothesise that a PMMS, representing a complete and articulated system, is justified above a certain dimensional threshold, comprising of medium to large sized organisations. Surprisingly, in a study on the implementation of Activity-Based Costing, Krumwiede (1998) has also observed that larger firms are more likely to adopt PMMS, but has concluded that the reasons for the size impact were not clear.

In Australia, Hoque and James (2000) had investigated a relationship between the Balanced Scorecard use and organisation size. Hoque and James (2000) have found that larger organisations are likely to make more use of the Balanced Scorecard, and have provided several plausible explanations of the positive association.

Conceptually, the use of PMMS is associated with the size of organisation in several ways. As indicated by Hoque and James (2000), larger organisations typically have a larger number of rules and procedures for coordinating and controlling the internal activities, as well as more elaborate performance evaluation techniques. In consequence, larger organisations may require a larger number of the performance parameters (De Toni and Tonchia, 2001), and the management evaluation of the activities may be proportional to the size of the business.

The time it takes to develop a PMMS may also depend on the organisation's size. It has been estimated that in smaller organisations a PMMS could be completed in minimally six months, while in larger organisations the process might take several years (Olve et al., 1999).

2.3.3 PMMS design factors

With reference to the advantages of a particular PMMS concept, it has been claimed that a PMMS approach should be adapted to the needs of the user (Olve et al., 1999). Although this precludes an absolute comparison of the methods, for exploratory purposes, the effects of different PMMS design, ranging from combinations of financial

and specific non-financial measures (Ittner and Larcker, 2003; Ittner et al., 2003; Chenhall and Langfield-Smith, 1998a) to the more integrated performance measures and strategy orientated systems (Chenhall, 2004; Chenhall and Langfield-Smith, 1999a; 1998a), were compared and statistically tested to examine their relative ability to explain PMMS outcomes (Ittner and Larcker, 2000).

With regard to the extent of involvement of external consultants in the PMMS design and the development of PMMS software, findings in the previous literature are mixed and inconclusive. It is generally recommended that the software must be selected carefully and researched fully prior to implementing the PMMS, as was the case at Phillips Electronics (Gumbus and Lyons, 2002). Malina and Selto (2001) reported that the staff members with responsibility of designing and implementing a Balanced Scorecard have had formal training, but were not using services of outside consultants. According to Neely et al. (2000), despite the requirement that measures should be company specific and derived from strategy, and the significant benefits of involvement in the process of PMMS development, managers "are still looking for off-the-shelf solutions which require little time and effort to develop" (Neely et al., 2000, p. 1141). A useful distinction has been made by Rai and Bajwa (1997), in their study on executive information system. Rai and Bajwa (1997) have identified two complementary system capabilities, collaboration support and decision support. Executive information systems for collaboration support were described as relatively standardised and replicable, while the systems for decision support had to be developed with regard to the specific characteristics of the user and task (Rai and Bajwa, 1997). Accordingly, it appears that the components of the PMMS used for collaboration support can be pre-packaged and sourced from external vendors, while the decision support component has to be developed internally.

The above considerations can be extended to the analysis of potential benefits by Andersen (2001), who pointed to the differences between the larger and more complex organisations and the smaller ones. Larger organisations are more likely to exploit the communication and control elements of PMMS in providing relevant information about the activities in the organisation. In smaller organisations, the benefits of a PMMS would

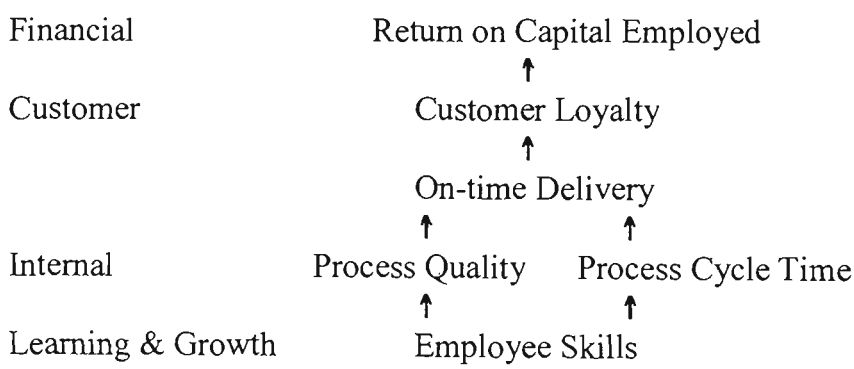
be derived from the description of strategic vision and strategic objectives, and secondly, in the development of more effective strategic management processes.

Causal links among PMMS perspectives and measures

One of the most important characteristics of the PMMS is the cause and effect relationships 'logic' or 'chain', linking the performance measures and putting the drivers of future value in the relationships with the desired outcomes. The links between the key success factors and organisation's future profitability are a primary distinguishing feature of the most popular PMMS, the Balanced Scorecard (Kaplan and Norton, 2001c, 1996c,). The cause and effect relationships between measures and perspectives have been considered as a defining characteristic of the Balanced Scorecard concept by Malmi (2000), Norreklit (2000), and Hoque and James (2000).

The mapping of means and ends relationships in the development of a Balanced Scorecard has been represented by a linear chain, or a 'vertical vector', by Kaplan and Norton (1996a). Strategic objectives are spread across four zones or 'perspectives', in accordance with the classification of objectives into financial, internal business process, customer, learning and growth categories. A typical cause and effect chain, starting with the improvements in learning and growth perspective, which in turn lead to more satisfied customers, and then to happier shareholders, is shown in Figure 2.3.3.1.

Figure 2.3.3.1 Cause and effect relationships in the Balanced Scorecard



Source: Kaplan and Norton, 1996a, p. 66

The model (Kaplan and Norton, 1996a, b & c) disaggregates overall organisational performance into four different, critical, measurable and inter-related points of view. These perspectives depict critical cause – and – effect relationships in the enactment of an organisation's strategy. The Balanced Scorecard and its associated strategy maps follow a one-way linear approach to strategic performance management, starting with learning and growth perspective and culminating in financial results for shareholders:

> effective innovation, learning & growth by employees → efficient internal business process → satisfied & loyal customers → good financial results for shareholders.

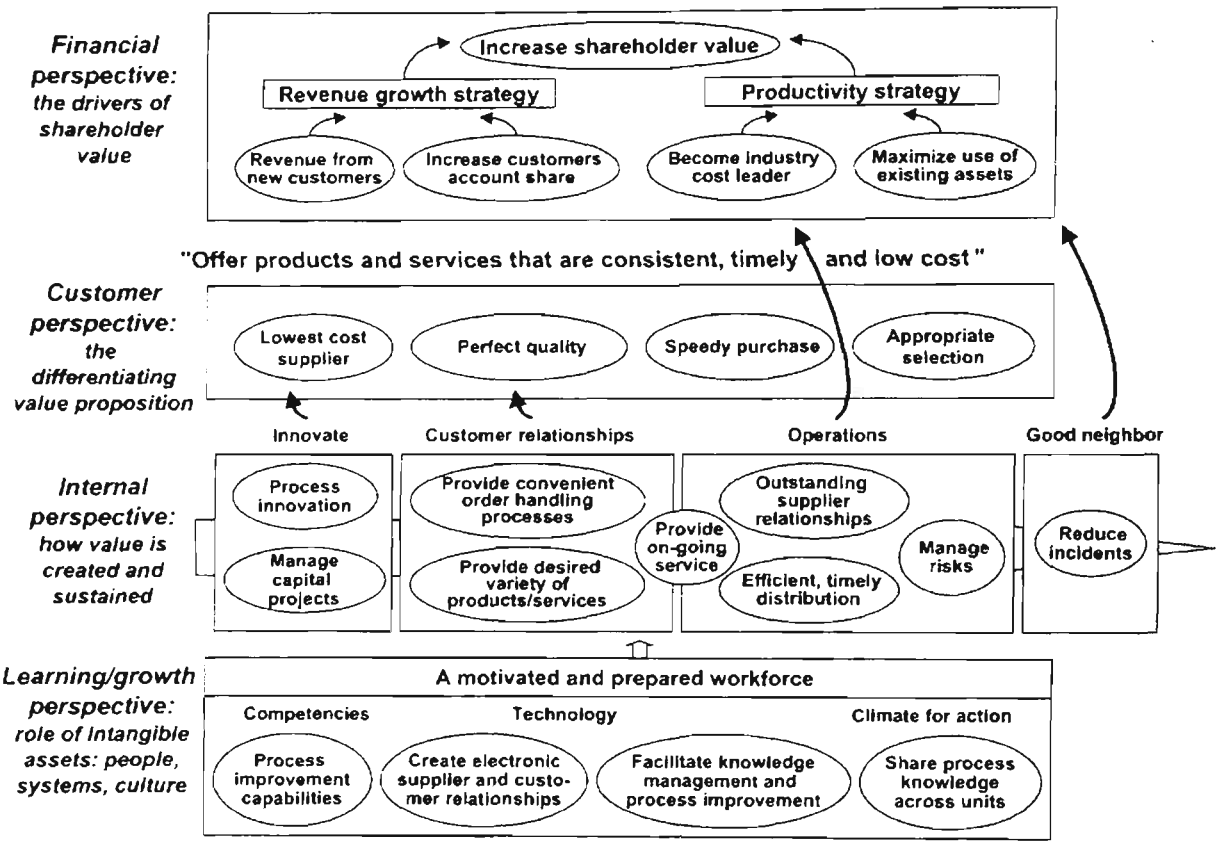
The two lower perspectives contain objectives relating to the most important activities in terms of business processes, cycle time, productivity etc., and what needs to happen for these processes to be sustained and further developed in terms of people, product and process development (Kaplan and Norton, 1996c). The perspectives in the lower portion of the scorecard highlight activities of long-term significance (Olve et al., 1999). Competencies and capability of improving are factors with longer-term effects than the share of new products, which in turn is an indicator of the outlook for future profits.

The two top perspectives, customer and financial, contain objectives relating to the desired outcomes of the activities undertaken, i.e., how the organisation wishes to be perceived by the customers, and how this will ultimately translate into financial results and economic value (Kaplan and Norton, 1996c).

According to Olve et al. (1999), the objectives in the different perspectives should be clearly connected, and should portray the coherent business strategy. Developing a strategic linkage model can help articulating the causality between the objectives (Andersen, 2001), and should clearly show how the activities in the lower part of the scorecard, or the 'drivers' (Kaplan and Norton, 2000) are logically justifiable for attaining the objectives in the upper two perspectives (Olve et al., 1999), or the 'outcomes' (Kaplan and Norton, 2000). The strategic linkage model has also been termed 'success map' by Neely and Bourne (2000), and 'strategy map' by Kaplan and

Norton (2000). The success map (Neely and Bourne, 2000) has been described as a cause and effect diagram containing the 'levers' which will impact on the business performance (Kaplan and Norton, 2000). An example of a strategy map is presented in Figure 2.3.3.2, which clearly demonstrates how each strategic objective is linked in the chain of cause and effect across the standard Balanced Scorecard perspectives.

Figure 2.3.3.2 Example of a strategy map



Source: de Waal, 2003, p. 35

In recent years, the need for the 'means and ends' component has been recognised in a general PMMS context. Thus, Chenhall (2003, p. 136) suggests that management control systems should "provide vertical links between strategy and operations and horizontal links across the value chain". Lack of understanding of a measure's cause and effect has been cited as a reason for failure of PMMS by Miller and Israel (2002). Bititci et al. (2000, p. 694) discussed the dynamic performance measurement systems, and identified the following barriers to their adoption:

- Inability to develop causal relationships between competitive and strategic objectives and processes and activities;
- Inability to quantify the relationships between measures within a system.

According to Neely and Bourne (2000), many organisations have not incorporated a cause and effect component during the development of performance measurement systems. In a survey by Ittner et al. (2003), less than a quarter of respondents using the Balanced Scorecard had built causal links between drivers and outcomes of performance in their systems, and most did not validate the model. In Australia, Walsh (2000) had surveyed the use of the Balanced Scorecard, and reported that early versions of the Balanced Scorecard in Australian organisations did not have the causal component, and there was no attempt to link the various performance areas or perspectives in a cause-and-effect chain. The driver-outcome relationships were not recognised (Walsh, 2000). Similarly, organisations in other countries did not know enough about the links between the key success factors and the desired financial outcomes, and were unable to clarify the causal factors of its financial performance (Epstein and Manzoni, 1998).

Criticism of the concept

The logic of a 'cause and effect chains' component in PMMS has been investigated and critiqued from both theoretical and empirical viewpoints. According to Artley and Stroh (2001) and Olve et al. (1999) the chains of cause-and-effect are not easily established, given that external variables outside organisation's control often effect actual outcomes. For this reason, the outcomes may be a result of the factors unrelated to the organisation's strategic plans, and the extent of impact of such factors should be estimated by special in-depth analyses and evaluations.

With regard to the causal links between four performance perspectives of the Balanced Scorecard, the model was seen as deficient in providing guidance as to how to improve performance to achieve the desired strategic results (Gautreau and Kleiner, 2001). Lee and Ko (2000) viewed the Balanced Scorecard as a powerful tool to define the

organisational strategic goals. However, the Balanced Scorecard did not indicate the functional relationships between the four performance perspectives. Similarly, Otley (1999) has reviewed the Balanced Scorecard literature, and found that it contains few recommendations on how means and ends should be linked analytically.

Brignall (2002) and Norreklit (2000) argued that the links between the various perspectives of the Balanced Scorecard are interdependent and circular, and not unidirectional. In consequence, the relationships among the various perspectives are ambiguous and complex, making the Balanced Scorecard impracticable, and its utility greatly reduced. However, such criticism appears to be misguided, given that Kaplan and Norton (1996a) have recognized, albeit only in the footnote, that the model was unidirectional, and have emphasized the interdependence among the measures:

> "For simplicity, we show the cause-and-effect relationships as uni-directional. In practice, feedback loops exist (for example, higher financial performance generates free cash flow that can be reinvested back into developing new products and services, enhanced employee skills, and greater processes capabilities. Also, improved customer satisfaction can feed back to higher motivation and morale among employees." (p.79).

Norreklit (2000) investigated some of the key assumptions of the Balanced Scorecard, and found them to be essentially flawed. In particular the following causal relationship: organisational learning and growth → internal business processes → customer perspective → financial measures (Kaplan and Norton, 1996c, p.31, diagram adapted), where the measurements in non-financial areas are to be used to predict future financial performance, had not been empirically proved or rejected. The linear chain may be plausible, but it represents a simplification of reality (Otley, 1999), and the model does not promote understanding of the relationships between various measures (Bititci, 2001) Norreklit (2000) argued that the nature of the alleged causal relationships is actually only a logical one and not a cause-and-effect relationship. Norreklit (2000) provided the examples of non-causality between quality and financial results, and customer profitability or customer loyalty and profitability, and concluded that the Balanced

Scorecard makes invalid assumptions about causal relationships, leading potentially to dysfunctional organisational behaviour and sub-optimised performance.

Brignall (2002) extended the criticism of the causal relationships to the other PMMS models, such as the Performance Pyramid and the Results and Determinants Framework. Brignall (2002) pointed at the ambivalent, dual nature of the measures in the chain, with no single, unique sequence of events, and asserted that each perspective may contain both drivers and outcome measures that may be related to more than one perspective. Consequently, the causal relationships in the Balanced Scorecard model are typically a "fuzzy mess of interactions and interdependencies that inevitably fail to capture the unintended consequences that many performance initiatives may have" (Brignall, 2002, p. 89).

Another difficulty with cause and effect relationships pertains to the organisational level at which measures for different parts of the organisation, and different performance dimensions, are related to the business of the organisations as a whole, at an overall level (Olve et al.,1999). The problem of identifying the relevant levels of organisational analysis for studying interactions among the detailed performance measures (Brignall, 2002) has been elaborated by Ittner and Larcker (1998b), in their analysis of the value relevance of the customer satisfaction measures, as leading indicators of financial performance, at customer, business unit and firm-level data. Ittner and Larcker (1998b, p. 33) concluded that the "problems caused by the aggregation of multiple initiatives will make it more difficult to trace chains of cause and effect to identify leading and lagging indicators". Olve et al. (1999) reported on the practical attempt to overcome the problem, through application of combined value chain and causal analysis.

Despite the significant research of non-financial indicators as predictors of financial performance, conducted during the last ten years, the state of empirical research of the interrelationships among different perspectives and their measures has been described to be 'in its infancy' by Brignall (2002, p. 89). Earlier, Stone and Banks (1997) have pointed at the 'speculation' and the 'belief' that improved customer focus leads to

superior economic results. The obvious difficulties in establishing a causal relationship between the various measures in non-financial areas and the accounting and stock performance, can be illustrated by the example of the alleged link between customer satisfaction and financial performance in Xerox. According to Ittner and Larcker (2000), Xerox spent millions of dollars on customer surveys, under the assumption that improvements in customer satisfaction were the primary leading indicator of better financial performance, which was later disproved. Subsequently, a customer loyalty measure replaced customer satisfaction as a leading indicator of financial performance. However, as reported by Olve et al. (1999), at the same time it had been found that the main leading indicator, or cause, of customer loyalty was customer satisfaction, and that an increase of 1 percent in customer satisfaction led to an increase of 0.5 percent in customer loyalty. The association had allegedly been strongly supported by Xerox' comprehensive statistical evidence.

Equally inconclusive, or mixed, results regarding the difficulties in identifying the non-financial areas and measures causally related to financial outcomes, were reported by other researchers as well. Banker et al. (2000), in their report on an incentive plan based on non-financial measures, also pointed to the absence of a theoretical functional relationship between a non-financial measure of customer satisfaction and financial performance. However, Banker et al. (2000) found positive associations between customer satisfaction measures and future accounting performance. Ittner and Larcker (1998b) have researched and refuted the causality between quality measures and accounting and stock improvements, and concluded that no evidence exists on the impact of including non-financial measures in performance evaluation and incentive compensations. Ittner and Larcker (2003) have found that firms with cause and effect linkages in their PMMS performed better, and had higher returns on assets and equity, while Ittner et al. (2003) study on differences between the financial services organisations with more coherent PMMS were more satisfied with their PMMS, but have not improved economic performance.

How to establish the causal relationships

As described in the previous section, determining the cause and effect relationships is often more difficult than expected. However, Malina and Selto (2001) noted that effectively communicating the links between lagging (financial) and leading (non-financial) performance measures throughout the organization may be crucial to implementing strategy successfully.

The simplest method of establishing the cause and effect relationships is to formulate a graphic model, representing how the measures are linked with the performance perspective and to measures of objectives in other perspectives (Artley and Stroh, 2001; Olve et al., 1999). According to Artley and Stroh (2001), a structured approach to creating an explicit causal model would involve the following activities:

- listing the objectives for each performance perspective;
- describing the measures for each perspective; and
- illustrating how each objective can be quantified and displayed.

At the same time, it has been claimed that the majority of managers have failed to adopt an appropriate design of the cause and effect relationships, based on the valid data reported to them, and have been working on intuition (Ittner and Larcker, 2000). According to Otley (1999), organisations may be relying on the tacit knowledge of the management consultants who implemented the PMMS, and such knowledge could be formally explicated. The testing of the causal model has also been carried out qualitatively "... where managers validated and refined the programs being used to drive service quality and customer retention." (Kaplan and Norton, 2001b, p. 154)

The inability to develop quantitative causal models can be also attributed to the lack of performance data. According to Kaplan and Norton (1996b),

> "...accumulating sufficient data to document significant correlations and causation among the Balanced Scorecard measures can take a long time – months or years. Over the short term, managers' assessment of strategic impact may have to rest on subjective and qualitative judgments. Eventually, however, as more

evidence accumulates, organizations may be able to provide more objectively grounded estimates of cause-and-effect relationships." (p. 84).

Learning based on experience has also been emphasised as a means of identifying the cause and effect relationships in a PMMS, at both individual and organisation levels (Olve et al., 1999). Managers can determine whether their strategies are valid through a cumulative effect of double loop learning (Senge, 1990), which enables them to test the assumptions underlying their strategies (Balanced Scorecard Report, 2000b). The testing of strategy assumptions, or hypotheses, may result in rejection, when expected linkages are not occurring, or in the adjustment when unexpected linkages are identified. According to Olve et al. (1999, p. 321), a review of cause-and-effect relationships, in the form of testing the assumptions underlying organisation's strategy is a continuous process, given the fast changes in today's markets and technologies, and the "... dynamic relationships in a Balanced Scorecard can be modelled with a systems dynamics approach." (Kaplan and Norton, 1996a, p. 79).

Apart from testing the hypotheses of associations, i.e., identifying the statistical correlations between measures (Kaplan and Norton, 2001b), a set of advanced statistical techniques to examine patterns of causal linkages among measures have also been reported. Thus, at Sears analysts performed causal modelling, factor analyses, and cluster analyses to identify systemic patterns of linkages, and the further analysis showed the varying impacts of key drivers on different lines of business at the store levels (Balanced Scorecard Report, 2000b). The use of leading and lagging indicators in measurement analysis has been advocated by Ittner and Larcker (2000), who claimed that the resulting causal business model can help identify the predictors of future financial performance, and allocate weightings to measures, based on the strength of the statistical relationship. Bittitci et al. (2000) have also discussed techniques that can be used to model and quantify the relationships between performance measures, and have developed and validated an approach using the analytical hierarchy process.

In the same way the statistical analyses have been used to evaluate historical relationships among measures, causal relationships have been used to forecast the strategy's trajectory, which "gave managers a window into the future to see the impact of today's operations" (Olve et al., 1999, p. 17). This has been accomplished with the aid of a dynamic simulation model (Balanced Scorecard Report, 2000b), which incorporated feedback loops and delays, to allow for the size, or relative importance of measures. At that, the timing of associations among driver variables and outcome variables could also be programmed in the model, so as to establish the length of time it will take before the effects become apparent. Simulation models for the Balanced Scorecard applications, such as Ithink, have increasingly been used by a number of consulting firms (Olve et al., 1999).

Number and balance of performance perspectives and measures

As suggested by Chenhall (2003), PMMS should be evaluated on the extent to which they accommodate financial and non-financial measures. Earlier, Langfield-Smith (1997) has identified the balance between short-term and long-term measures as one of the issues in performance measurement which was lacking in empirical evidence.

According to Abernathy (1997), the concept of balancing performance measures has first been introduced by Felix and Riggs (1986) in the Performance Matrix, composed of a group of performance measures that are priority weighted, and used to determine performance pay on the basis of a balanced performance index, reflecting key performances associated with the jobs. The concept of balancing performance measures was firmly established in 1992 when Kaplan and Norton introduced the Balanced Scorecard. The summary of the concept is to translate business mission accomplishments into a critical set of measures distributed among an equally critical and focused set of business perspective (Kaplan and Norton, 1992), including both financial and non-financial and internal and external measures and indicators, and linking past outcome measures with the future driver measures. The principle that measurement needs to be balanced across multiple dimensions, to be effective and support organisational goals, has

also become entrenched in management practice, judging by the responses in the KPMG enterprise management study (Miller and Israel, 2002).

Since 1992, when the concept was introduced, many variations of the Balanced Scorecard have been reported. Many scorecards include standard (Kaplan and Norton, 1996c, 1992) performance perspectives, financial, customer, internal business processes and learning and growth. Numerous organisations have introduced customised perspectives, or 'boxes' of indicators (Epstein and Manzoni, 1998), in addition to the standard model. Regardless of the number of performance perspectives, it has been emphasized that they all are equally important in the long run, and should be strategically focused, and balanced, so that no perspective predominates over the others (Kaplan and Norton, 1996c, 1992).

In addition to the four performance areas or perspectives of the original Balanced Scorecard model, organisations have also incorporated the following measures and perspectives in PMMS: human resource, or employee perspective (Miller and Israel, 2002; Olve et al., 1999); special measures of information technology (Olve et al., 1999); special environmental focus (Olve et al., 1999); stakeholder measures, including those pertaining to the public health and safety, environmental protection, and economic impact on community and society, or corporate citizenship (Malina and Selto, 2001), and major projects currently underway (Miller and Israel, 2002). Given the particular importance of compliance to laws and regulations, numerous organisations and industries, e.g., utilities, have introduced legal perspective (Gautreau and Kleiner, 2001; Balanced Scorecard Report, 2000a).

As suggested by Olve et al. (1999), there are several different kinds of balance to be established in PMMS, such as those "between the short and long run, between different parts of the scorecard, between how others see us (perspective) and how we see ourselves (focus)". In conformance with the four Balanced Scorecard performance perspectives proposed by Kaplan and Norton (1996c, 1992), the comprehensiveness and the

composition of the measures used in surveyed organisations was analysed to explore the impact of varying 'balance' of the PMMS on the outcomes of PMMS.

With regard to the actual 'balance' in PMMS, the results of recent research by Hackett Group on the use of the Balanced Scorecard suggest barely any difference between the organisations with the Balanced Scorecard, with 75 percent of all measures being financial, and the organisations without a scorecard, with 82 percent of financial measures (Norton, 2001). The imbalance of PMMS has also been pointed to by Neely et al. (2000), who report on the predominance of financial and operational measures in the PMMS, with only a few related to the customer perspective and none related to the innovation and learning perspective.

The number and composition of measures in PMMS has been a topic of the rules and guidelines for the design of a balanced PMMS (Norton, 2001; Kaplan and Norton, 1996c). Several considerations have been emphasised concerning the number of measures for each scorecard, such as the requirement to limit the number of measures to a strategically critical few, of approximately 20 (Kald and Nillson, 2000), or between 15 to 20 measures at corporate and business unit level (Norton, 2001; Kaplan and Norton, 1996b & c). According to Artley and Stroh (2001), the number of strategically important measures depends on the complexities of the organisation, and in 'best practice' organisations the working number of measures has been set at between three and 15 at each level within the organisation. Gautreau and Kleiner (2001) report on the case of General Electric, where only three performance measures are considered critical by the company's CEO, namely cash flow, customer satisfaction, and employee satisfaction. At Halifax the scorecard comprised 16 measures, of which the Board of Directors followed 10 – 12 (Olve et al., 1999).

The actual composition of measures in PMMS largely depends on the level at which the measures are to be used. The measures must allow for multilevel management by showing the interrelationship of measures and their linkage to strategic objectives, i.e., their relevance in value creation (Miller and Israel, 2002). Most often measures at a

more operational level are specific, whereas the corresponding measures at higher levels are more general (Olve et al., 1999). According to Norton (2001), the number of measures may vary according to the level of the particular scorecard or perspective, with 15 to 25 measures per corporate and business unit levels scorecards, and five to ten measures in group and individual scorecards. The number of critical measures decreases at lower levels of organisation, due to the lesser degree the measures can be influenced by the unit or the individual at lower levels of organisation (Norton, 2001).

The differences between top-level and lower level scorecards can be viewed in Table 2.3.3.1.

Table 2.3.3.1 Employee and Executive Scorecards

EMPLOYEE SCORECARD		EXECUTIVE SCORECARD	
Financial - 10%	**Customer - 40%**	**Financial - 40%**	**Customer - 20%**
- Net profit versus budget	- Customer retention/ existing business - Customer satisfaction/ new business	- Return on equity greater than cost of capital - Increase earnings margins	- Customer retention/ existing business - Customer satisfaction/ new business
Process - 40%	**Innovation - 10%**	**Process - 20%**	**Innovation - 20%**
- Increase gross margin on old product - Increase net margin (excluding research and development, sales and marketing costs)	- Meet target revenue percentage from new products - Meet target date for new product rollout	- Reduce unit costs - Reduce cycle time	- Meet target revenue percentage from new products - Meet target date for new product rollout

Source: Knight, 2000, p. 2

In practice, it has also been recognised that the design of the corporate organisation limits the extent to which goals can be decomposed. For example, in Electrolux the limit has been set at the level of division (Olve et al., 1999).

Many PMMS use generic measures (Kaplan and Norton, 1996a). These typical core measures, used by the majority of CEOs, represent learning, process and outcome measures which reflect the common goals of many strategies, as well as similar structures across industries and companies. They include profitability, market share, productivity,

customer satisfaction, customer retention and employee skills. Among all the measures, customer satisfaction is generally regarded as the most important performance indicator (Gautreau and Kleiner, 2001), as are the customer-related performance measures, which were deemed to be an extremely important driver of long-term success by 72 percent of organisations, in a survey reported by Ittner and Larcker (2000). The choice of drivers of performance is linked to the organisation's particular strategy, and is determined by the chosen market segments, the competitive environment, and particular internal processes and growth capabilities that enable the financial and customer objectives to be achieved (Ittner and Larcker, 2000; Kaplan and Norton, 1996c).

With respect to the composition of the measures in a multiple perspective PMMS, the norm found in the literature (Norton, 2001) suggests that a good balance will be created by including five financial measures in a PMMS, while the remaining 18 to 25 measures should focus on customers, internal processes, and learning and growth. Good scorecard design would have five measures in each customer and learning and growth categories, and internal process perspective would comprise the highest number of measures, eight to ten, or 34 percent. At that, "... depending on industry circumstances and a business unit's strategy, one or more additional perspectives may be needed – interests of other important stakeholders must be expressed – employees, suppliers, and community." (Kaplan and Atkinson, 1998, p. 379). A greater emphasis on internal processes has also been reported by Kald and Nilsson (2000), in their survey on the Balanced Scorecard in Nordic countries. The overall conformance with the above distribution prescriptions has allegedly been confirmed in a study of 22 organisations that had implemented the Balanced Scorecard, as reported by Norton (2001).

In contrast to the quantitative suggestions on the number and composition of the PMMS measures, other authors have emphasized the relative character and significance of the PMMS structure. Thus, Mavrinac and Vitale (1997) pointed at the efficient balance among the measures, with the goal "... to cover a large amount of territory (whether three categories or six) with as few measures as possible." (p. 28). Chenhall (2004) has investigated the importance of having coherent, integrative systems, which provide both

the links of strategy with operations, and consist of a broad array of measures. The results of the study by Ittner et al. (2003) show that greater measurement emphasis and diversity, relative to competitors with average or benchmark measurement practices, are correlated with higher satisfaction and stock market performance.

The difficulties in designing a balanced PMMS have been attributed to the fact that the quality of short-term financial measurement is considerably better than non-financial measurement in areas such as customer satisfaction, employee performance, operational results, quality, alliances, supplier relations, innovation, community and the environment (Ittner and Larcker, 2000). Non-financial measurement, unlike financial measures, which had been in use for many years, are allegedly difficult to establish and quantify (Gautreau and Kleiner, 2001). Selected measures need to be rated on several important dimensions, such as availability of supporting data, accuracy, precision and clarity, and general validity (Mavrinac and Vitale, 1997). Given that leading indicators are used to forecast future trends inside and outside the organisation (Artley and Stroh, 2001), quantitative, or quantifiable, statistically reliable and discriminating (Mavrinac and Vitale, 1997), measures are preferred because they produce comparative data about trends, which allow for assessment of changes in the processes and strategy, identification of significant uncontrollable factors, and which support continuous improvement.

However, poor statistical reliability has been identified as a major problem with non-financial measures, many of which are based on surveys with few respondents and few questions, such as satisfaction measures, and other behavioural measures which measure the underlying culture or attitude of the personnel or organisation (Artley and Stroh, 2001). In consequence, poor statistical reliability of such measures reduces their ability to discriminate superior performance or predict future financial results.

Miller and Israel (2002) have suggested that non-traditional measures, related to intangibles and emerging areas such as an entity's marketplace, stakeholders, strategic implementation and resource management, have tended to be less well defined. Although these measures should be predictive, they often "... rely on incomplete, anecdotal, and

conflicting data that are gathered inconsistently" (Miller and Israel, 2002, p. 2). Unreliable measurement has been cited as a reason for eliminating the Learning and Growth category from the scorecard (Malina and Selto, 2001). Mavrinac and Vitale (1997) have identified two broad groups of organisations, which they have termed 'value versus values', of which the 'value' organisations were inclined towards the use of measures that could be explicitly and quantifiably linked with the attainment of the business strategy, and preferred the measures that that could produce objective, accurate values, even in non-financial areas. Most 'value' organisations did not use measures based on customer or employee opinion surveys, and favoured outcome measures over activity measures (Mavrinac and Vitale, 1997). It has been suggested that such organisations may be preoccupied with formal 'hard' measures (Chenhall, 2003), and that organisations may optimally use a diverse set of performance measures to reflect the diversity of management decisions and efforts (Ittner and Larcker, 1998a), including those measures that require subjective assessments of progress (Chenhall, 2003). The absence of non-financial measures such as environmental and social responsibility will often adversely affect an organisation's long-term financial outcome, as poor performance in those areas may result in diminished employee loyalty, customer satisfaction, brand value and strength of reputation (Miller and Israel, 2002). The awareness of the importance of non-financial performance measures, as well as the practical difficulties associated with those measures, had been confirmed in a study of the Fortune 500 companies (Manoochehri, 1999), which found that although 76 percent of companies rated 'morale and corporate culture' as highly important, only 37 percent measured this factor. Similarly, 'innovation' was considered as highly important by 63 percent of organisations, but was measured by only 22 percent of organisations. The gap was explained by the lack of the information system's capability to collect data, and the fact that some non-financial measures are subjective and cannot be easily quantified and meaningfully measured with numbers (Manoochehri, 1999).

It has been claimed that the ability to manage intellectual capital and exploit intangible assets has become far more decisive than the ability to invest and manage in physical assets (Kaplan and Norton, 2001a, 1996c), and that reliance on a limited set of

operational and financial measures can be fatal, therefore necessitating performance measurement in several areas (Tiwana and Ramesh, 2000). According to Kaplan and Norton (2001a), "Measurement systems and related performance management systems were not designed to deal with the sophistication and complexity presented by assets that are intangible". The problems with measurement of intellectual capital, or intangibles, are caused by their characteristics. Thus, Balanced Scorecard Report (2000a) states that the value of an intangible, such as 'workforce knowledge' may be difficult to measure because it does not have direct impact on tangible outcomes like revenue or profit, and is separated in time and logic from tangible outcomes. Secondly, the value of intangibles is contextual, can only be determined in the context of particular strategy, and differs from organisation to organisation (Balanced Scorecard Report, 2000a). The value of intangibles, with the exception of brand names (Kaplan and Norton, 2001a), is also said to be potential, i.e., their value is only realised when transformed into tangible value through organisational processes of design, delivery, and service. Finally, intangibles must be bundled with other assets to create value (Kaplan and Norton, 2001a). It has been claimed that the Balanced Scorecard was developed to address these problems, as it allows an organisation to describe a unique strategy, by capturing all unique value creating factors, defined by strategy, like cycle times, experience levels, turnover, etc.

2.3.4 PMMS use factors

Number of organisational levels using PMMS

The ability of PMMS to provide decision-making support for decision makers at all organisational levels has been described as another desirable characteristic of PMMS design (Eom et al., 1998), and a fundamental concern for organisations (Chenhall and Langfield-Smith, 1999b). The findings of previous research indicate that organisations differ greatly in their levels of adoption of PMMS (Malmi, 1999; Olve et al., 1999). Some organisations may have one or a few executives supported by PMMS capabilities, while other organisations may have a significant majority of their executives supported by these technologies (Rai and Bajwa, 1997).

According to Kaplan and Norton (2001b), the top-level scorecard and measures are decomposed and aggregated to lower-level managers and organisational units. However, corporate level measures may not be applicable at lower organisational levels, and may not be easily disaggregated, or cascaded (Ittner and Larcker, 1998a). Individuals and departments at lower levels transform high-level objectives and priorities into their own objectives, as was the case in the departmental development of key result areas in the five companies investigated by Chenhall and Langfield-Smith (1999a). Ultimately, personal scorecards can be used to set personal objectives (Kaplan and Norton, 2001b). At various levels, relevant strategic measures, action plans and targets have to be introduced to enable coordinating decisions and actions at the desired organisational levels (Kaplan and Norton, 1996c). The process of relating performance measures used in a company to a logical part of the business, i.e., identifying whether an existing performance belongs to the business, business unit, or process, may be difficult, according to Bititci (2001).

The size of the organisation has been identified as a primary factor contributing to the extent of disaggregation of PMMS measures and their application to lower-level organisational units (Olve et al., 1999), which is necessary to make the PMMS sufficiently tangible and understandable. If the organisation is so flat and small that everyone can see the effect of the top-level scorecard on his own work, no further breakdown is necessary. As pointed by Olve et al. (1999) and Andersen (2001), in small or 'flat' organisations, a high level PMMS can be simply used as a mental or verbal frame of reference for addressing general strategic and operational issues resulting from the pursuit of long-term goals, without the need for further breakdown of the PMMS, and without the need for developing a complicated and administratively demanding measurement regime. However, in most organisations, development of a PMMS for the entire organisation will involve the process of communication and strategic alignment between the hierarchical levels (Kaplan and Norton, 1996c).

According to Speckbacher et al. (2003), the most popular PMMS framework, the Balanced Scorecard, was originally intended for implementation in the entire organisation. However, it appears that a large number of the scorecards are primarily

applied at the business unit level (Malmi, 2001), owing to the formulation of competitive strategies at a business unit level, and the inability to compare and aggregate the non-financial measures at an overall corporate level (Mavrinac and Vitale, 1997). In consequence, strategy and PMMS development in organisations with different multiple businesses typically "... start somewhere in the middle of an organization, and then the links are designed up" (Marquardt, 2000, p. 2).

Extent of use of other innovative management tools

Integration of PMMS with other systems in organisations has been discussed by several authors. According to Otley (1999), PMMS is supported by traditional measurement systems in organisation, and can be more effectively used in combination with existing control systems. PMMS shares inputs with the other systems, and produces outputs for other systems (De Toni and Tonchia, 2001). To gain greater benefits, the PMMS should be used in integration between the various areas of business, and should be supported by the following information systems, and management accounting innovations:

1) The accounting system, regarding both the balance sheet accounting, the analytical cost accounting, or costing/activity-based costing (Chenhall and Langfield-Smith, 1999a), and the budgeting (De Toni and Tonchia, 2001);
2) The manufacturing planning and control systems (Chenhall and Langfield-Smith, 1999a);
3) The strategic planning (De Toni and Tonchia, 2001, Chenhall and Langfield-Smith, 1999a);
4) Shareholder value management and metrics, Total Quality Management, reengineering, employee empowerment, time-based management, and benchmarking (Kaplan and Norton, 2001a; 1996c)

According to Kald and Nilsson (2000), a high degree of integration of PMMS with other systems of planning and performance monitoring is a major contributing factor which makes it easier to implement changes in the way of doing business. The extent to which Australian organisations integrate their PMMS with other innovative management

techniques and other information systems appears to vary among the organisations, and to be rather limited, according to the findings of Chenhall and Langfield-Smith (1999a).

As contended by Olve et al. (1999, p. 148), "the idea of presenting a number of different measures in a compact document is not new", since "measurement is central in a variety of concepts which have appeared in recent years, such as total quality management (TQM), business process management (BPM), Quality awards, ISO certification, and others". Performance measurement has also become more prominent in areas of production management, market research, and human-resource management, along with the development of measures used for financial control such as Economic Value Added. Kaplan and Norton (2001b) argue that such new financial metrics are fully compatible with the Balanced Scorecard and that each enhances the other.

2.3.5 PMMS champion characteristics

A competent in-house PMMS champion can assist in design and propagation of PMMS in the organisation (Epstein and Manzoni, 1998; Rai and Bajwa, 1997). PMMS champions provide the primary direction for PMMS adoption and implementation by leading the organisation's PMMS system (Epstein and Manzoni, 1998). PMMS champions may be instrumental in securing appropriate support from internal sources, can accelerate learning process and reduce knowledge barriers associated with the deployment of complex information technology innovations (Rai and Bajwa, 1997).

The most detailed discussion about the functional background of the PMMS champion was provided by Epstein and Manzoni (1998). They emphasised the role of financial specialists in the development of the Balanced Scorecard, due to the alleged skills they may have with respect to measurement and structured reasoning (Epstein and Manzoni, 1998). In contrast, Chenhall and Langfield-Smith (1999b) have emphasized the importance of developing the management accounting systems outside the traditional financial accounting function, and have identified accounting departments and management accountants as critical in diffusing the systems throughout the organisations.

With the exception of sales and manufacturing managers, financial specialists, specifically controllers, are better skilled than other managers at identifying the right performance indicators, due to their experience and training (Epstein and Manzoni, 1998).

2.4 PMMS as strategic management systems

2.4.1 Introduction

The fundamental purposes of performance measurement are to provide insights into operations, to support strategic planning, and to focus the organisation on the attainment of strategic goals (Artley and Stroh, 2001; Kaplan and Norton, 1996c). There are several models of the planning process, developed by the normative literature on strategy, which reflect the differences in planning practices in public and private organisations, and the differences between the large and the small to medium sized business organisations. However, it has been proposed that many basic strategic management issues are relevant in all organisations (Andersen, 2001), and that major components involved in the execution of strategic planning correspond closely. Common to all organisations is interest in accomplishment of sustainable high performance and the fulfillment of stakeholders' expectations in general, acquisition of a lasting competitive advantage (Olve et al., 1999), and in the case of publicly traded firms, the delivery of shareholder value (Andersen, 2001).

Strategy planning is the starting point for any organisation. Typically, the first stage of strategy formulation would consist of several activities aimed at:

- providing a clear sense of direction (Anderson, 2001), resulting in the development of organisational mission and strategic vision, and identification and establishment of top-level goals and objectives;
- understanding a business model of the organisation, to ascertain the ability to accomplish the mission and strategic goals, through an assessment of organisational strengths and weaknesses, as well as the external environments, identification of business areas in need of improvement, and the subsequent

generation and selection of strategic alternatives in which the organisation defines how it intends to achieve goals (Boyd and Reuning, 1998; Hopkins and Hopkins, 1997).

The strategy formulation is followed by the implementation phase and the monitoring and control of the results. The process would also encompass gathering feedback and testing the hypotheses on which the strategy is based, to make the necessary adjustments and modifications in the organisation's goals and strategies (Artley and Stroh, 2001; Kaplan and Norton, 2000, 1996c).

In the above described activities, organisations will need to develop and deploy performance measurement and performance management systems, as a prerequisite of the successful implementation of strategy. The overall importance of performance measurement and management systems has been recognized and emphasized in all stages of identification, pursuit and achievement of strategic goals. It has been asserted that PMMS represent the central issue of the performance-based management process (Artley and Stroh, 2001), and the key to implementing strategy (Gautreau and Kleiner, 2001), since performance measurement and management systems provide the data on performance that will be collected, analysed, reported and used in documenting the progress towards the strategic goals and objectives, and in arriving at business decisions. The practical applications of PMMS, reported in case studies often emphasise the strategy functions of the PMMS. For example, the General Integrated Measurement System, developed in 1994 by Electrolux, was aimed at:

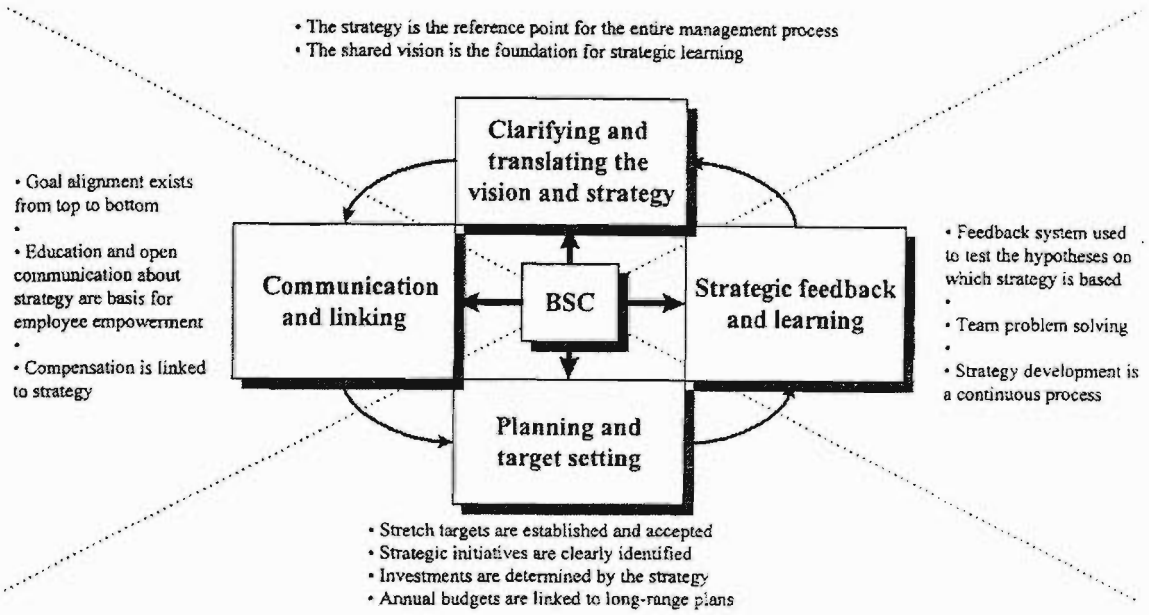
- Moving ahead with the company's strategy, and
- Linking the strategy to business plans, by clearly showing the interrelationship between the company's vision, strategy, and short-term planning (Olve et al., 1999, p. 99).

Performance measurement and management systems support organisational existence by enabling business improvements (Artley and Stroh, 2001), and maximize the probability of successful implementation of strategy (Andersen, 2001). Flowing from the

organisational mission and the strategic planning process, performance measurement systems succeed when the organisation's strategy, specific value drivers and performance measures are in alignment (Langfield-Smith, 1997), and integrated with the strategic business activity, and when senior managers convey the organisation's mission, vision, values and strategic direction to employees and external stakeholders (Andersen, 2001). The performance measures give life to the mission, vision, and strategy by providing a focus that allows each employee to know how they contribute to the success of the organisation and its stakeholders measurable expectations (Andersen, 2001).

The most popular PMMS, the Balanced Scorecard model of Kaplan and Norton, has been explicitly described as a strategic management system (Kaplan and Norton, 1996a, b & c). According to Olve et al. (1999, p. 54), the ease with which the Balanced Scorecard makes it possible to "... decompose the vision into specific, reality-based strategies which people in the organisation feel that they can understand and work with", is the foremost advantage of the model. An explicit vision and strategy underlie all four performance perspectives of the model, and the design of the Balanced Scorecard requires that, for each perspective, strategic aims, measures, specific goals, and action plans are formulated. The process of using the Scorecard as a strategic management system was described as a cycle depicted in Figure 2.4.1.1 below.

Figure 2.4.1.1 Balanced Scorecard as a Strategic Management System



Source: Kaplan and Norton, 1996c, p.11

As can be observed in Figure 2.4.1.1, the vision is made explicit and it is communicated in terms of goals and incentives. These are used to focus the work, allocate resources, and set targets. Follow-up results in learning, which in turn leads to re-examination of the vision. At every step, the scorecard serves as the means of communication, and is used in all phases of the planning and control process. In the words of Kaplan and Norton,

> "...a properly constructed balanced scorecard should tell the story of the business unit's strategy. It should identify and make explicit the sequence of hypotheses about the cause-and-effect relationships between outcome measures and the performance drivers of those outcomes. Every measure selected for a balanced scorecard should be an element in a chain of cause-and-effect relationships that communicates the meaning of the business unit's strategy to the organization" (Kaplan and Norton, 1996c, p. 31).

The entire strategic planning cycle, using the Balanced Scorecard in accordance with the prescriptions by Kaplan and Norton (1996a & b), may take more than two years. Starting with the corporate scorecard developed by a small group of senior executives, middle

management is then engaged in development of the scorecard for each business unit, on the basis of the corporate scorecard, subject to the shared vision and the extent of interrelation between the top-level strategic goals and those of the business units. At the end of the first year, various operations will have been reviewed in terms of the scorecard at different levels, and the descriptions of these operations can be communicated throughout the organisation. In the second year, more tangible goals are developed all the way down the line to individual employees, and control and incentive systems consistent with the scorecard are introduced. The scorecards for their various activities should be sufficiently explicit to guide employee efforts towards the accomplishment of the strategy, and to explain how they contribute to the general effort (Kaplan and Norton, 1996a, 1996b). However, Ittner and Larcker (1998a) reported that, for the majority of managers, the scorecards failed to clarify strategic goals and to relate their jobs to the strategies.

2.4.2 Strategy uses of PMMS

The review of the strategy related uses of PMMS, mainly the Balanced Scorecard and its variants, reveals several most frequently discussed specific uses, namely the communication of strategic goals, development of individual performance measures based on the PMMS, incentives and rewards based on PMMS, use of PMMS in external reporting, and the use of PMMS as a dynamic strategic management system.

Communicating strategic goals

Use of PMMS in communicating strategic goals of organisation, the extent of their accomplishment, the specific actions needed to achieve the strategy (Ittner et al., 2003), and the links between leading and lagging measures (Malina and Selto, 2001), has been described as crucial and essential (Ittner and Larcker, 2000; Kaplan and Norton, 1996a & b). Communication in establishing, using and maintaining a PMMS should be multidirectional, running top-down, bottom-up, and horizontally within and across the organisation (Artley and Stroh, 2001). The foremost use of a PMMS is to communicate

strategy to employees and the employee performance needed to achieve strategic goals (Ittner et al., 2003). Managers must be clear and concise in communicating the strategy and in setting the performance goals for employees (Ittner and Larcker, 2000).

In addition to using a PMMS to communicate the strategy to employees, an organisation's ability to achieve its strategic goals depends of whether it has the trust of its other stakeholders, such as customers, investors, regulators, suppliers and others. As suggested by Olve et al. (1999), a PMMS could also be used as a means of communicating information relevant to different stakeholders, so that they can better understand the organisation's strategy and performance. Increased openness has many benefits for stakeholders, one of which is to assist investor decision – making. Performance measurement systems thus become a tool which may help improve governance and accountability to various stakeholders.

Developing personal and team objectives

It has been claimed that the primary function of the Balanced Scorecard is to control company operations (Olve et al., 1999; Kaplan and Norton, 1996c). By communicating strategy throughout organisation and linking actions to strategic vision, the performance measurement system is used in describing performance expectations and objectives for operating units and individuals, required to contribute to the fulfilment of the organisation's vision (Banker et al., 2000; Olve et al., 1999; Kaplan and Norton, 1996b). The absence of a link between the measures in PMMS and individual performance management has been quoted as a reason for failure of PMMS initiatives by the respondents in a survey by KPMG (Miller and Israel, 2002).

The method to disaggregate the top level measures and targets to the individual level has been described as the 'cascade' approach, which allows measures to be disaggregated to the most detailed level possible (Kaplan and Norton, 1996c). In rare instances, the overall objectives at the top-level will be sufficiently detailed and actionable to all employees, but, as a general rule, measures at a more operational level are specific, "..

whereas the corresponding measures at higher levels are more general" (Olve et al., 1999, p. 135), so that the scorecard must be disaggregated if the organisation is to benefit from the full potential of the Balanced Scorecard method (Kaplan and Norton, 1996c). In practice, the extent to which goals can be disaggregated may be limited. For example, at one company the limit has been set at the division, or intermediate level (Olve et al., 1999).

In 'cascading' the measures down, logical consistency among measures at different levels should be established (Kaplan and Norton, 1996c, p.213). It is not imperative that every employee understands every overall strategic aim and success factor. Instead, employees should concentrate on the few which they can affect directly (Artley and Stroh, 2001; Kaplan and Norton, 1996c).

Basis for incentive and reward system

A decision that all organisations must face is how to measure employees' performance and how to compensate employees based on performance. Once the PMMS measures have been determined, they must become the basis of performance evaluation, in order to motivate employee behaviour and effect organisational performance (Speckbacher et al., 2003; Malmi, 2001; Ittner and Larcker, 2000). The PMMS "should be linked with prompt and well-understood rewards and penalties. Rewards that are delayed, uncertain, or ambiguous may be ineffective motivational devices" (Malina and Selto, 2001). Linking of the performance evaluation and reward to performance on the PMMS is a way for top management to show focus and consistency in everyday use of PMMS. According to Malmi (2001), the ability to steer the organisation according to the strategy is determined by the extent to which they reward managers on the basis of PMMS measures.

Kaplan and Norton (1996c) have suggested that rewards systems should be linked to the Balanced Scorecard measures, and have more recently found that most organisations, or approximately 60 percent of organisations using the Balanced Scorecard, link incentive

compensation for their senior executives to the Balanced Scorecard, typically after managing with the scorecard for a year (Kaplan and Norton, 2001b). Interestingly, according to Norton (in Marquardt, 2000), the compensation issue is often the primary reason for adopting the Balanced Scorecard in numerous organisations.

Reporting measures to public

While the majority of reported functions of multiple perspectives performance measurement systems are focused on internal organisational uses, in recent years there has been increasing advocacy of use of PMMS for external reporting, in annual reports and other publications. In Australia, Chenhall and Langfield-Smith (1998a) reported on the results of a survey by CIMA, which found 85 percent of surveyed members being supportive of the need to integrate non-financial and financial information in accounting reports. It is believed that

> "by improving the quality and breadth of performance measures, organizations can clarify and standardize their internal and external messages – thereby increasing the transparency of the information they provide and enhancing corporate governance" (Miller and Israel, 2002, p. 4).

The use of PMMS to articulate the goals of the venture, and the activities that will realise the goals may prove useful in securing the necessary external backing for the business (Andersen, 2001). Olve et al. (1999) have identified situations where the Balanced Scorecard may be particularly useful in providing owners and investors market with the more thorough picture of the business:

- "Companies with a few dominant owners, who require a more extensive description and are able to use it,
- Companies with substantial intellectual capital and wishing to influence their valuation by the market,
- Companies in close collaboration with others and seeking to provide their partners with a description of themselves and of their relationship" (p. 294).

The appropriateness of using PMMS for more complete explanation and communication of business value has been illustrated in the example of Skandia (Olve et al., 1999). The company had used its PMMS, called Navigator, as a supplement to the annual reports in external reporting to external stakeholders. Given that the company's value allegedly largely consisted of intangibles, a company's balance sheet could not fully explain its value (Olve et al., 1999). In contrast to the recommendations and examples of use of PMMS for external reporting, Kaplan and Norton (1996b) believed that the Balanced Scorecard should only be communicated to external shareholders if ways are devised to inform about the Balanced Scorecard measures without disclosing competitively sensitive information. Similarly, Mavrinac and Vitale (1997) found that only one of ten firms had included non-financial measures in its annual report, and had warned of the legal risks associated with making the commercially sensitive information public.

The most comprehensive evidence that non-financial factors, and non-financial information, influence investment decisions by institutional investors, was reported in a study reported by Low and Siesfeld (2000). The study highlights the need for companies to identify the key non-financial measures that matter to investors in their industry, and it identifies critical factors in four major industries that investors believe influence competition. The findings are aimed at assisting organisations in identifying areas for improvement and at improving communication with investors. The most important finding of that study pertains to the degree to which investment decisions are driven by non-financial information, of approximately 35 percent. The study claims that there is a consistency in the perceived importance of particular types of non-financial data, across different types of investors, and that "... the value of non-financial data has nothing to do with any particular investment strategy or type of investor; it is universally relevant" (Low and Siesfeld, 2000, p. 3). The ranking of non-financial criteria relevant to investors is displayed in Figure 2.4.2.1.

Table 2.4.2.1 Non-Financial Factors Used by Investors

Quality of management	**Rank**
Execution of Corporate Strategy	1
Quality of Corporate Strategy	3
Management Expertise	7
Quality of Organisational Vision	16
CEO Leadership Style	24
Strength of Market Position	**Rank**
Innovativeness	4
Market Share	6
Brand Image	13
Strength of Marketing & Advertising	21
Global Capability	22
Executive Compensation Plan Effectiveness	**Rank**
Alignment of Compensation with Shareholder Interests	8
Performance-based Compensation	12
Ration of CEO compensation to workforce	39
Strength of Corporate Culture	**Rank**
Ability to attract and retain talented people	5
Quality of workforce	18
Quality of Incentive Performance Systems	23
Quality of Employee Training	28
Employee Turnover Rates	30
Use of Employee Teams	38

Quality of investor communication	**Rank**
Management Credibility	2
Accessibility to Management	25
Quality of Guidance	29
Knowledge & Expertise of Investor Relations Contact	31
Quality of Published Materials	34
Effectiveness of New Product Development	**Rank**
Research Leadership	9
New Product Development Efficiency	14
New Product Development Cycle Time	17
Percentage of Revenue Derived from New Products	20
Level of Customer Satisfaction	**Rank**
Customer Satisfaction Level	11
Repeat Sales Level	19
Number of Customer Complaints	32
Quality of Customer Service Department	33
Quality of Products and Services	**Rank**
Quality of Major Business Processes	10
Customer-perceived Quality	15
Product Defect Rates/Service	25
Product Durability	27
Product Quality Awards	35
Process Quality Awards	36

Source: Low and Siesfield, 2000, p. 4

Low and Siesfeld (2000), as well as Ittner et al. (2003), point out that, besides the investors, greater openness and innovation in the quality and scope of external reporting is also recommended by regulators and by key industry and professional standard-setting bodies. At a global level, a group of non-governmental organisations and companies working with the United Nations, has inaugurated the Global Reporting Initiative (GRI), which proposed a set of voluntary, non-financial reporting guidelines covering more than 90 indicators of environmental, social and economic performance and being tested by more than 100 companies worldwide.

PMMS as a dynamic system

Using a strategic performance framework like the Balanced Scorecard is an ongoing process (Mc Jorrow and Cook, 2000), and the process is really never finished (Olve et al.,

1999). In order to maintain organisational flexibility and agility, PMMS are used to regularly appraise strategic performance and check whether the organisation is doing what it set out to do, whether it is achieving the expected results, and what the organisation needs to do differently in future (Andersen, 2001; Artley and Stroh, 2001). As generalised by Miller and Israel (2002, p. 3),

> "organisations that remain agile and vigilant to the need to change their strategies (and thus their measures) to meet evolving needs are more likely to succeed in an environment marked by progressively greater change".

The concept of using PMMS as a central part of a strategic management and control system (Kaplan and Norton, 2000; 1996a, b & c) proposes that the long-term focus and the ambition to learn from experience have to be combined with flexible reactions and adaptation to a fast-changing environment, affecting the organisation's situation and organisation (Kaplan and Norton, 2000; Olve et al., 1999). Organisational agility creates learning about the validity of strategy, and it also forms a foundation for deciding what needs to be done in the future based on learning and changes in the external environment. By measuring the objectives, it is possible to test, review, validate and if necessary amend the strategy represented by the measures (Mc Jorrow and Cook, 2000b). For PMMS to facilitate this process, they must have special design attributes, allowing the organisation to scan and report critical changes. According to Simons (1995), management control systems must be used to "stimulate organizational learning and the emergence of new ideas and strategies" (p. 91), and as "a catalyst for the continual challenge and debate of underlying data, assumptions, and action plans" (Simons, 1995, p. 97), i.e., as interactive control systems, in addition to being diagnostic control systems, which monitor organisational outcomes of intended strategies, and support the organisation's ability to remain stable in a changing context. According to Bititci (2001), most organisations are unable to differentiate between improvement and control measures, due to the lack of a dynamic PMMS framework, capable of changing the priorities within the PMMS, in consequence to the changes in the external and internal environment of the organisation.

PMMS need to be continually reassessed and improved, as strategies and competitive, market, organisational, and regulatory environments change (Ittner and Larcker, 2000), in order to adequately respond to changing needs and priorities (Neely, 1999). The choice of performance measures is a dynamic process, and the information provided by the PMMS can drive changes in both the objectives and measures used to track them (Andersen, 2001).

To prevent management from overlooking key dimensions of performance which impact on the goals of the company, Kaplan and Norton (1996c) recommend that the scorecard be updated on a regular basis, in an annual cycle similar to that of a budget (Kaplan and Norton, 1996c). Mc Jorrow and Cook (2000b) report on an organisation in which reviewing the Balanced Scorecard is accepted as a normal part of business, following a review and 'fine-tune' of the strategy. More recently, Norton (2001) has identified "hundreds of organisations that have introduced Balanced Scorecards go through this process (review strategic outcomes and modify the strategy) on a monthly basis" (p. 2) . However, Olve et al. (1999) suggested that few companies are capable of thoroughly reviewing their business strategy more often than once a year, and that the process of strategic change, facilitated by a 'transformational' scorecard, covered a period of four to six years at some companies, which, in practice, is probably an infrequent event "which may cause the whole organization to review its corporate level objectives and priorities, which in turn results in the need for restructuring the whole Performance Measurement System" (Olve, 1999, p. 272). In another example, Olve et al. (1999) described the development of the Balanced Scorecard in Halifax as an operational management system, rather than as a strategic tool, as the organisation was not ready for a comprehensive process of strategic review. Despite the limited operational scope of the scorecard, the development required a project manager, assisted by a core group of thirteen members, working full-time with the project for two years.

The PMMS must be constantly updated, as it requires realignment with changing strategies or corporate structure (Gautreau and Kleiner, 2001). However, there is an unavoidable tension between 'continuous improvement' and continuity of measures and

data sets (Artley and Stroh, 2001). According to Kald and Nillson (2000), "a well established and smoothly functioning system of management control is difficult to modify; it may thus retard the adaptation of performance measurement to changes in company situation" (p. 122). Yoon et al. (1995) have emphasised the stability of task knowledge, since constantly modifying a knowledge base to reflect changes in the business is arduous work, while Gautreau and Kleiner (2001) have recognised a negative impact of frequent updating of PMMS, which may take a great amount of time and resources. Artley and Stroh (2001) suggest that changes may make trend analysis impossible, and therefore measures should not be changed without careful consideration.

2.5 Summary

Chapter 2 provides a review of the literature on the characteristics, types, and frameworks of the PMMS, as used in this study. Drawing on several literature sources, especially those concerning the most widely used and researched framework, the Balanced Scorecard, an operational definition of the PMMS was collated. In the review, particular attention has been given to the strategic uses and features of the PMMS, which informed the PMMS benefits variables used in the study.

Following the PMMS frameworks, the primary success factors and barriers to successful implementation of the PMMS were reviewed. The entire set of PMMS barriers, elaborated on in the previous literature, and used in the study was reviewed. All success factors used in the study were also reviewed, with the exception of the four factors, which determine the success of management support systems generally, but were not identified in the PMMS literature. These factors were 'Related to immediate problems', 'Demonstrates results rapidly', 'Direct impact on bottom-line', and ' 'Relies on existing resources'.

The complementarities to PMMS success were reviewed next, with the greatest emphasis on the PMMS design factors of the causal links among PMMS perspectives and measures, and the number, composition and balance between the measures. The

literature on organisation complementarity, such as size, and the PMMS use factors of organisational pervasiveness of the PMMS use, and integration of the PMMS with other innovative management tools, was also reviewed. The section concludes with the review of the research on the relevance of the PMMS champion characteristics on PMMS success.

Chapter 3 Research design and method

3.1 Introduction

This section addresses research design and method for the present study, including the sampling procedure, data collection, construction and establishment of validity of the PMMS study variables, and statistical tests used to accomplish specific research aims. Because of the lack of empirical evidence about the determinants and complementarities of PMMS success in Australian business organisations, a multi-organisation survey approach to data collection has been used. This approach was expected to identify the core and secondary factors contributing to the accomplishment of PMMS benefits. The organisations in this study have been selected because of their use of PMMS.

3.2 Sampling procedure

Selection of participating organisations

The study was limited to the top 500 organisations listed on the ASX. The population of the top 500 public companies, funds, groups and other business organisations, listed on the Australian Stock Exchange, was ascertained from the list compiled by the Business Review Weekly internet site (Ranking by Market Capitalisation, ($'000), www.brw.com.au/brwli...p500public/2001), current on 20 March 2002. The addresses and other contact details of approximately 90 percent of the study population were obtained through connect4.com.au Internet site comprehensive directory. The contact information for the remaining organisations was found in Jobson's Year Book of Public Companies (2001).

Response rate

Of the 500 questionnaires that were sent out, and after one reminder where 500 questionnaires were mailed again, 135 usable responses indicating the use of multiple perspective PMMS were received. This constitutes a response rate of 27 percent, which

can be considered a reasonably good rate for a survey of this nature (Stone and Banks, 1997), and is also comparable to the 30 (Walsh, 2000) to 35 percent (Hoque and James, 2000) response rates achieved in the surveys on the Balanced Scorecard in Australia.

External validity of the sample

Upon summarizing the data on industries, contained in the answer to Question 1 of the questionnaire, a chi-squared goodness of fit test was applied to determine whether the industry structure of surveyed organisations matched the industry structure of the population consisting of the top 500 organisations. The purpose of the test was to provide an insight into the representativeness of the sampled organisations with respect to the industry sector. The exact external validity or representativeness of the sample could not be established precisely. The census information of actual number of organisations with the PMMS in the population of top 500 listed organisations, and their composition with regard to the industry and size are not known. For this reason, only a comparison with the entire population of top 500 organisations, with regard to the industry could be made, irrespective of the actual number of organisations actually using PMMS. For illustrative purpose only, the industry comparison between surveyed organisations with PMMS and the entire top 500 organisations is presented. The match between the surveyed organisations and the entire population has been tested formally, applying the procedure described in the following paragraphs.

The industry composition of the population as defined above was ascertained by summarizing the standard industry classification of the respective 500 organisations, found on the connect4.com.au internet site. The results of the chi-squared test for equality of proportions are laid out in Table 3.2.1, presented below. From the data on chi-squared values and the corresponding level of significance, pertaining to the entire sample, it can observed that the difference between the industry structure of responding organisations and the top 500 Australian listed organisations is indeed significant at the level of 0.004. The observed frequencies of all participating organisations were larger than their respective expected frequencies, except of those belonging to the category

'Other', where the observed frequency was much less than the expected frequency. However, a repeat of the Chi-square test for industry difference with industry category 'Other' omitted, produced a value of Chi-squared of 8.3, at the actual level of significance of p = 0.08, lower than the critical value of 9.49, and thus not significant at the level of 0.05. The result indicates that organisations in manufacturing, finance and insurance, mining, construction and property and business services which participated in the survey, are represented in proportions not statistically different to their respective proportions in the top 500 Australian listed organisations. Thus, it can be concluded that there is no statistically significant industry difference between the majority of responding organisations, comprising 63 percent of the sample, and the top 500 Australian listed companies, but the difference is significant if organisations belonging to industry category 'Other' are included. In other words, the sample is relatively representative of the five main industries, but relatively unrepresentative of all 'Other' industries. This finding also shows that, for this particular sample structure, there was a more pronounced inclination for the use of PMMS in organisations operating in the main industries - manufacturing, finance and insurance, mining, construction, and property and business services, compared to the organisations in 'Other' industries.

Table 3.2.1 Industry difference between population and sample

	Top 500 Australian listed organisations		Surveyed organisations		Surveyed organisations excluding Other	
			Observed	Expected	Observed	Expected
Industry	**n**	**%**	**n**	**n**	**n**	**n**
Manufacturing	139	27.8	43	37	43	37
Finance and Insurance	71	14.2	23	19	23	19
Mining	49	9.8	17	13	17	13
Construction	24	4.8	13	7	13	7
Property and Business Services	34	6.8	10	9	10	9
Other	183	36.6	29	50		
Total	500	100	135		106	
			χ^2=17.12 p = 0.004		χ^2=8.3 p = 0.08	

Industry category 'Other' was composed by aggregating 29 organisations in wholesale trade, health and community services, personal and other services, transport and storage, retail trade, electricity and gas supply and accommodation and cafes and restaurants. The reason for collapsing these organisations into the category 'Other' is twofold. Firstly, for several of these industries the expected frequencies would have been five, or fewer, organisations. The Chi-square statistics assume that the expected values are very large, and 'should be calculated only if fewer than about 20 per cent of all cells have expected frequencies of less than 5 and no cell has an expected frequency of less than one' (Kent, 2001, p.112). The obtained minimum expected frequencies were violating the above rule, and this had been rectified by summing up their frequencies and creating the new industry category 'Other'. Secondly, if the analyses and tests were performed on the original industry data, the results and their interpretation would be potentially far more complex, with no corresponding increased conclusiveness and generalisability.

This finding in itself does not provide evidence of the representativeness of the sample, or the lack of it, as it is not possible to compare and test the sample with the actual industry proportions of all organisations with PMMS within the top 500 listed organisations. Nonetheless, despite the unavailability of the complete information on pervasiveness and distribution of PMMS among the top 500 organisations, it can be observed that the sample size of 27 percent of the target population of organisations is relatively large, and comparable to the survey estimate by Walsh (2000), which put the proportion of PMMS use in Australian organisations to approximately 30 percent. It may be assumed that the sample in this research may in fact be representative of the population of organisations with PMMS. Based on these considerations, it may plausibly be argued that PMMS are relatively more prevalent in the above five main industries, than they are in all other industries. The extent of relative overrepresentation of particular industries, which may be indicative of the relative propensity towards the use of PMMS in those industries, varies among the five industries. Manufacturing and finance and insurance organisations do not appear to be highly over-represented, nor do the property and business services organisations, with the 16 percent, 21 percent, and 11 percent larger observed frequencies than the expected frequencies, respectively. In

contrast, mining, and especially construction organisations, seem to be seriously over-represented, with the respective actual frequencies larger than the expected frequencies by 31 and 86 percent.

The most striking imbalance is exhibited by the organisations in 'Other' industries. Only 29 organisations in the 'Other' category had taken part in the survey, as opposed to the expected number of 50, indicating that organisations in 'Other' industries were underrepresented in the sample. The group comprises organisations belonging to 11 different industries, with no one individual industry frequency exceeding five organisations. This imbalance is the main contributor to the overall mismatch between the sample and population organisations, as demonstrated by the results of the Chi-squared test, performed on the main industries only, and shown in Table 3.2.1.

Level of analysis

In answering to all of the questions, respondents were asked to provide information on the PMMS used at the highest management level of their respective organisations. This requirement was made explicit by the specification of the PMMS "at top management level" in the question 6, which was the first question on specific design features of the PMMS used in surveyed organisations. The data on the use of PMMS at various organisational levels are presented below in Table 3.2.2. It can be observed that the corporate PMMS had been used in a majority, or 115 organisations, accounting for roughly 85 percent of the sample. In contrast, the reported use of PMMS at other organisational levels is strikingly less. The use of PMMS at divisional level was reported by 58 percent of all respondents, while the use at all other organisational levels was below 50 percent in all categories.

The use of PMMS at individual and group or team level was at around 40 percent, indicating the comparatively low use of PMMS as an operational control tool. The PMMS were used as a strategic control tool to a much higher extent, which is reflected in the data on usage at corporate and divisional control.

Table 3.2.2 Distribution of PMMS used by organisational level

	Level description						
				Teams		Business unit	
	Corporate	Division	Departments	/groups	Personal	All units	Some units
Number of levels	n	n	n	n	n	n	n
1	5	1	1	1		1	
2	34	12	7	4	4	9	2
3	20	17	11	3	8	17	3
4	24	20	14	19	14	8	2
5	18	16	15	15	16	10	2
6	14	13	13	13	13	11	2
Total	115	79	61	55	55	56	11
% of all (135) organisations	85.2	58.5	45.2	40.7	40.7	41.5	8.1

Information on the use of PMMS for strategic purposes can also be considered as supportive of the assertion that the respondents were referring primarily to top management's use of PMMS. As shown in Table 3.2.3, PMMS were used for specific strategic purposes by up to 70 percent of participating organisations, e.g., in strategy formulation and implementation.

Table 3.2.3 Extent of PMMS use for strategic purposes

	Respondents	
Strategic use	n	%
Quality of decision	102	76
Communicate strategic goals	95	70
Strategy formulation	94	70
Strategy implementation	94	70
Rewards system	92	68
Feed-back	92	68
Developing personal objectives	87	64
Developing team objectives	85	63
Resource allocation	79	59
Reporting to public	76	56
Strategic planning	75	56
Reporting and control	65	48
Other strategic purpose	4	3

The data on the extent of use by users of different managerial and functional background, presented below in Table 3.2.4, indicate that the PMMS were used by CEOs in 96 percent of organisations, by other senior managers in 93 percent of organisations, which clearly indicates that PMMS were used at the top managerial level. PMMS have also been used by board members in more than three quarters of the surveyed organisations.

Table 3.2.4 Extent of PMMS use by functional background

User functional background	Respondents	
	n	%
CEO	129	96
Other senior managers	125	93
Accounting/finance	124	92
Board members	103	76
Sales/marketing	85	63
Manufacturing/production	76	56
Product manager	73	54
Other managers	13	10

Based on the data on the 115 corporate level PMMS, in Table 3.2.2, and frequency data on use of the PMMS at top managerial levels in Table 3.2.4, it may be concluded that the PMMS reported in this survey appear to have been designed to suit the needs of top-level management, mainly corporate and divisional, responsible for the accomplishment of organisational mission and overall operations. This finding indicates that the PMMS measures were developed to be used by senior management, who were the targeted level of analysis in this study, and their staff, with strategy development, planning and control as the starting point and motivation for PMMS.

Respondents

Given that the survey had been planned without the prior knowledge of the actual occurrence of the PMMS in the survey population, the 500 persons assumed to have been in charge of the development and maintenance of PMMS in all top 500 Australian listed organisations were invited to participate in this study via a survey letter. Survey

questionnaires were mailed to the registered office or corporate head office of the organisations, addressed to the accountant or chief financial officer, though no prior assumptions were made regarding the most appropriate person to complete the questionnaire. An attempt was made to ensure that the requested information was provided by the person involved in the initiation and design of PMMS, and was most familiar with the overall PMMS implementation process, i.e., the most knowledgeable person in organisation. To that effect, the accompanying letter included the request that the questionnaire is completed by the manager, management accountant, or other officer with responsibility for the development and implementation of the performance measurement and management system. Respondents were explicitly asked to provide information on the PMMS, the development of which they have managed.

3.3 Data collection

Questionnaire administration

As described in Section 1.2 'Rationale for research', knowledge about the methods which companies in Australia have chosen to monitor and manage performance is limited. The purpose of this study, therefore, has been to enhance knowledge and understanding of the benefits of PMMS use and the factors contributing to its success.

The questionnaire was selected as a most appropriate instrument to collect the necessary data needed to accomplish the aims of the research, broadly characterised as exploratory, descriptive, and correlational. The data were collected from the population of the top 500 Australian publicly listed companies, which has necessitated the use of a postal questionnaire as most economical means of data collection. Administering the questionnaire via mail was considered to be crucial in ensuring the anonymity of respondents and their organisations. This concern for anonymity, as a prerequisite for total confidentiality, was of paramount importance in maximizing the response rate. A copy of the the cover letter is provided in Appendix 2.

The survey was administered in accordance with the guidelines in Zikmund (1997, p.244). Before the mailing, each of the 500 organisations' addresses was verified by inspecting the information on their internet sites. A follow-up letter with a further copy of the survey was sent to the entire population of 500 organisations, since the survey was entirely anonymous, and the identity of organisations which had not responded to the initial mailing could not be ascertained. The management accountants, accountants or other respondents were asked to fill out the surveys personally, since they had the requested information, or to ask another senior executive to complete the survey.

Questionnaire development and design

The first phase of questionnaire development involved the identification and development of variables comprising all success determinants and complementarities, and PMMS benefits. The variables and the ways of measuring them were identified through the review of the relevant scholarly and professional literature in the PMMS field generally, and in other related disciplines such as strategic management and control, and decision support systems. Following the literature review, the questions for the questionnaire were formulated. The purpose was to draft a questionnaire that would cover the central issues relating to the benefits of PMMS and the success determinants, designated as variables to be used in the analyses conducted to accomplish the research objectives. The very few available questionnaires and measuring instruments identified and utilized in previous studies in the PMMS area were not considered usable in this study. However, there were several instruments and measurements used in previous research on related issues, pertaining to the use and benefits of other managerial innovative tools, which were found appropriate and applicable for this study. These measures and instruments were mainly used in their original format, while some instruments and measures had to be adapted to better serve the specific topic and purposes of this research.

Seventeen measures, out of the total of twenty-five, were used to elicit factual information. These measures were applied in the questions on organisation details, respondent details, and PMMS use and characteristics. The remaining eight questions

employed subjective measures. The respondents were invited to indicate their satisfaction with the PMMS strategic use items (Question 8) and with PMMS use in other decision areas (Question 12). The subjective assessment was elicited on the extent of PMMS use by various users (Question 11), extent of dollar improvements (Question 16), and the perceived importance of determinants of PMMS success (Questions 19 and 20). Finally, the respondents were also asked about the perceived status of PMMS use in their organisations in comparison with the industry competitors (Question 14), and the satisfaction with other management tools and techniques (Question 15).

Subjective measures have been widely used in organisational research, and were considered appropriate for this research. It has been assumed that, as a matter of policy, very few organisations would be willing to provide proprietary and any other confidential information, and would want to secure their anonymity in this survey. The other assumption was that the organisations would be unlikely to have the financial information pertaining to PMMS, such as the PMMS cost-benefit analyses, and other estimates of the alleged benefits, since none has been reported in previous research studies and other literature. Similarly, quantified objective information could not be obtained for other variables, described in the previous paragraph.

In using subjective performance measures, it was assumed that the respondents had sufficient perspective and information to assess the study variables, given the position and the central role of the respondents in the development and implementation of the PMMS in the surveyed organisations.

In the second phase of questionnaire development, and prior to drafting the final version of the questionnaire to be mailed to the organisations in the sample, a pilot questionnaire was developed. The purpose was to obtain useful suggestions on how to improve on the general appearance of the questionnaire, question formulation, and the length of the questionnaire, with a purpose of designing a final version with which to achieve a sufficiently high response rate. These suggestions were elicited from a group of Victoria

University staff with a scholarly and professional involvement in management, and with experience in conducting large-scale surveys of business organisations.

The final version of the questionnaire under the title heading 'Use and Benefits of Performance Measurement and Management Systems in Australian Listed Organisations Survey', which can be found in Appendix 1, is composed of five sections. Section 1 consists of three questions on organisations details. Question 1 is on the industry of surveyed organisations, consistent with the standard industry divisional level classification, effective in Australia and New Zealand (Australian Bureau of Statistics). Question 2 is on the size, measured by the number of employees. Question 3 is also on the size of organisation, but with respect to the market capitalization.

Section 2 examines the PMMS use and characteristics and contains twelve questions. The first question required the respondents to indicate how long had the PMMS been in use in their organisation. The second question is on the specific type or framework of PMMS used in organisations. This is followed by a question on the specific performance measurement groupings or areas comprising the PMMS, with the number of measures in each area, used at top management level. The fourth question in Section 2 asked the respondents to indicate the hierarchical or organisational levels at which PMMS was used in their organisations. Question 8 in this section is on the use of PMMS for strategic purposes or applications in organisations. The question comprises twelve strategic planning and control items. The respondents were asked to mark the items applicable in their organisations, as well as the satisfaction with PMMS use in accomplishment of the respective strategic purpose. Question 9 measures the degree of involvement of external software developers and consultants in the design and implementation of PMMS. Question 10 examines a very important design feature of PMMS, the existence and type of the causal relationship subsystem, in which the link between actions or drivers of future performance and desired outcomes is established and described. The information on the users of PMMS was elicited by Question 11. Respondents were invited to mark the user descriptions as applicable in their organisations, and to indicate the extent of use of PMMS by these users. This is followed by two more multi-item questions. Question

12 examines the satisfaction with the use of PMMS in eight specific business decision areas. Creative features of PMMS are examined in Question 13, however, due to the low number of responses, the data were omitted from the analyses. The section follows with Question 14 on the perceived status of organisation relative to industry competitors. Question 15 concludes the section, and asks for information on the number of, and satisfaction with, the other managerial tools and techniques used in organisation.

Section 3 of the questionnaire is on the benefits and costs of the PMMS. The first question, 16, in the section asks for information on the perceived dollar improvement achieved in various business areas. Question 17 asks respondents to estimate PMMS costs incurred in various cost categories. The final question in Section 3, 18, is on PMMS budget efficiency, i.e., whether the PMMS cost was contained within budget or not. Due to the poor reliability, the data on the PMMS cost estimates are not presented in this report.

Next comes Section 4 on determinants of PMMS success, i.e., the success factors and barriers. Accordingly, the section comprises of only two questions. Both questions are multi-item questions. The question on success factors, 19, lists thirteen success factors, identified in the literature review phase, and asks the respondents to mark the factors relevant for their PMMS. At that, the respondents are asked to indicate the importance of these factors. Question 20, which is on the factors identified as barriers to successful implementation and use of PMMS, is structured in the same way as Question 19 on the success factors, and contains 15 items pertaining to specific barriers.

Section 5 is the last in the questionnaire, and contains six questions on the PMMS champion or person with principal responsibility for PMMS in the organisation. The questions are intended to elicit information on the following details: respondent's position in the organisation, Question 21; primary area of expertise, Question 22; organisation tenure, Question 24; position tenure, Question 23; level of education, Question 26, and formal responsibility for PMMS, Question 25.

3.4 Development and validation of questionnaire measures

This section discusses the rationale for the selection of questionnaire measurements and instruments used for measuring the study variables. The origin and source of each questionnaire item used in previous studies is indicated and described, as is the research purpose and context of the previous use of the item. Previously established psychometric qualities of the measure are also reported. The multi-item scales or measures and the way they were constructed is also discussed. The scale, or level of measurement is discussed, as the scale type is a primary determinant in the selection of the appropriate statistical method.

3.4.1 Measurement of dependent variables

Dependent variables, described in Chapter 1, Table 1.4.1, reflect the constructs of PMMS benefits, which are defined, for the purpose of this study, as the intended or desired set of outcomes of organisational use of PMMS (Chenhall, 2004), as well as the extent of various uses of PMMS and satisfaction with PMMS in the use for various purposes. Consequently, the benefits are operationally defined as those measurable dimensions of PMMS performance proposed by the literature, as well as additional or alternative measures of PMMS performance which had been considered and utilised in previous empirical research on PMMS and other managerial tools and innovations.

Consistent with the measurement identified in the literature, the benefits of PMMS were grouped into four distinct dimensions. Those dimensions capture and measure the benefits attributable to the use of PMMS, such as the use for strategic purposes, use by various users in organisations, use in specific business decision areas (Foster and Swenson, 1997), and the extent of dollar improvements (Foster and Swenson, 1997).

In the same manner the concept of benefits of PMMS is multi-dimensional, all benefits dimensions are constructed by grouping several theoretically related items into a single scale, in order to adequately and comprehensively measure all elements of PMMS

benefits. Individual items were measured on a five-point ordinal scale, and the answers are expressed as statements with which respondents were asked to agree or disagree. The answers were indicated by circling the appropriate number on a five-point scale, with the extreme points being 1 (one), corresponding to the least or lowest agreement, and 5 (five) at the other extreme, indicating the highest or greatest agreement with the item rating.

In subsequent analyses and discussions every dependent variable is used and presented in two different formats. In Section 4.1 on the relevance of benefits and determinants of PMMS in Australian business organisations, the variables are presented in the itemised format, identical to the one applied in the questionnaire. Section 4.2, where the correlations between the main determinants of PMMS success and PMMS benefits are established and discussed, required the modification of the dependent variables format. To accomplish this, each dependent variable has been transformed by summing up the scores given by the respondents to the items, belonging to each variable. Thus, instead of the multi-item original variables, the composites of summative variables had been constructed. Consequently, the resulting theoretical scale ranges of composite variables had been expanded in accordance with the simple formula: $n \times$ item theoretical range. In the formula n stands for the number of items comprising the variable, the item theoretical range is one (1) to five (5), if the item was marked as applicable by respondents. Otherwise, the range is non-existent, or zero if the item was not marked as applicable by the respondent. Obviously, the total score of the composite variable will be zero, if no items have been marked as applicable, and it will have the theoretical lower limit of one, if only one item was deemed applicable by the respondent. By applying the formula to each dependent variable, the theoretical ranges were obtained. Theoretical ranges, together with the actual ranges, and the means and medians of the variables are presented in Table 3.4.1.1. The division of the entire range into the low, middle and high sections, reflecting the distribution of the sample scores into the lowest third, the middle third and highest third of the cases, is also presented.

Table 3.4.1.1 Ranges of composite dependent variables

Dependent variable	Items n	Theoretical range: Lower limit	Theoretical range: Upper limit n x 5	Org. n	Actual range: Minimum	Actual range: Maximum	Mean	Median	Low range	Middle range	High range
PMMS use for strategic purposes	12	1	60	135	3	56	26	23	3 - 18	19 - 31	32 - 56
Extent of PMMS use by users	7	1	35	134	3	35	19	20	3 - 16	17 - 22	23 - 35
Decision areas supported by PMMS	7	1	35	133	3	35	17	18	3 - 14	15 - 20	21 - 35
Extent of dollar improvements	7	1	35	126	1	29	13	12	1 - 10	11 - 16	17 - 29

As can be observed, no maximum composite rating had been obtained by any of the 135 respondents to the dependent variables of 'PMMS use for strategic purposes' and 'Extent of dollar improvements attributable to PMMS use'. Although the exact distribution of scores is not presented here, it can also be seen that at least some respondents have given the maximum rating to the two remaining variables, 'Extent of PMMS use by users from various functional and managerial background' and 'Specific business decision areas supported by PMMS'. For illustrative purpose, the means of composite dependent variables are also displayed in Table 3.4.1.1, as are the frequencies of the organisations for which the rating of each variable was provided.

The variables were constructed by adding the respondents' unweighted rating scores. The decision to apply unweighted, or equal weighted rating scores, was made on the basis of several considerations. First, no useful references could be found on generally applicable, theoretically derived weightings of the items in the literature. On the practical side, the assignment of weights, reflecting the relative importance, would be more time consuming and potentially more confounding for the respondents, with an associated risk of achieving a lower response rate. Finally, although the application of weights might have increased the precision and discriminative property of the measures, such advantage was not considered to be crucially important. The level of precision of unweighted ratings was considered to be satisfactory for an exploratory and descriptive research reported in this study. The decision was supported by visual checking of the distributions of the item scores. Although the normality of item scores distributions were not ascertained by testing the skewness and kurtosis, the distribution plots were visually examined and found to be similar, as corroborated by the values of centre and dispersion measures displayed in the section 3.5.2 Variability and discriminant reliability.

Consequently, the items had the similar actual weights in the composite scales, which obviated the need to transform the items by standardizing their scores.

The composite scales were built and used to exploit several advantages over the itemised scales. The primary consideration was to allow for intelligible theoretical interpretation and discussion of the relationships, which necessitated a conversion of the information contained in several specific itemised variables into the more abstract variables (de Vaus, 1995, p. 249), i.e., a reduction of the number of items to a manageable number of underlying variables. The composite scales are considered to be especially useful for the measurement of abstract perceptions (Page and Meyer, 2000, p. 146), such as those measured through independent and dependent variables in this study. The variables obtained through this process can be considered to be the single indices of the multidimensional concepts measured by the dependent and independent variables. The concepts were comparatively complex and exhaustive, and were measured by using a multiple indicators or items (Page and Meyer, 2000, p. 146), their numbers ranging from seven to twelve, in the case of the dependent variables, and from thirteen to fifteen in the independent variables.

According to de Vaus (1995), measurement by a composite scale also increases the validity of a measure, and helps in minimising the distortions caused by measurement error in the use of a single-item measures of a complex concept. Reliability is also increased, as using several related questions alleviates the poor reliability of answers to a single question, which may be poorly worded and misinterpreted by respondents. It can be concluded that the composite scales provide far more accurate assessment (Page and Meyer, 2000, p. 146) of the independent and dependent major study variables in this study, than would have been obtained by the use of the overall, single item questions on the same variables.

PMMS use for strategic purposes

Satisfaction with the use of PMMS for strategic purposes consisted of the following 12 items, reflecting distinct strategic planning and control elements:

- Strategy formulation,
- Strategic planning,
- Communicate strategic goals,
- Developing personal objectives,
- Developing team objectives,
- Resource allocation matched to strategic priorities,
- Correct implementation of strategy,
- Feed-back to enable corrective action,
- Improves quality of decision making and problem solving,
- Replace formal reporting and control structure,
- Basis for incentive and reward system, and
- Reporting measures to public.

Satisfaction with the use of PMMS for strategy applications was indicated by marking the appropriate number. The scale is: 1 = Very dissatisfied, 2 = Somewhat dissatisfied, 3 = Satisfied, 4 = Quite satisfied, 5 = Very satisfied.

Extent of PMMS use by various users

The use of PMMS was designed as a measure of the functional and managerial use of PMMS in organisations, consisting of questions about the perceived extent of PMMS use by various users. The response categories of functional background were:

- CEO,
- Other senior managers,
- Board members,
- Manufacturing/production personnel,
- Accounting/finance personnel,
- Product/service managers, and

- Sales/marketing personnel.

The extent of use of PMMS by various users was indicated by marking the appropriate number on the following scale: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Very often.

Decision areas supported by PMMS

The variable 'Decision areas' comprises several specific decision areas that may be supported and improved through the use of PMMS, namely:

- Capacity management and capital investment decisions,
- Working capital management decisions,
- Product development decisions,
- Restructuring or reorganisation decisions,
- Outsourcing decisions,
- Budgeting and planning, and
- Forecasting.

The variable is comprised of the six decision areas used previously by Foster and Swenson (1997) to measure the success of Activity-Based Cost Management. The success variable used in the original research (Foster and Swenson, 1997) also contains eight additional decision areas pertaining more specifically to the use of the activity-based costing systems, i.e., process/operations and product management areas of use. These items were omitted from the scale used in this research, so as to render the scale more indicative of the overall decision areas in which PMMS may typically be used.

The respondents were asked to indicate the satisfaction with PMMS use in those areas by marking the appropriate number on the following scale: 1 = Very dissatisfied, 2 = Somewhat dissatisfied, 3 = Satisfied, 4 = Quite satisfied, 5 = Very satisfied.

The extent of dollar improvements

The extent of dollar improvements attributable to the use of PMMS is a surrogate measure for unobtainable objective and unobservable measures of financial performance. It is composed of the following items describing the specific improvement areas:

- Sales and marketing,
- Distribution,
- Product/service design,
- Customer satisfaction,
- Process/operations management,
- Increased market share, and
- Stock appreciation.

The extent of improvements in each area was indicated by marking the appropriate number on the following scale: 1 = Very little, 2 = Somewhat significant, 3 = Fairly significant, 4 = Very significant, 5 = Extremely significant.

This measure was also used by Foster and Swenson (1997), and in its original format it consists of twelve business functions. For the purpose of this research, only 'Sales and marketing' and 'Distribution' were retained in original format. As shown in Table 3.4.1.2, three items were used in the similar format to that of Foster and Swenson (1997), while the remaining two item business areas are unrelated to the original scale.

Table 3.4.1.2 Correspondence between items in variable 'Extent of dollar improvements'

Extent of PMMS attributed dollar improvement in areas	Foster and Swenson (1997) business function items
Sales and marketing	Sales and marketing
Distribution	Distribution
Product/Service design	Product management
Customer satisfaction	Customer service
Process/Operations management	Manufacturing/Production
Increased market share	
Stock appreciation	

3.4.2 Measurement of independent variables

3.4.2.1 Determinants of PMMS success

The success factors and barriers of PMMS were measured by two distinct multi-item instruments. They have been constructed by grouping the individual determinants of PMMS performance or benefits, identified in the literature review. Similarly to the sourcing and development of dependent variables in this study, determinants of PMMS success have predominantly been drawn from the prescriptive literature on PMMS and other managerial innovative tools, and to a lesser extent from the empirical research on factors conducive to success or failure of PMMS, decision support systems, and other information management systems.

For this research 28 PMMS success determinants were identified and selected from the literature. The selection was based on the existence of literature supporting their relevance as likely determinants of PMMS implementation success. The grouping of these factors into the two large multi-item sets of factors, i.e., the construction of variables, does not reflect any common theoretical or conceptual base. This is in contrast to the development and construction of multi-item PMMS benefits dependent variables, which were composed of related items, e.g., variable 'PMMS use for strategic purposes', where item descriptions correspond to the main integral phases and elements of the strategic planning and execution process in organisations. This was not the underlying principle in constructing the variables of determinants of PMMS success, as can be observed in the exposition of the measures, presented in the following two sections. The groupings are loosely connected aggregations of factors, made on the basis of factors being described as either a success factor, or enabler, of PMMS, or as a barrier. The rationale for the design of the composite variables of success factors and barriers, as opposed to the use of single-item measures, was that such design had advantages over single-item measures, in the analysis and interpretation of correlations between the factors and the dependent, PMMS benefits, variables. These advantages are explained in

detail in the section 3.6.3 Establishing the correlations between PMMS determinants and benefits.

Notwithstanding the above described difference, the independent variables and measurement items are in other respects similar or identical to the dependent variables measuring the PMMS benefits. All individual success factors of PMMS were grouped, as were the barriers. Items were measured on a five-point ordinal scale, with respondents indicating their answers by circling the appropriate number on the scale.

Finally, similarly to the transformation of dependent variables, the independent variables and measures have had the scores given to individual items summed up, in order to create the composite variables. Theoretical scale ranges of independent variables of PMMS determinants, created through this operation, are listed in Table 3.4.2.1.

Similarly to the composite dependent variables, the independent variables' actual ranges do not correspond to their theoretical ranges. They are smaller for both the 'PMMS success factors' and 'PMMS barriers'. The actual values of the range, as well as the means and the number of organisations which have given a score, are presented in Table 3.4.2.1.

Table 3.4.2.1 Ranges of composite independent variables

		Theoretical range			Actual range						
Independent variable	Items n	Lower limit	Upper limit n x 5	Org. n	Minimum	Maximum	Mean	Median	Low range	Middle range	High range
Success factors	13	1	65	133	4	61	30	26	4 - 22	23 - 37	38 - 61
Barriers	15	1	75	125	3	73	25	20	3 - 15	16 - 27	28 - 73

Success factors of PMMS

The dependent variable of the success factors determining the success of PMMS consists of the following factors:

- Supported by senior executives,
- Full acceptance at all levels of organisation,

- Successfully delegated to staff and consultants,
- Individual accountability for results,
- Related to immediate problems,
- Demonstrates results rapidly,
- Direct impact on bottom-line,
- Allows realistic target-setting,
- Relies on existing resources,
- Drivers of future performance easy to identify,
- Good fit between objectives and measures easy to establish,
- Can be implemented in increments, and
- Easy to manage.

The respondents were asked about the relative importance of success factors for PMMS, used in their respective organisation, by marking the appropriate number on the following scale: 1 = Relatively unimportant, 2 = Not so important, 3 = Important, 4 = Fairly important, 5 = Very important.

PMMS barriers

The factors that may obstruct effective and successful implementation and use of PMMS systems in organisations, and grouped under a heading 'Barriers' in the questionnaire, are listed below:

- System not supportive of strategy,
- Too many measures and too complex,
- Not understood by employees,
- Not adopted by employees,
- Organisational culture not performance oriented,
- Resistance due to vested interests,
- Resistance due to anxiety,
- System prone to managerial and employee manipulation,
- Fear of sensitive information being revealed,

- Wrong configuration of physical resources, human resources, systems and procedures,
- Insufficient resources,
- Important stakeholders excluded,
- Hierarchical top-down method,
- Data required to generate performance indicators not available, and
- Data not readily accessible from present information systems.

Their relative importance, as perceived by the respondents, was scaled identically as in the previous variable of PMMS success factors: 1 = Relatively unimportant, 2 = Not so important, 3 = Important, 4 = Fairly important, 5 = Very important.

3.4.2.2 Complementarities to PMMS success

Organisation industry

The industry in which the participating organisations were operating was measured on a nominal scale, with the industry categories consistent with the Australian and New Zealand Standard Industry Classification (Australian Bureau of Statistics). The respondents were asked to indicate the main industries in which their organisations operated.

Organisation size

Organisation size was measured on ordinal scales. The first scale measured the number of employees, and allowed the respondents to indicate the size by marking one of the following ranges: 1 = less than 50, 2 = from 51 to 100, 3 = from 101 to 500, and 4 = more than 500.

The second scale was used to measure the size of the organisation in regard to market capitalisation. The options in ranges were as follows: 1 = less than $100 million, 2 =

from $100 million to $499 million, 3 = from $500 million to $2 billion, and 4 = more than $2 billion.

Time of use of PMMS

Information on the length of time PMMS were in use in organisations was elicited by asking respondents to answer two questions. First the respondents were asked how many years had PMMS been in use in their organisations. The scale consisted of the following ranges: 1 = less than one year, 2 = from one to three years, and 3 = more than three years.

The second was a relative measure, where the respondents were asked to indicate the status of their use of PMMS relative to that of their industry competitors, on a descriptive scale, consisting of the following points: 1 = laggard, 2 = somewhat behind, 3 = middle of the pack, 4 = close follower, and 5 = industry leader. This item has been used previously by Sirkka and Ives (1991) in their questionnaire on executive involvement and participation in the management of information technology.

Type of PMMS

The type of PMMS used was ascertained by asking the respondents to mark as many as applicable of the PMMS descriptions. The PMMS types were described in the accompanying letter to the survey, and were depicted as "a system comprising of performance measures in process, customer and organisational learning and innovation areas, in addition to financial measures and indicators. Such a system may also use measures from other non-financial areas, and is usually described as a Balanced Scorecard, Performance Scorecard or Performance Dashboard." A separate option 'Other' was also provided, and respondents were asked to provide a description of any such system.

Number of levels at which PMMS is used

The number of organisational levels of PMMS was measured on an ordinal scale, and the respondents were asked to indicate all levels at which PMMS was used in their organisations. The following descriptions of organisational levels were applied in the scale: 1 = corporate, 2 = division, 3 = department, 4 = teams/groups, 5 = personal, and 6 = business unit, with alternatives 6a = all business units or 6b = some business units.

Involvement of PMMS consultants

The extent of involvement of external consultants in the design, development and application of PMMS in organisations was measured on a nominal scale. The category options were as follows: 1 = Designed and developed in-house entirely, 2 = Pre-packaged program purchased from vendor, and 3 = Designed in-house using external consultant: 3a = little extent, 3b = moderate extent, 3c = significant extent.

Cause and effect component of PMMS

The cause and effect relationship between the drivers of future performance and outcomes was measured on an ordinal, or ordered categorical scale. To allow for the maximum variety of the answers, the options were not presented on a single consistent scale, such as the six-point scale used by Ittner et al (2003). Instead, the entire scale is a combination of a dichotomous scale, a descriptive, or categorical scale, and an ordinal scale. The following categories of cause and effect relationship, from non-existent to the normatively most advanced, constituted the scale: 1 = not used, 2 = used, 3 = explicit in the system, 4 = established qualitatively, and 5 = established and validated quantitatively.

PMMS champion characteristics

The characteristics of PMMS champion in organisations were measured across several dimensions. It may be assumed that the majority of questionnaires were completed by the person who was the champion of PMMS in the respective organisation, in compliance

with the request made in the letter accompanying the survey. The letter asked specifically that "the questionnaire be completed by the manager, management accountant, or other officer with responsibility for the development and implementation of the performance measurement and management system".

The first PMMS champion characteristics was position in organisation, and the respondents were given the following options: 1 = CEO, 2 = managing director/director, 3 = senior manager, 4 = manager, and 5 = other.

The second question in the group was about the functional background of the respondent. The original scale consisted of ten different primary areas of expertise. After the counting of frequencies, it could be observed that the respondents were overwhelmingly from the three areas, financial accounting, finance, and management accounting, with only very few other categories reported, namely human resources and corporate affairs. Accordingly, the number of areas of expertise was reduced to five categories, instead of ten.

The third and the fourth scales, in the group of measurements of PMMS champion characteristics, were used to measure the length of time in the position and organisation tenure. They were measured on an ordinal scale ranging as follows: 1 = less than two years, 2 = from two to five years, and 3 = more than five years.

The fifth of the PMMS champion characteristics' measures was that of formal responsibility for performance measurement. This was measured on a binary scale with options of 'yes' and 'no'.

The final scale was used to measure the highest level of educational achievement of the respondent. For that purpose, an ordinal scale was used, with the following categories: 1 = secondary, 2 = undergraduate, and 3 = postgraduate.

3.4.3 Overview of variables

The entire set of variables, including both the independent as well as dependent variables, elaborated on in the preceding sections, are presented in an overview in Table 3.4.3.1. The purpose is to present the variables employed in this survey, the theoretical concepts and construct underlying the variables, and the scales and measures used to measure the variables.

Table 3.4.3.1 Constructs and variables

Constructs	Operational definitions (question no. in questionnaire)	Scale/measure
	Dependent variables	
1. PMMS benefits	1. PMMS use for strategic purposes (q. 8)	Ordinal/12 items
	2. Functional/managerial use of PMMS (q. 11)	Ordinal/7 items
	3. PMMS use in specific decision areas (q. 12)	Ordinal/7 items
	4. PMMS dollar benefits estimate (q. 16)	Ordinal/7 items
	Independent variables	
1. PMMS success determinants	1. Success factors (q. 19)	Ordinal/13 items
	2. Barriers (q. 20)	Ordinal/15 items
2. Organisational complementarities of PMMS success	1. Organisation industry (q. 1)	Nominal/6 categories
	2. Organisation size - no. of employees (q. 2)	Ordinal/4 categories
	3. Organisation size - market capitalisation (q. 3)	Ordinal/4 categories
3. Use complementarities of PMMS success	1. Time PMMS in use (q. 4)	Ordinal/3 categories
	2. PMMS use status relative to competitors (q. 14)	Ordinal/5 categories
	3. Number of org. levels PMMS used (q. 7)	Ordinal/6 categories
	4. Use of other innovative managerial tools (q. 15)	Ordinal/3 categories
4. Design complementarities of PMMS success	1. PMMS type (q. 5)	Nominal/4 categories
	2. Number of performance perspectives (q. 6)	Ordinal/4 categories
	3. Number of performance measures (q. 6)	Ordinal/3 categories
	3. PMMS software source (q. 9)	Nominal/5 categories
	4. Cause - effect link b/w drivers and outcomes (q. 10)	Ordinal/5 categories
5. PMMS champion complementarities of PMMS success	1. Position in organisation (q. 21)	Nominal/5 categories
	2. Primary area of expertise (q. 22)	Nominal/5 categories
	3. Position tenure (q. 23)	Ordinal/3 categories
	4. Organisation tenure (q. 24)	Ordinal/3 categories
	5. Formal responsibility for PMMS (q. 25)	Binary
	6. Level of education (q. 26)	Ordinal/3 categories

3.5 Validation of variables

3.5.1 Preliminary validation

In conformance with the threefold character of this study, exploratory, descriptive, and correlational, several procedures were followed to ensure the validity and reliability of the measures used. In the initial phase of development of dependent and independent variables, to ensure their content validity, a comprehensive survey of the relevant literature was undertaken. The literature survey identified the important aspects and components of each variable, and consequently those components were included in the scales construction. As discussed in Section 3.4.1, the theoretical underpinnings of the variables are relatively well established and most of the constructs and the proposed relationships have been addressed previously.

The scales were then pre-tested by administering the initial survey questionnaire to a group of five academics and five practitioner executives, experts in the area of development and application of variables in organisational research. The objective of this phase in questionnaire development was to minimize non-random error, and other causes of invalidity in the actual survey, by having the following aspects assessed:

- validity, or how appropriately the scales measure the phenomena intended;
- completeness or scope, to ensure that all relevant items are included in composite variables; and
- readability and clarity, to ensure that respondents would not misinterpret a particular question.

The experts' review of the questionnaire was followed by interviews with the group. Based on the suggestions in their feedback, modifications in form and clarity, to improve readability, were made to the questionnaire. The items comprising the major variables remained as derived from the literature, with a very few amendments. The result of this phase were the measures described in Section 3.4.1, and summarised in Table 3.4.3.1.

3.5.2 Variability and discriminant reliability

As discussed in the section 3.4.1 Measurement of dependent variables, they reflect the construct of PMMS benefits, which is defined, for the purpose of this study, as the intended or desired set of outcomes of organisational use of PMMS. In other words, the PMMS performance is judged on the ability of the PMMS to assist in accomplishment of specific intended or normative objectives. The majority of constructs have been used extensively in previous research, which, in addition to adequate reliability and validity, should ensure the precision and discriminative property of the measures.

In addition, given that suggestions on development of scales had been obtained from the experienced practitioners and researchers of organisational phenomena in the questionnaire design phase of the research, data were expected to show an adequate variability of responses. The risk of the favourable response bias, associated with the fact that the persons responsible for the PMMS development and maintenance in the organisations were invited to provide information, has been alleviated or eliminated by ensuring the total anonymity, and the total confidentiality of information by the few respondents who had chosen to reveal the identity of their organisations. Upon a critical examination of the responses received, no unduly favourable view by any one respondent, which would render information provided meaningless and invalid, had been detected.

This examination was followed by the formal analysis of variability of responses on the success of PMMS, measured by standard deviation and interquartile range. The values can be observed in the tables shown below. The values of measures of central tendency, arithmetic mean and median, are also provided to serve as a reference point to the data on the variability of answers. Both measures of central tendency and the dispersion of data were calculated and reported, as they indicated how respondents had reacted to the questionnaire items and the quality and appropriateness of the items and measures. In particular, these measures were useful in detecting improperly worded and poorly understood items, through low variability of answers to these items, and in detecting any

respondents' bias in answering, if the respondents have tended to respond similarly to all items (Cavana, Delahaye and Sekaran, 2001, p. 319). The frequencies of the respondents providing an answer to a particular question item are also included, as an additional indicator of satisfactory variability of answers, as they illustrate the applicability of items to a widely varying numbers of organisations.

Data in Table 3.5.2.1 support the previous assertions on the adequate discriminative ability of measures used to ascertain the PMMS use for strategic purposes. The means range from the highest value of 3.66 to the minimal mean of 2.66. The standard deviations range from 0.83 to 1.08, and the number of organisations to which the particular items apply vary from four to a hundred and two. Taken together, these figures suggest an adequate variability of responses.

Table 3.5.2.1 Variability of scores of 'Satisfaction with PMMS use for strategic purposes'

	Respondents		Satisfaction			
Use for strategic purpose	n	%	Mean	St.dev.	Median	Interquartile range
Communicate strategic goals	95	70	3.66	0.87	4	3 - 4
Developing team objectives	85	63	3.51	0.88	4	3 - 4
Improves quality of decision making and problem solving	102	76	3.48	0.83	4	3 - 4
Resource allocation matched to strategic priorities	79	59	3.43	0.93	4	3 - 4
Strategic planning	75	56	3.43	0.89	4	3 - 4
Strategy formulation	94	70	3.43	0.91	3	3 - 4
Correct implementation of strategy	94	70	3.36	0.83	3	3 - 4
Basis for incentive and reward system	92	68	3.32	0.97	3	3 - 4
Developing personal objectives	87	64	3.31	0.94	3	3 - 4
Reporting measures to public	76	56	3.29	1.08	3	3 - 4
Other strategic purpose	4	3	3.25	0.96	3	2 - 4
Feed-back to enable corrective action	92	68	3.18	0.92	3	3 - 4
Replace formal reporting and control structure	65	48	2.66	1.00	3	2 - 3

Scale: 1 = Very dissatisfied, 2 = Somewhat dissatisfied, 3 = Satisfied,
4 = Quite satisfied, 5 = Very satisfied.

Similarly, the data on variability of the scales employed to measure the PMMS use in specific business decision areas, presented in Table 3.5.2.2, show similarly adequate variability of responses. In comparison with the scales of PMMS use for strategic purposes, the mean values show somewhat lesser variability, probably due to fewer items comprising the scale. However, it can be observed that the numbers of organisations vary as greatly.

Table 3.5.2.2 Variability of scores of 'Satisfaction with PMMS use in specific business decision areas'

	Respondents		Satisfaction			
Decision area	n	%	Mean	St.dev.	Median	Interquartile range
Budgeting & planning	122	90	3.78	0.81	4	3 - 4
Forecasting	114	84	3.75	0.83	4	3 - 4
Other areas	5	4	3.60	1.34	3	3 - 5
Working capital management	102	76	3.58	0.92	4	3 - 4
Capacity management and capital investment decisions	104	77	3.55	0.90	4	3 - 4
Product development	65	48	3.29	0.84	3	3 - 4
Outsourcing	60	44	3.17	1.09	3	2 - 4
Restructuring/reorganisation	74	55	3.14	1.00	3	2 - 4

Scale: 1 = Very dissatisfied, 2 = Somewhat dissatisfied, 3 = Satisfied,
4 = Quite satisfied, 5 = Very satisfied.

The data on the next measure of PMMS benefits, the dollar improvements attributable to the use of PMMS, are shown in Table 3.5.2.3, and again demonstrate satisfactory variability of responses. The means of individual items are from 2.65 to 3.66, standard deviations are all in the vicinity of one, and the numbers of organisations providing their ratings are from 72 to 101.

Table 3.5.2.3 Variability of scores of 'Extent of PMMS attributed dollar improvements'

	Respondents		Extent			
Dollar improvement	n	%	Mean	St.dev.	Median	Interquartile range
Process/operations management	101	75	3.66	0.85	4	3 - 4
Customer satisfaction	97	72	3.18	0.92	3	3 - 4
Distribution	54	40	2.98	1.11	3	2 - 4
Product/service design	61	45	2.93	0.96	3	2 - 4
Sales and marketing	86	64	2.93	0.82	3	2 - 4
Increased market share	72	53	2.69	1.06	3	2 - 4
Stock appreciation	77	57	2.65	0.98	3	2 - 3

Scale: 1 = Very little, 2 = Somewhat significant, 3 = Fairly significant,
4 = Very significant, 5 = Extremely significant.

With respect to the responses on the extent of PMMS use by users belonging to various functional and managerial backgrounds, it is also evident that the measures allowed for satisfactory variability. As shown in Table 3.5.2.4, the means range from 2.95 to 4.25, standard deviations are from 0.76 to 1.18, and the organisations' frequencies are from 13 to 125.

Table 3.5.2.4 Variability of scores of 'Extent of PMMS use by users of various managerial and functional background'

	Respondents		Extent			
Functional background	n	%	Mean	St.dev.	Median	Interquartile range
Accounting/finance personnel	124	92	4.25	0.76	4	4 - 5
Other managers and personnel	13	10	3.92	0.76	4	3 - 4
Other senior managers	125	93	3.83	0.83	4	3 - 4
CEO	129	96	3.60	1.02	4	3 - 4
Manufacturing/production personnel	76	56	3.59	1.05	4	3 - 4
Product/service manager	73	54	3.47	0.93	4	3 - 4
Sales/marketing personnel	85	63	3.35	1.03	3	3 - 4
Board members	103	76	2.95	1.18	3	2 - 4

Scale: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Very often.

Similarly to the analyses of discriminative reliability of the dependent variables, the analyses of the two sets of the determinants of success or failure of PMMS have revealed adequate variability of the responses.

The set of variability indicators, contained in Table 3.5.2.5, shows that the means of individual success factors varied from 3.06 to 4.25, standard deviations have exhibited the range similar to that of the dependent variables, and the numbers of organisations varied from 62 to 126.

Table 3.5.2.5 Variability of scores of 'Importance of PMMS success factors'

	Respondents		Importance			
Success factor	n	%	Mean	St.dev.	Median	Interquartile range
Supported by senior executives	126	93	4.25	0.83	4	4 - 5
Full acceptance at all levels of organization	96	71	4.04	0.89	4	3 - 5
Individual accountability for results	84	62	3.98	0.84	4	4 - 5
Easy to manage	103	76	3.97	0.77	4	3 - 5
Allows realistic target-setting	91	67	3.85	0.70	4	3 - 4
Drivers of future performance easy to identify	79	59	3.81	0.75	4	3 - 4
Good fit between objectives and measures easy to establish	76	56	3.80	0.73	4	3 - 4
Successfully delegated to staff and consultants	63	47	3.63	1.07	4	3 - 5
Demonstrates results rapidly	74	55	3.42	1.05	3	3 - 4
Related to immediate problems	76	56	3.32	0.96	3	3 - 4
Direct impact on bottom-line	76	56	3.32	1.04	3	2 - 4
Relies on existing resources	80	59	3.14	1.02	3	2 - 4
Can be implemented in increments	62	46	3.06	1.21	3	2 - 4

Scale: 1 = Relatively unimportant, 2 = Not so important, 3 = Important,
4 = Fairly important, 5 = Very important.

The final set of scales, measuring the items of PMMS barriers, is shown in Table 3.5.2.6, and can also be viewed as having a satisfactory variability. This can be observed in the values of means ranging from 2.77 to 3.42. The standard deviations of the scores given to the items were around one, and the specific barriers were recognized to a varying extent, from 53 to 82 respondents.

Table 3.5.2.6 Variability of scores of 'Importance of PMMS barriers'

	Respondents		Importance			
Barrier	n	%	Mean	St.dev.	Median	Interquartile range
Too many measures and too complex	81	60	3.42	1.08	4	2 - 4
Important stakeholders excluded	74	55	3.39	0.96	3	2 - 4
Not understood by employees	62	46	3.34	1.27	4	2 - 4
System prone to managerial and employee manipulation	75	56	3.21	1.14	3	3 - 4
Wrong configuration of physical resources, human resources, systems and procedures	69	51	3.19	0.91	3	3 - 4
Not adopted by employees	67	50	3.18	1.34	3	2 - 4
Organisational culture not performance oriented	59	44	3.17	1.19	3	2 - 4
Fear of sensitive information being revealed	54	40	3.17	1.02	3	2 - 4
System not supportive of strategy	82	61	3.09	1.09	3	2 - 4
Insufficient resources	63	47	3.05	1.18	3	2 - 4
Resistance due to vested interests	63	47	3.05	1.01	3	2 - 4
Data not readily accessible from present information systems	67	50	2.97	1.13	3	2 - 4
Hierarchical top-down method	71	53	2.87	1.00	3	2 - 4
Data required to generate performance indicators not available	59	44	2.83	1.22	3	2 - 4
Resistance due to anxiety	53	39	2.77	1.03	3	2 - 4

Scale: 1 = Relatively unimportant, 2 = Not so important, 3 = Important,
4 = Fairly important, 5 = Very important.

To sum up briefly, the analyses of discriminant reliability of measures for dependent and independent variables have all showed satisfactory variability of the responses.

3.5.3 Construct reliability

As shown in Table 3.4.3.1, all four PMMS benefits variables and both PMMS determinants variables were measured using the ordinal scales comprised of between seven and fifteen items, depending on the complexity or multidimensionality of the variables. Many of the measures had been previously used, their psychometric properties were established in the previous research, and are provided in the following paragraphs.

The internal consistency or reliability of the composite multi-item measures was evaluated by computing the alpha coefficients (Cronbach, 1951), which is the common measure of scale reliability or unidimensionality (de Vaus, 1995). The alpha coefficient determines the internal reliability or consistency of a set of items designed to measure a particular characteristic or concept. It can be thought of as the proportion of variation in the respondent's score which is explained by the items (Cramer, 1998, p. 393). All computed Cronbach alpha coefficients for composite scales were quite high and were considered fully appropriate for subsequent analyses of PMMS variables using the composite variables, namely the correlational analyses of PMMS benefits and determinants, and the testing of differences between the PMMS benefits based on PMMS complementarities.

No consensus has been achieved among researchers as to what constitutes acceptable value of Cronbach alpha. Thus, the often quoted recommendation by Van de Ven and Ferry (1979) puts the alpha at minimally 0.35, with appropriate ranges depending on the complexity of variables, while Nunally (1978) recommended a level of 0.5 as acceptable for exploratory studies. de Vaus (1995, p. 256) suggests that a much higher alpha, of at least 0.7 is needed for a reliable scale.

As exhibited in the tables, the internal consistency reliability alpha coefficients for the constructs in this study are all well above the recommended levels. The alphas for all variables range between 0.77 and 0.93. The coefficients were also calculated for the different industries to examine their robustness in different sampling contexts, and were found to converge with the overall alphas for all respondents, discussed in the following paragraphs.

Cronbach reliability for the construct of 'PMMS use for strategic purposes' was 0.80. Based on data in Table 3.5.3.1, the coefficient would have increased by eliminating the item 'Reporting the measures to public', which was weakly correlated to the scale. However, the improvement would have been negligible, so the item was retained as part of the scale.

Table 3.5.3.1 Item - total statistics of variable 'PMMS use for strategic purposes' (Cronbach alpha = 0.8051)

Strategic purpose Item description	Item - total correlation	Alpha if item deleted
Strategy formulation	0.588	0.777
Strategic planning	0.567	0.780
Communicate strategic goals	0.383	0.797
Developing personal objectives	0.513	0.785
Developing team objectives	0.587	0.778
Resource allocation	0.611	0.774
Strategy implementation	0.451	0.791
Feed-back	0.415	0.794
Quality of decision	0.309	0.802
Reporting and control	0.427	0.794
Rewards system	0.395	0.796
Reporting to public	0.150	0.815

The second composite scale, consisting of the items pertaining to the use of PMMS by various users, has also a high Cronbach reliability, 0.77. As shown in Table 3.5.3.2, the item 'Accounting/finance personnel' had a low item-to-scale coefficient of 0.26, and

could have been dropped from the scale. However, if the item was excluded from the scale, the improvement in scale reliability would be negligible, so the item was retained.

Table 3.5.3.2 Item - total statistics of variable 'PMMS user functional background' (Cronbach alpha = 0.7681)

User Item description	Item - total correlation	Alpha if item deleted
CEO	0.518	0.734
Other senior managers	0.563	0.733
Board members	0.492	0.742
Manufacturing/production personnel	0.421	0.758
Accounting/finance personnel	0.261	0.776
Product/service managers	0.708	0.690
Sales/marketing personnel	0.531	0.730

The overall alpha for the scale 'Specific decision areas' was 0.8, and could not be improved by eliminating any item from the scale, as could be observed in Table 3.5.3.3.

Table 3.5.3.3 Item - total statistics of variable 'PMMS use in specific decision areas' (Cronbach alpha = 0.801)

Decision area Item description	Item - total correlation	Alpha if item deleted
Capacity management and capital investment	0.540	0.774
Working capital management	0.493	0.782
Product development	0.366	0.802
Restructuring or reorganisation	0.551	0.772
Outsourcing	0.508	0.783
Budgeting and planning	0.701	0.748
Forecasting	0.620	0.761

By comparing the Cronbach reliability calculated for the complete scale 'Dollar improvement' with the alpha values in column 'Alpha if item deleted' in Table 3.5.3.4, it can be observed that the maximum alpha was achieved, and that it could not be improved.

Table 3.5.3.4 Item - total statistics of variable 'PMMS attributable dollar improvement' (Cronbach alpha = 0.8236)

Dollar improvement sector Item description	Item - total correlation	Alpha if item deleted
Sales and marketing	0.638	0.790
Distribution	0.622	0.790
Product/service design	0.514	0.800
Customer satisfaction	0.593	0.790
Process/operations management	0.449	0.810
Increased market share	0.605	0.790
Stock appreciation	0.560	0.800

Similarly to the scales constituting the dependent variables of PMMS benefits, the independent variables of PMMS determinants, employing the scales presented in Tables 3.5.3.5 and 3.5.3.6, have also exhibited a high degree of construct reliability. It should be noted that the alphas for the independent variables are reported for illustrative purpose only, and should not be interpreted as indicating any unidimensional underlying concepts beyond the simple groupings of the PMMS success factors and barriers.

As can be observed in Table 3.5.3.5, the 'PMMS success factors' scale shows that the itemized factors hold together very well, which is confirmed by the alpha value of 0.87.

Table 3.5.3.5 Item - total statistics of variable 'PMMS success factors' (Cronbach alpha = 0.8691)

Success factor Item description	Alpha if item deleted
Supported by senior executives	0.852
Organisational acceptance at all levels	0.855
Can be delegated to staff and consultants	0.854
Individual accountability for results	0.857
Related to immediate problems	0.859
Demonstrates results rapidly	0.852
Direct Impact on bottom-line	0.859
Allows realistic target - setting	0.862
Relies on existing resources	0.872
Drivers of performance easy to identify	0.851
Fit between objectives and measures easy to establish	0.863
Incremental implementation	0.862
Easy to manage	0.870

The Cronbach reliability of 'PMMS barriers' scale is the highest of all scales capturing the multidimensional concepts. The Cronbach alpha for overall scale is equal to 0.93. The recalculated coefficients show that deletion of any items would not result in an increase of reliability.

Table 3.5.3.6 Item - total statistics of variable 'PMMS barriers' (Cronbach alpha = 0.931)

Barrier Item description	Alpha if item deleted
PMMS not supportive of strategy	0.923
Too many measures and too complex	0.926
Not understood by employees	0.922
Not adopted by employees	0.922
Organisational culture not performance oriented	0.923
Resistance due to vested interests	0.924
Resistance due to anxiety	0.923
PMMS prone to managerial and employee manipulation	0.923
Fear of sensitive information being revealed	0.934
Wrong configuration of physical resources, human resources, systems and processes	0.927
Insufficient resources	0.926
Important stakeholders excluded	0.931
Hierarchical top-down method	0.935
Data required to generate performance indicators not available	0.922
Data not readily accessible from present information systems	0.930

3.5.4 Autocorrelation effect

Given the length, scales could not be placed in separate parts of the survey questionnaire to mitigate potential autocorrelation effect. To ascertain the extent of autocorrelation among the four PMMS success variables, the correlation coefficient were calculated for each pairwise combination of the PMMS success variables. The results are shown in Table 3.5.4.1.

Table 3.5.4.1 Correlations between dependent PMMS benefits variables, significant at p = 0.01

PMMS benefits variables	Coefficient of correlation		
	Pearson's *r*	Spearman's rho	Kendall's tau b
Strategic purpose - Functional managerial use	0.565	0.567	0.415
Strategic purpose - Specific decision areas	0.622	0.689	0.510
Strategic purpose - Dollar improvements	0.549	0.555	0.406
Functional managerial use - Specific decision areas	0.556	0.505	0.369
Functional managerial use - Dollar improvements	0.392	0.399	0.280
Specific decision areas - Dollar improvements	0.547	0.574	0.430

As can be observed, all PMMS success variables are significantly correlated, and the strength of correlations can be interpreted, according to qualifications in Table 3.5.4.2, as low to moderate, suggesting that autocorrelation, being markedly less than one, was within acceptable boundaries. Therefore, it appears that, on the whole, the PMMS benefits variables indeed reflect different dimensions of PMMS outcomes.

Table 3.5.4.2 Interpretation of correlation coefficients

Size of correlation	Interpretation	Size of correlation	Interpretation	Size of correlation	Interpretation
1	Perfect relationship				
0.99 to 0.75	Very strong relationship	0.9 to 1	Very high correlation		
0.74 to 0.5	Strong relationship	0.7 to 0.89	High correlation	0.7 and higher	Large, strong or high
0.49 to 0.3	Moderate relationship	0.5 to 0.69	Moderate correlation	0.4 to 0.69	Moderate or modest
0.29 to 0.1	Weak relationship	0.3 to 0.49	Low correlation	0.1 to 0.39	Small, weak or low
0.09 to 0.01	Trivial relationship	0 to 0.29	Little if any correlation		
0	No relationship				

Source: compiled and adapted from Gauch (2000, p. 307), Hinkle, Wiersma and Jurs (1994, p. 119), and Cramer (1998, p. 141)

3.6 Selection of statistical techniques and tests

3.6.1 Introduction

Consistent with the research objectives elaborated on in Chapter 1, the study was organised so that many different aspects of multiple perspective performance

measurement and management systems and practices in Australia would be covered. The broad objective was to explore the importance of various determinants of PMMS success. These determinants were divided in two groups.

The first group consists of factors identified through the literature review phase of the research, as being directly conducive to the success of PMMS, or impeding the success, i.e. the success factors and barriers. These factors constitute the items of the composite variables 'PMMS success factors', question 19 of the questionnaire, and the variable 'PMMS barriers', question 20.

Another broad group involves the factors which have not been proposed explicitly in the previous literature as being related to the PMMS success, but may be tentatively assumed to be correlated to the PMMS success. These factors, termed the PMMS success complementarities, together with the questionnaire questions used to collect and analyse the required information, are presented as follows:

1) organisation industry and size complementarities (questions 1, 2, and 3);
2) the PMMS use complementarities, such as the PMMS time in use (question 4), perceived PMMS status in comparison with competitors (question 14) and the scope of PMMS use at various organisational levels (question 7);
3) number of other managerial innovative tools used in organization (question 15);
4) the PMMS design complementarities, such as the PMMS model or framework used in organization (question 5), number of distinct performance measurement areas and number of measures in the PMMS used (question 6) and causal link between drivers and outcomes features of the PMMS (question 10);
5) the PMMS development complementarity, namely the source of PMMS software (question 9); and
6) the PMMS champion and project leader complementarities, such as organisation position (question 21), primary area of expertise (question 22), position tenure (question 23), organisation tenure (question 24), PMMS formal responsibility (question 25) and level of education (question 26).

3.6.2 Establishing the relevance of PMMS success determinants and benefits

As discussed in Section 1.4, the first objective of this study was to investigate and establish the relevance of both the benefits of PMMS and the factors contributing to the accomplishment of those benefits. The PMMS benefits, determinants and complementarities, which have been identified in the review of the previous research and professional literature, will have their relevance evaluated in the Australian business context. To accomplish this research goal, information on average use and spread was required. To test the relevance, several different sets of data have been constructed on the basis of responses from the survey participants. These data sets contain descriptive statistics on the PMMS benefits across four distinct groupings, and on the PMMS success factors and barriers. The format of presentation is similar to the tables displayed in the section 3.5.2 Variability and discriminant reliability, and contains the following sections: item description; absolute and relative frequencies of organisations in which the item was marked as relevant; and data on the scores given to the items by the respondents, consisting of measures of central tendency arithmetic mean and median, and measures of dispersion standard deviation and interquartile range. The last column in the tables contains the mode values and the relative frequencies of the organisations for which a mode score was provided by the respondents. In other words, the relevance of the PMMS benefits and their determinants will be ascertained through an analysis and interpretation of elementary descriptive statistics.

Given that the measurement scale determines the type of descriptive measures used, the primary statistics used to summarise the data and describe the relevance of PMMS success determinants and benefits comprises of the measures which are strictly applicable to ordinal data, such as the measure of centre, the median, and the measure of dispersion, the interqaurtile range, which represents the range of the middle 50 percent of the cases. Being by definition a value of the 50^{th} percentile, the median was primarily used as a useful measure of centre suitable for the skewed distributions, indicating that the respondents have tended to rate the relevance of all itemized variables as important, or the middle point of the scale, or more than important, i.e., 4 or 5 on the scale. In addition,

the measures of centre and dispersion applicable to interval level variables are also included in the tables, in violation of the strict scale assumptions, which preclude arithmetic operations on categories which cannot be quantified in precise interval amounts, as was the case with the item scales. Having only a very limited number of possible values of five points, these scales should only be treated as discrete ordinal scales, and could not be considered to be continuous interval. However, the use of the mean can be legitimized, because, with an increase of the number of responses, the inaccuracies caused by the use of mean on ordinal data are cancelled out by an averaging effect, consistent with the Central Limit Theorem (Page and Meyer, 2000, p. 146).

Notwithstanding the seriousness of deviations from the scale assumptions and the skewness of all distributions, the arithmetic mean and the standard deviation allow for more precision in assessing the relevance of PMMS variables. As can be observed in the tables presented in the section 4.1, the use of median alone, on a five-point scale does not allow for a satisfactory and informative differentiation between the items, as it does not distinguish between small variations. Subsequently, it is of little value in the ranking of the items in terms of their relevance. Similarly, the data on interquartile range, if analysed in isolation from the other descriptive statistics mentioned here, are not precise and discriminative enough for a meaningful interpretation of the dispersion of the item scores. However, the interquartile range is presented in Tables, as a useful measure showing the scores of the middle 50 percent organisations.

3.6.3 Establishing the correlations between PMMS determinants and benefits

The second goal of this research, described in Section 1.4 was to calculate and analyse the strength of association between the PMMS benefits and the determinants of PMMS success or failure. To establish and explain the relevance of the PMMS determinants to the accomplishment of the benefits of PMMS, several different tests were conducted. The hypothesized direct relationships between the PMMS success factors and PMMS benefits, and inverse relationships between the PMMS barriers and PMMS benefits, were tested by computing correlation coefficients between the major study variables. The

coefficients give a clear indication of the significance and direction of association, as well as the contribution of the PMMS determinants to the success of PMMS in surveyed organisations. The size of coefficients was qualified as per combination of Gauch (2000), Hinkle, Wiersma and Jurs (1994), and Cramer (1998) rules displayed in Table 3.5.4.2.

The itemized factors, which had been found in the preceding phase of this research to be relevant to Australian listed organisations, were correlated in two different formats. First, the composite or aggregate PMMS determinants variables were correlated with the composite PMMS benefits variables. Specifically, the PMMS success factors variable had been correlated with each of the four PMMS benefits variables, and the procedure was then repeated with the PMMS barriers variable correlated with the four PMMS benefits variables. First, the correlations were calculated for the entire range of the composite variables. Following that, the scattergrams representing the pairs of values of independent and dependent composite variables, with trend or regression lines incorporated, depicting each correlation were produced, visually checked, and interpreted for the 'Low', 'Middle' and 'High' sections of the dependent variables' ranges, to ascertain linearity and the strength of association along the different sections, representing the lowest, middle and high scores thirds of the sample. These analyses were conducted to check how robust and general the initial pattern is, i.e., whether the coefficients for the entire sample actually faithfully reflected the true correlations, given that the anticipated direct or inverse relationships, and their strength, might not have equally applied to all subgroups: 'Low', 'Middle' and 'High'. With respect to the presumed linear nature of relationships, the obvious problems with the adequacy of linear measures in representing the correlations were identified, as well as with the heteroscedasticity, or the non-uniform clustering of the scores about the regression line. The alternative coefficients to measure a curvilinear relationship were not considered, as these are usually applied to the frequency data, and would have unnecessarily complicated the analyses. Transformation of the variables was also not an option, due to the ordinal character of the data, which had already been transformed once, in the construction of the composite scales.

Three types of correlation coefficients were calculated, Pearson's product-moment correlation coefficient r, Spearman's rho r_s, and Kendall's tau b. The Pearson's correlation coefficients were calculated although they are not strictly appropriate to the scales on an ordinal level of measurement. This has been done because the scales of composite independent and dependent variables could be regarded as a quasi-interval, or a continuous interval variable, justifying the use of parametric techniques, as the inaccuracies in ordinal data tend to be cancelled out when many responses are added together (Page and Meyer, 2000, p. 146). The ranges of the composite variables consist of a sufficiently large number of scale points, obtained by adding the responses for several ordinal itemized variables, as evidenced in Tables 3.4.1.1 and 3.4.2.1. Given that the computing formula for Spearman's rho r_s is derived by simplifying the formula for the Pearson's product-moment correlation r (Siegel and Castellan, 1988), the similar, or practically identical, values of both measures were obtained from the same data, as demonstrated in the tables in the section 4.2.3 and 4.2.4. These values, and the respective obtained levels of significance of $p = 0.01$, suggest that the application of the Pearson's coefficient, in violation of parametric assumptions, did not affect the probability of committing a Type I error.

In relation to both Pearson's and Spearman's coefficients, the Kendall's tau b coefficients for the composite variables were not directly comparable and were markedly lower, consistent with the different underlying methodology of calculating the Kendall's coefficient (Siegel and Castellan, 1988, p. 251). With regard to the sensitivity, or the ability to detect the association between the variables, Kendall's tau is equal to Spearman's coefficient, as both coefficients utilize the same amount of information (Siegel and Castellan, 1988, p. 251). As suggested by de Vaus (1995) and Cramer (1998, p. 364), Kendall's coefficient is more appropriate in cases with a lot of tied ranks, or more specifically if there are a lot of cases and relatively few categories, i.e., scale points, as in the calculations of correlations between the items. Spearman's rho is more appropriate where there are fewer cases and larger variables (Cramer, 1998, p. 364).

Kendall's coefficient was included in the analyses due to the inability to unreservedly determine the magnitude of the problem of tied ranks in each of the eight correlation calculations performed. For each calculation the number of tied ranks can be ascertained by inspecting the scattergrams, and then estimating the difference between the number of all cases in the analyses, approximately 130, and the number of non-tied cases represented by dotted data points, which varies greatly among the correlations, but is patently less than 130 in all correlations.

The analyses include a discussion on magnitude of association, and the portion of changes in PMMS benefits which may be explained by changes in PMMS determinants, measured by the coefficient of determination r^2, and presented in the last column of the table. The results are displayed in the following tabular format:

Type of correlation coefficient	**Coefficient size**	**Significance level**	**Percentage of covariance explained**
Pearson's product-moment			
Kendall's tau b			
Spearman's rho			

The second set of bivariate correlations has been computed and presented for itemized PMMS benefits and itemized PMMS determinants. The strength of association has been measured by Spearman's correlation coefficient and Kendall's tau b correlation coefficient. Pearson's coefficent has not been calculated, given that the item scale constisted of only five points, and could not be regarded to be interval, or quasi-interval, as was the case with the composite scales. The guiding principle in the selection of statistical techniques was to relax the stringent assumptions minimally, and only if justified by the research objectives' requirements. At that, the correlation information calculated by Spearman's rho and Kendall's tau was considered sufficient, and the convergence of the values of the Pearsons's and Spearman's coefficients is discussed in preceding paragraphs.

The level of significance was specified at p = .05. The choice of a five percent significance was made on the basis of the size of sample, in accordance with the recommendation by de Vaus (1995, p.189). The other consideration in choice of the level of significance was the accuracy and discriminability of the data. Given that subjective measures of independent and dependent variables were used to elicit the perceived importance of PMMS determinants and the magnitude of PMMS benefits, in lieu of unobservable and unavailable objective data, a relatively conservative and low cut-off level of five percent (Page and Meyer, 2000, p. 167) was chosen.

The purpose of calculating significant correlations between the items comprising the PMMS benefits and PMMS determinants variables was to obtain a more detailed structure, underlying the relationships between the principal composite variables in which all items were combined in the initial analyses. The discussion in this section is restricted to highlighting and commenting on the most noticeable item-to-item associations, with respect to the magnitude of correlations and the incidence of particular items or sub-groups of items. The theoretical considerations were kept to a minimum or entirely absent, subject to the availability of references and interpretability of correlations. The presentation of correlations adheres to the following format of correlation matrices:

Independent variable	**Dependent variable - PMMS benefit**					
PMMS success factor or barrier	Item 1	Item 2	.	.	.	Item n
Item 1	*	*	*	*	*	*
Item 2	*	*	*	*	*	*
.	*	*	*	*	*	*
.	*	*	*	*	*	*
.	*	*	*	*	*	*
Item n	*	*	*	*	*	*

*** A cell contains correlation coefficient if significant at minimally p <= 0.05**

3.6.4 Identification of PMMS complementarities

The third objective of this research was to identify the differences in achieved PMMS benefits, based on complementarities to PMMS success, other than the fundamental

PMMS success factors and barriers analysed in the preceding phase. These complementarities, presented in Table Section 1.4.1, had been ascertained by conducting several types of statistical tests: Kruskal – Wallis test, Jonckheere – Terpstra test, and Mann – Whitney test.

All three types of tests are ranking tests, and are applicable for testing the differences in scores which are not exact in a numerical sense, but which are in effect simply ranks (Siegel and Castellan, 1988). The choice of a test was made in accordance with the usefulness of each procedure for the particular scale of measurement of independent variable. More precisely, the choice among the three tests was made according to the suitability and applicability to the scale of measurement of the PMMS complementarities. The exact classification of PMMS complementarities with regard to the type of variable, and the respective type of the test applied to identify the differences in PMMS success is presented in Table 3.6.4.1.

Table 3.6.4.1 PMMS complementarities and statistical tests

PMMS complementarity		Scale of measurement	Appropriate test
Category	**Description**		
Organisation characteristics	Industry	Categorical	Kruskal - Wallis
	No. of employees	Ordinal	Jonckheere - Terpstra
	Market capitalisation	Ordinal	Jonckheere - Terpstra
PMMS design	PMMS type	Categorical	Kruskal - Wallis
	No. of performance areas	Ordinal	Jonckheere - Terpstra
	No. of performance measures	Ordinal	Jonckheere - Terpstra
	Source of PMMS software	Categorical	Kruskal - Wallis
	Causal link among performance perspectives and measures	Ordinal	Jonckheere - Terpstra
PMMS use	Time PMMS in use	Ordinal	Jonckheere - Terpstra
	Perceived PMMS status	Ordinal	Jonckheere - Terpstra
	No. of organisational levels PMMS used	Ordinal	Jonckheere - Terpstra
	Use of other innovative tools	Ordinal	Jonckheere - Terpstra
PMMS champion characteristics	PMMS formal responsibility	Binary	Mann - Whitney
	Organisational position	Categorical	Kruskal - Wallis
	Primary area of expertise	Categorical	Kruskal - Wallis
	Position tenure	Ordinal	Jonckheere - Terpstra
	Organisation tenure	Ordinal	Jonckheere - Terpstra
	Level of education	Ordinal	Jonckheere - Terpstra

3.6.4.1 Identification of binary complementarity

The information on the sole binary complementarity in this study, reflecting the respondent's formal responsibility for performance measurement, was elicited by Question 25. To test whether the PMMS benefits, measured by all four dependent variables, differed significantly between the two groups, the Mann-Whitney test was used. The Mann-Whitney test is applicable to the testing of independence of two groups or categories, measured on an ordinal scale, as is the case with PMMS formal responsibility (Siegel and Castellan, 1988, p. 128). The test uses small groups, which makes it suitable for both groups, as their sizes are 118 and 16. The significance level was 0.05.

3.6.4.2 Identification of complementarities with three or more groups

Apart from the respondents' formal responsibility for performance measurement, all other PMMS complementarities consisted of three or more groups. The differences in PMMS benefits among the groups belonging to the same complementarity had been tested in a multi-step process. First, for each PMMS complementarity, the appropriate test was conducted to compare the groups and indicate whether there is an overall difference among the groups, at the level of significance of 0.05. When the obtained value of the test is significant, it indicates that at least one of the groups is different from at least one of the others (Siegel and Castellan, 1988, p. 213).

The tests used in the first phase were the Kruskal-Wallis test and the Jonckheere-Terpstra test. The Kruskal-Wallis test was used to identify the differences in PMMS benefits among the groups which were strictly categorical, i.e., where only the existence of the differences ($\neq$) between at least two groups could be tested, with no prior theoretical assumptions about the direction of those differences. In contrast, the Jonckheere-Terpstra test for ordered alternatives tested the differences in PMMS benefits between the groups that were ordered in a specific a priori sequence (Siegel and Castellan, 1988, p. 216), that

is, the test has been used to ascertain if there was at least one strict inequality (< or >), specified by ordering of the groups a priori.

In the second phase, when an overall test indicated difference between the groups, a procedure for testing the differences between all pairs of the groups had been employed, in order to determine which groups were different. The differences in PMMS benefits between the individual pairs of groups had been tested by using the following inequality, suggested by Siegel and Castellan (1988, p. 213):

$$|\text{Mean rank}_u - \text{Mean rank}_v| \geq z_{\alpha/k(k-1)} \sqrt{[N(N+1)/12]\,(1/n_u+1/n_v)}$$

$_u$ and $_v$ in the inequality stand for the first and the second group in the pair. In presentation of the results of pairwise comparisons, the groups were marked by capital letters starting with A. k denotes the number of groups, N stands for the size of the sample, and n signifies the size of the group. The value of $z_{\alpha/k(k-1)}$ is the abscissa value from the unit normal distribution above which lies $\alpha/k(k\text{-}1)$ percent of the distribution. The values of z were obtained from the Appendix Table A in Siegel and Castellan (1988, p. 320).

In each complementarity, all possible pairwise comparisons were performed. The number of comparisons (# c) can easily be computed as $k(k - 1)/2$. For example, the number of all pairwise comparisons of four groups is six. In all analyses, all pairwise comparisons had to be investigated, as no specific expectations, or predictions, could be made about the results. In the case of the analyses involving Kruskal-Wallis tests, no theoretical overall direction of differences could be assumed at all. As to the analyses based on the Jonckheere-Terpstra test, specific a priori pairwise differences were theoretically justified and were planned and incorporated in the study design. However, given the unequal group sizes, significant differences could not be detected on the basis of the respective average ranks only. Instead, the entire series of all possible comparisons had to be conducted. For example, if the groups were of equal size, to ascertain the differences in PMMS benefits between four groups, only three specific pairwise comparisons would need to be performed: between the first and second group, between

the second and third group, and between the third and fourth group. With the unequal group sizes, only a general direction of differences could be assumed, and a total of six comparisons were needed.

In the final step of the procedure concerning the differences in PMMS benefits between the various complementarities groups, the significant relationships in the data are described using a coefficient of correlation eta squared (Heiman, 1992, p. 480), calculated in accordance with the formula:

$$\eta^2 = H_{obt}/N - 1$$

where H_{obt} is the value computed in the Kruskal-Wallis test. In describing the significant relationships based on Jonckheere-Terpstra test, respective H_{obt} from the Kruskal-Wallis test statistics had been inserted in the formula. This was necessary due to the inapplicability of the Jonckheere-Terpstra test statistics to the above formula, and is at the same time appropriate, given that the Kruskal-Wallis test and the Jonckheere-Terpstra test produce practically identical results, with the Jonckheere-Terpstra test being somewhat more sensitive in detecting the differences among the ordered groups (Siegel and Castelan, 1988). The correlation described using η^2 is analogous to, and is interpreted in the same fashion as the coefficient of determination derived from the coefficient of correlation, i.e., it indicates the percent of the variance in the PMMS benefits scores that can be explained by the variation of PMMS complementarity groups or level descriptions. Eta squared is considered adequate and sufficient measure of correlation (Heiman, 1992, p. 400), even though it only describes the correlation in the sample data, i.e., at the level of descriptive statistics. All findings' presentations will adhere to the following tabular format:

	PMMS success dimensions											
	Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements		
PMMS success complementarity	n*	Average Rank	Different to**	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to
1												
2												
.												
.												
n												
Total												
Test statistics significance***												
η^2												

* signifies the number of organizations,

** 'Different to' column contains information on differences between groups, at $p \leq 0.05$,

*** Test statistics significance of $p \leq 0.05$ is shaded,

all PMMS success dimensions measured by the aggregate of the rating responses to their component items.

Chapter 4 Findings and Discussion

4.1 Determination of PMMS success factors, barriers and benefits relevance

This section investigates the overall descriptive measures of the PMMS success factors, barriers, and the benefits of PMMS in organisations, with the purpose of establishing and commenting on their relevance in Australian business organisations. The tables presented provide the data needed for an analysis of the PMMS success factors, the barriers, and four PMMS benefits variables. The data were summarised to indicate the frequency distributions, and the measures of central tendency mean, median, and mode, and the measures of dispersion standard deviation, and interquartile range of responses to each of the items.

4.1.2 PMMS success factors

Respondents were invited to indicate the main success factors in implementing the PMMS program. As can be observed in Table 4.1.2.1, the most frequently reported success factor was PMMS 'Supported by senior executives', which was marked by 126, or 93 percent of all respondents. Half of all respondents considered the support by senior executives to be either very important or fairly important, with the latter qualification provided by 44 percent of respondents, all of which indicates a paramount relevance of this PMMS success factor. Following closely was the PMMS 'Easy to manage' factor, reported by 103 respondents. The mode importance of the factors was 4, which corresponds to the qualification of 'fairly important'. Altogether, eight success factors had the median and the mode of four, or 'fairly important'. The median importance indicator of 3, which was the middle point of the importance scale, was obtained for the remaining five factors. A mode of 3, or a moderate importance, was calculated for the three success factors. The indication of the PMMS 'Full acceptance at all levels of organisation' was reported by 96 respondents, and 'Allows realistic target setting' was reported by 91 respondents. All other success factors were reported by markedly fewer respondents, never exceeding 60 percent of all respondents, and averaging roughly half of the sample. With respect to the number of respondents, these numbers indicate a

relatively lesser importance of PMMS success factors such as 'Can be implemented in increments', 'Successfully delegated to staff and consultants', and 'Direct impact on bottom-line', which were reported by about half of the respondents. Such overall low frequencies also account for the low proportions of organisations in the mode scores groups, 16, 15, and 19 percent of the total sample respectively.

Table 4.1.2.1 Importance of PMMS success factors

	Respondents		Importance				
Success factor	n	%	Mean	St.dev.	Median	Interquartile range	Mode and percent of N
Supported by senior executives	126	93	4.25	0.83	4	4 - 5	5 (44)
Full acceptance at all levels of organization	96	71	4.04	0.89	4	3 - 5	5 (26)
Individual accountability for results	84	62	3.98	0.84	4	4 - 5	3 (33)
Easy to manage	103	76	3.97	0.77	4	3 - 5	4 (38)
Allows realistic target-setting	91	67	3.85	0.70	4	3 - 4	4 (41)
Drivers of future performance easy to identify	79	59	3.81	0.75	4	3 - 4	4 (33)
Good fit between objectives and measures easy to establish	76	56	3.80	0.73	4	3 - 4	4 (36)
Successfully delegated to staff and consultants	63	47	3.63	1.07	4	3 - 5	4 (15)
Demonstrates results rapidly	74	55	3.42	1.05	3	3 - 4	3 (19)
Related to immediate problems	76	56	3.32	0.96	3	3 - 4	3 (24)
Direct impact on bottom-line	76	56	3.32	1.04	3	2 - 4	4 (19)
Relies on existing resources	80	59	3.14	1.02	3	2 - 4	4 (23)
Can be implemented in increments	62	46	3.06	1.21	3	2 - 4	4 (16)

Scale: 1 = Relatively unimportant, 2 = Not so important, 3 = Important,
4 = Fairly important, 5 = Very important.

With respect to the overall relevance of the PMMS success factors, an analysis of the differences based on the length of the use of the PMMS in the sample organisations, presented in Table 4.1.2.2, revealed that the only difference exists between the organisations using PMMS less than a year and the organisations using PMMS for more than three years. At that, the importance of PMMS success factors increases with the time PMMS were in use, which is rather difficult to explain. The implication is that the presence of the PMMS success factors is more difficult to determine in the first year of PMMS use, when the system is only being adopted and established by an organisation, than it is in the organisations which had been using PMMS for at least three years. A plausible explanation may have to do with the perceptual character of the variables, i.e., the longer the PMMS are used, the more factors are recognised as critical to the success of the PMMS. At any rate, this finding coincides with and complements the results of the analysis of the differences of the PMMS benefits with respect to the length of use of PMMS, as shown in Table 4.3.4.1.2. The results indicate the corresponding numbers of

organisations in each group, and the same direction of the differences in PMMS benefits, with benefits significantly less in organisations which had used PMMS for less than one year, in comparison with the organisations using the PMMS for more than three years.

Table 4.1.2.2 PMMS success factors ranking by number of years PMMS in use with Jonkheere-Terpstra test, pairwise comparison, and coefficient of determination

	Composite PMMS success factors		
Years of PMMS in use	**n**	**Average Rank**	**Different to**
Less than 1 year	16	53	C
1 - 3 years	33	60	
More than 3 years	84	72	
Total	133		
Jonckheere-Terpstra Test Statistics - Significance		0.03	
η^2		0.04	

4.1.3 PMMS barriers

In comparison with the PMMS success factors items, of which the majority had the median of four, or 'fairly important', and the mode of five, or 'quite important', in two factors, barriers seem to have an overall lesser importance, as can be observed in Table 4.1.3.1. Only two items had the median value of four, while the remainder of barriers had a median importance of three, or moderate. In terms of their mode values, the barriers also appeared to have an overall lesser relevance, as no barrier had a mode of five, a majority of eleven barriers had a mode of four, while the remainder of four barriers had a mode value of three or two. The most frequently reported PMMS barrier was 'System not supportive of strategy', which was marked by 82, or 61 percent, of respondents. The second most frequent barrier was 'Too many measures and too complex', indicated by almost equal number of the respondents.

Table 4.1.3.1 Importance of PMMS barriers

Barrier	Respondents		Importance				
	n	%	Mean	St.dev.	Median	Interquartile range	Mode and percent of N
Too many measures and too complex	81	60	3.42	1.08	4	2 - 4	4 (24)
Important stakeholders excluded	74	55	3.39	0.96	3	2 - 4	4 (19)
Not understood by employees	62	46	3.34	1.27	4	2 - 4	4 (18)
System prone to managerial and employee manipulation	75	56	3.21	1.14	3	3 - 4	4 (19)
Wrong configuration of physical resources, human resources, systems and procedures	69	51	3.19	0.91	3	3 - 4	4 (20)
Not adopted by employees	67	50	3.18	1.34	3	2 - 4	4 (14)
Organisational culture not performance oriented	59	44	3.17	1.19	3	2 - 4	4 (15)
Fear of sensitive information being revealed	54	40	3.17	1.02	3	2 - 4	4 (13)
System not supportive of strategy	82	61	3.09	1.09	3	2 - 4	3 (20)
Insufficient resources	63	47	3.05	1.18	3	2 - 4	4 (14)
Resistance due to vested interests	63	47	3.05	1.01	3	2 - 4	4 (06)
Data not readily accessible from present information systems	67	50	2.97	1.13	3	2 - 4	4 (14)
Hierarchical top-down method	71	53	2.87	1.00	3	2 - 4	3 (18)
Data required to generate performance indicators not available	59	44	2.83	1.22	3	2 - 4	2 (14)
Resistance due to anxiety	53	39	2.77	1.03	3	2 - 4	3 (14)

Scale: 1 = Relatively unimportant, 2 = Not so important, 3 = Important,
4 = Fairly important, 5 = Very important.

Similar to the pattern of responses on the PMMS success factors, all other barriers were reported by far fewer respondents, ranging from 40 to 55 percent. Both the lower overall importance given to the PMMS barriers, indicated by the lower values of the medians and modes, and the low reported frequency of the barriers may be an indication that the PMMS used by the sample organisations are now at a fairly mature stage of development, as can be ascertained by the data in Table 4.3.3.2, and Table 4.1.3.2, shown here.

Table 4.1.3.2 PMMS barriers ranking by number of years PMMS in use with Jonkheere-Terpstra test, pairwise comparison, and coefficient of determination

Years of PMMS in use	Composite PMMS barriers		
	n	Average Rank	Different to
Less than 1 year	15	72	C
1 - 3 years	32	71	
More than 3 years	78	58	
Total	125		
Jonckheere-Terpstra Test Statistics - Significance		0.05	
η^2		0.03	

As can be observed, the lesser overall importance of the PMMS barriers, in comparison with the PMMS success factors, is due to the PMMS barriers marked as less important by the largest group of the respondents in organisations which had used the PMMS for more than three years. With regard to the direction, it can be seen that the importance of PMMS barriers decreases with the number years the PMMS had been in use, as opposed to the direction of relevance of the PMMS success factors.

4.1.4 PMMS use for strategic purposes

As shown in Table 4.1.4.1, the PMMS were used for strategic purposes by a large number of surveyed organisations, exceeding 50 percent of all organisations in all but two of the itemized specific uses. The results show that 76 percent of organisations were using the PMMS to 'Improve the quality of decision making and problem solving', and the respondents were in average 'quite satisfied' with the PMMS fulfilling this function, as indicated by the median value of four, as well as the mode of four, which value was reported by 37 percent of all respondents. The other widely advocated use of the PMMS, to 'Communicate strategic goals', was reported by 95 respondents, or 70 percent, the median satisfaction was four, or 'quite satisfied', and the mode value, reported by 27 percent of all respondents, was three, or 'satisfied'. The respondents in 94 organisations were less satisfied, albeit not markedly, if the respective mean and median figures are considered, with the use of the PMMS for 'Strategy formulation' and 'Correct implementation of strategy'. The mode value of four, or 'quite satisfied' was obtained for the PMMS in use for the purposes of 'Developing team objectives', by 31 percent of respondents, 'Strategic planning', 27 percent, and 'Basis for incentive and reward system', 27 percent of all respondents.

Table 4.1.4.1 Satisfaction with PMMS use for strategic purposes

	Respondents		Satisfaction				
Use for strategic purpose	n	%	Mean	St.dev.	Median	Interquartile range	Mode and percent of N
Communicate strategic goals	95	70	3.66	0.87	4	3 - 4	3 (27)
Developing team objectives	85	63	3.51	0.88	4	3 - 4	4 (31)
Improves quality of decision making and problem solving	102	76	3.48	0.83	4	3 - 4	4 (37)
Resource allocation matched to strategic priorities	79	59	3.43	0.93	4	3 - 4	3 (25)
Strategic planning	75	56	3.43	0.89	4	3 - 4	4 (27)
Strategy formulation	94	70	3.43	0.91	3	3 - 4	3 (27)
Correct implementation of strategy	94	70	3.36	0.83	3	3 - 4	2 (27)
Basis for incentive and reward system	92	68	3.32	0.97	3	3 - 4	4 (27)
Developing personal objectives	87	64	3.31	0.94	3	3 - 4	3 (22)
Reporting measures to public	76	56	3.29	1.08	3	3 - 4	3 (21)
Other strategic purpose	4	3	3.25	0.96	3	2 - 4	4 (3)
Feed-back to enable corrective action	92	68	3.18	0.92	3	3 - 4	3 (26)
Replace formal reporting and control structure	65	48	2.66	1.00	3	2 - 3	3 (17)

Scale: 1 = Very dissatisfied, 2 = Somewhat dissatisfied, 3 = Satisfied,
4 = Quite satisfied, 5 = Very satisfied.

Surprisingly, and despite the PMMS having been used by a majority of organisations for a range of strategic purposes, the use of the PMMS to 'Replace formal reporting and control structure' was reported by less than 50 percent of the respondents. Fifty percent of those respondents who provided an estimate, were in the range of two to three, on a five-point scale, which indicates relatively low satisfaction with the PMMS used for formal organisational reporting and control.

4.1.5 Extent of PMMS use by various users

The data on the use of PMMS by end users in the sample organisations, classified in accordance with the functional background of these users, are provided in Table 4.1.5.1. Evidently, the PMMS were being used by almost all CEOs and 'Other senior managers', i.e., 96 and 93 percent respectively. This was followed by the 'Board members', who were users of PMMS in 76 percent of organisations. The median and mode extent of use of PMMS by the CEOs, as reported by the respondents, was four, or 'often'. Similarly, the 'Other senior managers' were reportedly significant users of the PMMS, as indicated by the median value of four, and the mode of three. Despite the PMMS being used by the 'Board members' in three quarters of the organisations, this group seemed to have been using the PMMS to a far lesser extent than the CEOs and "Other senior managers', with the median of three, and the mode of two, or 'Rarely'.

Table 4.1.5.1 Extent of PMMS use by functional background

	Respondents		Extent of use				
Functional background	n	%	Mean	St.dev.	Median	Interquartile range	Mode and percent of N
Accounting/finance personnel	124	92	4.25	0.76	4	4 - 5	5 (40)
Other managers and personnel	13	10	3.92	0.76	4	3 - 4	4 (4)
Other senior managers	125	93	3.83	0.83	4	3 - 4	3 (44)
CEO	129	96	3.60	1.02	4	3 - 4	4 (39)
Manufacturing/production personnel	76	56	3.59	1.05	4	3 - 4	4 (21)
Product/service manager	73	54	3.47	0.93	4	3 - 4	4 (23)
Sales/marketing personnel	85	63	3.35	1.03	3	3 - 4	4 (22)
Board members	103	76	2.95	1.18	3	2 - 4	2 (24)

Scale: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Very often.

The next highly represented group were the 'Accounting and finance personnel', who were the users of PMMS in 92 percent of organisations. The average extent of use of PMMS among 'Accounting and finance personnel' was very high. The median extent was four, or 'often', and the mode was five, or 'very often'. Such a high percentage of users, and the high extent of use is not surprising, given that practically all PMMS champions were from the financial accounting, finance, and management accounting areas of expertise, of which the respective frequencies are shown in Table 4.3.5.2.1.

The remaining groups, 'Manufacturing and production personnel', 'Product and service managers', and 'Sales and marketing personnel', were represented by markedly fewer users, of between 54 and 63 percent. However, despite the lower frequencies, the use of PMMS by these groups was described by the respondents as fairly extensive, with the relative majority using the PMMS 'often', which corresponds to the mode of four.

4.1.6 PMMS use in specific decision areas

As can be observed in Table 4.1.6.1, the data on the PMMS use in specific decision areas exhibit a high variation, both in the frequencies of organisations, and in the indicators of the satisfactions with the PMMS use in these areas. The highest reported percentage, 90 percent, of PMMS use is in 'Budgeting and planning', as is the average satisfaction with the PMMS, which had a mode value of four, or 'quite satisfied', a score given by 44 percent of all respondents. Similar numbers, of more than one hundred organisations,

were reported for the use of PMMS in 'Forecasting', 'Working capital management', and 'Capacity management and capital investment decisions'. The satisfaction with PMMS in these areas was assessed similarly favourably by the respondents, as evidenced by the mode value of four, which was the score given by 41 percent, 34 percent, and 35 percent of all respondents, respectively.

Table 4.1.6.1 Satisfaction with PMMS decision areas

	Respondents		Satisfaction				
Decision area	n	%	Mean	St.dev.	Median	Interquartile range	Mode and percent of N
Budgeting & planning	122	90	3.78	0.81	4	3 - 4	4 (44)
Forecasting	114	84	3.75	0.83	4	3 - 4	4 (41)
Other areas	5	4	3.60	1.34	3	3 - 5	3 (31)
Working capital management	102	76	3.58	0.92	4	3 - 4	4 (34)
Capacity management and capital investment decisions	104	77	3.55	0.90	4	3 - 4	4 (35)
Product development	65	48	3.29	0.84	3	3 - 4	3 (21)
Outsourcing	60	44	3.17	1.09	3	2 - 4	2 (12)
Restructuring/reorganisation	74	55	3.14	1.00	3	2 - 4	3 (20)

Scale: 1 = Very dissatisfied, 2 = Somewhat dissatisfied, 3 = Satisfied,
4 = Quite satisfied, 5 = Very satisfied.

In contrast, the remaining specific decision areas supported by PMMS, 'Product development', 'Outsourcing', and 'Restructuring and reorganisation', were reported by markedly fewer respondents, or around 50 percent of all respondents, and the satisfaction with the use of PMMS was, in average, marked lower. The median and mode values in all three areas were three, or 'Satisfied'.

4.1.7 Extent of dollar improvements

The final group of the reported PMMS benefits, the 'Extent of PMMS dollar improvements', shown in Table 4.1.7.1, has also been reported by relatively low numbers of respondents. The maximum frequency is 101, or three quarters of the sample, which was the proportion of the respondents reporting the dollar improvements in 'Process and operations management', with the average extent of improvements described as 'Very

significant', reported by 34 of all respondents. The mode extent of dollar improvements of four, attributed by 27 percent of all respondents, was also obtained in 'Sales and marketing'. The dollar improvements from the use of PMMS to improve 'Customer satisfaction' were reported by 97 respondents, with an average extent of three, or 'fairly significant'.

Table 4.1.7.1 Extent of PMMS dollar improvements

	Respondents		Extent				
Dollar improvement	n	%	Mean	St.dev.	Median	Interquartile range	Mode and percent of N
Process/operations management	101	75	3.66	0.85	4	3 - 4	4 (34)
Customer satisfaction	97	72	3.18	0.92	3	3 - 4	3 (31)
Distribution	54	40	2.98	1.11	3	2 - 4	3 (14)
Product/service design	61	45	2.93	0.96	3	2 - 4	3 (19)
Sales and marketing	86	64	2.93	0.82	3	2 - 4	4 (27)
Increased market share	72	53	2.69	1.06	3	2 - 4	3 (16)
Stock appreciation	77	57	2.65	0.98	3	2 - 3	3 (20)

Scale: 1 = Very little, 2 = Somewhat significant, 3 = Fairly significant,
4 = Very significant, 5 = Extremely significant.

'Fairly significant' dollar improvements, corresponding to the mode and median value of three, were reported in 'Distribution' by 14 percent of all respondents, 'Product and service design' by 19 percent, 'Increased market share' represented by 16 percent of respondents, and 'Stock appreciation' with 20 percent. Such low proportions are also reflected in the overall low proportions of the total number of respondents who had reported any dollar benefits in these areas, i.e., 40, 45, 53, and 57 percent.

4.2 Correlations between PMMS success factors, barriers and benefits

4.2.1 Overview of the section

The matrices of correlations among the major study composite variables are presented in the tables in the sections 4.2.3 and 4.2.4. As hypothesized, all four PMMS benefits variables correlated positively and significantly with the composite independent variable, PMMS success factors, and they also correlated inversely and significantly with the

composite variable PMMS barriers. The actual calculated level of significance of all correlations was 0.01. Given the comparatively small sample size of between 125 and 135, depending on the variables involved in the calculation, and the fact that the correlation effects were detected at a very low p of 0.01, the existence of correlations in the population can be indeed inferred with a great confidence.

4.2.2 Item-to-item correlations

Given the lack of theoretical support for many of the item-to-item correlations, this analysis was conducted for exploratory purposes, and readers are cautioned in interpreting the results. The correlations between each item or the dependent, PMMS benefits variables, and those of the success factors and barriers are presented in the tables in the sections 4.2.3 and 4.2.4, which provide correlation matrices for the twelve PMMS success factors, or enablers, and thirteen PMMS barriers. The 12 independent items in the success factors variable set, and the 13 independent items in the barriers set were correlated with the itemized PMMS benefits variables grouped into four distinct variable sets, by calculating the Kendall's tau b and Spearman's r_s coefficients. The tables summarise the data according to the two independent variables' items sets, and provide significant correlations with all four PMMS success measures at either 0.05 or 0.01 level. Correlation matrices show how the itemised success factors and barriers, belonging to the respective variables sets, correlate with the itemised benefits and other success items, constituting the four PMMS success variables sets. The coefficients provide an indication of the strength of each item-to-item correlation. The direction of the correlation, as anticipated by the research design and confirmed by the actual results, is positive in all correlations between the PMMS success factors and PMMS benefits, and it is negative between the PMMS barriers and the benefits.

The incidence of significant item-to-item significant correlations, as evidenced by the information in the matrices, varies greatly among the various sets of the dependent PMMS variables, when each set is correlated by itemized PMMS success factors. The

number of significant correlations of PMMS benefits is almost as equally varied for the itemized PMMS barriers.

The other striking finding is that overall incidence of significant correlations of PMMS benefits with the PMMS success factors is much larger than it is with the PMMS barriers. The reason for such disproportionate frequencies of significant correlation lies in the much smaller sample size of the PMMS barriers, as can be ascertained by comparing the frequencies in Tables 4.1.2.1 and 4.1.3.1, which precluded detection of a larger number of significant relationships, at either a level of 0.01, or the less stringent level of 0.05, at which it would have been easier to achieve statistical significance. At that, the respondents' scores to the barriers exhibited a lesser variation in comparison with the PMMS success factors' items, as demonstrated by the values of measures of dispersion in the same tables.

Nonetheless, despite the relatively low incidence of significant item-to-item correlations between certain sets of independent and dependent variables, the significant correlations were obtained in all sets of variables. These correlations provide the additional support for the hypothesised relationships between the composite PMMS success factors and PMMS benefits, and the composite PMMS barriers and benefits. The coefficients of determination, showing the portions of explained variance in the dependent PMMS success variables that can be attributed to the variance in success factors and barriers, are not included in the matrices, but can easily be calculated by squaring the values of the correlation coefficients.

The results of calculations of the correlations between the items belonging to the major composite variables are markedly less uniform and conclusive, when compared to the correlations between the composite variables. Overall, the numbers of significant correlations between the items support the findings described in the previous paragraph. However, the numbers of item-to-item correlations vary greatly. The number of significant correlations between the PMMS success factors and PMMS benefits is markedly larger than the number of significant correlations between the PMMS barriers

and PMMS benefits. For example, the number of the correlations between the 'Specific PMMS decision areas' and PMMS barriers is four, as exhibited in Table 4.2.4.3.3, and the number of the significant correlations between the items of 'Extent of dollar improvements' and barriers is as low as two, Table 4.2.4.4.3.

The most probable reason for the imbalance between the number of significant correlations between the PMMS benefits with the success factors, and those with the barriers, lies in the greater variability of the scores to the PMMS success factors, which can be ascertained by comparing Table 4.1.2.1 Importance of PMMS success factors, with Table 4.1.3.1 Importance of PMMS barriers, and by comparing Table 4.1.2.2, showing the differences in success factors with regard to the time PMMS had been in use, with Table 4.1.3.2, showing the differences in barriers. Secondly, the inability to detect a larger number of significant item-to-item correlations may be partly explained by the lower discriminative property of the item scale, which consisted of only five points, in contrast to a highly discriminative composite scales, comprising much larger numbers of scale points.

Finally, as can be seen by inspecting the frequency columns in the tables in the section 4.1, the sample sizes pertaining to the specific items are far smaller, with the majority between 40 and 60, in comparison with the sample, 125 to 135, for the composite variables, which has also diminished the number of significant item-to-item correlations.

The number of the item-to-item correlations which are significant at $p \leq 0.01$ is roughly equal to the number of correlations significant at $p \leq 0.05$. Evidently, if the correlations significant at less stringent levels, for instance $0.05 < p \leq 0.1$, were included, the item-to-item correlation matrices would have been more populated. However, as determined by the research design, a relatively conservative, or stricter, level of 0.05 was set as critical in correlation calculations in this study, and subsequently all correlations significant at higher levels were omitted.

In interpreting the size of the correlation coefficients, several rules pertaining to the methodology and the properties of the correlation coefficients were adhered to.

The first difficulty in interpreting the size of the coefficients was that in deciding what magnitude indicates a noteworthy association is arbitrary. Given that the scale for the correlation coefficient is not interval or ratio, but ordinal (Hinkle et al., 1994), the correlation coefficients cannot be compared by using the arithmetic relations. For example, a correlation coefficient of 0.9 is not twice as large as a coefficient of 0.45, although the value of 0.9 indicates a high relationship, and a coefficient of 0.45 indicates somewhat lower relationship. Therefore, to assist in interpreting the size of the coefficients, the criteria presented in Table 3.5.4.2 will be applied.

It can be observed that the rules of interpretation in the different sections of the table do not correspond perfectly. However, such discrepancy did not seriously affect the coherence in interpreting the size of the coefficients, as all coefficients fell within a limited range from 0.2 to 0.64, and, by applying the above rules, could be subsequently described as ranging from 'Small or weak' to 'Moderate', or 'Strong' at best.

The second important consideration in interpreting the size of the coefficients is that a correlation coefficient is also a measure, or index, of the proportion of individual differences in one variable that can be associated with individual differences in another variable (Hinkle et al., 1994). The square of the correlation coefficient (r^2), or the coefficient of determination, equals the proportion of the total variance in one variable that can be associated with the variance in another variable. Given that the coefficients of correlation used in this study, the Spearman's r^s, Pearson's product-moment coefficient of correlation r, and Kendall's tau b, are all symmetric measures, either variable can be considered independent or dependent, i.e., the variance of either of the composite variables, or items, can be explained by the variance in the other variable. However, in accordance with the research design, and consistent with the theoretical model proposed in the study, the coefficients of determination (r^2) had been used to explain the variance in the composite dependent variables, PMMS benefits, by the variance in the independent

variables, composite PMMS success factors and PMMS barriers. The coefficients of determination for the item-to-item correlations are not presented in the respective tables, but can be easily calculated by squaring the coefficients in the correlation matrices.

4.2.3 Correlations between PMMS success factors and PMMS benefits

PMMS use for strategic purposes

As can be observed in Table 4.2.3.1, the coefficients of correlation between the importance of the 'PMMS success factors' and the satisfaction with the 'PMMS use for strategic purposes', in the entire sample, i.e., for the entire range of the composite scores, are comparatively high, and are within a range which can be described as 'Moderate' or 'Strong', in accordance with the rules displayed in Table 3.5.4.2. The values of the Pearson's and Spearman's coefficients are nearly identical, at 0.59 and 0.57, respectively, while the correlation is somewhat lower, 0.42, when measured by the Kendall's tau b. These coefficients are indeed high, when compared to the coefficients obtained between the other composite independent and dependent variables, and are the highest in the entire set of analyses.

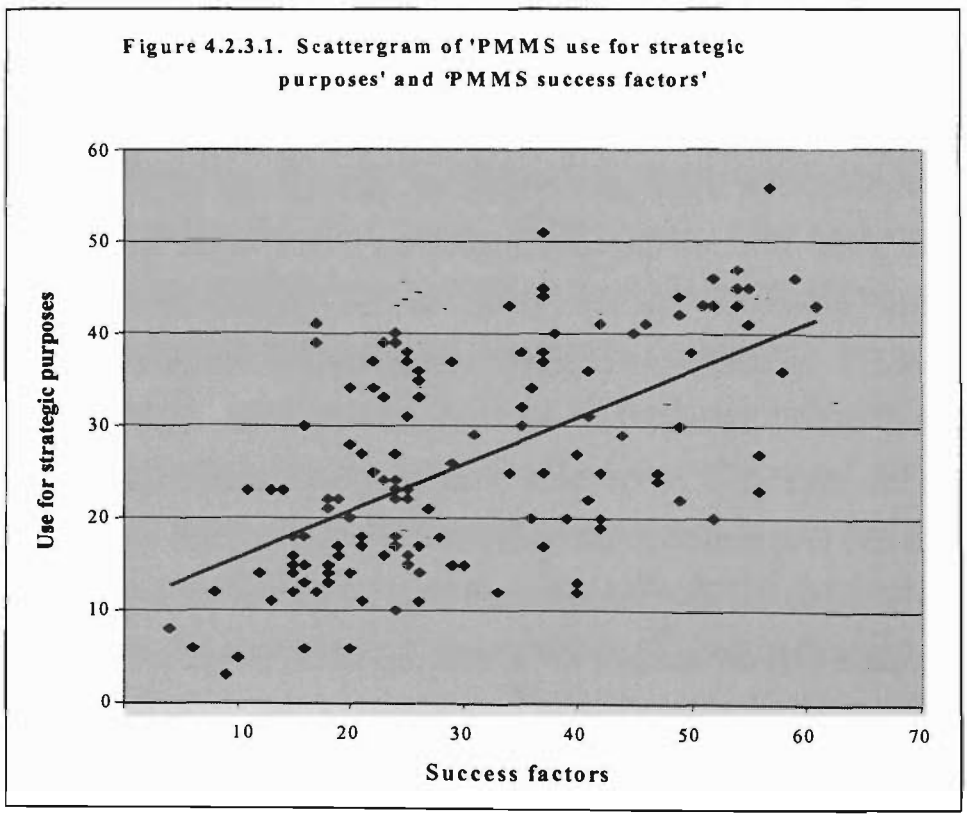
The correlation sizes suggest that, for a large part, high satisfaction scores with the use of PMMS for strategic purposes are associated with the high importance of the success factors identified for the study. The size of the correlation coefficients, which are less than one, indicate that the correlation is less than perfect, and indicates that there may be other factors, other than those involved in the calculations, which might have also contributed to individual differences in the scores to the dependent variable. Consequently, the variance in the composite scores of the satisfaction with the PMMS use for strategic purposes can be separated in two components. The extent of the variance associated with the differences, or variance, in the composite importance scores for the PMMS success factors is expressed in the coefficients of determination, shown in Table 4.2.3.1. It can be observed that the portion of the total variance in the dependent variable that can be associated with the variance in the PMMS success factors is 33 or 34 percent, when the coefficients of determination are based in the Pearson's and

Spearman's coefficients, and is markedly less, 17 percent, when obtained by squaring the Kendall's tau b.

Table 4.2.3.1. Correlation between 'PMMS success factors' and 'PMMS use for strategic purposes', p = 0.01

Coefficient type	Coefficient size	Coefficient of determination
Pearson's r	0.59	0.34
Kendall's tau b	0.42	0.17
Spearman's r_s	0.57	0.33

With respect to the correlation coefficients for the entire sample, i.e., for the entire range of the composite scores, which suggested 'Moderate' or 'Strong' positive linear relationship, an analysis of the scattergram that illustrates the relationship, in Figure 4.2.3.1, supports the above qualifications of the strength of association. It can also be observed that the relationship along the entire range of scores can be adequately approximated by a linear measure of correlation. The positive direction of the association, which was first postulated theoretically, was also confirmed.



The initial pattern of association between the 'PMMS success factors; and the 'PMMS use for strategic purposes' was investigated further by analyzing the scattergram in Figure 4.2.3.1, to ascertain how robust and conclusive the overall association is. The analysis involved the segmentation of the entire range of the composite satisfaction scores of the dependent variable, 'PMMS use for strategic purposes', into the three groups, each comprising approximately a third of the respondents. The groups' were described as the 'Low', 'Middle', and 'High', with regard to the ranges of the respective scores, as shown in Table 4.2.3.2. This was followed by the calculation of the correlations between the respective groups of the scores of satisfaction with the 'PMMS used for strategic purposes' with the corresponding scores of importance of the success factors, and the coefficients are presented in Table 4.2.3.2. The scatterplots of the sample sub-correlations are not presented here, and the analysis of the sub-correlations was made primarily by interpreting the respective sections as depicted in Figure 4.2.3.1. It is emphasized that the sub-correlations' trend or regression lines do not correspond to the respective one-third sections in Figure 4.2.3.1. Likewise, the size and direction of the coefficients are not necessarily similar or identical to that of the correlation coefficient of the entire range of score values. Instead, they are to be viewed and interpreted as the complementary measures to the principal coefficients, i.e., those describing the overall correlations.

By checking visually the distribution of scores around the trend line, in Figure 4.2.3.1, and by referring to the coefficient values in Table 4.2.3.2, it can be observed that the correlations at the 'Low' and 'High' ranges are relatively 'Moderate', consistent with the overall pattern of association in the entire sample. However, it appears that the scatter for the 'Middle' section indicates little, if any, correlation, as supported by the low coefficient in Table 4.2.3.2, which is at that negative.

Table 4.2.3.2 Ranges of composite variables 'PMMS use for strategic purposes', 'PMMS success factors', and correlations at low, middle and high section

Dependent variable	Items n	Org. n	Mean	Median	Actual range Low range/*r*	Actual range Middle range/*r*	Actual range High range/*r*	No. of *r*'s with hypothesised sign (+)
PMMS use for strategic purposes	12	135	26	23	3 - 18/0.35	19 - 31/-0.05	32 - 56/0.57	2
Success factors	13	133	30	26	4 - 22	23 - 37	38 - 61	

The groupings of the significant coefficients in Table 4.2.3.3 suggest that the majority of the PMMS success factors were correlated with the satisfaction scores given to the PMMS as the 'Basis for incentive and rewards system' and the PMMS being used for 'Reporting measures to public'. Fewer PMMS success factors were correlated with the PMMS use for the 'Feedback to enable corrective action'. The remaining uses of the PMMS for strategic purposes were associated with only a few PMMS success factors. At that, no PMMS success factors were significantly associated with the scores of the satisfaction with the PMMS in the 'Strategy formulation', 'Strategic planning', 'Communication of strategic goals', and the 'Improvement of the quality of decision making and problem solving'.

Table 4.2.3.3 Correlation coefficients of PMMS success factors importance and PMMS strategic purposes satisfaction

Kendall's tau b/Spearman's rho correlation coefficients significant at the 0.05 level are identified with *, and those significant at the 0.01 level are identified with **.

	Strategic purpose							
Success factors	Developing personal objectives	Developing team objectives	Resource allocation	Strategy implementation	Feed-back	Reporting and control	Rewards system	Reporting to public
Senior executives support							.27**/.32**	.21*/.24*
Organisational acceptance							.3**/.35**	
Delegated to staff					.37**/.44**		.4**/.48**	
Accountability for results					.29**/.32**	.27*/.32*	.3**/.35**	.38**/.43**
Immediate problems solving	.31/*.36**						.35**/.4**	.37**/.44**
Rapid results			.4**/.47**		.25*/.31*	.41**/.49**		.36**/.42**
Impact on bottom-line			.26*/.31*		.28*/.33*		.32**/.38**	.38**/.44**
Realistic target setting			.23*/.26*	.25*/.28*	.2*/.24*		.3**/.34**	
Reliance on existing resources	.25*/.29*						.4**/.45**	.4**/.48**
Easy identification of drivers	.25*/.3*				.32*/.36**		.31**/.36**	.36**/.36**
Good fit b/w objectives and measures	.28*/.32*			.24*/.27*			.3**/.35**	
Incremental implementation		.29*/.34*					.27*/.31*	
PMMS easy to manage					.22*/.24*		.27**/.31**	
No. of significant correlations	4	1	3	2	7	2	12	7
Maximum possible no. of significant correlations	156							
Total of significant correlations	38							
Percentage of significant correlations	24							

Range of r: 0.24 - 0.24

PMMS use by various users

The correlation between the aggregate importance of the 'PMMS success factors' and the extent of 'PMMS use by users of various functional and managerial background ' can be qualified as 'Moderate'. The Pearson's and Spearman's coefficients, presented in Table 4.2.3.4, are 0.48 and 0.49, and Kendall's tau b is 0.35. The magnitude of association, although not the highest presented in the study, appears to be consistent with the overall

comparatively high and narrow range of coefficients, exhibited by all four PMMS benefits correlations with the PMMS success factors.

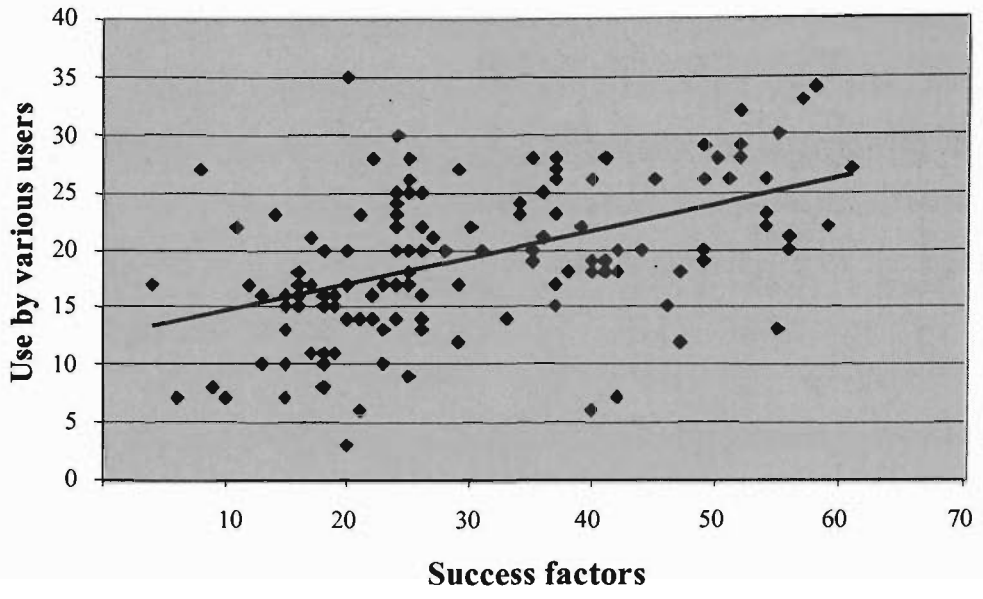
Table 4.2.3.4 Correlation between 'PMMS success factors' and 'PMMS use by users of various functional and managerial background', p = 0.01

Coefficient type	Coefficient size	Coefficient of determination
Pearson's r	0.48	0.23
Kendall's tau b	0.35	0.12
Spearman's r_s	0.49	0.24

As evident in the data on the coefficients of determination, the variation in the extent of the 'PMMS use by various users' cannot be entirely explained by the variation, or variance, in the PMMS success factors. The portion that can be explained by the variance in the PMMS success factors is about 24 percent, or roughly a quarter, when the coefficients of determination are calculated by squaring the Pearson's and Spearman's coefficients of correlation.

While the overall correlation, the coefficients of which are presented in Table 4.2.3.4, is faithfully and conclusively represented by the scattergram in Figure 4.2.3.2, the analysis of the three segments, or ranges – 'Low', 'Middle', and 'High', by means of the visual inspection of the respective segments, and the coefficients in Table 4.2.3.5, provides a more complex pattern of association. The 'Low' range of the extent of PMMS use is weakly associated with the success factors, and the direction of association is positive, as expected.

Figure 4.2.3.2 Scattergram of 'PMMS use by users of various functional and managerial background' with 'PMMS success factors'



However, it appears that the scatter for the 'Middle' section indicates little, if any, correlation, as supported by the low coefficient in Table 4.2.3.5, which is negative. Also negative is the correlation between the 'High' range of scores and the success factors. Both latter findings warrant caution in interpretation. Obviously, despite the statistical significance, the findings should not be interpreted simplistically, as showing that the extent of PMMS use among the various users increases with the decreased importance of the PMMS success factors. Rather, these findings should be viewed in conjunction with the findings in Table 4.3.3.2, which show that the extent significantly increases with the years of use. Therefore, the unexpected correlations in the 'Middle' and 'High' ranges may be explained by markedly higher importance of the PMMS success factors in organisations which had a short history of PMMS use, less than a year, in comparison with the organisations in which PMMS had been in use for longer than a year.

Table 4.2.3.5 Ranges of composite variables 'Extent of PMMS use by various users', 'PMMS success factors', and correlations at low, middle and high section

Dependent variable	Items n	Org. n	Mean	Median	Actual range: Low range/r	Actual range: Middle range/r	Actual range: High range/r	No. of r's with hypothesised sign (+)
Extent of PMMS use by users	7	134	19	20	3 - 16/0.15	17 - 22/-0.9	23 - 35/-0.46	1
Success factors	13	133	30	26	4 - 22	23 - 37	38 - 61	

With respect to the item-to-item correlations, presented in Table 4.2.3.6, a relatively large number of significant correlations was detected, with a total of 35, or 34 percent, which is the highest proportion in all correlation calculations. All coefficients are in the range from 0.2 to 0.53, which size can be interpreted as 'Low' to 'Moderate'. Interestingly, the extent of use of PMMS by 'Product and service managers' is correlated with the scores of importance of majority of the success factors, nine, followed by 'Other senior managers' with six success factor, and the 'CEO' user category with five factors. Likewise, the use of PMMS by 'Accounting and finance personnel', which was by far of the greatest extent of all categories of users, as shown in Table 4.1.5.1, was associated with five success factors. The use by 'Board members', which category had used the PMMS to the least extent, as seen in the same table, was associated with only two success factors, 'Support by senior executives', and 'Direct impact on bottom-line'.

Table 4.2.3.6 Correlation coefficients of PMMS success factors importance and extent of PMMS use

Kendall's tau b/Spearman's rho correlation coefficients significant at the 0.05 level are identified with *, and those significant at the 0.01 level are identified with **.

Success factors	User description: CEO	Other senior managers	Board members	Manufacturing/ production personnel	Accounting/ finance personnel	Product/ service managers	Sales/ marketing personnel
Senior executives support	.28**/.33**	.22**/.24**	.21*/.23*	.23*/.27*	.18*/.2*	.41**/46**	
Organisational acceptance				.31**/.35**	.22*/.24*	.31**/.36**	
Delegated to staff	.24*/.28*	.3**/.34**				.47**/.53**	.41**/.49**
Accountability for results	.29**/.32**	.33**/.37**		.29*/.34*		.41**/.47**	.27*/.31*
Immediate problems solving	.32**/.38**	.37**/.41**				.29*/.33*	
Rapid results		.38**/.43**			.21*/.24*		
Impact on bottom-line	.2*/.24*	.35**/.41**	.23*/.28*			.42**/.49**	0/.26*
Reliance on existing resources						.28*/.33*	
Easy identification of drivers					.27*/.29*	.26*/.3*	
Good fit b/w objectives and measures				.27**/.3*			.26**/.3*
Incremental implementation						.3**/.4**	
PMMS easy to manage					.2*/.22*		
No. of significant correlations	5	6	2	4	5	9	4

Maximum possible no. of significant correlations	104
Percentage of significant correlations	35

Range of r: 0.20 - 0.53

PMMS use in specific business decision areas

The coefficients of correlation between the PMMS success factors and the aggregate scores of satisfaction with the 'Use of PMMS is specific business decision areas' differ very little from the coefficients obtained for the other PMMS benefits and success factors. Pearson's and Spearman's coefficients are 0.51 and 0.5, i.e., 'Modest' or 'Moderate'. The coefficients of determination explain about a quarter of the total variance in the dependent variable by the variance in the success factors.

Table 4.2.3.7 Correlation between 'PMMS success factors' and 'PMMS use in specific business decision areas', p = 0.01

Coefficient type	Coefficient size	Coefficient of determination
Pearson's r	0.51	0.26
Kendall's tau b	0.36	0.13
Spearman's r_s	0.50	0.25

The visual inspection of the scatter in Figure 4.2.3.3 reveals that the association of the entire range of the scores can be indeed described as 'Moderate'. It can also be seen that the correlations of the 'Low' and the 'Middle' ranges of the scores of the dependent variable are positive, consistent with the overall pattern of association, showing that the low and middle composite scores of the satisfaction with the use of PMMS is designated decision areas increases with the increases of the scores of importance of PMMS success factors. However, the highest third of the scores of the dependent variable, with a negative coefficient shown in Table 4.2.3.8, appears not to conform to the overall pattern of association, similarly to the sequence of correlations of PMMS use by various categories of users and the success factors. It is likely that an analogous explanation can be provided for this deviation from the overall pattern, i.e., it appears that the correlation along the different ranges of scores is moderated by the third variable, the years of use of PMMS. Alternatively, such deviation may be explained by diminishing relevance of the

particular set of the success factors, as PMMS become established better, and used more extensively in organisations, in the course of several years.

Figure 4.2.3.3 Scattergram of 'PMMS use in specific business decision areas' and 'PMMS success factors'

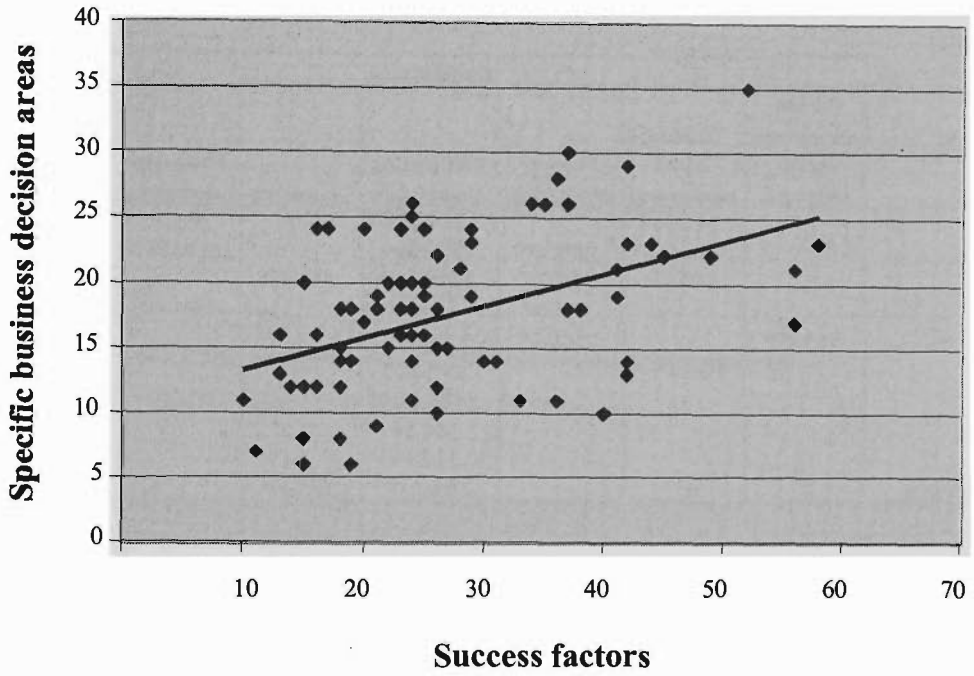


Table 4.2.3.8 Ranges of composite variables 'Decision areas supported by PMMS', 'PMMS success factors', and correlations at low, middle and high section

Dependent variable	Items n	Org. n	Mean	Median	Actual range: Low range/r	Actual range: Middle range/r	Actual range: High range/r	No. of r's with hypothesised sign (+)
Decision areas supported by PMMS	7	133	17	18	3 - 14/0.07	15 - 20/0.09	21 - 35/-0.18	2
Success factors	13	133	30	26	4 - 22	23 - 37	38 - 61	

The extent of use of PMMS in itemized specific business decision areas is significantly correlated with the itemized success factors in 26 cases, accounting for 29 percent of the maximum possible number of such correlations. A strikingly large number of success factors, nine, are associated with the satisfaction with use of PMMS in decisions concerning 'Restructuring and reorganisation'. All other itemized decision areas were associated with fewer success factors, their numbers varying from one to four. Relatively conspicuous is the number of significant correlations of decisions made in 'Product development', four, which may be viewed as consistent with the importance of PMMS

success factors to the use of PMMS by 'Product and service personnel', elaborated upon in the previous item-to-item analyses. Satisfaction with PMMS in decision making in 'Capacity management and capital investment' area was significantly associated with only one success factor, the ability of PMMS to 'Demonstrate results rapidly'.

Table 4.2.3.9 Correlation coefficients of PMMS success factors importance and specific PMMS decision areas satisfaction

Kendall's tau b/Spearman's rho correlation coefficients significant at the 0.05 level are identified with *, and those significant at the 0.01 level are identified with **.

	Decision area						
Success factors	Capacity management capital investment	Working capital management	Product development	Restructuring/ reorganisation	Outsourcing	Budgeting/ planning	Forecasting
Senior executives support		.19*/.21*		.22*/.24*		.2*/.22*	
Organisational acceptance			.26*/.29*	.22*/.26*		.26**/.29**	.26**/.29**
Delegated to staff		.26*/.31*	.32*/.36*	.33**/.38**	.36*/.42*		
Accountability for results			.31*/.34*			.24*/.27*	.25*/.28*
Rapid results	.23*/.27*		.28*/.32*	.25*/0			
Impact on bottom-line		0/.25*		.28*/.34*			
Realistic target setting				.31**/.36**		.3**/.33**	
Reliance on existing resources				.26*/.3*			
Easy identification of drivers				.3*/.35*			.21**/.23*
Good fit b/w objectives and measures				.28*/.32*	.32*/.37*		
No. of significant correlations	1	3	4	9	2	4	3
Maximum possible no. of significant correlations	91						
Total of significant correlations	26						

Range of r: 0.21 - 0.42

PMMS attributed dollar improvement

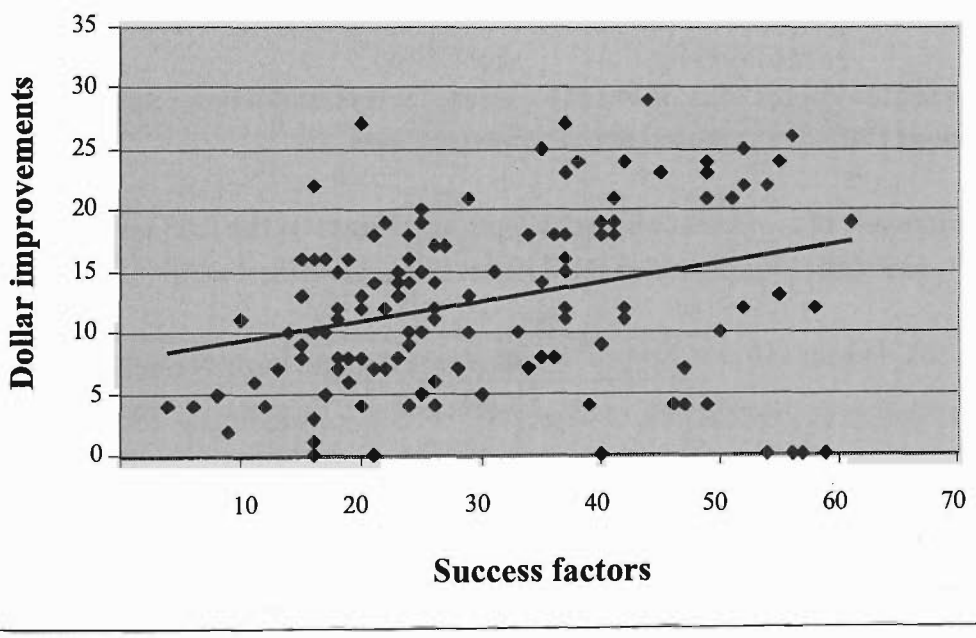
The coefficients of the overall association between the composite scores for PMMS success factors and the extent of 'PMMS attributed dollar improvements' are presented in Table 4.2.3.10, and the graphic depiction of the correlation is given in Figure 4.2.3.4. The size of the coefficients indicates a 'Low' or 'Moderate' strength of association. Consequently, the coefficients of determination are relatively small, and show that less than a quarter of the total variance in 'PMMS attributed dollar improvements' can be explained by the variance in the importance of the success factors.

Table 4.2.3.10 Correlation between 'PMMS success factors' and 'PMMS attributed dollar improvement', p = 0.01

Coefficient type	Coefficient size	Coefficient of determination
Pearson's r	0.48	0.23
Kendall's tau b	0.35	0.12
Spearman's r_s	0.46	0.21

The scatter of the values points about the trend line in Figure 4.2.3.4 indicates that the relationship is approximately linear, and that the identified relationship appears to be more consistent at the lower values of both variables.

Figure 4.2.3.4 Scattergram of 'PMMS dollar improvements' and 'PMMS success factors'



The above interpretation of the correlation at the 'Low' range of the dependent variable is supported by the value of the coefficient, 0.15, shown in Table 4.2.3.11. For the 'Middle' and 'High' range of the 'PMMS attribute dollar improvements', negative coefficients were calculated, which again may be interpreted to indicate very little or no relevance of

the success factors, either the entire set, or the large number of those factors, to the accomplishment of 'PMMS attributed dollar improvements' at higher levels.

Table 4.2.3.11 Ranges of composite variables 'Extent of dollar improvements', 'PMMS success factors', and correlations at low, middle and high section

Dependent variable	Items n	Org. n	Mean	Median	Actual range: Low range/r	Actual range: Middle range/r	Actual range: High range/r	No. of r's with hypothesised sign (+)
Extent of dollar improvements	7	126	13	12	1 - 10/0.15	11 - 16/=0.28	17 - 29/-0.21	1
Success factors	13	133	30	26	4 - 22	23 - 37	38 - 61	

Similar to the low or non-existent correlations at the three segments of the composite scale of the dependent variable, the data on item-to-item correlations, shown in Table 4.2.3.12 also suggest that, at a more detailed level, the incidence of correlations is very low, and the correlations are mostly 'Weak' of 'Low'. The percentage of significant item-to-item correlations is nine, and all coefficients are in the range from 0.21 to 0.36. Only four specific business areas, out of a total of seven, were found to be correlated with the PMMS success factors, and were correlated with only two success factors each.

Table 4.2.3.12 Correlation coefficients of PMMS success factors importance and extent of PMMS attributed dollar improvements

Kendall's tau b/Spearman's rho correlation coefficients significant at the 0.05 level are identified with *, and those significant at the 0.01 level are identified with **.

	Extent of dollar improvements			
Success factors	Distribution	Product/ service design	Process/ operations management	Increased market share
Senior executives support			.18*/.21*	
Organisational acceptance		.28*/.32*		.29*/.34**
Rapid results				.27*/.31*
Realistic target setting		.29*/.33*		
Reliance on existing resources	.3*/.36*			
Good fit b/w objectives and measures	.27*/.3*		.31*/.34*	
Maximum possible no. of significant correlations	91			
Total of significant correlations	8			

Range of *r*: 0.21 - 0.36

4.2.4 Correlations between PMMS barriers and PMMS benefits

PMMS use for strategic purposes

The data on the strength of correlation between the composite scores of the importance of PMMS barriers and the satisfaction with the 'PMMS use for strategic purposes', presented in Table 4.2.4.1, indicate 'Moderate' correlation, when interpreted according to the rules in Table 3.5.4.2. The strength of correlation is approximately the same to the correlation between PMMS success factors and 'PMMS use for strategic purposes', elaborated on earlier. The coefficient of determination show that about a quarter of the total variance in the scores of the dependent variable can be accounted for by the variance in the PMMS barriers.

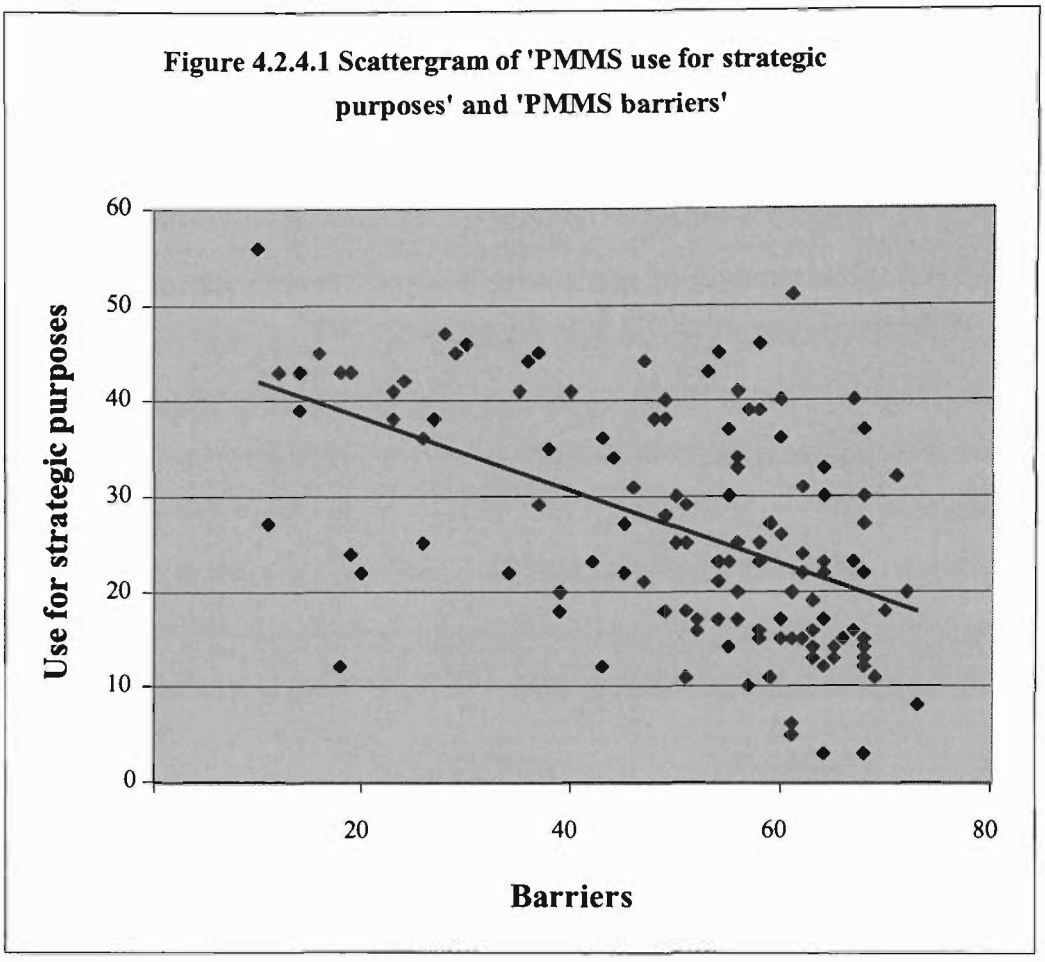
Table 4.2.4.1. Correlation between 'PMMS barriers' and 'PMMS use for strategic purposes', p = 0.01

Coefficient type	Coefficient size	Coefficient of determination
Pearson's r	-0.52	0.27
Kendall's tau b	-0.38	0.14
Spearman's r_s	-0.52	0.27

A visual inspection of the scattergram in Figure 4.2.4.1 allows for a more detailed analysis of the correlation pattern. Similarly to the scattergrams depicting the fit of the values of the scales of the PMMS success factors and the PMMS benefits, which were presented in the preceding section, a more prominent grouping of the value points can be observed around the low end of the trend line, suggesting an uneven, or heteroscedastic, pattern of data, and consequently the existence of non-uniform correlation along the various ranges of the dependent variable. As discussed in the subsequent analyses of the remaining four overall correlations between the PMMS barriers and the PMMS benefits, such a pattern can be observed in all scattergrams. In comparison with the scattergrams of the correlations between PMMS success factors and the benefits, the groupings are more striking, and representative of the particular segment of the range of scores of the

PMMS benefits which actually largely contributed to the magnitude of a particular correlation.

Figure 4.2.4.1 Scattergram of 'PMMS use for strategic purposes' and 'PMMS barriers'



The coefficients of correlation of the segmented range of values of the dependent variable are provided in Table 4.2.4.2. The negative sign of the coefficients of the 'Low' and 'High' range indicate an expected direction of association in these two sub-samples. The 'Middle' range' of the scores of 'PMMS use for strategic purposes' is positively associated with the scores for PMMS barriers. Such a pattern of association is difficult to explain, as it would imply the actual relevance of the PMMS barriers only for the 'Low' and 'High' ranges of the satisfaction with the 'PMMS use for strategic purposes', and not for the 'Middle' range.

Table 4.2.4.2 Ranges of composite variables 'PMMS use for strategic purposes', 'PMMS barriers', and correlations at low, middle and high section

Dependent variable	Items n	Org. n	Mean	Median	Actual range Low range/r	Middle range/r	High range/r	No. of r's with hypothesised sign (-)
PMMS use for strategic purposes	12	135	26	23	3 - 18/-0.41	19 - 31/0.13	32 - 56/-0.06	2
Barriers	15	125	25	20	3 - 15	16 - 27	28 - 73	

The item-to-item coefficients of correlation, displayed in Table 4.2.4.3, can be interpreted as describing 'Low' or 'Moderate' associations. Only thirteen, or seven percent, of all possible correlations were significant, with the PMMS use as a 'Basis for incentive and rewards system' being correlated with the four barriers. 'Reporting measures to public' and 'Replace formal and reporting and control structure' were each associated with the three barriers, while 'Developing team objectives' was correlated with the PMMS barrier of PMMS 'Not adopted by employees'.

Table 4.2.4.3 Correlation coefficients of PMMS barriers importance and PMMS strategic purposes satisfaction (all coefficients negative)

Kendall's tau b/Spearman's rho correlation coefficients significant at the 0.05 level are identified with *, and those significant at the 0.01 level are identified with **.

	Strategic purpose				
Barrier	Developing team objectives	Feed-back	Reporting and control	Rewards system	Reporting to public
PMMS not suportive of strategy		.29**/.33**	.23*/.29*		
PMMS too complex				.34**/.39**	
PMMS not understood by employees				.4**/.48**	.27*/.33*
PMMS not adopted by employees	.24*/.28*	.27*/.32*	0/.33*	.34**/.41**	.33**/.38**
Organisational culture			.35**/.42**	.28*/.33*	.35**/.42**
No. of significant correlations	1	2	3	4	3
Maximum possible no. of significant correlations	180				
Total of significant correlations	13				
Percentage of significant correlations	7				

Range of r: 0.28 - 0.48

PMMS use by various users

The size of the coefficients of correlation between PMMS barriers and extent of 'PMMS use by users of various functional and managerial background', shown in Table 4.2.4.4, is strikingly smaller than that of the coefficients of correlation between PMMS barriers and

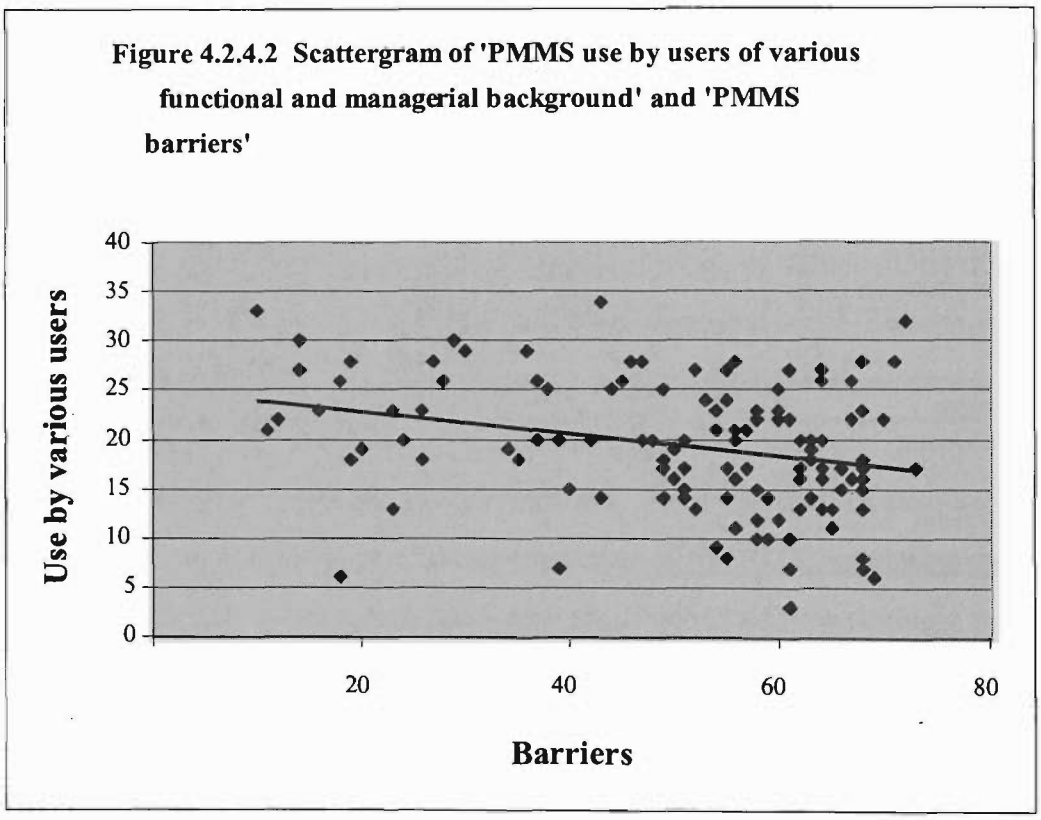
'PMMS use for strategic purposes', and can be unreservedly interpreted as 'Low'. The coefficients, together with the remaining coefficients of correlations between PMMS barriers and other PMMS benefits, exhibit a pattern of consistently low association, when compared with coefficients between the PMMS success factors and PMMS benefits.

Table 4.2.4.4 Correlation between 'PMMS barriers' and 'PMMS use by users of various functional and managerial background', p = 0.01

Coefficient type	Coefficient size	Coefficient of determination
Pearson's *r*	-0.26	0.07
Kendall's tau b	-0.18	0.03
Spearman's r_s	-0.26	0.07

The scatter in Figure 4.2.4.2 suggests a relatively broad dispersion of values, which by large is indicative of a weak association, as captured by the values of the coefficients of correlation.

Figure 4.2.4.2 Scattergram of 'PMMS use by users of various functional and managerial background' and 'PMMS barriers'



Interestingly, as can be seen in Table 4.2.4.5, the barriers are not associated negatively with the 'Low' perceived extent of use of PMMS by various users, but are associated with the 'Middle' and 'High' perceived extent of use in expected direction. However, the correlation of the 'Middle' range is practically nonexistent, -0.04, while in the 'High' range the coefficient is only -0.24, indicating very weak relation, i.e., the coefficient of determination of only about 0.05, or 5 percent of total variance of the PMMS use by various users.

Table 4.2.4.5 Ranges of composite variables 'Extent of PMMS use by various users', 'PMMS barriers', and correlations at low, middle and high section

Dependent variable	Items n	Org. n	Mean	Median	Actual range Low range/*r*	Middle range/*r*	High range/*r*	No. of *r*'s with hypothesised sign (-)
Extent of PMMS use by users	7	134	19	20	3 - 16/0.14	17 - 22/-0.04	23 - 35/-0.24	2
Barriers	15	125	25	20	3 - 15	16 - 27	28 - 73	

The number of significant item-to-item correlations is comparatively large, 35, which is about 29 percent of all possible correlation in the matrix. The extent of PMMS use by 'Product/service managers' is associated with the importance of ten PMMS barriers, 'Other managers' with the nine barriers, while the extent of use by user categories of 'CEO' and 'Board members' were each correlated with the six PMMS barriers.

Table 4.2.4.6 Correlation coefficients of rank orders of PMMS barriers importance and extent of PMMS use (all coefficients negativ

Kendall's tau b/Spearman's rho correlation coefficients significant at the 0.05 level are identified with *, and those significant at the 0. identified with **.

Barrier	User description: CEO	Other senior managers	Board members	Manufacturing/ production personnel	Accounting/ finance personnel	Product/ service managers	Sales/ marketing personnel
PMMS not suportive of strategy	.29**/.34**	.36**/42**					
PMMS too complex	.21*/.25*		.22*/.27*				
PMMS not understood by employees	.25*/.29*	.26*/.32*	.33**/.39**			.29*/.35*	
PMMS not adopted by employees	.22*/.27*	.4**/.47**	.41**/.49**			.26*/.32*	
Organisational culture		.29**/.35**				.27*/.33*	
Resistance due to vested interests		.28*/.33*					
Resistance due to anxiety		.26*/.31*			.26*/.29*	.35*/.42**	
PMMS prone to manipulation	.32**/.38**	.34**/.4**	.25*/.3*				.24*/.29*
Sensitive information revealed		.29**/.34*		0/.34*		.37**/.43**	.32*/.38*
Wrong configuration of resources		.24*/.28*				.25*/.3*	
Insufficient resources	.35**/.42**	.44**/.51**	.32**/.4**				
Hierarchical top-down method						.27*/.34*	
PMMS data not available						.25*/.31*	
PMMS data not acceessible			.28*/.34*			.26*/.32*	
No. of significant correlations	6	10	6	1	1	9	2

Maximum possible no. of significant correlations	120
Total of significant correlations	35
Percentage of significant correlations	29

Range of *r* : 0.21 - 0.41

PMMS use in specific business decision areas

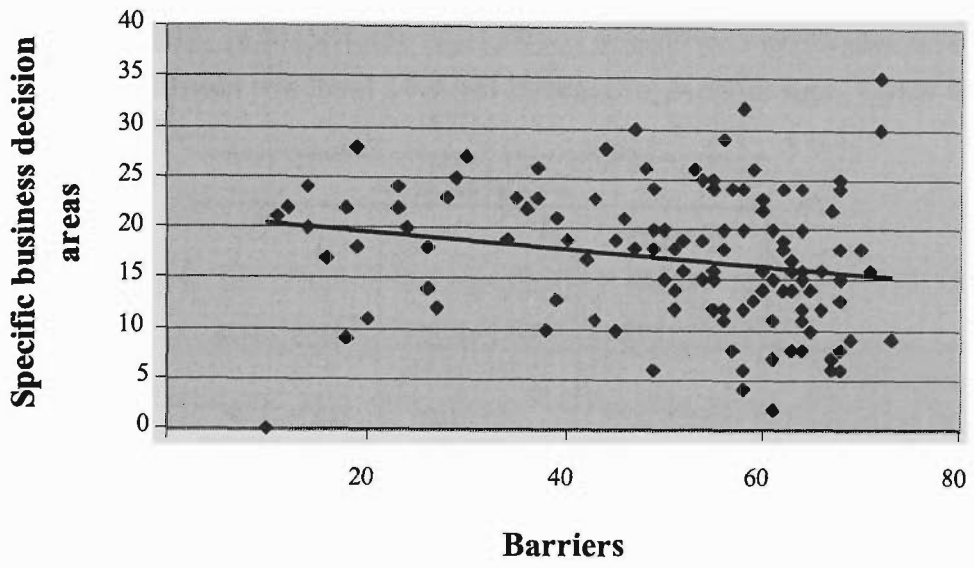
A very weak overall correlation, of r = -0.23, and r_s = -0.31, was also obtained between the composite scores of 'PMMS use in specific business uses' and PMMS barriers. The coefficients of determination indicate that only five to ten percent in the variance of PMMS use can be explained by the variance in PMMS barriers.

Table 4.2.4.7 Correlation between 'PMMS barriers' and 'PMMS use in specific business decision areas', p = 0.01

Coefficient type	Coefficient size	Coefficient of determination
Pearson's r	-0.23	0.05
Kendall's tau b	-0.22	0.05
Spearman's r_s	-0.31	0.10

The weak correlation is also depicted in Figure 4.3.4.3, in which the regression line is almost parallel to the x axis. The scatter of the values is also indicative of little association between the variables, as the data are obviously highly heteroscedastic, and are dispersed very broadly, and in a non-uniform pattern around the regression line.

Figure 4.3.4.3 Scattergram of 'PMMS use in specific decision areas' and 'PMMS barriers'



The correlations in the 'Low' and 'Middle' ranges of the scores of the dependent variable, shown in Table 4.2.4.8 are negative, as expected by the research design, but the size of the coefficients is practically negligible. The size of the coefficient in the 'High' range is also very small, 0.1, and is positive, which would imply that the extent of use in 'High' range group would increase with the importance of PMMS barriers, which is patently a nonsensical interpretation.

Table 4.2.4.8 Ranges of composite variables 'Decision areas supported by PMMS', 'PMMS barriers', and correlations at low, middle and high section

	Items	Org.			Actual range			No. of *r* 's with
Dependent variable	n	n	Mean	Median	Low range/*r*	Middle range/*r*	High range/*r*	hypothesised sign (-)
Decision areas supported by PMMS	7	133	17	18	3 - 14/-0.03	15 - 20/-0.08	21 - 35/0.1	2
Barriers	15	125	25	20	3 - 15	16 - 27	28 - 73	

Table 4.2.4.9 contains significant item-to-item relationships, of which only four were identified. Out of a total of seven distinct business decision areas, the two were correlated with one PMMS barrier, while the satisfaction with the use of PMMS in 'Product development decisions' was associated with the two PMMS barriers.

Table 4.2.4.9 Correlation coefficients of PMMS barriers importance and specific PMMS decision areas satisfaction (all coefficients negative)

Kendall's tau b/Spearman's rho correlation coefficients significant at the 0.05 level are identified with *, and those significant at the 0.01 level are identified with **.

	Decision area		
Barrier	Working capital management	Product development	Forecasting
PMMS prone to manipulation		.34*/.41**	
Sensitive information revealed	.35**/.4**	.38*/.44*	.28*/.33*
Maximum possible no. of significant correlations	105		
Total of significant correlations	4		

Range of r: 0.33 - 0.44

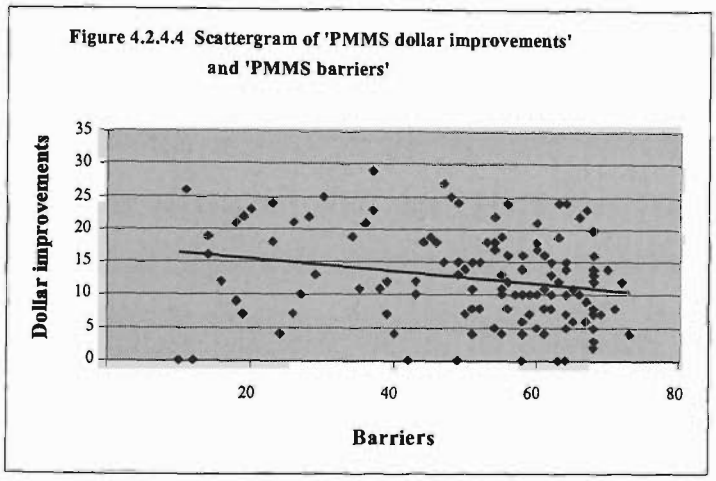
PMMS attributed dollar improvement

The correlation between the composite scores of PMMS barriers and the extent of 'PMMS attributed dollar improvement' is represented by the coefficients in Table 4.2.4.10, and the scattergram in Figure 4.2.4.4. With regard to the size, the correlation can be described as 'Weak' or 'Low', with the values for both the Pearson's and Spearman's coefficients being –0.32. The coefficient of determination is 0.1, showing that only 10 percent of the variance in the scores of 'PMMS attributed dollar improvements' can be accounted for by the variance in the scores of importance in PMMS barriers.

Table 4.2.4.10 Correlation between 'PMMS barriers' and 'PMMS attributed dollar improvement', p = 0.01

Coefficient type	Coefficient size	Coefficient of determination
Pearson's r	-0.32	0.10
Kendall's tau b	-0.23	0.05
Spearman's r_s	-0.32	0.10

Quite similarly to the 'PMMS use in specific business decision areas', the scattergram in Figure 4.2.4.4 displays a pattern characterized by a very low slope of the trend line, with the heteroscedastic and very wide spread of the data points around the line, all of which provides additional support to the assertion of a very weak association.



The correlations between all three ranges of the scores of 'PMMS attributed dollar improvements', shown in Table 4.2.4.11 have the hypothesized negative sign, with the size of the coefficients being –0.01, -0.13, and -0.04, i.e., trivial or low at best.

Table 4.2.4.11 Ranges of composite variables 'Extent of dollar improvements', 'PMMS barriers', and correlations at low, middle and high section

Dependent variable	Items n	Org. n	Mean	Median	Actual range Low range/r	Actual range Middle range/r	Actual range High range/r	No. of r's with hypothesised sign (-)
Extent of dollar improvements	7	126	13	12	1 - 10/-0.01	11 - 16/-0.13	17 - 29/-0.04	3
Barriers	15	125	25	20	3 - 15	16 - 27	28 - 73	

The matrix of significant item-to-item correlations, displayed in Table 4.2.4.12, also shows that the correlations between the extent of 'PMMS attribute dollar improvements'

and PMMS barriers, identified in this study, were practically nonexistent. Only two items, measuring the extent of improvements in 'Process/operations management' and 'Stock appreciation' were significantly correlated with the single PMMS barrier, 'Fear of sensitive information being revealed'.

Table 4.2.4.12 Correlation coefficients of PMMS barriers importance and PMMS attributed extent of dollar improvements (all coefficients negative)

Kendall's tau b/Spearman's rho correlation coefficients significant at the 0.05 level are identified with *.

	Extent of dollar improvements	
Barrier	Process/ operations management	Stock appreciation
Sensitive information revealed	.32*/.36*	.3*/.36*

4.2.5 Summary of findings

The results of the correlational analyses elaborated on in the preceding sections are presented summarised in Tables 4.2.5.1, 4.2.5.2 and 4.2.5.3, in order to outline the findings in a more presentable format, and to illustrate the most salient points. As can be observed in Table 4.2.5.1, the sizes of correlations between the composite PMMS success factors and the benefits, or outcomes, of PMMS are contained within a relatively narrow range of between 0.46 and 0.57, and can be qualified as 'Moderate', in accordance with the rules displayed in Table 3.5.4.2. On the whole, the correlations between the PMMS barriers and the dependent variables are 'Weak', or 'Low', except for the PMMS use for strategic purposes, with this variable being moderately associated with the PMMS barriers.

Table 4.2.5.1 Overview of correlations (r_s) between composite variables

	Composite independent variables	
Composite dependent variables	**PMMS success factors**	**PMMS barriers**
PMMS use for strategic purposes	0.57	-0.52
PMMS use by users of various functional and managerial background	0.49	-0.26
PMMS use in specific business decision areas	0.50	-0.26
PMMS attributed dollar improvement	0.46	-0.32

Table 4.2.5.2 shows the structure of correlations between the PMMS determinants, measured by composite independent variables, and the PMMS benefits, decomposed into the 'Low', 'Middle' and 'High' reported ranges of the benefits. As can be observed, with regard to the number of the expected associations, the PMMS barriers were more uniformly associated with the PMMS benefits, resulting in a total of nine, or three quarters, of all possible correlations. The correlations between the PMMS success factors and PMMS benefits displayed somewhat less consistency, given that only six, or half, of the ranges of PMMS benefits were associated with the success factors.

Table 4.2.5.2 Overview of correlations at 'Low', 'Middle', and 'High' ranges of dependent variables

	Independent variables	
	PMMS success factors	PMMS barriers
Dependent variables	No. of *r* 's with hypothesised sign (+)	No. of *r* 's with hypothesised sign (-)
PMMS use for strategic purposes	2	2
PMMS use by users of various functional and managerial background	1	2
PMMS use in specific business decision areas	2	2
PMMS attributed dollar improvement	1	3
Total	6	9
Maximum possible no. of significant correlations	12	12

The summary of significant correlations between the itemized independent and dependent variables, presented in Table 4.2.5.3, shows that PMMS barrier items were associated with the PMMS benefits items to a very small extent, as only ten percent of all possible correlations were significant. The number of associations with PMMS success factors was markedly larger, and accounted for approximately a quarter of all possible correlations.

Table 4.2.5.3 Overview of item-to-item correlations

	Itemised independent variables	
	PMMS success factors	PMMS barriers
Itemised dependent variables	No. and percentage of correlations	No. and percentage of correlations
PMMS use for strategic purposes	38 / 24 %	13 / 7 %
PMMS use by users of various functional and managerial background	35 / 34 %	35 / 29 %
PMMS use in specific business decision areas	26 / 28 %	4 / 4 %
PMMS attributed dollar improvement	8 / 9 %	2 / 2 %
Total	107 / 24 %	54 / 10 %
Maximum possible no. of significant correlations	442	510

4.3 PMMS benefits complementarities

In the first part of each section elaborating on the impact of an individual PMMS complementarity on the accomplishment of PMMS benefits, a summary descriptive information on the PMMS complementarity is provided. The purpose of presenting the descriptive data and measures is to allow for an initial insight into the data, and to assist in formation of an overall picture of the response patterns, by enabling the comparisons among the groups, or categories, comprising the respective complementarity variables.

Absolute and relative frequencies for the demographic and PMMS variables, displayed in the tables, were computed using SPSS procedures. The measures of centre, the mean, median, and mode were incorporated in the frequency tables of the PMMS perspectives and measures. The distributions of the number of performance perspectives, or areas, are graphically presented by the stacked bars.

In the second part of each section on the PMMS complementarities, the results of the Mann-Whitney, Kruskal-Wallis, and Jonckheere-Terpstra tests are presented in tabular format, together with the frequency data, and the mean ranks of the groups. The measure of association, η^2, is also presented, for each significant correlation between the independent variable, PMMS complementarity, and the extent of PMMS benefits in all four dimensions.

4.3.1 Organisation complementarities

Within each section on the organisation complementarities, descriptive information is provided on a number of characteristics of surveyed organisations. Information on distribution of organisations with regard to the industry and size is provided first. The organisations were classified in Table 4.3.1.1 with regard to the main industry. In the few instances where conduct of business in multiple industries had been reported by the organisations, they were classified according to the reported largest portion of annual revenue derived in a particular industry. This basic summary presentation of distribution

of organisations by main industry is followed by the two expanded analyses of their involvement in other industries, presented in Tables 4.3.1.1 and 4.3.1.2. Data on distribution of the size of organisations in terms of number of employees and market capitalization are also presented in Tables 4.3.1.4 and 4.3.1.6.

Industry

The composition of surveyed organisations with respect to the main industry in which they operated was shown in Table 3.2.1. Table 4.3.1.1. shows the industry composition of surveyed organisations in a more analytical, disaggregated format. It can be observed that a majority, or approximately 85 percent, of organisations operated in only one industry. The extent of diversification is indeed very limited, as evidenced by the number of organisations operating in more than one industry, shown in the respective columns. The greatest business diversification was exhibited by the finance and insurance organisations, of which five operated in one additional industry, one operated in two other industries, and one organisation operated in three other industries.

Table 4.3.1.1 Organisation distribution by number of industries engaged in

	Industries engaged in			
Main Industry	**Only main industry**	**1 other industry**	**2 other industries**	**3 other industries**
	n	**n**	**n**	**n**
Manufacturing	38	5		
Finance and insurance	16	5	1	1
Mining	17			
Construction	11	2		
Property and bus. services	9	1		
Other	23	6		
Total	114	19	1	1
% of all (135) organisations	84.4	14.1	0.7	0.7

The degree of diversification of the finance and insurance organisations greatly exceeds industry diversification of any other sector in the sample. First, no other organisations

had reported doing business in more than one other industry. For illustration, there were only five manufacturing organisations, out of 43, operating in one other industry. Similarly, only six of 29 organisations from 'Other' miscellaneous industries were engaged in one additional industry. All mining organisations were operating in a single industry. Construction, and property and business services organisations were only marginally involved in other industries, with two and one organisation respectively.

The above findings indicate that the majority of surveyed organisations were operating in one industry, with only 14 percent engaging in diversified businesses.

Table 4.3.1.2 shows the actual industry of 29 organisations in 'Other' industries, not belonging to main industries reported in the previous section. As can be observed, there were five organisations each from health services, personal and other services, and wholesale trade industries. Four retail trade and three electricity, gas and water organisations had also taken part in the survey. The transport and storage industry was represented by two organisations. Only one organisation from communication services, gaming, motion picture, radio and television services, and accommodation, cafes and restaurants each had reported that they had some type of PMMS in use.

Table 4.3.1.2 'Other' organisations distribution by number of industries engaged in

	Industries engaged in	
	Only main industry	1 other industry
'Other' 29 organisations	n	n
Health services	5	
Personal and other services	5	
Personal and household goods - wholesale	3	2
Personal and household goods - retail	2	1
Other retail trade		1
Electricity, gas and water	3	
Transport and storage	2	1
Communication services	1	
Accomodation, cafes and restaurants	1	
Gaming	1	
Motion picture, radio and television services		1
Total	23	6
Total main and other industry	29	

With respect to the accomplishment of PMMS benefits, the results of the Kruskal-Wallis tests displayed in Table 4.3.1.3, indicate significant differences in the scores of the extent of 'Functional and managerial PMMS use' and the extent of 'PMMS attributable dollar

improvements'. The lowest average extent of 'Functional and managerial PMMS use' has been calculated for the 'Finance and insurance' organisations, and the respective score is different to the scores in 'Manufacturing', 'Mining', and the organisations in 'Other' industries. Similarly, a low average score has been obtained for the thirteen respondents in 'Construction', but is significantly different only to 'Manufacturing'. The lowest scores of the perceived extent of 'PMMS attributable dollar improvements' had been reported in 'Mining' and 'Construction', and were significantly different to the high-score industries 'Manufacturing', 'Finance and insurance', and 'Other'. The differences among the various industry groups were ascertained at the level of significance p = 0.001, which indicates very high probability of the existence of the differences in the population.

Table 4.3.1.3 PMMS success dimensions ranking by industry with Kruskal-Wallis Test, pairwise comparisons, and coefficients of determination

	PMMS success dimensions									
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements		
Industry	n	Average Rank	n	Average Rank	Different to	n	Average Rank	n	Average Rank	Different to
A Manufacturing	43	68	43	82	B,D	43	69	42	71	C,D
B Finance and insurance	23	63	23	41	C,F	23	70	22	68	C,D
C Mining	17	59	17	74		17	56	17	36	F
D Construction	13	53	13	47		13	53	12	40	F
E Property and business services	10	87	10	63		10	68	9	58	F
F Other	29	77	28	75		27	74	24	80	
Total	135		134			133		126		
Kruskal-Wallis Test Statistics - Significance		0.213		0.001			0.493		0.001	
η^2				0.16					0.17	

The strength of association, with the values of the η^2 of 0.16 and 0.17, indicates that 16 and 17 percent of all variance in the scores of the extent of 'Functional and managerial PMMS use' and the extent of 'PMMS attributable dollar improvements' in the sample is accounted, or explained, by the industry to which the organisations belonged. Given that η^2 is analogous to the coefficient of determination, the strength of the association can be interpreted, with reference to the rules in Table 3.5.4.2, as 'Low' or 'Moderate'. The total number of significant correlations between the PMMS complementarity 'Industry' and the PMMS benefits is two, out of the maximum of four possible significant correlations. This proportion, coupled with the relatively moderate magnitude of the two significant correlations and the inability to detect a coherent pattern of changes in the

PMMS benefits among the various 'Industry' groups, can be considered to be only weakly supportive of the notion of the relevance of the 'Industry' as an explanatory factor in accomplishing PMMS benefits.

Number of employees

The absolute and relative frequency data on the distribution of the organisations with regard to the number of employees are presented in Table 4.3.1.4. As can be observed, the responses represent a full range of company sizes, and the distribution is characterised by a great proportion of large companies, which renders the results of the analyses more indicative of the PMMS practices in larger organisations.

The above assertion is supported by the value of the median range of the number of employees, which is '100 – 500'. Even more importantly, the preponderance of large organisations in the sample is also reflected in the fact that the mode range, 'More than 500', accounts for nearly 49 percent, or approximately a half of all organisations. Comparatively smaller organisations were represented by 20 organisations with up to 100 employees, of which nine organisations had fewer than 50 employees. Given the small frequency, and the categories of the number of employees, these organisations indeed accounted for only a minute proportion of the entire sample.

Table 4.3.1.4 Organisation distribution by number of employees

Number of employees	n	%
Less than 50	9	6.7
51 - 100	11	8.1
101 - 500	49	36.3
More than 500	66	48.9
Total	135	100.0

The results of the Jonckheere-Terpstra test, shown in Table 4.3.1.5, indicate that 'Number of employees' is a complementarity which may help explain the differences in the accomplished PMMS benefits. The observed differences in all four PMMS benefit categories can be said to exist in the population, given that the probability of the sampling error is in all cases less than the critical, $p = 0.05$. The amount of the variance in the

scores of the four PMMS benefits, expressed in the values of η^2, that can be accounted for by the complementarity 'Number of employees', ranges from eight to thirteen percent, and is indicative of 'Low' correlation, as per Table 3.5.4.2. The results of the pairwise comparisons indicate the overall pattern and direction of significant differences, which exist between the small group of nine organisations with 'Less than 50' employees and virtually all other, larger, organisations. There were no significant differences in PMMS benefits among the groups of organisations with more than 50 employees. Considered in conjunction, and given the low frequency of the category 'Less than 50' employees, these findings clearly provide modest support to the assertion of the relevance of the complementarity 'Number of employees'.

Table 4.3.1.5 PMMS success dimensions ranking by number of employees with Jonkheere-Terpstra test, pairwise comparisons, and coefficients of determination

	PMMS success dimensions											
	Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements		
Number of employees	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to
A Less than 50	9	29	B,C,D	9	34	C,D	9	22	B,C,D	9	21	B,C,D
B 51 - 100	11	63		11	38		11	67		11	66	
C 101 - 500	49	70		48	66		48	68		45	66	
D More than 500	66	72		66	78		65	72		61	68	
Total	135			134			133			126		
Jonckheere-Terpstra Test Statistics - Significance		0.039			0.000			0.019			0.045	
η^2		0.08			0.13			0.10			0.10	

Market capitalization

As can be observed in Table 4.3.1.6, there were 26 smaller organisations with the market capitalisation of less than $ 100 million. The majority of organisations were quite sizeable. More than three quarters, or 80.7 percent, had indicated that their market capitalisation was more than $100 million. Of those, 59 organisations had reported market capitalisation larger than $500 million. The fifteen largest organisations had a market capitalisation of more than $2 billion. The typical respondent was relatively

large: the median and mode market capitalization was '100 million – 499 million', and the second category with the highest frequency was '500 million – 2 billion'.

Table 4.3.1.6 Organisation distribution by market capitalisation

Market capitalisation	n	%
Less than 100 million	26	19.3
100 million - 499 million	50	37.0
500 million - 2 billion	44	32.6
More than 2 billion	15	11.1
Total	135	100.0

The results of the Jonckheere-Terpstra test, presented in Table 4.3.1.7, show no significant association between the market capitalisation of the sample organisations and extent of or satisfaction with the PMMS benefits in any PMMS benefit dimension. Conseqently, it may be concluded that 'Market capitalisation' does not represent a PMMS complementarity.

Table 4.3.1.7 PMMS success dimensions ranking by market capitalisation with Jonkheere-Terpstra test

	PMMS success dimensions							
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
Market capitalisation	n	Average Rank	n	Average Rank	n	Average Rank	n	Average Rank
Less than 100 million	26	74	26	57	26	72	24	68
100 million - 499 million	50	61	49	67	49	60	47	64
500 million - 2 billion	44	66	44	72	43	67	43	56
More than 2 billion	15	87	15	76	15	80	12	79
Total	135		134		133		126	
Jonckheere-Terpstra Test Statistics - Significance		0.491		0.101		0.523		0.682

4.3.2 PMMS design complementarities

Following the analyses of the PMMS success complementarities of industry and size, a set of analyses of characteristics of PMMS used in surveyed organisations is provided. In accordance with the exploratory objectives of the study, descriptive information on PMMS allows for an empirically substantiated analysis of the fundamental PMMS characteristics, assumed to have been the complementarities to the PMMS benefits. The groups or sub-samples were formed for the following PMMS characteristics:

1) The description of the PMMS, and the varieties of systems in use;
2) The completeness and comprehensiveness of the PMMS, evident in the application of other performance perspectives and measures, in addition to financial measures;
3) The degree of involvement of PMMS consultants in establishment and maintenance of the PMMS; and
4) The extent of development of the causal links among the various performance areas and measures in the PMMS.

PMMS type

Table 4.3.2.1 shows the distribution of PMMS types in the sample organisations. As can be seen, 46 respondents claimed that their organisations had adopted the Balanced Scorecard type of PMMS, followed by 32 organisations with 'Performance Scorecard'. The form of PMMS in use had been described as 'Performance Dashboard' by 10 respondents, while 47 organisations had used some other type of multiple perspective PMMS. In all, approximately two thirds of organisations had used a system described as either Scorecard or Dashboard. Based on these descriptions alone, it would be difficult to reach any conclusion on the degree of similarity of these two systems.

Table 4.3.2.1 Distribution of PMMS by type

PMMS type	n	%
Balanced Scorecard	46	34.1
Performance Scorecard	32	23.7
Performance Dashboard	10	7.4
Other	47	32.6
Total	135	100.0

As indicated in the previous section on the type of PMMS reported by the respondents, 46 organisations had used systems different to the Scorecard and Dashboard types. Table 4.3.2.2 contains descriptions of these systems. As can be observed, organisations had described their systems at varying levels of precision, and in accordance with the different bases of classification. Concerning the amount of information, or precision, some organisations had provided only general descriptions such as 'internal measures', 'variety of measures' and 'individual goals and objectives'. More comprehensive descriptions had been provided by other organizations. The descriptions provided by two organisations pertain to the type of software they were using as a platform for their PMMS, namely Lotus notes shareware and Hyperion.

Table 4.3.2.2 Other PMMS systems

Description
Economic Value Added + Internal Project Performance Review
Backlog margin, assets under management, contract profile, income streams, Safety and environment
Internal measures
Revenue & cost reporting, personal KPI assessment
Mystery shopper, guest survey, industry benchmarking variance reporting
Sales and margins (customer and financial perspective)
Management accounts including financial & non-financial KPI's
Various measures
Cost control & Reporting by department
Individual goals and objectives
Lotus notes activity database and function monitoring
Hyperion
Various measures
Quarterly contracted operator reports
Variety of measures
Benchmarking
Social & environmental reporting
Earned value (Process & financial)
Management by objectives

The categories in Table 4.3.2.1 and the descriptions in Table 4.3.2.2 indicate two large groupings of PMMS systems. Firstly, there is a relatively homogenous group of 88 organisations with the 'Scorecard' or 'Dashboard' type of PMMS, as illustrated by the frequency data in Table 4.3.2.1. The other group of approximately one third of organisations use a very wide variety of other PMMS systems and collections of performance measures, with almost as many differences as the number of cases in the group.

To ascertain the differences in PMMS benefits a Kruskal-Wallis test and a pairwise comparison were conducted. From Table 4.3.2.3, reproduced below, it can be observed that the only statistically significant difference of perceived PMMS benefits is that between the 'Balanced Scorecard' type of PMMS and 'Other' PMMS, in the benefits dimension 'Extent of dollar improvements'. The comparison of the respective mean rank values provides an initial indication of a possible significant difference, which was tested and confirmed by a Kruskal-Wallis test. Given that no other significant differences were identified by Kruskal-Wallis tests, this finding cannot be viewed to sufficiently support the notion of the PMMS type being conducive to the success or accomplishment of PMMS benefits in the population.

Table 4.3.2.3 PMMS success dimensions ranking by PMMS type with Kruskal Wallis H Test, pairwise comparison, and coefficient of determination

	PMMS success dimensions								
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements		
PMMS type	n	Average Rank	n	Average Rank	n	Average Rank	n	Average Rank	Different to
A Balanced Scorecard	46	75	45	70	45	72	44	73	D
B Performance Scorecard	32	64	32	61	32	61	31	63	
C Performance Dashboard	10	54	10	63	10	58	10	62	
D Other	44	62	44	67	43	64	39	50	
Total	132		131		130		124		
Kruskal-Wallis Test Statistics - Significance		0.224		0.768		0.497		0.028	
η^2								0.07	

The above finding indicates that no one particular type of the performance measurement system has any intrinsic advantage, and the classification, or labeling, of the system practically bears no relevance to the success of the system. As can be observed in the above table, 'Balanced Scorecard', 'Performance Scorecard', and 'Other' multiple perspectives measurement systems were used by a comparable, roughly equal numbers of organisations, respectively 46, 32 and 44, which illustrates the absence of a particular preference for any specific type of the PMMS. Based on the analysis of survey data on other PMMS features, presented in the following sections of the study, it appears that there is a high degree of convergence in the design of all PMMS, irrespective of type. There is a great similarity in the labeling itself, resulting in terms 'Balanced',

'Scorecard', 'Performance' and 'Dashboard' applied to describe PMMS in 68.4 percent of organisations.

Number of performance areas

As can be observed in Table 4.4.2.4, a majority of organisations, representing 55 percent of the sample, had two or three performance perspectives in their PMMS. Of these, 37 organisations had PMMS comprised of only two performance perspectives, while 38 organisations had a better developed PMMS with the measures grouped into three distinct perspectives. A group comprising the largest number of organisations, 56, or 41 percent of all organisations, had four perspectives in their PMMS, which corresponds with the suggestions of the Balanced Scorecard originators (Kaplan and Norton, 1992, 1993). Additional perspectives to the basic PMMS model with four perspectives had been made to the PMMS in only four organisations.

The median number of PMMS areas or perspectives was three, and the mode was four. This finding lends support to the assertion of a comparatively developed and balanced PMMS in use in the sample organisations. More than a quarter, or 27 percent, of the organisations reported only two performance areas in the PMMS, while the largest group of 56 organisations, accounting for approximately 42 percent of the sample, had used a developed PMMS with four performance areas.

Table 4.3.2.4 Distribution of PMMS by number of perspectives

Number of perspectives	n	%
2	37	27.4
3	38	28.1
4	56	41.5
5	4	1.5
Total	135	100.0
Mean	3.12	
Median	3	
Mode	4	

Given the overall importance of the number of multiple performance areas as an object of primary research interest in this study, a *t* test was conducted to confirm that the number of the PMMS perspectives in population is probably three. The results of a one-sample *t* test for differences in means, displayed in Table 4.3.2.5 additionally corroborate the mean value of three performance areas. The obtained mean value has been tested against the hypothesised means of two and four perspectives, and the obtained significance levels indicate that the mean number of PMMS areas is not statistically different to three.

Table 4.3.2.5 *t* test for equality of mean number of PMMS perspectives

PMMS perspectives mean	*t* test mean	Difference significant at $p \leq 0.01$
3.12	2	Yes
	3	No
	4	Yes

Additional analyses of the descriptive data on distribution of the performance perspectives were also conducted, to obtain a more complete picture of the comprehensiveness and balance of PMMS in sample organisations. The average number of PMMS perspectives was calculated on the basis of three organisation grouping variables, the industry, number of employees and market capitalisation, and two PMMS use grouping variables, the PMMS type and the time PMMS had been in use. The findings are presented in the tables, and the distributions of the number of perspectives are depicted by the respective stacked bar charts.

The distribution of the perspectives in various industries is presented in Table 4.3.2.6, and is also shown in Figure 4.3.2.1. The median number of perspectives in all industries is three, as is the median for all other PMMS complementarities, discussed in the subsequent section. The mean values are in the range from 2.9 to 3.4, or around three. However, neither the median or the mean appear to representantive and conclusive of the shape of the distribution. As can be noticed in the data on the mode values in Table 4.3.2.6, and as represented by Figure 4.3.2.1, the distributions of the number of

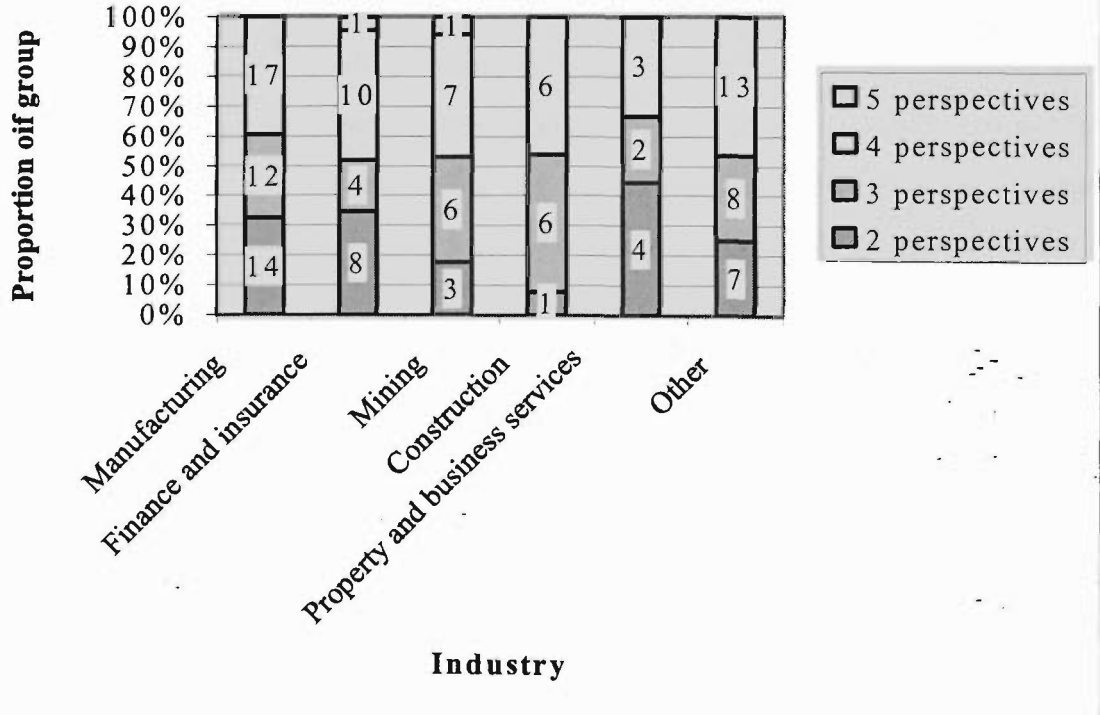
performance areas in all industries are skewed. The mode number of the areas in five industries is four, 'Construction' had a bimodal distribution of three and four performance areas, and 'Property and business services' had a mode of two performance areas, i.e, lower than the respective mean and median values.

Table 4.3.2.6 Distribution of PMMS perspectives by industry

		No. of perspectives					
				2	3	4	5
Industry	**n**	**Mean**	**Median**	**n**	**n**	**n**	**n**
Manufacturing	43	3.1	3	14	12	17	
Finance and insurance	23	3.2	3	8	4	10	1
Mining	17	3.4	3	3	6	7	1
Construction	13	3.4	3	1	6	6	
Property and business services	9	2.9	3	4	2	3	
Other	28	3.2	3	7	8	13	
Total	133						

Mode frequencies shaded

Figure 4.3.2.1 Distribution of no. of PMMS perspectives by industry



With regard to the number of employees, similar distribution patterns as in the case of 'Industry' can be observed. The median was three for all categories, and all mean values were above three, i.e., either 3.2 or 3.4. The distributions are uniformly characterized by the mode value of four performance perspectives, which can be observed in Table 4.3.2.7, and which is illustrated by the height of the respective stacks in Figure 4.3.2.2. A fifth performance perspective has been incorporated in the PMMS by two organisations which had 'More than 500' employees', i.e., which were in the largest category, while the number of employees in the remaining two organisations with five performance perspectives was not reported.

Table 4.3.2.7 Distribution of PMMS perspectives by number of employees

		No. of perspectives					
				2	3	4	5
No. of employees	n	Mean	Median	n	n	n	n
Less than 50	9	3.4	3	4	1	5	
51 - 100	11	3.2	3	3	3	5	
101 - 500	48	3.2	3	13	13	22	
More than 500	65	3.2	3	17	17	29	2
Total	133						

Mode frequencies shaded

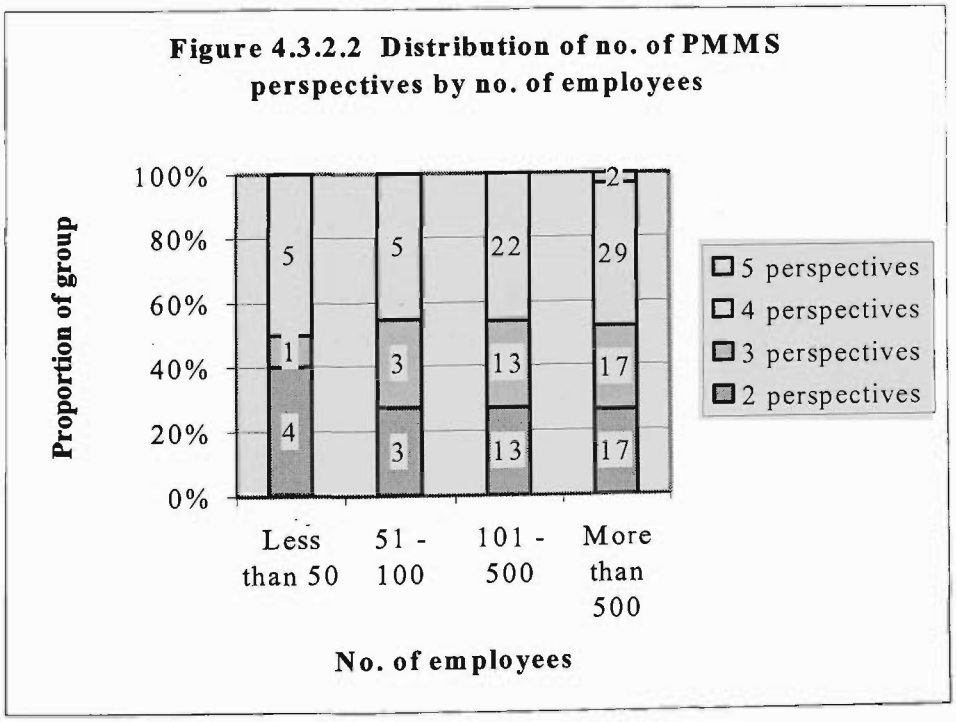
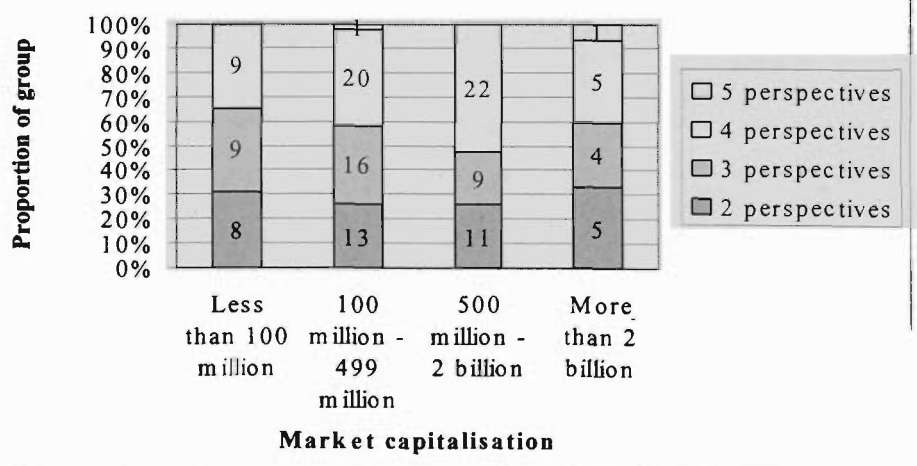


Table 4.3.2.8 shows the data on the distribution of performance perspectives with regard to the market capitalization, and the same information is displayed in Figure 4.3.2.3. As can be observed, with the exception of the two categories comprising the organisations with the smallest and the largest capitalization, which both had an inconclusive bimodal distribution, the sample had a mode of four performance perspectives. The two middle groups had highly skewed distributions, as had the other two groups, albeit to a lesser extent. As was the case with the 'Industry' and 'Number of employees', the median in all groups was three, and the mean values were also in the region of three performance perspectives.

Table 4.3.2.8 Distribution of PMMS perspectives by market capitalisation

				No. of perspectives			
				2	3	4	5
Market capitalisation	**n**	**Mean**	**Median**	**n**	**n**	**n**	**n**
Less than 100 million	26	3.0	3	8	9	9	
100 million - 499 million	50	3.2	3	13	16	20	1
500 million - 2 billion	42	3.3	3	11	9	22	
More than 2 billion	15	3.1	3	5	4	5	1
Total	133			Mode frequencies shaded			

Figure 4.3.2.3 Distribution of no. of PMMS perspectives by market capitalisation

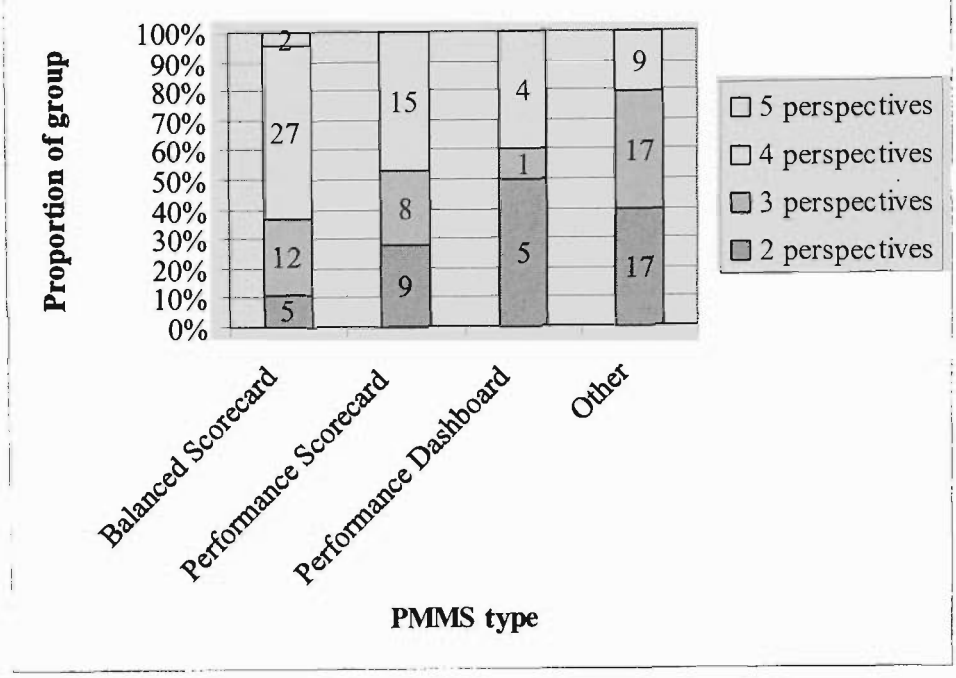


In comparison with all other PMMS complementarities, of which the discussion is presented in this section, the distributions of the number of performance areas exhibit more variability. The data in Table 4.3.2.9 and Figure 4.3.2.4 suggest that, with respect to the number of performance areas, there were two distinct groups. The first group would consist of 'Balanced Scorecard' and 'Performance Scorecard' PMMS, which had a mode of four perspectives, in contrast to 'Performance Dashboard', with a mode of two, and 'Other' types of PMMS, with a bimodal distribution of two and three perspectives. Such distributions had also determined the values of the mean and median, which are both markedly larger in the first group. Fifty-nine percent of organisations using the 'Balanced Scorecard' reported four performance perspectives, and two organisations in the same group had five perspectives in the PMMS.

Table 4.3.2.9 Distribution of perspectives by PMMS type

				No. of perspectives			
				2	3	4	5
PMMS type	**n**	**Mean**	**Median**	**n**	**n**	**n**	**n**
Balanced Scorecard	46	3.6	4	5	12	27	2
Performance Scorecard	32	3.2	3	9	8	15	
Performance Dashboard	10	2.9	2.5	5	1	4	
Other	43	2.8	3	17	17	9	
Total	131			Mode frequencies shaded			

Figure 4.3.2.4 Distribution of no. of PMMS perspectives by PMMS type

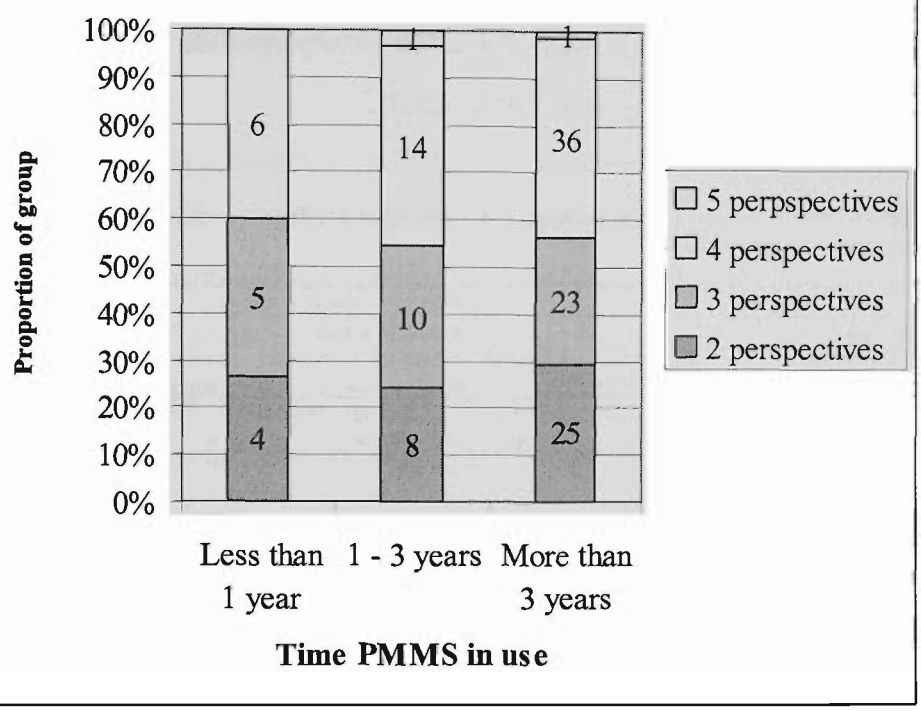


The data on the distributions of perspectives, presented in Table 4.3.2.10 and Figure 4.3.2.5, suggest skewed distributions with respect to the number of years PMMS had been in use, with the means of around three and the medians of three, while the mode was again four perspectives in all groups. However, the distributions appear to be less skewed then the distributions of the groups belonging to the other PMMS complementarities, as demonstrated by the narrower range of frequencies in all three groups.

Table 4.3.2.10 Distribution of perspectives by time PMMS in use

		No. of perspectives					
				2	3	4	5
Years of PMMS in use	**n**	**Mean**	**Median**	**n**	**n**	**n**	**n**
Less than 1 year	15	3.1	3	4	5	6	
1 - 3 years	33	3.2	3	8	10	14	1
More than 3 years	85	3.2	3	25	23	36	1
Total	133			Mode frequencies shaded			

Figure 4.3.2.5 Distribution of no. of PMMS perspectives by time PMMS in use



The complementarity 'Time PMMS in use' accounts for the differences in the scores of all PMMS benefits dimensions, except for the 'Functional/managerial extent of PMMS use'. The results of the Jonckheere-Terpstra tests are significant at the level p=0.04, or stricter. The direction of the association between 'Extent of dollar improvements' with the number of PMMS perspectives is not entirely conclusive, but is clearly positive between 'Satisfaction with PMMS use for strategic purposes' and 'Satisfaction with PMMS use in specific decision areas' with the number of PMMS perspectives, i.e., the scores of the latter two PMMS benefits variables increase with the increase of the number of PMMS perspectives. Interestingly, the results may be viewed as indicative of the significantly greater PMMS benefits being obtained through the use of the PMMS consisting of four performance perspectives, of which the largest proportion were 'Balanced Scorecard' and 'Performance Scorecard', as itemised in Table 4.3.2.9. However, the results of the Kruskal-Wallis tests in Table 4.3.2.3 provide limited evidence about the importance of 'PMMS type' in explaining the differences in PMMS benefits,

and only coincide with the results pertaining to the 'Extent of dollar evidence' in Table 4.3.2.11.

The η^2 coefficients range from 0.05 to 0.07, which can be interpreted as indicative of 'Low' correlation, in accordance with the rules in Table 3.5.4.2.

Table 4.3.2.11 PMMS success dimensions ranking by number of performance areas with Jonkheere-Terpstra test, pairwise comparisons, and coefficients of determination

		PMMS success dimensions									
		Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements		
Number of performance areas		n	Average Rank	Different to	n	Average Rank	n	Average Rank	Different to	n	Average Rank	Different to
A	2	30	56	C	30	58	30	56	C	25	57	
B	3	38	56	C	37	63	37	52	C	36	49	C
C	4	56	73		56	66	56	73		56	69	
D	5	2	69		2	50	2	73		2	54	
Total		126			125		125			119		
Jonckheere-Terpstra Test Statistics - Significance			0.02			0.46		0.01			0.04	
η^2			0.05					0.07			0.07	

Number of performance measures

Table 4.3.2.12 shows the frequencies of the PMMS perspectives, together with the mode ranges of measures in each perspective. As can be observed, 135 organisations reported using financial PMMS measures, customer measures were used by 109 organisations, and 100 organisations reported the use of procees measures. These frequency figures indicate either the universal use, as is the case with the financial measures, or strong emphasis on process and customer performance measures in surveyed organisations. A very pronounced tendency towards the use of financial measures has been demonstrated, with the financial measures having been reported by all organisations, and their mode ranging from 10 to 14 measures, both of which is markedly higher than any other performance perspective.

Three quarters or more of organisations have indicated the use of customer and process measures. The mode of process measures is from 5 to 9, while the mode of customer measures is somewhat low, from 1 to 4. The frequency data of learning and innovation

measures indicate that this perspective had not yet been adopted as widely as the financial, customer and process measures. The measures of learning and innovation had been used in 57 organisations, or 42.2 percent of the sample organisations, while other measures have been devised in only 16 organisations, which is only 12 percent.

Large differences between the mode ranges of the numbers of measures can be observed in Table 4.3.2.12. Already at this descriptive level, it is obvious that the distribution of measures between various performance perspectives is highly disproportional, with the mode range of financial perspective being the highest, from 10 to14 measures, followed by the mode range from 5 to 9 measures in process perspective. Finally, the mode number of measures in 'Customer', 'Learning & innovation' and 'Other' measures perspectives is from 1 to 4.

Table 4.3.2.12 Distribution of PMMS perspectives with mode ranges

Perspective	Organisations n	% of total sample (135)	Mode range of measures	% of n with mode range
Financial	135	100	10 - 14	49.6
Customer	109	81	1 - 4	47.7
Process	100	74	5 - 9	46.0
Learning & Innovation	57	42	1 - 4	64.9
Other measures	16	12	1 - 4	50.0

The frequency distributions data on the number of measures in each perspective are displayed in Table 4.3.2.13 and in Figure 4.3.2.6. As already pointed in the previous paragraphs, markedly unequal distributions of the ranges of measures in each perspective can be noted.

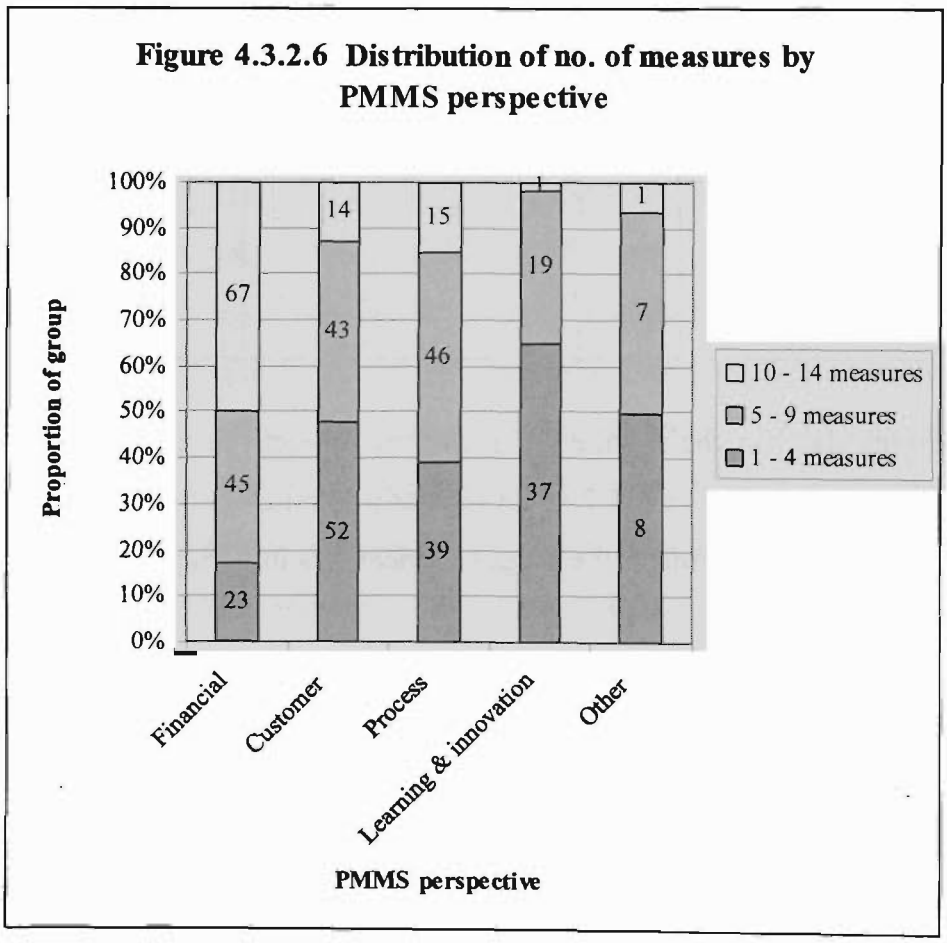
The disparities in the population were formally tested by the chi-squared test for equality of proportions, and the results indicated the significant differences among all perspectives, at $p = 0.05$, except for the 'Customer' and 'Process' perspectives. The similarity of the sample distributions of the ranges of measures in these two perspectives can also be observed in Figure 4.3.2.6.

Table 4.3.2.13 Distribution of no. of measures by PMMS perspectives

	Perspective														
	Financial			Customer			Process			Learning & innovation			Other		
Number of measures	n	% Total	% Total used	n	% Total	% Total used	n	% Total	% Total used	n	% Total	% Total used	n	% Total	% Total used
1-4	23	16.3	16.3	52	38.5	47.7	39	28.9	39.0	37	27.4	64.9	8	5.9	50.0
5-9	45	31.9	31.9	43	31.9	39.4	46	34.1	46.0	19	14.1	33.3	7	5.2	43.8
10-14	67	48.1	48.1	14	10.4	12.8	15	11.1	15.0	1	0.7	1.8	1	0.7	6.3
Total used	135	100.0		109	80.7		100	74.1		57	42.2		16	11.9	
Not used				26	19.3		35	25.9		78	57.8		119	88.1	
Total	135	100.0	96.3	135	100.0	100.0	135	100.0	100.0	135	100.0	100.0	135	100.0	100.0

Mode absolute frequencies shaded

Figure 4.3.2.6 Distribution of no. of measures by PMMS perspective



The results of the Jonckheere-Terpstra test, presented in Table 4.3.2.14, suggest the significant differences in the composite scores of satisfaction with 'PMMS use for strategic purposes' and 'PMMS use in specific decision areas', associated with the number of financial measures being used in the PMMS. The direction of association is positive, i.e., the aggregated satisfaction scores increase with the higher ranges of financial measures used in PMMS. However, the significant pairwise differences had only been obtained in comparison of the groups with up to nine financial measures with the group of '10 – 14' measures. This finding points to the relatively weak strength of association, which was reflected in the values of the eta-squared coefficient, 0.05 and 0.08.

Table 4.3.2.14 PMMS success dimensions ranking by number of financial measures with Jonkheere-Terpstra test, pairwise comparisons, and coefficients of determination

	PMMS success dimensions									
	Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements	
Number of measures - financial	n	Average Rank	Different to	n	Average Rank	n	Average Rank	Different to	n	Average Rank
A 1 - 4	22	50	C	22	61	22	50	C	20	51
B 5 - 9	43	62		43	65	43	57	C	42	60
C 10 - 14	65	73		64	66	64	75		61	67
Total	130			129		129			123	
Jonckheere-Terpstra Test Statistics - Significance		0.01			0.63		0.00			0.10
η^2		0.05					0.08			

Similar to the financial measures, the differences in extent of accomplished PMMS benefits are significantly correlated with the ranges of 'Customer' measures in only one PMMS benefits dimensions, 'PMMS use in specific business decision areas', as shown in Table 4.3.2.15. Again, the association is positive and comparatively weak, with the value of η^2 being 0.07. Pairwise comparisons reveal that the differences in the scores of satisfaction with 'PMMS use in specific business decision areas' existed between both of the groups of up to ten customer measures and the group with '10 – 14' measures.

Table 4.3.2.15 PMMS success dimensions ranking by number of customer measures with Jonkheere-Terpstra test, pairwise comparisons, and coefficients of determination

	PMMS success dimensions								
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements	
Number of measures - customer	n	Average Rank	n	Average Rank	n	Average Rank	Different to	n	Average Rank
A 1 - 4	52	52	51	57	51	48	C	48	51
B 5 - 9	43	57	43	52	43	55	C	42	50
C 10 - 14	14	62	14	52	14	74		13	64
Total	109		108		108			103	
Jonckheere-Terpstra Test Statistics - Significance		0.25		0.37		0.01			0.43
η^2						0.07			

The actual levels of significance, obtained in the Jonckheere-Terpstra test of differences in PMMS benefits, subject to the varying numbers of 'Process' measures, are shown in Table 4.3.2.16. The results show there were no significant differences at the critical level of $p \leq 0.05$, nor would any significant differences be detected at a less stringent level, such as $0.05 < p \leq 0.1$. The difference in the ranks of respective scores of the sample groups cannot be said to exist in the population, and can therefore be attributed to random sampling.

Table 4.3.2.16 PMMS success dimensions ranking by number of process measures with Jonkheere-Terpstra test

	PMMS success dimensions							
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
Number of measures - process	n	Average Rank	n	Average Rank	n	Average Rank	n	Average Rank
A 1 - 4	39	49	39	50	39	48	39	48
B 5 - 9	46	52	46	48	46	50	45	48
C 10 - 14	15	49	14	58	14	57	14	58
Total	100		99		99		98	
Jonckheere-Terpstra Test Statistics - Significance		0.84		0.64		0.35		0.36

No significant difference in the scores of PMMS benefits among the groups with the various ranges of the measures in the 'Learning and innovation' perspective, were detected, as shown in Table 4.3.2.17. Somewhat higher average ranking of the first three PMMS benefits can be observed by a single organisation with the '10 – 14' Learning and innovation measures. However, as this was a single incidence, the overall results attest

practical irrelevance of having the larger number of measures of 'Learning and innovation', with respect to the impact on the extent of PMMS benefits.

Table 4.3.2.17 PMMS success dimensions ranking by number of learning and innovation measures with Jonckheere-Terpstra test

	PMMS success dimensions							
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
Number of measures - learning and innovation	n	Average Rank	n	Average Rank	n	Average Rank	n	Average Rank
A 1 - 4	37	26	37	29	37	28	37	25
B 5 - 9	19	34	19	29	19	30	18	36
C 10 - 14	1	52	1	41	1	52	1	31
Total	57		57		57		56	
Jonckheere-Terpstra Test Statistics - Significance		0.06		0.85		0.44		0.18

Lastly, the complementarity analysis of the 'Other' measures also demonstrates that the extent of accomplishment of PMMS benefits is not associated with the number of 'Other' measures, as can be observed in Table 4.3.2.18.

Table 4.3.2.18 PMMS success dimensions ranking by number of other measures with Jonkheere-Terpstra test

	PMMS success dimensions							
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
Number of measures - other	n	Average Rank	n	Average Rank	n	Average Rank	n	Average Rank
A 1 - 4	8	9	8	8	8	8	7	6
B 5 - 9	7	7	7	9	7	9	6	8
C 10 - 14	1	14	1	13	1	10	1	13
Total	16		16		16		14	
Jonckheere-Terpstra Test Statistics - Significance		0.88		0.54		0.50		0.21

Other measures had been used by only 16 organisations, to a very little average extent, with a mode of 1 to 4 measures. Descriptions of these measures are provided in Table 4.3.2.19. It can be noticed that a majority of these measures are industry specific variants of common measures. Thus, the project measures in construction and property services appear to represent a type of process measure applicable to that particular industry. Similarly, measures of 'People' or labour are usually found within the 'Learning and innovation' perspective. Health and safety were most prominently represented in mining and manufacturing organisations, perhaps due to the specific work conditions in these

industries. A negligible number of organisations had indicated the use of social and environmental measures.

Table 4.3.2.19 Use of other performance measures

Other performance area description	Industry
Partners, People, Health, Safety, Environment (Sustainable	Mining
Legal compliance, project	Property services
Project/Property	Construction & property
Market share/Growth	Communication services
Labour	Personal and household goods - retail trade
OHS, organisation	Manufacturing
OHS, Social & Environmental	Food, beverages &

Software source

Table 4.3.2.20 shows the data on distribution of PMMS in responding organisations with respect to the source of PMMS software. Approximately a third of the sample organisations had reported the use of PMMS software developed entirely within organisations, without the involvement of external consultants. The total reliance on externally developed software was indicated by 15 organisations, which had purchased pre-packaged, non-customised PMMS software. At this level of analysis, it is difficult to comment on the utility of non-customised software in relation to the specific and differentiated strategy pursued by a particular company.

Table 4.3.2.20 Distribution of PMMS by source of software

Source description	n	%
In-house	46	34.1
Pre-packaged	15	11.1
Consultants - little	16	11.9
Consultants - moderate	19	14.1
Consultants - significant	36	26.7
Total specified	132	97.8
Not specified	3	2.2
Total	135	100.0

Between these two extremes, the remaining organisations, constituting more than a half of the sample, indicated that they had used the services of external PMMS specialists to a varying extent. Approximately a quarter of organisations had reported a great, or significant involvement of PMMS consultants, while little or moderate extent of consultant involvement in PMMS development had been indicated by another quarter of organisations. Overall, the data presented indicate that a majority of organisations had engaged services of consultants in development of PMMS.

As can be observed in Table 4.3.2.21, there were no significant differences between the reported PMMS benefits in any of the four distinct dimensions, with regard to the source of PMMS software.

Table 4.3.2.21 PMMS success dimensions ranking by PMMS software source with Kruskal-Wallis test

	PMMS success dimensions							
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
PMMS software source	n	Average Rank	n	Average Rank	n	Average Rank	n	Average Rank
In-house	46	62	46	67	46	64	42	55
Pre-packaged	15	58	15	72	15	62	14	55
Consultants - little	16	65	16	67	15	60	15	62
Consultants - moderate	19	80	19	71	19	65	19	71
Consultants - significant	36	70	36	62	36	73	34	71
Total	132		132		131		124	
Kruskal-Wallis Test Statistics - Significance		0.394		0.893		0.763		0.241

Pre-packaged PMMS software had been used by 11.1 percent of organisations, whose success was not significantly different to organisations using the other sources of PMMS software. This finding clearly demonstrates that certain organisations can equally successfully use a generic ready-made, or non-customised PMMS software, which may reflect their generic business strategy.

Causal links among PMMS perspectives and measures

The distribution of the PMMS with respect to the type of causal links among the perspectives and measures is shown in Table 4.3.2.22. As can be observed, 34 organisations, a quarter of the sample, did not have a causal links component in their PMMS. Another 23 respondents had reported the causal link as being 'Used', and eleven respondents had chosen the category 'Explicit' to describe the causal link. Further 64 respondents, representing 47 percent of the sample, have qualified their PMMS causal link as either 'Qualitative' or 'Quantitative'.

Table 4.3.2.22 Respondent distribution by type of causal link

Causal link	n	%
Not used	34	25
Used	23	17
Explicit	11	8
Qualitative	26	19
Quantitative	38	28
Total	132	98

From the data in Table 4.3.2.23 it can be observed that the extent of PMMS benefits in all four dimensions is dependent on the type of causal link among the various perspectives measures, considered to capture the drivers of future performance and the outcomes. The most striking difference is between the organisations in which the causal link is not used in their PMMS and all other organisations where causal link is used, irrespective of the qualification or description, i.e., either 'Used', 'Explicit', 'Qualitative', or 'Quantitative'. The significant differences are already observable at raw data level, by comparison of average ranks of the scores of PMMS benefits. The average rank of PMMS benefits in all four dimensions ranges from 45 to 51 in the PMMS without causal links. At the other extreme, 'Explicit' and 'Quantitative' causal links are associated with the range of PMMS benefits from 65 to 92.

Table 4.3.2.23 PMMS success dimensions ranking by type of causal link between drivers and outcomes with Kruskal-Wallis Test, Jonckheere-Terpstra Test, pairwise comparisons, and coefficients of determination

	PMMS success dimensions											
	Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements		
Causal link	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to
A Not used	34	49	C, E	34	46	B, D, E	34	45	C, D, E	32	51	D, E
B Used	23	64		23	79		22	54	C, D	20	52	
C Explicit	11	92	D	11	75		11	95		10	72	
D Qualitative	26	67		26	71		26	76		24	72	
E Quantitative	38	76		38	72		38	76		38	69	
Total	132			132			131			124		
Kruskal-Wallis Test Statistics - Significance		0.006			0.007			0.000			0.076	
Jonckheere-Terpstra Test Statistics - Significance		0.004			0.014			0.000			0.017	
η^2		0.11			0.12			0.18			0.07	

The greatest PMMS benefits in two dimensions, as indicated by the highest values of average ranks, 92 and 95, are associated with the use of 'Explicit' causal links, which had been used in the PMMS in only 11 organisations. It is not possible to deduce the qualitative, quantitative or mixed character of the causal links incorporated in the PMMS from the qualifier 'Explicit'. This has been intentionally included in the research design phase of scaling of the variables, to allow for those respondents who are uncertain about the other attributes, except that the causal links incorporated in the PMMS in their organisations are 'Explicit'.

A comparatively large number of organizations, 34, had not used a causal link. The absence of causal links is associated with the lowest PMMS benefits in those organisations, and is significantly different to the majority of the PMMS with a causal link. The specific differences can be read in the column 'Different to' in each PMMS benefit dimension. The direction of association is not entirely conclusive, apart from the very conspicuous differences between the categories 'Not used' and 'Explicit' in all four PMMS benefit dimensions. The strength of association across the four benefits varies from 0.07 to 0.18, which values are indicative of 'Low' to 'Moderate' association.

4.3.3 PMMS use complementarities

Time in use

Table 4.3.3.1 shows the distribution of the surveyed organisations with regard to the time since the sample organisations had adopted the PMMS system. The 135 PMMS reported by the respondents are the multiple perspective performance measurement and management systems that had been in operation from less than one year to more than three years. A very large proportion, 63.7 percent, of all respondents indicated that their organisations have had a PMMS for more than 3 years. In terms of time PMMS had been in use, the typical PMMS can be assumed to have been at a fairly mature stage of development. This is a remarkable finding, because it clearly indicates that, by June 2002 when the survey was administered, PMMS had been popular for several years. The fact that 86 organisations had been using PMMS continuously for at least three years can be interpreted as an indicator of the systems' perceived usefulness, and also demonstrates that PMMS had become a proven management technique in Australian listed organisations.

A total of approximately 36 percent of respondents have indicated the use of PMMS for less than three years, and only 16 organisations have had a PMMS for less than one year.

Table 4.3.3.1 Respondent distribution by time PMMS in use

Years	n	%
Less than 1 year	16	11.9
1 - 3 years	33	24.4
More than 3 years	86	63.7
Total	135	100.0

The differences in the perceived extent of PMMS benefits, which could be attributed to the complementarity variable of the time PMMS were in use, are shown in Table 4.3.3.2. The results of the pairwise comparisons of the groups show that the sample can be

consolidated into the two groups, with the first group comprising the organisations having had the PMMS in use for less than three years. The perceived PMMS benefits obtained in the group were significantly lower than the benefits in the category 'More than 3 years'. The direction of association is patently positive, so that the PMMS benefits increase with the time in use. However, similarly to the other PMMS complementarities, the strength can be largely described as 'Low' or 'Weak', as indicated by the values of η^2, with the sole exception of the association between the time PMMS had been in use and 'Extent of dollar improvements', for which the association was 'Moderate'.

Table 4.3.3.2 PMMS success dimensions ranking by number of years PMMS used, Jonkheere-Terpstra test, pairwise comparisons, and coefficients of determination

	PMMS success dimensions											
	Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements		
Number of years	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to
A Less than 1 year	16	46	C	16	47	C	16	47	C	14	51	C
B 1 - 3 years	33	56	C	33	58	C	33	60		32	58	
C More than 3 years	86	77		85	75		84	74		80	68	
Total	135			134			133			126		
Jonckheere-Terpstra Test Statistics - Significance		0.000			0.002			0.005			0.047	
η^2		0.07			0.09			0.06			0.11	

Status of PMMS compared to competitors

Similar to the distribution with respect to the actual time the PMMS had been in use in the sample organisations, the distribution of the perceived status of PMMS relative to the competitors, displayed in Table 4.3.3.3, can be collapsed into the two groups, roughly corresponding to the former distribution. The first group would comprise organisations characterized by the respondents as 'Laggard' and 'Somewhat behind', with the number of organisations matching that of the organisations which had used PMMS for less than three years, while the other group would be made up of the 'Middle of the pack', 'Close follower', and 'Industry leader' categories, with the total of 89 organisations, not dissimilar to the category of 'More than 3 years'.

Table 4.3.3.3 Respondent distribution by status of PMMS use

PMMS status	n	%
A Laggard	20	15
B Somewhat behind	24	18
C Middle of the pack	41	30
D Close follower	26	19
E Industry leader	22	16
Total	133	99

The above discussed analogy between the two distributions can also be extended to the results of the Jonckheere-Terpstra tests, and the subsequent pairwise comparisons, displayed in Table 4.3.3.4. Except for a couple of deviations from the overall pattern, a positive correlation between the extent of PMMS benefits and the PMMS status categories, each corresponding to a more advanced status of adoption and implementation of PMMS, can be ascertained. The strength of association can be described as somewhat larger than was the case with the time the PMMS were in use. It is 'Weak' in 'Satisfaction with PMMS use for strategic purposes', and is 'Moderate' in 'Functional and managerial extent of PMMS use', 'PMMS use in specific decision areas', and 'Extent of dollar improvements'.

Table 4.3.3.4 *PMMS success dimensions ranking by organisation PMMS status with Jonkheere-Terpstra test, pairwise comparisons, and coefficients of determination*

	PMMS success dimensions											
	Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements		
PMMS status	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to
A Laggard	20	49	C, E	20	62	E	20	62	E	20	56	E
B Somewhat behind	24	49	C, E	24	49	C, D, E	24	49	E	23	57	E
C Middle of the pack	41	74		41	68		41	65	E	38	61	
D Close follower	26	66	E	26	71		26	66	E	24	66	
E Industry leader	22	91		22	84		22	96		21	79	
Total	133			133			133			126		
Jonckheere-Terpstra Test Statistics - Significance		0.000			0.008			0.001			0.035	
η^2		0.08			0.15			0.14			0.11	

Use by number of organisational levels

The number of levels was used as an independent variable in testing whether the greater benefits are accomplished if PMMS were used more comprehensively, i.e., at more organisational levels, in comparison to the more partial use at only some levels of organisation.

The results of the Jonckheere-Terpstra tests, reproduced in Table 4.3.3.5, show significant differences in the PMMS benefits, depending on the number of organisational levels at which PMMS were used. Except for the single deviation from the overall pattern, the association is positive in all PMMS benefits dimensions, starting from the number of organisational levels of two onwards. The association with the 'Use of PMMS for strategic purposes' and the 'Functional/managerial extent of PMMS use' is not perceptible, when the number of levels at which PMMS were used is one. The average rank of the PMMS benefits at a single level is either the same in one benefit, or actually higher in the other three benefits, in comparison to the benefits when the PMMS were used at two levels. By far the greatest extent of PMMS benefits in all four dimensions was reported for the organisations in which the PMMS were used at five or more organisational levels. Consequently, the majority of the pairwise comparisons show the significant differences between that number of levels, and the organisations in which the PMMS were used at fewer levels. The strength of association is 'Weak' in 'Extent of

Table 4.3.3.5 PMMS success dimensions ranking by number of organisational levels at which PMMS is used, Jonkheere-Terpstra test, pairwise comparisons, and coefficients of determination

		PMMS success dimensions											
		Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements		
Number of organisational levels		n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to
A	1	9	63		9	64		9	52	E	8	42	E
B	2	38	46	C, D, E	37	48	C, E	37	48	D, E	34	48	E
C	3	25	66	E	25	74		25	64	E	24	61	E
D	4	29	71		29	60	E	29	67	E	29	64	
E	5	28	85		28	83		27	87		26	81	
Total		129			128			127			121		
Jonckheere-Terpstra Test Statistics - Significance		0.000			0.003			0.000			0.000		
η^2		0.13			0.14			0.16			0.06		

dollar improvements', and it is 'Moderate' in all other PMMS benefits.

Use of other innovative managerial tools

The results of the Jonckheere-Terpstra test, displayed in Table 4.3.3.6, indicate significant and striking differences in the scores of PMMS benefits among the organisations using the different numbers of other administrative and managerial tools and techniques. As can be observed, the majority of organizations, 64, had reported the use of one to three of other organisational tools. The average extent of the PMMS benefits in those organisations was comparatively low, as shown by the values of the average ranks, and was significantly different to both the groups of organisations with '4 – 6' other tools, and the groups with '7 – 9' tools. Somewhat higher PMMS benefits had been reported by organisations with four to six other tools, which were also significantly different to the group with '7 – 9' tools in one PMMS benefits dimension, the satisfaction with 'PMMS use for strategic purposes'. The greatest overall PMMS benefits were reported by the organisations using between seven to nine other tools, whose PMMS benefits, expressed in the average ranks, were nearly twice as large as those of the category '1 – 3'. Such large differences may indicate that the experience, gained in implementing other tools and techniques, probably facilitates a successful implementation of the PMMS, as well as efficient integration with other innovative managerial tools.

Table 4.3.3.6 PMMS success dimensions ranking by organisation use of management tools, Jonkheere-Terpstra test, pairwise comparisons, and coefficients of determination

	PMMS success dimensions											
	Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements		
No. of other tools	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to
A 1 - 3	64	46	B, C	64	47	B, C	64	46	B, C	64	42	B, C
B 4 - 6	35	66	C	35	70		35	71		33	74	
C 7 - 9	18	91		18	81		18	81		17	85	
Total	117			117			117			114		
Jonckheere-Terpstra Test Statistics - Significance		0.000			0.000			0.000			0.000	
η^2		0.16			0.23			0.18			0.29	

4.3.4 Respondent complementarites

For the purpose of this study, no specific assumptions with regard to impact of the PMMS champion characteristics were made. The respondents were selected as they were expected to be involved in strategic planning and designing performance measurement systems within their organisations. Accordingly, such individuals were likely to be aware of factors that facilitate or inhibit the strategic and other uses of PMMS in the organisation.

The differences in the extent of accomplishment of PMMS benefits with regard to the PMMS 'champion' characteristics' were tested, and the findings are presented in this section. These PMMS 'champion ' characteristics are:

a) the managerial level,
b) functional background,
c) position tenure,
d) organisation tenure,
e) formal performance measurement responsibility, from position description,
f) level of education.

Managerial level

As exhibited in Table 4.3.4.1, the results of the Kruskal-Wallis test indicate that the PMMS benefits across all four dimensions are not significantly different, except for the 'Extent of functional/managerial use' dimension, where the extent of the PMMS use by the user category 'CEO' is significantly lower than use by other users. In effect, this finding indicates that the four CEOs respondents, and PMMS 'champions', had reported that they were using the PMMS to a very limited extent.

Table 4.3.4.1 PMMS success dimensions ranking by type of respondent position with Kruskal-Wallis Test, pairwise comparisons, and coefficients of determination

	PMMS success dimensions								
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
Respondent position	n	Average Rank	n	Average Rank	Different to	n	Average Rank	n	Average Rank
A CEO	4	42	4	26	C, D, E	4	45	4	49
B Managing director/director	4	59	4	64		4	73	4	59
C Senior manager	67	72	67	62	E	67	69	63	62
D Manager	39	61	39	72		39	65	38	60
E Other	20	72	20	87		19	69	17	82
Total	134		134			133		126	
Kruskal-Wallis Test Statistics - Significance		0.400		0.020			0.788		0.240
η^2				0.08					

Although the differences in other dimensions are not statistically significant, the PMMS benefits are markedly low, as reflected by the values of the average ranks of the scores, if the PMMS 'champion' is the 'CEO'. Still, the PMMS champion category 'Managing director/director', which may be used to describe a similar position to 'CEO', had the PMMS benefits comparable, and not different to all other champion categories. An alternative explanation of the low PMMS benefits in all dimensions may be systematic bias against and dissatisfaction with the PMMS on the part of the four 'CEO' respondents in the survey. Such dissatisfaction may have been caused by the CEOs' very high expectations as to the PMMS program outcomes and results, which may have failed to materialize, and had consequently lead to the very little extent of the use of the PMMS by the CEOs. Ultimately, the relatively low frequencies, four, of both categories 'CEO' and 'Managing director/director' may have precluded formation of more conclusive findings, given the inability to obtain statistical significance of small differences when dealing with insufficient samples sizes.

The largest group of the PMMS champion was 'Senior manager', which was represented by 67 respondents, or 50 percent of all cases.

Functional background

The data on the distribution of the sample respondents in respect with the primary areas of expertise, together with the values of the average ranks of the scores of PMMS benefits, are presented in Table 4.3.4.2.

Table 4.3.4.2 PMMS success dimensions ranking by type of respondent primary area of expertise with Kruskal-Wallis Test

	PMMS success dimensions							
	Satisfaction with PMMS use for strategic purposes		Functional/manageria extent of PMMS use		Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
Area of expertise	n	Average Rank	n	Average Rank	n	Average Rank	n	Average Rank
Financial accounting	32	71	32	70	32	65	31	60
Finance	34	63	34	56	34	65	33	58
Management accounting	54	65	54	69	54	66	50	63
Human resources	8	72	8	68	7	60	6	79
Corporate affairs	2	31	2	67	2	67	2	62
Total	130		130		129		122	
Kruskal-Wallis Test Statistics - Significance		0.600		0.229		0.934		0.829

Respondents in financial accounting and finance were represented in nearly identical numbers of 30 to 34, or between 23 to 26 percent of all respondents. Interestingly, these frequencies indicate a relatively high level of adoption of the PMMS among finance specialists, which demonstrates their willingness to embrace multi-dimensional performance systems, instead of use of only financial measures. Functional background in 'Management accounting' was indicated by 54 respondents, or 40 percent of the sample. There were only very few respondents with a functional background other than financial accounting, finance and management accounting. Only eight respondents with functional expertise in human resources had taken part in the survey, and only two with a background in corporate affairs.

As can be observed, there were no significant differences in PMMS benefits between the five distinct areas of respondent expertise. The 'Average Rank' column figures in each PMMS benefit dimensions show that there is no particular systematic tendency to report

a higher or lower extent of PMMS benefits by respondents from any area of expertise, which is indeed confirmed by the results of Kruskal-Wallis tests.

Position tenure

The data on the distribution of the respondents with respect to the tenure in the position are shown in Table 4.3.4.3, as is the result of the Jonckheere-Terpstra test with the pairwise comparison.

Table 4.3.4.3 PMMS success dimensions ranking by type of respondent current position tenure with Jonkheere-Terpstra Test, pairwise comparison, and coefficient of determination

	PMMS success dimensions								
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
Position tenure	n	Average Rank	n	Average Rank	Different to	n	Average Rank	n	Average Rank
A Less than 2 years	38	64	38	77	C	37	60	34	59
B 2 - 5	56	67	56	65		56	66	52	63
C More than 5 years	39	70	39	60		39	74	39	66
Total	133		133			132		125	
Jonckheere-Terpstra Test Statistics - Significance		0.515		0.048			0.130		0.404
η^2				0.03					

As can be seen, there were practically no differences in the extent of perceived PMMS benefits among the three categories. The only significantly different reported PMMS benefit with regard to the length of the respondents tenure in position was the 'Functional/managerial extent of the PMMS use'. The difference has been ascertained between the respondent with the position tenure of 'Less than two years' and those with 'More than five years'. Surprisingly, the direction of correlation is negative. This represents a finding of minor importance, as no other evidence of relationship between the respondent position tenure and the extent of PMMS benefits were produced.

Organisation tenure

Similar to the differences in PMMS benefits in regard with the position tenure, the analysis of the differences between the groups with different lengths of organisation

tenure also revealed no statistically significant differences at $p \leq 0.05$, as shown in Table 4.3.4.4.

Table 4.3.4.4 PMMS success dimensions ranking by type of respondent organisation tenure with Jonkheere-Terpstra test

	PMMS success dimensions							
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
Organisation tenure	n	Average Rank	n	Average Rank	n	Average Rank	n	Average Rank
Less than 2 years	24	73	24	84	23	68	20	67
2 - 5	60	62	60	64	60	62	56	63
More than 5 years	50	71	50	64	50	73	50	63
Total	134		134		133		126	
Jonckheere-Terpstra Test Statistics - Significance		0.732		0.107		0.343		0.686

Performance measurement formal responsibility

The possible association between the formal responsibility for performance measurement in organisations and the extent of PMMS benefits has been tested by Mann-Whitney test, for which the results are presented in Table 4.3.4.5. It can be observed that there were no significant differences in any PMMS benefits.

Table 4.3.4.5 PMMS success dimensions ranking by respondent formal responsibility for performance measurement and Mann-Whitney Test

	PMMS success dimensions							
	Satisfaction with PMMS use for strategic purposes		Functional/managerial extent of PMMS use		Satisfaction with PMMS use in specific decision areas		Extent of dollar improvements	
PMMS formal role	n	Average Rank	n	Average Rank	n	Average Rank	n	Average Rank
Yes	118	69	118	67	117	68	112	65
No	16	55	16	75	16	59	14	54
Total	134		134		133		126	
Mann-Whitney Test Statistics - Significance		0.161		0.423		0.404		0.298

Level of education

The distribution of the respondents with respect to the level of education, and the results of the Jonckheere-Terpstra tests are displayed in Table 4.3.4.6. On the average, the

respondents, PMMS champions, seem to be a highly educated group, as can be seen in the mode category 'Postgraduate', which accounted for nearly half of the sample. The proportion of the respondents with 'Undergraduate' education is also as high, while there were only eight respondents with 'Secondary' education. Considered in isolation, these frequencies are illustrative of the institutionally gained expertise and sophistication required to develop a PMMS.

Table 4.3.4.6 PMMS success dimensions ranking by respondent level of education with Jonkheere-Terpstra test, pairwise comparisons, and coefficients of determination

	PMMS success dimensions										
	Satisfaction with PMMS use for strategic purposes			Functional/managerial extent of PMMS use			Satisfaction with PMMS use in specific decision areas			Extent of dollar improvements	
Level of education	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank	Different to	n	Average Rank
A Secondary	8	34	C	8	22	B, C	8	37	C	8	47
B Undergraduate	61	63	C	61	67		60	61	C	59	60
C Postgraduate	65	76		65	73		65	76		59	69
Total	134			134			133			126	
Jonckheere-Terpstra Test Statistics - Significance		0.003			0.019			0.003			0.061
η^2		0.09			0.08			0.07			

The results of the Jonckheere-Terpstra tests show significant differences between the PMMS benefits in all dimensions, except for the 'Extent of dollar improvements'. Even without referring to the test results, great differences between the respondents with secondary level of education and the respondents with higher levels of education can be observed. The direction of the correlation is positive, i.e., the respondents belonging to 'Undergraduate' and 'Postgraduate' categories had reported much higher benefits of the PMMS, compared to the respondents with 'Secondary' education.

Table 4.3.4.7 shows the composition of the group with 'Postgraduate' education. As indicated by the postnominals CA and CPA, the majority of the respondents had an identifiable professional background in accounting, represented by a total of 39 respondents, or 28 percent of the total sample.

Table 4.3.4.7 Respondent postgraduate qualificatio

Description	n
CA	24
CPA	15
Graduate Diploma	10
MBA	6
AMP (Harvard)	1
Total	56

4.3.5 Summary of findings

The significant correlations among the PMMS benefits and the complementarities of the benefits are summarised according to the four broad groupings, and are presented in the section.

As can be seen in Table 4.3.6.1, a total of six significant correlations between the organisation complementarities and the PMMS benefits had been obtained, which accounts for 50 percent of all possible correlations between the variables. The values of η^2 range from 0.08 to 0.17, and are for the most part 'Moderate'. The most remarkable complementarity was 'Number of employees', which was significantly correlated with all four PMMS benefits, followed by 'Industry' with two significant correlations, while 'Market capitalisation', with no significant correlations, appears to practically have no influence on the extent of accomplishment of PMMS benefits.

Table 4.3.5.1 Overview of organisation complementarities to PMMS benefits with η^2 values

Composite dependent variable	Industry	Number of employees	Market capitalisation
PMMS use for strategic purposes		0.08	
PMMS use by users of various functional and managerial background	0.16	0.13	
PMMS use in specific business decision areas		0.10	
PMMS attributed dollar improvement	0.17	0.10	
Range of η^2	0.16 - 0.17	0.08 - 0.13	
Total and percentage of significant complementarities = 6 / 50			

About 30 percent of all PMMS design complementarities, shown in Table 4.3.5.2, have had an overall impact on the extent of PMMS benefits. The complementarity of 'Causal links' among the PMMS perspectives and measures was significantly correlated with all four PMMS benefits, followed by 'Number of performance areas' with three significant correlations. 'PMMS type' was only negligibly associated with the extent of PMMS benefits, having been correlated to only one PMMS benefit, as was the number of measures in 'Customer' perspective. The number of measures in 'Financial' perspective was correlated to two PMMS benefits, which demonstrates relatively limited importance of this complementarity.

Table 4.3.5.2 Overview of PMMS design complementarities to PMMS benefits with η^2 values

Composite dependent variables	PMMS type	PMMS software source	Causal link	Number of performance areas	Number of measures				
					Process	Customer	Financial	Learning and innovation	Other
PMMS use for strategic purposes			0.11	0.05			0.05		
PMMS use by users of various functional and managerial background			0.12						
PMMS use in specific business decision areas			0.18	0.07		0.07	0.08		
PMMS attributed dollar improvement	0.07		0.07	0.07					
Range of η^2	0.07		0.07-0.18	0.05-0.07		0.07	0.05-0.08		
Total and percentage of significant complementarities = 11 / 30 %									

Significant correlations between the PMMS use complementarities and the extent of PMMS benefits are shown in Table 4.3.5.3. The strongest correlations, which can be

described as 'Moderate', had been between the 'Number of other managerial tools' and the PMMS benefits, while the remaining PMMS use complementarities were 'Weak'.

Table 4.3.5.3 Overview of PMMS use complementarities to PMMS benefits with η^2 values

Composite dependent variables	Number of years PMMS in use	PMMS use status compared with competitors	Number of other managerial tools	Number of organisational levels PMMS used
PMMS use for strategic purposes	0.07	0.08	0.16	0.13
PMMS use by users of various functional and managerial background	0.09	0.15	0.23	0.14
PMMS use in specific business decision areas	0.06	0.14	0.18	0.16
PMMS attributed dollar improvement	0.11	0.11	0.29	0.06
Range of η^2	0.06-0.11	0.08-0.15	0.16-0.29	0.06-0.14
Total and percentage of significant complementarities = 16 / 100 %				

With regard to the 'PMMS champion', or respondent, complementarities, displayed in Table 4.3.5.4, only 22 percent of all possible correlations were significant. The majority of those were between the respondents' 'Level of education' and the three of PMMS benefits. Respondents' 'Position' and 'Position tenure' were each associated with one PMMS benefit.

Table 4.3.5.4 Overview of respondent complementarities to PMMS benefits with η^2 values

Composite dependent variables	Position	Area of expertise	Position tenure	Organisation tenure	PMMS formal role	Level of education
PMMS use for strategic purposes						0.09
PMMS use by users of various functional and managerial background	0.08		0.03			0.08
PMMS use in specific business decision areas						0.07
PMMS attributed dollar improvement						
Range of η^2	0.08		0.03			0.07-0.09
Total and percentage of significant complementarities = 5 / 22 %						

As can be seen by comparing the four tables, the PMMS use complementarities appear to have had the most noticeable impact on PMMS benefits, in both the proportion of significant complementarities, and in the strength of relationships. This was followed by the group of PMMS design complementarities, of which the causal link component was positively associated with the accomplishment of PMMS benefits in all four dimensions, and the number of performance areas being correlated with three PMMS benefits. In the third group of PMMS complementarities, the size, measured by the number of employees, was correlated to all four PMMS benefits. The industry was associated with two PMMS benefits, making a total of six significant complementarities. Finally, the PMMS champion complementarities were significant in only five combinations, with the level of PMMS champion education accounting for the correlations with three PMMS benefits.

Chapter 5 Concluding remarks

5.1 Contribution to knowledge

The exploratory research reported in this dissertation was undertaken as a step towards developing an empirical basis for assessing the status, determinants, and consequences of multiple perspective performance measurement and management in Australian business organisations. The study provides evidence and an analytical and structural insight into the implementation and application of PMMS in Australian listed organisations. A number of findings can be distilled from this study.

The study has identified and confirmed the relevance of several PMMS determinants, complementarities and outcome variables. In designing the empirical research, several validating procedures were instituted to ensure that reliable and unbiased data were used in analyses. The questionnaire was developed following an extensive review of the relevant literature to identify the most applicable variables and measurements. The questionnaire was then pretested and improved on the basis of suggestions by a group of experienced management researchers. All composite dependent and independent variables were tested for internal, or measurement scale, reliability by calculating the Cronbach alphas. Measures of PMMS outcomes were also tested for discriminative validity, to ensure that they were sufficiently divergent from each other. External validation of the sample with regard to population industry composition was tested, as well as the internal validity of the measurement scales in the industry sectoral subsamples.

The results of the research apply to all industries, given that the study deliberately did not focus on any one industry. The sample predominantly consisted of large organisations, with about 50 percent of organisations having more than 500 employees, and approximately 80 percent of organisations with market capitalization of more than $100 million. A large majority of organisations had used PMMS for more than three years,

and about a third of organisations described their use of PMMS in comparison with competitors as being 'middle of the pack'.

This research takes performance measurement and management systems at the highest organisational level as a unit of analysis, and provides evidence of the types of PMMS. The most often reported type of PMMS was the Balanced Scorecard, used by roughly a third of organisations, while 'Performance Scorecard' and 'Performance Dashboard' were used by another third of organisations. The other non-specified types of PMMS were used by the remaining third. The results also show that the organisations were using comparatively complete and comprehensive PMMS, as approximately three quarters were using PMMS with three or more distinct performance perspectives, or categories. The PMMS were characterized by the predominance of financial measures, followed by customer and process measures. These were used by 81 and 74 percent of organisations, respectively. 'Learning and innovation' measures were used by less than a half of the sample organisations, with a majority of those organisations using between one and four of the measures. Finally, the other measures were reported by only 12 percent of organisations. A majority of organisations had developed their PMMS with varying involvement from an outside consultant. A third of organisations had developed their PMMS entirely in-house, while pre-packaged PMMS had been implemented by 11 percent of organisations. A quarter of all organisations did not have a cause-and-effect component in their PMMS. Among the organisations with causal links in their PMMS, a majority claimed to have a 'quantitative' type of causal links, followed by 'qualitative' links.

In addition to investigating the design of PMMS, and the extent to which PMMS are used among Australian business organisations, the data on the benefits of PMMS have been appraised. This study contributes empirical evidence of the actual outcomes of PMMS use, and the results moderate the optimistic tone that prevails in much of the current popular literature on PMMS, as the findings do not suggest that PMMS produce spectacular performance advantages to organisations.

With respect to the impact on organisation strategy, the results indicate that PMMS are widely used for a variety of strategic purposes in 50 to 75 percent of organisations. PMMS were used in approximately 70 percent of organisations in strategy formulation, communicating the strategic goals, and strategy implementation, and were reported to improve the quality of decision-making and problem solving in 76 percent of organisations. The least reported uses of PMMS were in reporting the measures to the public, and in using the PMMS to replace formal reporting and control structures, with 56 and 48 percent of the organisations respectively.

The extent of use of PMMS by top managers and other employees is relatively high, indicating that the adoption and implementation of PMMS has indeed spread among the executives. The PMMS have been used frequently by more than ninety percent of accounting/finance personnel, the CEOs and other senior managers. The use of PMMS by the board members was reported in approximately three quarters of organisations, albeit to a lesser extent. The use of PMMS by other personnel, such as the product/service managers, manufacturing/production personnel, and sales/marketing personnel was also reported at a far lesser extent, by 54 to 63 percent of organisations.

The findings also provide evidence that PMMS were used in a majority of organisations in budgeting and planning, forecasting, management of working capital, and to assist decisions concerning capital investments and capacity management. Fewer organisations had used their PMMS in decision areas of product development, outsourcing, and those pertaining to restructuring and reorganisation.

Finally, PMMS have resulted in fairly significant reported financial improvements in a number of organisations. About three quarters of respondents reported financial improvements in the management of their process/operations, and in customer satisfaction, and about two thirds in sales and marketing. Financial improvements in distribution, product/service design, increased market share, and stock appreciation were reported by 40 to 57 percent of organisations in the sample.

One of the objectives of the study was to empirically test the determinants of PMMS success proposed in the literature, i.e., the key contingency factors that affect the design, implementation and use of PMMS. In consequence, this study provides evidence on a broad range of factors that can facilitate or inhibit the adoption and implementation of PMMS.

Overall, this study supports the predictions concerning the importance of the PMMS determinants identified in the previous literature. The most frequently reported PMMS success factors were 'support by senior executives', 'PMMS easy to manage', 'full acceptance at all levels of organisation', and 'allows realistic target-setting'. In contrast to PMMS success factors, the individual barriers were recognised by fewer respondents, never exceeding sixty percent of the sample. 'PMMS not supportive of strategy' and 'too many measures and too complex' were the most frequent inhibitors of PMMS success, followed by 'system prone to managerial and employee manipulation' and 'hierarchical top-down method'.

The results also indicate that PMMS success, as measured by the dependent variables of PMMS use for strategic purposes, functional and managerial use, use in specific decision areas, and the extent of perceived dollar improvements, is related to several major factors, aggregated as the success factors and barriers of PMMS. The strength of the association between the aggregated PMMS determinants and the outcome, or success, dimensions of PMMS was found to be moderate to strong.

In addition, more detailed analyses, involving the particular itemized determinants were conducted, which further support and extend the evidence of association between the aggregate PMMS determinants and outcome variables. The major specific PMMS success factors as determined by the number of significant correlations with the PMMS specific outcomes, appear to be 'accountability for results', 'impact on bottom-line', 'realistic target-setting', 'easy identification of drivers', 'senior executives' support', and 'organisational acceptance'.

In the PMMS barriers subset, the most frequent factors independently associated with the PMMS outcomes items, were 'PMMS not adopted by employees', 'PMMS not understood by employees', 'PMMS prone to manipulation', and 'sensitive information revealed'.

While the survey findings confirm the relevance of all primary determinants of PMMS success, the results of item-to-item correlational analyses may assist practitioners in reducing the number of determinants to a more manageable set consisting of ten most significant determinants.

The degree of interconnectedness, both conceptually and in practice, of these determinants was discussed and pointed at in the literature review. In consequence, the managers, PMMS champions, and other involved parties would need to institute policies and take specific actions to maximise the extent of success factors and minimise the extent of barriers, such that a majority of factors influence and reinforce each other, and collectively and simultaneously determine the success of PMMS.

Following the above considerations, to assist in the development of a PMMS, a simple model, not reflecting any particular hierarchy or sequence of PMMS determinants, can be constructed. The model would comprise two broad groups of determinants, both those important in practically all projects, i.e., generic factors, and more specific factors, pertaining more particularly to the success of PMMS, as shown below.

Generic factors	**PMMS specific factors**
Supported by senior executives	Drivers of future performance easy to identify
Individual accountability for results	Allows realistic target-setting
Not understood by employees	Direct impact on bottom-line
Not adopted by employees	Full acceptance at all levels of organization
	System prone to managerial and employee manipulation
	Fear of sensitive information being revealed

In addition to the assessment of relevance of the primary determinants of PMMS success, the results of the research provide evidence on the several sets of complementary factors, influencing the extent of PMMS benefits or outcomes.

The findings suggest that organisational complementarities of industry and size are associated to a very limited extent with PMMS benefits. The industry variable helps explain some variation between the organisations, however the pattern of association did not reveal any consistent direction of differences between organisations in different industries. Similarly inconclusive are the differences on the basis of the organisation size. While there were significant differences between organisations with less than 50 employees and all other organisations, it must be noted that there were only nine organisations with less than 50 employees taking part in the survey. In addition, no differences were ascertained with regard to market capitalization. This represents another confirmation that PMMS practitioners should not base PMMS decisions on the size and industry considerations of their organisations, and should not concern themselves with the preconceptions about the appropriateness of the PMMS in their organisations. The practical implication of this finding is that PMMS can be expected to deliver the expected benefits across the entire range of organisations' sizes and industries.

Next, the relations between PMMS outcomes and PMMS design complementarities were investigated. Apart from a difference in the 'extent of dollar improvements' between the Balanced Scorecard and the 'other' PMMS, no other significant differences were found regarding the type of PMMS used. A more conclusive finding was obtained on the number of distinct performance areas, which were significantly directly associated with PMMS benefits. The finding is supportive of and consistent with the prescriptions in the literature, and shows that the highest benefits were obtained in organisations using the PMMS with four performance perspectives. With regard to the differences in the number of measures in each of the perspectives, the results of the tests are far less conclusive and supportive of the notions of 'balance' in contemporary PMMS. The average number of financial measures is between ten and fourteen, which may be appropriate for the use at the highest organisational level, but is markedly higher than the 'balanced' proportion

found in the reviewed literature. Further analysis of PMMS perspectives with regard to the number of measures revealed more significant gaps between theory and practice. Customer measures were used by 109 organisations, process measures by 100 organisations, measures of learning and innovation were reported by only 57 respondents, and finally, other measures were used in 16 organisations. While it would require additional analyses to comment on possible dysfunctional bias in the PMMS analysed, it appears that the number of measures in each performance perspective does not contribute greatly to the extent of the benefits achieved by PMMS. In all analyses, the only significant differences were obtained between the PMMS with a higher number of financial measures, in two PMMS outcome dimensions, and between the various numbers of customer measures, in one PMMS outcome dimension. No differences were ascertained for the process, learning and innovations and other measures.

Practical implication is that the prescriptions concerning the optimal number of measures in the PMMS perspectives need not be adhered to, or strictly followed, in the development and refinement of PMMS. Organisations can accomplish good PMMS outcomes despite relatively imbalanced, disproportionate and parsimonious use of non-financial measures. However, organisations must ensure a balance with regard to the coverage and comprehensiveness of the broader groupings of measures, i.e., the number of distinct PMMS perspectives.

Despite the lack of conclusive evidence about the 'balance' among the PMMS measures, the research supports previous findings and recommendations about the appropriately designed PMMS with regard to the existence and character of causal links among the performance perspectives and measures. The data on the association of different types of causal links with the degree of PMMS outcomes show that more developed causal links between the measures are an integral component in an effective and successful PMMS. The lack of a causal link has consistently resulted in the lowest reported PMMS benefits, along all four dimensions. Such PMMS were used by approximately a quarter of all organisations, and were significantly different to the majority of PMMS with causal links. The direction of differences among the PMMS with a causal links could not be

ascertained precisely, due to the nominal scale type. However, it appears that using 'explicit' causal links is conducive to accomplishing the highest PMMS benefits, in three dimensions, and that there were no differences between the PMMS incorporating either 'qualitative' or 'quantitative' links.

Given the prominence given in the literature, and the actual significance identified in this research, it appears that causal links are crucially important design complementarity, and a component to which the PMMS practitioners should give maximum emphasis.

The differences in PMMS benefits, or outcomes, were also investigated with regard to selected PMMS use complementary factors. Significant differences were obtained on the basis of the length of time the PMMS had been use. Higher benefits appear to accumulate in the organisations that had been using their PMMS for longer than three years, in comparison with the organisations with the PMMS in use for less than a year, in all four benefits dimensions. There were also differences between those organisations that had been using a PMMS between one to three years, in two PMMS benefits dimensions. A similar pattern of differences could be noticed when organisations were described in terms of their use of PMMS, compared to competitors. Markedly larger PMMS benefits were reported by 'Industry leader' organisations, and the differences were significant between the group and the majority of all other groups.

It follows that a PMMS project or initiative should not be abandoned prematurely, and that PMMS champions need to communicate realistic expectations with regard to the PMMS benefits, given that comparatively modest benefits accrue in the first three years of application and development. They also need to establish and communicate an awareness of the longer-term development of PMMS benefits, in order to maintain organisation-wide acceptance and support, before the desired outcomes become apparent in their full planned extent.

The number of organisational levels at which PMMS were used was also found to be significantly correlated with the accomplishment of PMMS outcomes. The direction of

the associations is positive, for the largest part. The greatest PMMS benefits can be achieved if PMMS are used at five or more organisational levels. This finding suggests that highly disaggregated PMMS, as well as PMMS implemented in complex organisations, are perceived as being more beneficial. Consequently, organisations should attempt to develop and implement PMMS at as many organisational levels as practicable. PMMS should be planned as a major implementation effort, rather than partial.

The differences with regard to use of other innovative managerial tools were also tested, and the results indicate strikingly larger PMMS benefits associated with the use of different numbers of such tools. Significant differences are almost uniformly exhibited between the group with the lowest use of other innovative managerial tools, with the range of one to three tools, and the second group of approximately 50 percent of organisations, which had used four or more tools. This finding implies that organisations should plan for an integration of the PMMS system with other managerial and information systems at the beginning of the project, in order to achieve greater overall success in the use of these systems.

Finally, this study has found very few systematic differences with regard to the PMMS champion, or the respondent, characteristics. The respondent's position does not have effect on the extent of PMMS outcomes, except that CEO's respondents reported that they were using the PMMS to a significantly lesser extent than other respondents. The respondents' primary areas of expertise did not account for any differences, probably due to the functional congruence between the respondents in financial accounting, finance and management accounting, who constituted about 90 percent of the sample. The position and organisations tenure of the respondents also did not help explain the differences in the extent of PMMS outcomes, neither did their formal responsibility for performance measurement. The only significant differences were obtained on the basis of the respondent's education, most notably between the respondents with secondary education and those with postgraduate education. However, the former group was comparatively small, and comprised only eight respondents, so this can be viewed as a

finding of minor importance. The differences were also significant in the two performance dimensions between the respondents with undergraduate and postgraduate education. Overall, this finding points to the need to have a comparatively educated PMMS champion, which practice is already well entrenched in Australian business organisations.

In summary, this study contributes evidence that the level of expected outcomes of PMMS is strongly linked to several sets of technical, behavioural and other primary factors that can facilitate or inhibit implementation of PMMS, and which explain a significant portion of variation in PMMS outcomes.

In addition, several complementary factors are also important for successful implementation of PMMS. This study provides empirical evidence on the structural characteristics of appropriately designed and developed PMMS. The results, summarized in section 4.3.5, suggest that differences in the perceived benefits of PMMS are correlated with all but one of the PMMS design complementarities, and point to the need to incorporate the causal link between the drivers and outcomes in a PMMS, and to design a comparatively balanced PMMS, with regard to the number and variety of performance perspectives.

Among other markedly important complementarities of PMMS that can be planned and provided, are the number of organisational levels that PMMS are used at, the number of other innovative managerial tools, and the level of education of PMMS champions, all of which were positively associated with the extent of all PMMS benefits. In conclusion, useful specifications are provided concerning PMMS structure, integration with other systems and the organisational scope of PMMS use, which enable organisations to develop a framework for implementation and management of PMMS. On the basis of these findings, it is recommended that organisations need to invest in the above requisite complementary factors, in order to gain PMMS related advantages.

This study may assist in improving PMMS practices in organisations by demonstrating the existence of a set of variables that can be used in implementing and modifying PMMS to achieve and improve PMMS success. The framework adopted in this research demonstrates the existence of critical factors and capabilities which need to be managed as they affect the use of PMMS, and influence the overall effectiveness of PMMS.

Given that identifying factors critical to the successful implementation and evolution of PMMS is a major concern in organisations intending to adopt PMMS, the awareness of the primary determinants and implementation difficulties of PMMS may assist PMMS development managers in devising appropriate strategies and mechanisms for dealing with potential problems. Although the total cost associated with the development, implementation and maintenance of a PMMS may be impossible to evaluate, it may be assumed that significant resources have already been deployed in many Australian business organisations that have already adopted PMMS, or are in the process of developing one.

The study contributes to several relevant areas of investigation in the PMMS literature. The main topics discussed include the extent of PMMS use, within both the population of the largest listed Australian organisations, and the pervasiveness of PMMS use in the sample organisations. The research reported in this study also identifies the benefits and other outcomes of PMMS use, as well as a wide range of behavioural, infrastructure, and implementation determinants of PMMS success. The study also provides an understanding of the design and organisational use of PMMS, and evidence in support of several predictions concerning these aspects of PMMS.

The research can be used as a part of a common basis for data collection in future investigations of PMMS, and may assist in reducing the discrepancies and inconsistencies arising from the use of differing survey instruments.

5.2 Limitations of the study

A major limitation of the study stems from a relatively small size of the sample, which precluded the investigation of research questions involving the moderating and interacting variables as they affect PMMS success, for which multivariate analyses would need to be conducted.

As can be observed in the tables containing descriptive data, the sample was sufficiently large to allow for a detailed description. However, very few items comprising the composite variables were applicable to a sufficient number of organisations. The responses to particular items were obtained from 50 to 60 respondents on average, while some items were applicable to only 30 to 40 organisations, thus rendering the data series large enough only for univariate and some bivariate analyses. With respect to the analyses actually conducted in this research, it may also be assumed that a larger sample would yield a larger number of statistically significant results, and thus allow for a more thorough investigation of possibly important differences, which involved pairwise comparisons of relatively small samples, some with very few cases.

Despite these limitations, this study represents one of the first attempts to identify and empirically test the determinants and complementarities of PMMS success or benefits, as measured through a comprehensive set of PMMS outcome variables. The results provide significant evidence that PMMS development managers can improve the likelihood of PMMS project success by managing a number of primary determinants and the complementary factors of PMMS success.

Notwithstanding the assertions about conclusiveness with regard to the variety of industry settings, made in the section on the external validity of the sample, 3.2, it is emphasised that the results are at best only broadly illustrative, due to the incompleteness and inconclusiveness of responses to the survey. The response rate of organisations with PMMS was fairly high at 27 percent, compared to other survey research in management accounting. However, there is no information on the number or industry composition of

the entire population of organisations with the PMMS in the top 500 Australian listed companies. The estimate of the number of such organisations, provided by the PMMS consultants, software vendors and other PMMS suppliers, is about 25 to 35 percent of the largest business organisations in the U.S.A., which may be comparable to the proportion of such organisations in Australia. However, this proportion could not be accurately estimated.

The applicability of the findings is also restricted due to the fact that the research did not focus on any specific organisations or industry, and that the sample was highly heterogeneous with regard to demographic characteristics, such as size and industry, and PMMS design and use characteristics.

However, it should be noted that the empirically validated knowledge about PMMS implementation success and the organisations' or industry specific variables is rather scant, which restricted the collection of information on the variables commonly reported in the predominantly normative literature on PMMS, to identify the factors applicable to a wide cross-section of business organisations. This makes the results and findings in this study widely generalizable over various sectors of the economy, including the various sizes and levels of sophistication needed for PMMS implementation. However, the extent to which the results attributed to the use of PMMS may have been caused by other, related, but omitted factors, or the specific contextual conditions of a particular organisation (Chenhall, 2003) is not known.

The study relies on self-reported perceptual results and indicators in the measurement of variables, which may make it difficult to interpret, as pointed by Ittner et al. (2003). The survey data were requested and obtained from the persons in organisations who were designated as the 'PMMS champion', who may have a strong, vested interest in PMMS being viewed as a success. However, given the anonymous character of the survey, and the satisfactory variability of the responses, it may be assumed that the data adequately reflect the overall status of PMMS practice in the sample organisations.

5.3 Recommendations for future research

This study is one of the few publicly accessible surveys on the design and use of PMMS in Australian organisations. Consistent with the orientation of the study and the findings, there are several interesting directions for further research.

To further understand the determinants of PMMS implementation success, and explore the possible interacting or moderating relationships between the independent variables, reflecting the influence of more complex structures and characteristics of PMMS, a larger sample size would be required. A greater amount of data would provide a basis for development and investigation of more complete and precise models of PMMS implementation.

A specific recommendation can be made regarding the 'other' organisations. Given that retail trade, transport and storage, electricity and gas, and other industries aggregated into the category 'other', comprise some quite sizeable organisations, in terms of revenue, market capitalisation or number of employees, future research on PMMS should address this problem by purposefully framing a sample to enable the researcher to identify and access the organisations with PMMS in these industries.

At an overall level, an exhaustive research of parameters of the entire target population of PMMS in the top 500 Australian listed companies, by means of a questionnaire survey, would be needed to:

- ascertain the degree of representativeness and generalizebility of demographic and PMMS characteristics of organisations in this survey;
- confirm the validity or amend the conclusions to the analyses conducted, and any recommendations arising from analyses and discussions of results and findings;
- increase the breadth (scope) of future PMMS research by establishing a comprehensive database on PMMS in the largest Australian organisations, which would serve as a starting point for any subsequent PMMS scholarly research at the national level. This would enable longitudinal research, which could possibly

produce evidence on causality, rather than association, between the use of PMMS and increased organisational performance (Chenhall, 2003), as well as evidence of the long-term sustainability of PMMS advantages, and changes in magnitude and importance of PMMS determinants.

If problems of privacy and confidentiality can be overcome in future research, and the identity of the organisations with PMMS and the contact persons in these organisations are obtained, for instance from the professional bodies and associations in management accounting, this opportunity could be exploited to obtain data on the PMMS organisations and contact persons in other large business organisations operating in Australia, in addition to those listed on Australian Stock Exchange. This would include private unlisted companies, publicly owned unlisted enterprises and organisations not listed on ASX. This additional information would greatly enlarge the sample of the organisations with PMMS, which in turn would ensure a very high degree of representativeness of PMMS features and its uses in surveyed organisations and the generalizebility of findings.

Other measures of PMMS success also need to be explored to extend the evidence presented in this study. A particularly interesting area of research would be the emergence and development of any accounting and other quantitative PMMS costs and benefits metrics recording and reporting system. This would allow for a more accurate assessment of PMMS investment decisions and practices, and comparison with alternative uses of organisatons' resources.

REFERENCE LIST

Abernathy, W. 1997, 'Balanced Scorecards make teamwork a reality', *The Journal for Quality and Participation,* Nov/Dec, pp. 58 – 59.

Andersen, H. 2001, *Balanced Scorecard implementation in SMEs: reflection on literature and practice*, 2GC Active Management, Berkshire, pp. 1-10.

Artley, W. & Stroh, S. 2001, *The Performance-Based Management Handbook: Establishing an Integrated Performance Measurement System*, http://www.orau.gov/pbm.

Australian Bureau of Statistics, Australian and New Zealand Standard Industry Classification (ANZSIC), http://www.abs.gov.au.

Averson, P. 2000, 'Top Ten Reasons for a Performance Measurement System', http://www.balancedscorecard.org/appl/top_ten.html.

Averson, P. 1999, 'The Balanced Scorecard and Knowledge Management', http://www.balancedscorecard.org/appl

Balanced Scorecard Collaborative, BSC Online Member's Briefing, 25/04/2001, http://www.bsonline/.

Balanced Scorecard Report 2000a, vol. 2, no. 3, http://www.bsonline/.

Balanced Scorecard Report 2000b, vol. 2, no. 4, http://www.bsonline/.

Banker, R., Janakiraman, S. & Konstans, C. 2002, 'Performance Measures and the Balanced Scorecard', http://www.fei.org/rf/download/Balanced_Scorecard_Results.pdf, pp. 1-3.

Banker, R., Potter, G. & Srinivasan, D. 2000, 'An Empirical Investigation of an Incentive Plan that Includes Nonfinancial Performance Measures', *The Accounting Review*, vol. 75, no.1, pp. 65-92.

Bititci, U.S. 2001, 'Integrated Performance Measurement Systems: A Research Report', http://www.dmed.strath.ac.uk/CSM/Research/ipmsapps.htm, pp. 1-13.

Bititci, U.S., Turner, T. & Begemann, C. 2000, 'Dynamics of performance measurement systems', *International Journal of Operations & Production Management*, vol. 20, no. 6, pp. 692-704.

Boyd, B. & Reuning E. 1998, 'A Measurement Model of Strategic Planning', *Strategic Management Journal*, vol. 19, pp. 181-192.

Brignall, S. 2002, 'The Unbalanced Scorecard: a Social and Environmental Critique', *Proceedings: PMA 2002 – Research and Action*, Boston, pp. 85-92.

Bromwich, M. & Bhimani, A. 1994, *Management Accounting: Pathways to Progress*, CIMA, London.

BSC Online Member's Briefing 2001, http://www.bscol.com.

Chenhall, R.H. 2005, 'Integrative strategic performance measurement systems, strategic alignment of manufacturing, learning and strategic outcomes: an exploratory study, *Accounting, Organizations and Society*, vol. 30, pp. 395-422.

Chenhall, R.H. 2003, 'Management control systems design within its organizational context: findings from contingency-based research and directions for the future', *Accounting, Organizations and Society*, vol. 28, pp. 127-168.

Chenhall, R. H. & Langfield-Smith, K. 1999a, 'Innovations in Management Accounting', *Australian CPA*, September, pp. 76-78.

Chenhall, R. H. and Langfield-Smith, K. 1999b, 'Reasons for Innovation', *Australian CPA*, October, pp. 75-77.

Chenhall, R. H. & Langfield-Smith, K. 1998a, 'Adoption and benefits of management accounting practices: an Australian study', *Management Accounting Research*, vol. 9, pp. 1-19.

Chenhall, R. H. & Langfield-Smith, K. 1998b, 'Factors influencing the role of management accounting in the development of performance measures within organizational change programs', *Management Accounting Research*, vol. 9, pp. 361-386.

Chenhall, R. H. & Langfield-Smith, K. 1998c, 'The relationship between strategic priorities, management techniques and management accounting: an empirical investigation using a systems approach', *Accounting, Organizations and Society*, vol. 23, no. 3, pp. 243 – 264.

Cramer, D. 1998, *Fundamental Statistics for Social Research: Step-by-step calculations and computer techniques using SPSS for Windows*, Routledge, London.

Creating the Strategy-focused Organisation with the Balanced Scorecard, 2000, conference, Sydney, Canberra, Wellington.

Cronbach, L. 1951, 'Coefficient alpha and the internal structure of tests', *Psychometrica*, vol. 16, pp. 297-334.

De Toni, A. & Tonchia, S. 2001, 'Performance measurement systems: Models, characteristics and measures', *International Journal of Operations & Production Management*, vol. 21, no. 1/2, pp. 46-70.

De Waal, A.A. 2003, 'The future of the balanced scorecard: An interview with Professor Dr Robert Kaplan', *Measuring Business Excellence*, vol. 7, no.1, pp. 30-35.

De Vaus, D.A. 1995, *Surveys in Social Research*, 4th edition, Allen & Unwin, St Leonards, Australia.

Dixon, J.R., Nanni, A.J., & Vollmann, T.E. 1990, *The new performance challenge: measuring operations for world-class competition*, Dow-Jones-Irwin, Homewood, IL.

Eccles, R.G. 1991, 'The performance measurement manifesto', *Harvard Business Review*, vol. 69, no. 1, January-February, pp. 131-137.

Eom, S.B., Lee, S.M., Kim, E.B., & Somarajan, C. 1998, 'A survey of decision support system applications (1988-1994)', *Journal of Operational Research Society*, vol. 49, no. 2, pp. 109 – 120.

Epstein, M. & Manzoni, F. 1998, 'Implementing Corporate Strategy: From Tableaux de Bord to Balanced Scorecard', *European Management Journal*, vol. 16, no. 2, pp. 190-203.

Felix, G.H. & Riggs J.L. 1986, *Productivity by the Objectives Matrix,* Oregon Productivity Center, Corvalis, OR.

Fitzgerald L., Johnston R., Brignall T.J., Silvestro R. & Voss C. 1991, *Performance Measurement in Service Business*, CIMA, London.

Foster, G. & Swenson, D.W. 1997, 'Measuring the Success of Activity-Based Cost Management and Its Determinants', *Journal of Management Accounting Research*, vol. 9, pp. 109-141.

Gauch, R.R. 2000, *Statistical Methods for Researchers made Very Simple*, University Press of America, Boston.

Gautreau, A. & Kleiner, B.H. 2001, 'Recent Trends in Performance Measurement Systems – the Balanced Scorecard Approach', *Management Research News*, vol. 24, no. 3/4, pp. 153-156.

Gumbus, A. & Lyons, B. 2002, 'The Balanced Scorecard at Philips Electronics', *Strategic Finance*, Nov, vol. 84, no. 5, pp. 45-49.

Heiman, G.W 1992, *Basic statistics for the behavioral sciences*, Houghton Mifflin Company, Boston.

Hinkle, D.E., Wiersma, W. & Jurs, S.G. 1994, *Applied statistics for behavioral sciences*, Houghton Mifflin Company, Boston.

Hopkins, W. & Hopkins, S. 1997, 'Strategic Planning – Financial Performance Relationships in Banks: A Causal Examination', *Strategic Management Journal*, vol. 18, no. 8, pp. 635-652.

Hoque, Z. & James, W. 2000, 'Linking Balanced Scorecard Measures to Size and Market Factors: Impact on Organizational Performance', *Journal of Management Accounting Research*, vol. 12, pp. 1-17.

How to use the Balanced Scorecard as a Strategic Management System, 1998, conference, Sydney, Melbourne, Canberra, Auckland.

Ittner, C.D. & Larcker, D.F. 2003, 'Coming up short on nonfinancial performance measures', *Harvard Business Review*, vol. 81, no. 11, November, pp. 88-95.

Ittner, C.D. & Larcker, D.F. 2001, 'Assessing empirical research in managerial accounting: a value-based management perspective', *Journal of Accounting and Economics*, vol. 32, pp. 349 – 410.

Ittner, C. D. & Larcker, D. F. 2000, 'Non-financial Performance Measures: What Works and What Doesn't', *Financial Times*, October 16, pp. 1-3.

Ittner, C. D. & Larcker, D. F. 1998a, 'Innovations in Performance Measurement: Trends and Research Implications', *Journal of Management Accounting Research*, vol. 10, pp. 205-238.

Ittner, C. D & Larcker, D. F. 1998b, 'Are Nonfinancial Measures Leading Indicators of Financial Performance? An Analysis of Customer Satisfaction', *Journal of Accounting Research*, vol. 36, no. 3, Supplement, pp. 1 – 35.

Ittner, C., Larcker, D. & Randall, T., 2003, 'Performance implications of strategic performance measurement in financial services firms', *Accounting, Organizations and Society*, vol. 28, no. 7-8, pp. 715-741.

Jobson's Year Book of Public Companies 2001.

Johnson, H.T. & Kaplan, R.S. 1987, *Relevance Lost – The Rise and Fall of Management Accounting*, Harvard Business School Press, Boston.

Kald, M. & Nillson, F. 2000, 'Performance Measurement at Nordic Companies', *European Management Journal*, vol. 18, no. 1, pp. 113-127.

Kaplan, R.S. 1994, 'Devising a Balanced Scorecard Matched to Business Strategy', *Planning Review*, September/October, pp. 15-19, p. 48.

Kaplan, R.S. & Atkinson, A.A. 1998, *Advanced Management Accounting*,: Prentice Hall, Englewood Cliffs, NJ.

Kaplan, R. S. & Norton, D. P. 2001a, 'Transforming the Balanced Scorecard from Performance Measurement to Strategic management: Part I', *Accounting Horizons*, vol. 15, no. 1, pp. 87-104.

Kaplan, R. S. & Norton, D. P. 2001b, 'Transforming the Balanced Scorecard from Performance Measurement to Strategic management: Part II', *Accounting Horizons*, vol. 15, no. 2, pp. 147-160.

Kaplan, R. S. & Norton, D. P. 2001c, *The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment*, Harvard Business School Press, Boston.

Kaplan, R. S. & Norton, D. P. 1996a, 'Linking the Balanced Scorecard to Strategy', *California Management Review*, vol. 39, no. 1, pp. 53-79.

Kaplan, R. S. & Norton, D. P. 1996b, 'Using the Balanced Scorecard as a Strategic Management System', *Harvard Business Review*, vol. 74, no. 1, January-February, pp. 75-85.

Kaplan, R. S. & Norton, D. P. 1996c, *The Balanced Scorecard: Translating Strategy into Action*, Harvard Business School Press, Boston.

Kaplan, R. S. & Norton, D. P. 1996d, 'Strategic learning & the Balanced Scorecard', *Strategy & Leadership*, September/October, pp. 19-24.

Kaplan, R. S. & Norton, D. P. 1993, 'Putting the Balanced Scorecard to Work', *Harvard Business Review*, vol. 71, no. 5, September-October, pp. 134-142.

Kaplan, R. S. & Norton, D. P. 1992, 'The Balanced Scorecard - Measures That Drive Performance', *Harvard Business Review*, vol. 70, no. 1, January-February, pp. 71-79.

Keegan, D.P., Eiler, R.G. & Jones, C.R. 1989, 'Are your performance measures obsolete?', *Management Accounting*, vol. 70, no. 12, pp. 45 – 50.

Kent, R. 2001, *Data Construction and Data Analysis for Survey Research*, Palgrave, Basingtonstoke, Hampshire.

Kennerley, M. & Neely, A. 2002, 'A framework of the factors affecting the evolution of performance measurement systems' *International Journal of Operations & Production Management*, vol. 22, no. 11, pp. 1222-1245.

Knight, C. 2000, 'From Business Strategy to Balanced Scorecard', *Perform Magazine*, http://www.pbviews.com/magazine/articles/business_strategy.html, pp 1-3.

Krumwiede, K.R. 1998, 'The implementation Stages of Activity-Based Costing and the Impact of Contextual and Organizational Factors', *Journal of Management Accounting Research*, vol. 10, pp. 239-277.

Langfield-Smith, K. 1997, 'Management control systems and strategy: a critical review', *Accounting, Organizations and Society*, vol. 22, no. 2, pp. 207-232.

Lee, S. & Ko, S. A. 2000, 'Building Balanced Scorecard with SWOT Analysis, and Implementing Sun Tzu's Art of Business Management Strategies on QFD methodology', *Managerial Auditing Journal*, vol. 15, no. 1/2, pp. 68-76.

Lipe, M. & Salterio, S, 2000 'The Balanced Scorecard: Judgmental Effects on Common and Unique Performance Measures', *The Accounting Review*, vol. 75, no. 3, pp. 283-298.

Low, J. & Siesfield, T. 2000, 'Measures That Matter: Non-Financial Performance', *Perform Magazine*, http://www.pbviews.com/magazine/articles/measures_that_matter.htms, pp. 1-5.

Lynch, R.L. & Cross K.F. 1991, *Measure Up! Yardsticks for Continuos Improvement*, Basil Blackwell (2nd edition published 1995).

Malina, M.A. & Selto, F.H 2001, 'Communicating and Controlling Strategy: An Empirical Study of the Effectiveness of the Balanced Scorecard', *Journal of Management Accounting Research*, vol. 13, pp. 47-90.

Malmi, T. 2001, 'Balanced scorecards in Finnish companies: A research note', *Management Accounting Research*, vol. 12, pp. 207-220.

Marquardt, E. 2000, 'Aligning Strategy and Performance With the Balanced Scorecard - An interview with David P. Norton', http://www.cfshq/task/NTC/balanced.htm.

Mavrinac, S. & Vitale, M. 1997, 'Where are they now – revisiting the original "Balanced Scorecard" firms', *Measuring Business Performance*, no. 2, pp. 26-30.

McJorrow, S. & Cook, T. 2000a, 'Balanced Scorecard: The First Generation', *Chartered Accountants Journal*, April, pp. 5 – 8.

McJorrow, S. & Cook, T. 2000b, 'Balanced Scorecard – What Happens in Real Life', *Chartered Accountants Journal*, May, pp. 30 – 33.

McNair, C.J., Lynch, R.L. & Cross, K.F. 1990, 'Do Financial and Nonfinancial Performance Measures Have to Agree?', *Management Accounting*, November, pp. 28-35.

McNair, C.J. & Masconi, W. 1987, 'Measuring Performance in Advanced Manufacturing Environment', *Management Accounting*, July, pp. 28-31.

Mevellec, P. 1995, 'The French Approach to ABC', *Australian Accountant*, April, pp. 10-20.

Miller, J. & Israel, E. 2002, 'KPMG: Performance measurement must be linked to business strategy', *Economist Intelligence Unit*, 7 May, pp. 1-5.

Neely, A. 1999, 'The performance measurement revolution: why now and what next?', *International Journal of Operations & Production Management*, vol. 19, no. 2, pp. 205-228.

Neely, A. & Bourne, M. 2000, 'Why measurement initiatives fail', *Measuring Business Excellence*, vol. 4, no. 4, pp. 3-7.

Neely, A., Mills, J., Platts, K., Richards, H., Gregory, M., Bourne, M. & Kennerley, M. 2000, 'Performance measurement system design: developing and testing a process-based approach', *International Journal of Operations & Production Management*, vol. 20, no. 10, pp. 1119 – 1145.

Norreklit, H. 2000, 'The Balance on the Balanced Scorecard – a Critical Analysis of some of its Assumptions', *Management Accounting Research*, vol.11 , pp. 65-88.

Norton, D. 2001, 'Beware: The Unbalanced Scorecard', *Balanced Scorecard Report*, vol. 2, no. 2, Harvard College.

Nunnally, J.C. 1978, *Psychometric Theory*, 2nd edition, Mc-Graw Hill, New York.

Olve, N.G., Roy, J. & Wetter, M. 1999, *Performance Drivers: A Practical Guide to Using the Balanced Scorecard*, John Wiley & Sons, Chichester.

Otley, D. 1999, 'Performance management: a framework for management control systems research', *Management Accounting Research*, vol. 10, pp. 363-382.

Page, C. & Meyer, D. 2000, *Applied Research Design for Business and Management*, McGraw-Hill, Roseville NSW.

Paladino, B. 2000, 'What Is Strategic-Operational Misalignment Costing Your Firm Each Year?', *The Journal of Corporate Accounting & Finance*, pp. 47-56.

Penny, N. 1998, 'Calculating the Actual Financial Returns from Implementing the BSC', *How to use the Balanced Scorecard as a Strategic Management System* seminar, sponsored by GENTIA, October, Melbourne.

Powell, T.C. & Dent-Micallef, A. 1997, 'Information Technology as Competitive Advantage: the Role of Human, Business, and Technology Resources', *Strategic Management Journal*, vol. 18, no. 5, pp. 375-405.

Rai, A. & Bajwa, D. 1997, 'An Empirical Investigation into Factors Relating to the Adoption of Executive Information Systems: An Analysis of EIS for Collaboration and Decision Support', *Decision Science*, vol. 28, no. 4, pp. 939 – 978.

Ranking by Market Capitalisation, ($'000), www.brw.com.au/brwli...p500public/2001 accessed on 20 March 2002.

Renaissance Group, http://www.rens.com/viewpoint.

Rigby, D. 2001, 'Management Tools and Techniques: A Survey', *California Management Review*, vol. 43, no. 2, pp. 139 – 160.

Shank, J.K., Jewett, W.G. & Brandstad, P.A. 1995, 'The Performance Management System: Turning Strategies into Results', *Strategy, Management, Competition*, Fourth Quarter, pp. 1-11.

Schatz, W. 2000, 'The Balancing Act', *Strategic Financial Management*, Summer, pp. 40-44.

Schneiderman, A. M. 1999, 'Why Balanced Scorecards Fail' *Journal of Strategic Performance Measurement*, January, Special Edition, p. 6.

Senge, P.M. 1994, *The fifth discipline: the art and practice of learning organization*, 1st edition 1990, Doubleday/Currency, New York.

Siegel, S. & Castellan, N.J. 1988, *Nonparametric statistics for the behavioral sciences*, McGraw-Hill, 2nd edition.

Silk, S. 1998, 'Automating the balanced scorecard', *Management Accounting*, vol. 79, no. 11. pp. 38-42.

Simons, H.A. 1995, *Levers of Control: How Managers Use Innovative Control Systems*, Harvard Business School Press, Boston, MA.

Sinclair, D. & Zairi, M. 1995, 'Effective process management through performance measurement: Part III – an integrated model of total quality-based performance measurement', *Business Process Re-engineering & Management Journal*, vol. 1, no. 3, pp. 50-65.

Sirkka, L. J. & Ives, B. 1991, 'Executive Involvement and Participation in the Management of Information Technology' *MIS Quarterly*, vol. 15, no. 2, pp. 205-227.

Speckbacher, G., Bischof, J. & Pfeiffer, T. 2003, 'A descriptive analysis on the implementation of Balanced Scorecards in German-speaking countries', *Management Accounting Research*, vol. 14, pp. 361-387.

Stone, C.L. & Banks, J.M. 1997, 'The use of customer-based and employee-based performance measures in *The Times* top 500 companies', *The TQM Magazine*, vol. 9., no. 2, pp. 152-158.

Tonchia, S. 2000, 'Linking performance measurement system to strategic and organizational choices', *International Journal of Business Performance Management*, vol. 2, nos. 1/2/3, pp. 15-29.

Tiwana, A. & Ramesh, B. 2000, 'Towards a Composite Metric for Electronic Commerce ROI: an Extension of the Balanced Scorecard', working paper, J. Mack Robinson College of Business, Atlanta, GA.

Van de Ven, A. & Ferry, D. 1979, *Measuring and Assessing Organizations*, Wiley, New York.

Walsh, P. 2000, 'Counting for local experience: The score keepers – 33 scorecards form Australian private and public sector', *Australian CPA*, vol. 4, November, pp. 44-50.

Watty, K. 2001, 'Managing For Improved Performance: The Potential Of The Balanced Scorecard', *Public Sector Bulletin*, vol. 5, April, pp. 1-3.

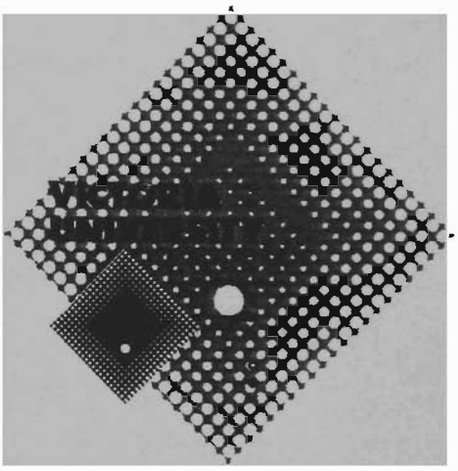
Withrow, B. 1995, 'Manage the Management Tools', *Canadian Business Review*, Summer, pp. 28-33.

Yoon, Y., Guimaraes T. & O'Neal Q. 1995, 'Exploring the Factors Associated With Expert Systems Success', *MIS Quarterly*, March, pp. 83-106.

Zikmund, W.G. 1997, *Business Research Methods*, 5th edition, The Dryden Press, Harcourt Brace College Publishers, Forth Worth, TX.

Zuboff, S. 1988, *In the Age of the Smart Machine*, Basic Books, New York.

Use and Benefits of Performance Measurement and Management Systems in Australian Listed Organisations Survey



Section 1: Organisation Details

1. **What are the main industries in which your company operates? If your company is engaged in more than one industry, please list the shares (in percent, approximate) of annual revenue in each industry.** *Please mark as many boxes as applicable.*

1. Manufacturing ☐ Food, beverages, tobacco ____ ☐ Textiles, clothing, footwear, leather ____ ☐ Wood and paper products ____ ☐ Printing, publishing, and recorded media ____ ☐ Petroleum, coal, chemical and associated products ____ ☐ Non-metallic minerals ____ ☐ Metal products ____ ☐ Machinery and equipment ____ ☐ Other ____	*2. Transport and Storage* ☐ Road transport ____ ☐ Rail transport ____ ☐ Water transport ____ ☐ Air and space transport ____ ☐ Other transport ____ ☐ Services to transport ____ ☐ Storage ____ *4. Finance and Insurance* ☐ Finance ____ ☐ Insurance ____ ☐ Services to finance & insurance ____	*3. Agriculture, Forestry and Fishing* ☐ Agriculture ____ ☐ Services to agriculture ____ ☐ Forestry and logging ____ ☐ Commercial fishing ____ *5. Mining* ☐ Coal mining ____ ☐ Oil and gas extraction ____ ☐ Metal ore mining ____ ☐ Other mining ____ ☐ Services to mining ____
6. Wholesale Trade ☐ Basic materials ____ ☐ Machinery and motor vehicles ____ ☐ Personal and household goods ____	*7. Retail Trade* ☐ Food ____ ☐ Personal and household goods ____ ☐ Motor vehicles and services ____	*8. Cultural and Recreational Services* ☐ Motion picture, radio and television services ____ ☐ Libraries, museums and the arts ____ ☐ Sport and recreation ____
9. Property and Business Services ☐ Property services ____ ☐ Business services ____	*10. Health and Community Services* ☐ Health services ____ ☐ Community services ____	*11. Construction* ☐ General construction ____ ☐ Construction trade services ____
12. Electricity, Gas & Water ☐ Electricity and gas supply ____ ☐ Water, sewerage, drainage ____	*13. Personal and Other Services* ☐ Personal services ____ ☐ Other services ____	*14. Accommodation, Cafes and Restaurants* ____
15. Communication services ____	*16. Education* ____	

2. **How many employees (full-time, part-time and casual) does your organisation employ?**

☐ Less than 50 ☐ 51 – 100 ☐ 101 – 500 ☐ More than 500

3. **What is your organisation's market capitalisation?** *Please provide the best approximate answer.*

☐ Less than 100 million ☐ 100 million – 499 million ☐ 500 million – 2 billion ☐ More than 2 billion

S[redacted]rement and management system use and characteristics

4. **Does your organization use any performance measurement and management system, other than statutory external financial reporting?** *Please mark the box as applicable and provide additional information.*

☐ Yes: how long: ☐ Less than 1 year ☐ 1 – 3 years ☐ More than 3 years
☐ System currently being developed, to be fully implemented in _____
☐ Discontinued, due to _____; How long ago _____; Description of the system _____
☐ System currently not used, but planned; How soon _____; Description of the system _____
☐ None of the above

Please proceed with the questionnaire as follows:

- *If your answer was "Yes" or "Being developed", please answer all the questions in the remainder of the questionnaire.*
- *If your answer was "Discontinued", "Planned" or "None of the above", please return the questionnaire in the enclosed, self-addressed envelope.*

5. **What type of performance measurement and reporting system is currently used in your organization?** *Please mark the box as applicable.*

☐ Balanced Scorecard ☐ Performance Scorecard
☐ Performance Dashboard ☐ Other, *please describe* _____

6. **What performance areas does the system consist of, and how many measures does it employ?** *Please mark the boxes as applicable and provide additional information.*

Performance area	*Number of measures at top management level*				
	None	1-4	5-9	10-14	15 or more
Process	☐	☐	☐	☐	☐
Customer	☐	☐	☐	☐	☐
Financial	☐	☐	☐	☐	☐
Learning and innovation	☐	☐	☐	☐	☐
Other, *please specify*					
_____	☐	☐	☐	☐	☐
_____	☐	☐	☐	☐	☐
_____	☐	☐	☐	☐	☐

7. **At what levels is performance system used in your organization ?** *Please mark as many boxes as applicable and provide additional information.*

☐ Corporate ☐ Division ☐ Departments ☐ Teams/groups ☐ Personal
☐ Business unit, *indicate whether:* ☐ All units ☐ Some units, with approximate share of organisation's revenue in %__

8. **What strategic purposes does your organization use the system for?** *Please mark the boxes as applicable and indicate how satisfied you are with the system by circling the appropriate number. 1=Very dissatisfied, 2=Somewhat dissatisfied, 3=Neither satisfied nor dissatisfied, 4=Quite satisfied, 5=Very satisfied.*

Strategic purpose	*Satisfaction*
☐ Strategy formulation	1 2 3 4 5
☐ Strategic planning	1 2 3 4 5
☐ Communicate strategic goals	1 2 3 4 5
☐ Developing personal objectives	1 2 3 4 5
☐ Developing team objectives	1 2 3 4 5
☐ Resource allocation matched to strategic priorities	1 2 3 4 5
☐ Correct implementation of strategy	1 2 3 4 5
☐ Feed-back to enable corrective action	1 2 3 4 5
☐ Improves quality of decision making and problem solving	1 2 3 4 5
☐ Replace formal reporting and control structure	1 2 3 4 5
☐ Basis for incentive and reward system	1 2 3 4 5
☐ Reporting measures to public	1 2 3 4 5
☐ Other, *please specify*	
_____	1 2 3 4 5
_____	1 2 3 4 5
_____	1 2 3 4 5

10. **How did your organisation obtain the system design and development/application software?** *Please mark the boxes as applicable.*

☐ Designed and developed in-house entirely ☐ Pre-packaged program purchased from vendor
☐ Designed in-house using external consultants, *please specify involvement of consultants:*
☐ Very little ☐ Little ☐ Moderate ☐ Significant ☐ Very significant

11. **Does your organisation's system use the link between drivers of future performance and results/outcomes?** *Please mark the boxes as applicable.*

☐ Not used ☐ Used ☐ Explicit in the system
☐ Established qualitatively (eg through discussions and managerial consensus)
☐ Established and validated quantitatively (eg statistical correlations, simulation, modelling, strategy 'mapping')

12. **To your knowledge, who are the users of performance measurement and management system information?** *Please mark the boxes as applicable and indicate (circle) the extent of use. 1=Never, 2=Rarely, 3=Sometimes, 4=Often, 5=Very often.*

User description	*Extent of use*
☐ CEO	1 2 3 4 5
☐ Other senior managers	1 2 3 4 5
☐ Board members	1 2 3 4 5
☐ Manufacturing/production personnel	1 2 3 4 5
☐ Accounting/finance personnel	1 2 3 4 5
☐ Product (service) managers	1 2 3 4 5
☐ Sales/marketing personnel	1 2 3 4 5
☐ Other managers and personnel, *please specify*	
_____	1 2 3 4 5
_____	1 2 3 4 5

13. **What area of decision making is supported by the system?** *Please mark the boxes as applicable and indicate how satisfied you are with the system by circling the appropriate number. 1=Very dissatisfied, 2=Somewhat dissatisfied, 3=Neither satisfied nor dissatisfied, 4=Quite satisfied, 5=Very satisfied.*

Decision area	*Satisfaction*
☐ Capacity management and capital investment decisions	1 2 3 4 5
☐ Working capital management decisions	1 2 3 4 5
☐ Product development decisions	1 2 3 4 5
☐ Restructuring or reorganisation decisions	1 2 3 4 5
☐ Outsourcing decisions	1 2 3 4 5
☐ Budgeting and planning	1 2 3 4 5
☐ Forecasting	1 2 3 4 5
☐ Other areas, *please specify*	
_____	1 2 3 4 5
_____	1 2 3 4 5

14. **Which creative features does your organisation's performance measurement and management system possess?** *Please mark the boxes as applicable and indicate usefulness. 1=Not at all useful, 2=Not very useful, 3=Somewhat useful, 4=Quite useful, 5=Very useful.*

Feature	*Usefulness*
☐ Ability to anticipate surprises, threats and crises	1 2 3 4 5
☐ Flexibility to adapt to unanticipated changes	1 2 3 4 5
☐ Identifying new business opportunities	1 2 3 4 5
☐ Role of identifying key problems	1 2 3 4 5
☐ Value as a basis for enhancing innovation	1 2 3 4 5
☐ Capacity to generate new ideas	1 2 3 4 5
☐ Formulating goals to be achieved in competitive environment	1 2 3 4 5
☐ Capacity to generate and evaluate strategic alternatives	1 2 3 4 5
☐ Anticipating, avoiding and removing barriers to strategy implementation	1 2 3 4 5
☐ Other, *please specify*	
_____	1 2 3 4 5
_____	1 2 3 4 5

[redacted]ation's use of the performance measurement and management system?

☐ Industry leader ☐ Close follower ☐ Middle of the pack ☐ Somewhat behind ☐ Laggard

15. **In addition to the performance measurement and management system, does your organisation use any <u>other</u> management tools and techniques, listed below?** *Please mark the box for the tool used, and indicate (circle the number) how satisfied you are with the tool. 1=Very dissatisfied, 2=Somewhat dissatisfied, 3=Neither satisfied nor dissatisfied, 4=Quite satisfied, 5=Very satisfied.*

Management tool	*Satisfaction*
☐ Benchmarking	1 2 3 4 5
☐ Growth strategies	1 2 3 4 5
☐ Strategic Alliances	1 2 3 4 5
☐ Core Competencies	1 2 3 4 5
☐ Reengineering	1 2 3 4 5
☐ Total Quality Management	1 2 3 4 5
☐ Activity Based Management	1 2 3 4 5
☐ Supply Chain Integration	1 2 3 4 5
☐ Knowledge Management	1 2 3 4 5
☐ Other, *please specify*	
_____	1 2 3 4 5
_____	1 2 3 4 5
_____	1 2 3 4 5

Section 3: Costs and benefits of the performance measurement and management system

Please state the best <u>estimate</u>, based on available information.

16. **System benefits estimate.** *Please mark the boxes as applicable and indicate the extent of dollar improvements in specific areas. 1=Very little, 2=Somewhat significant, 3=Fairly significant, 4=Very significant, 5=Extremely significant.*

Dollar improvements	*Extent*
☐ Sales and marketing	1 2 3 4 5
☐ Distribution	1 2 3 4 5
☐ Product/service design	1 2 3 4 5
☐ Customer satisfaction	1 2 3 4 5
☐ Process/operations management	1 2 3 4 5
☐ Increased market share	1 2 3 4 5
☐ Stock appreciation	1 2 3 4 5
☐ Dollar improvements in other areas, *please specify*	
_____	1 2 3 4 5
_____	1 2 3 4 5
_____	1 2 3 4 5

17. **System cost estimate.** *Please indicate the share of each cost item.*

Cost category	*% of total cost*					
	No cost	Less than 20	20-39	40–59	60–79	80 or more
Computer application	☐	☐	☐	☐	☐	☐
Consultancy fees	☐	☐	☐	☐	☐	☐
Data collection	☐	☐	☐	☐	☐	☐
Training	☐	☐	☐	☐	☐	☐
Other costs	☐	☐	☐	☐	☐	☐

18. **Budget efficiency**

System cost within budget: ☐ Yes ☐ No

Section 4: Success factor and barriers to implementation of the system

19. **What are the success factors of performance measurement and management system in your organization?**
Please mark the boxes as applicable and indicate the importance. 1=Not at all important, 2=Not so important, 3=Neutral, 4=Fairly important, 5=Very important.

Success factor	*Importance*
☐ Supported by senior executives	1 2 3 4 5
☐ Full acceptance at all levels of organization	1 2 3 4 5
☐ Successfully delegated to staff and consultants	1 2 3 4 5
☐ Individual accountability for results	1 2 3 4 5
☐ Related to immediate problems	1 2 3 4 5
☐ Demonstrates results rapidly	1 2 3 4 5
☐ Direct impact on bottom-line	1 2 3 4 5
☐ Allows realistic target-setting	1 2 3 4 5
☐ Relies on existing resources	1 2 3 4 5
☐ Drivers of future performance easy to identify	1 2 3 4 5
☐ Good fit between objectives and measures easy to establish	1 2 3 4 5
☐ Can be implemented in increments	1 2 3 4 5
☐ Easy to manage	1 2 3 4 5
☐ Other factors, *please specify*	
_____	1 2 3 4 5
_____	1 2 3 4 5
_____	1 2 3 4 5

20. Barriers to implementation of the system. *Please mark the boxes as applicable and indicate the importance. 1=Not at all important, 2=Not so important, 3=Neutral, 4=Fairly important, 5=Very important.*

Barrier	*Importance*
☐ System not supportive of strategy	1 2 3 4 5
☐ Too many measures and too complex	1 2 3 4 5
☐ Not understood by employees	1 2 3 4 5
☐ Not adopted by employees	1 2 3 4 5
☐ Organizational culture not performance oriented	1 2 3 4 5
☐ Resistance due to vested interests	1 2 3 4 5
☐ Resistance due to anxiety	1 2 3 4 5
☐ System prone to managerial and employee manipulation	1 2 3 4 5
☐ Fear of sensitive information being revealed	1 2 3 4 5
☐ Wrong configuration of physical resources, human resources, systems and procedures	1 2 3 4 5
☐ Insufficient resources	1 2 3 4 5
☐ Important stakeholders excluded	1 2 3 4 5
☐ Hierarchical top-down method	1 2 3 4 5
☐ Data required to generate performance indicators not available	1 2 3 4 5
☐ Data not readily accessible from present information systems	1 2 3 4 5
☐ Other, *please specify*	
_____	1 2 3 4 5
_____	1 2 3 4 5
_____	1 2 3 4 5

Section 5: Respondent Details

21. **What is your position in the organization?** *Please mark the box as applicable.*

☐ CEO ☐ Managing Director/Director ☐ Senior Manager ☐ Manager ☐ Other, *please specify* _____

22. **What is your primary area of expertise?** *Please mark the box as applicable.*

☐ Financial Accounting ☐ Finance ☐ Management Accounting ☐ Engineering
☐ Information Systems ☐ Manufacturing ☐ Sales ☐ Marketing
☐ Purchasing ☐ Human Resources ☐ Other, *please specify* _____

23. How many years have you held your **current position?** ☐ Less than 2 ☐ 2–5 ☐ More than 5

24. **How many years have you been with the organisation?** ☐ Less than 2 ☐ 2–5 ☐ More than 5

25. **Is performance measurement a formal role of your position?** *Please mark the box and provide additional information.*

☐ Yes ☐ No

If your answer was "No", what are your actual performance measurement responsibilities?

_____

_____

26. **What is your highest level of education?** *Please mark the box as applicable.*

☐ Secondary ☐ Undergraduate ☐ Postgraduate (*please specify the level*) _____

Thank you for taking the time to complete the questionnaire. Your contribution is very valuable and we appreciate it. Please return the completed form in the enclosed, self addressed envelope.

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VICTORIA UNIVERSITY OF TECHNOLOGY

Organisation
Att.: ?
Street
City

Date

Dear Sir/Madam,

This short survey is designed to study current practices in organisational performance management. It is being sent to a selected sample of the Australian organizations listed on Australian Stock Exchange. Authorised by the Victoria University, it forms part of a research project which aims to improve the use of performance measurement and management systems.

As you complete the questionnaire, the key term being utilised **'Performance Measurement and Management System'** means a system comprising of performance measures in process, customer and organisational learning and innovation areas, in addition to financial measures and indicators. Such a system may also use measures from other non-financial areas, and is usually described as a Balanced Scorecard, Performance Scorecard or Performance Dashboard.

In order to ensure the utmost confidentiality, this survey is completely anonymous.

If you would like a summary of survey results or take part in a follow-up to this survey, please mark the box in the enclosed sheet, and return it in the separate self-addressed envelope.

Please ensure that the questionnaire is completed by the manager, management accountant, or other officer with responsibility for the development and implementation of the performance measurement and management system.

I would be happy to answer any questions you might have. Please call on (03)9248 1073, or send an email to Zdenko.Miholcic@research.vu.edu.au

Thank you for the courtesy of your assistance.

Very sincerely yours,

Zdenko Miholcic

Doctor of Business Administration candidate

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VICTORIA UNIVERSITY OF TECHNOLOGY

17th July 2002

Dear Sir/Madam,

Four weeks ago a questionnaire titled 'Use and Benefits of Performance Measurement and Management Systems in Australian Listed Organisations Survey' was mailed to you.

If you have completed the questionnaire already, please accept our sincere thanks. If not, could you please return it at your earliest convenience. Because it was sent to a small selected representative sample it is most important that your information is included in the study.

If by some chance you did not receive the questionnaire or have mislaid it, we are enclosing another copy.

I am looking forward to receiving your completed questionnaire soon. Should you require additional information, please contact me on (03) 9248 1073, or send an email to Zdenko.Miholcic@research.vu.edu.au.

Thank you for the courtesy of your assistance.

Very sincerely yours,

Zdenko Miholcic

Doctor of Business Administration candidate