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Organization structure, competition and performance measurement systems and their joint effects on performance

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ABSTRACT

This study examines the effect of organization structure and competition on the design of performance measurement systems (PMSs) and their joint effects on performance. The design of performance measurement systems is investigated using two dimensions: the use of integrated measures related to the four perspectives of the balanced scorecard (BSC) and the stage of development of PMSs. The data for this study were collected from 168 valid responses (25.19%) of Taiwanese firms listed on the Taiwan Stock Exchange. The results indicate that organization structure is significantly associated with the design of PMSs. Compared to mechanistic organizations, organic organizations make greater use of integrated measures and the higher developmental stages of PMSs. The findings also partly support the presence of joint effects on performance involving organization structure, competition, and the use of PMSs. Specifically, the results show that when there is greater competition among firms, a positive relationship between the stages of PMS development and performance is of higher significance. Another conclusion derived from this study is that the use of integrated measures is more relevant with respect to organizational performance in mechanistic organizations than in organic ones.

1. Introduction

In relation to the appropriate use of performance measurement systems (PMSs) and their effects, contingency theory suggests that the fit between contextual factors and the design of management control systems (MCSs) is relevant to superior organizational performance (Chenhall, 2003; Ittner and Larcker, 1997; Langfield-Smith, 1997; Luft and Shields, 2003). However, the results of the impact of PMSs and their organizational context are mixed (Davis and Albright, 2004; Hoque and James, 2000; Ittner and Larcker, 1998a; Ittner et al., 2003; Malina and Selto, 2001).

The role of PMSs can be seen as allocating responsibilities and decision rights, setting performance targets, and rewarding outcomes (Merchant and Van der Stede, 2007). This role is consistent with aspects of organization structure, which is a formal control framework that encompasses reporting relationships, interactions between employees, information flows, and authority distribution with regard to carrying out activities within the organization (Burns & Stalker, 1961; Galbraith, 1973; Germain, 1996; Hall, 1987). The literature suggests important links between organization structure and performance measurement, which have been argued to be two of the most important design decisions made by managers (Abernethy et al., 2004; Langfield-Smith, 1997; Luft and Shields, 2003). The literature on PMSs emphasizes the linkages between strategy and such measures (Chenhall, 2008, 2005; Ittner et al., 2003; Kaplan and Norton, 1996, 2001; Otley, 1999), which aims to provide integrated approaches to linking operations with strategy and objectives to achieve the firm's goals in competitive markets.

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It is thus worthwhile to examine how PMSs can provide integrated information for better decision making and communication of strategic goals. This study addresses this issue by seeking to understand how organization structure and competition affect the design of PMSs, and how the contingent relationship of these two variables with such measurement systems affects organizational performance. According to Gerdin and Greve (2004), this study can be classified into two categories, including congruence and contingency type of fit.[1] The first research question is to test the congruence of fit, which considers the strength of the relationship between organization structure and the use of integrated measures/PMSs. The second research question tests the contingency form of fit to examine whether the effect of the use of PMSs on performance differs across various levels of context variables, such as organization structures and competition.

In line with previous research, this study considers the design of PMSs as having two dimensions. One is the use of integrated performance measures related to the four perspectives of the Balanced Scorecard (BSC). The other is the stages of PMS development. Prior empirical research related to the use of performance measurements has generally considered only a number of financial and nonfinancial performance measures in the organization's PMS or BSC (HassabElnaby et al., 2005; Hoque and James, 2000; Said et al., 2003; Van der Stede et al., 2006). In contrast, this paper considers the stage of PMS development as manifested in its links to strategy and incentives. In other words, besides a simple count or presence of measures in any or all of the four dimensions of the BSC, this paper also adopts the notion of measurement system linked to strategy and incentives, based on recent calls for viewing a PMS in a "causal model" or "strategy map" context (Kaplan and Norton, 2001; Ittner and Larcker, 2003). Given the causal links between performance measures, objectives and strategy contained in a PMS, achieving objectives by managers is dependent on the presence of incentives tied to the attainment of these goals (Ittner and Larcker, 2003; Webb, 2004). PMSs with cause-effect links between strategy, objectives, and incentives that are perceived to be strong will increase the attractiveness of achieving these aims.

Considering these features of PMS, we follow Speckbacher et al. (2003) and classify the stage of development of such systems in this study into three types. (1) Minimum-standard PMSs, i.e. those that only contain integrated performance measures in any or all of the four BSC dimensions. (2) Cause-and-effect PMSs, i.e. those that link to strategy by using cause-and-effect relationships. (3) Fully-developed PMSs, i.e. those that contain linkages to strategy and incentives as well as integrated performance measures related to the four perspectives of the BSC and encompassing cause-and-effect relationships between measures and strategy.

This study seeks to contribute to the management accounting literature in two main respects. First, it integrates organization structure, competition and the design of PMSs to explore the fit of the MCSs in organizations. In the congruence type of MCS research, the main purpose is to test if the MCS design is associated with context variables (see e.g. Frucot and Shearon, 1991; Kaplan and Mackey, 1992). This study thus meets previous calls in the literature for attention to be paid to the congruence type of MCS research concerning the relationship between PMS design and the context of organization structure and competition (Abernethy et al., 2004; Berry et al., 2009; Bromwich, 1990; Hoque et al., 2001; Langfield-Smith, 1997; Luft and Shields, 2003). More specifically, this study examines the effectiveness of the use of PMSs in competitive markets, as well as in different organization structures. This work also meets the need for the contingency type of MCS research to explore the consequences of different MCS designs across different context levels (Abernethy and Lillis, 1995; Bisbe and Otley, 2004; Brownell and Merchant, 1990). Second, this study extends the literature on the usage of financial and nonfinancial performance measures by considering the linkage of strategies, incentive schemes and performance measurements, as prior research has primarily discussed the effects of the use of nonfinancial measures on performance (e.g., Banker et al., 2000; HassabElnaby et al., 2005; Hoque and James, 2000; Said et al., 2003).

The next section reviews the related literature and develops the research hypotheses. The third section presents the research and survey design. The fourth section presents the empirical results. The fifth section discusses the findings, conclusion and limitations of the study, and suggests directions for future research.

2. Literature and hypotheses

There is a large and growing amount of literature on the use of PMS, including both financial and non-financial performance measures (Bhimani and Langfield-Smith, 2007; Banker et al., 2000; Chenhall, 1997; Ittner et al., 1997; Otley, 1999). There has also been considerable research exploring the impact of PMS on financial performance (Ittner and Larcker, 1998a, 2001; Hoque and James, 2000; Van der Stede et al., 2006). This study aims to examine the association and effectiveness of the fit between the use of PMSs and two contextual variables–organization structure internally and competition externally.

2.1. Performance measurement system

A PMS is a mechanism to allocate responsibilities and decision rights, set performance targets, and reward the achievement of targets (Merchant and Van der Stede, 2007; Otley, 1999). To perform these roles effectively, there is a need to innovate with regards to the means of mea-

[1] Congruence type of fit assumes the dependency of organizational design on context (e.g., environment, technology, size, or task etc.), disregarding the effect on performance brought by this relationship (Drazin and Van de Ven, 1985). The contingency type of fit is referred to as a positive impact on performance due to combinations of context and organizational design. Moderated regression analysis is the technique frequently used for analyzing contingency type to explain variations in performance in terms of interaction effects between context and organizational design. The moderating role of performance measurement has been explored in contexts of task and environmental uncertainty (Hirst, 1983, Scott and Tiessen, 1999), and within advanced manufacturing settings such as flexible manufacturing, total quality management and JIT (Abernethy and Lillis, 1995; Banker et al., 1993; Chenhall, 1997; Young and Selto, 1991).

suring performance within organizations (Chenhall and Langfield-Smith, 1998; Ittner and Larcker, 1998b; Kaplan and Norton, 1996, 2001; Libby and Waterhouse, 1996; Lillis, 2002). The simplest approach for developing an innovative PMS is the use of an integrated set of financial and non-financial measures (Ittner et al., 2003). Advocates of this approach argue that it can lead to superior firm performance (e.g., Banker et al., 2000; Lingle and Schiemann, 1996; Hoque and James, 2000).

In addition to this relatively simple approach, there are also calls for innovative PMSs to include financial and non-financial performance measures, as well as explaining cause-and-effect relationships between the various measures, and providing better links between PMS and factors such as strategy and compensation (Ittner and Larcker, 1998b; Kaplan and Norton, 1996, 2001; Otley, 1999). This calls for the need to develop a PMS that establishes causal links among measures, strategies and outcomes. The BSC proposed by Kaplan and Norton (1996) is one of the most well-known PMSs that attempts to incorporate these elements. The BSC has been classified into three different types of innovative PMS–the minimum-standard PMS, the cause-and-effect PMS, and the fully developed PMS (Speckbacher et al., 2003).

(1) The minimum-standard PMS can be defined as a system that combines financial and non-financial measures in the four BSC dimensions, namely financial, customer, internal process, and learning and growth. The goal of PMSs is to help allocate resources, assess and communicate progress toward strategic objectives, and to evaluate managerial performance (Ittner and Larcker, 2003). To achieve this goal, organizations can adopt performance measures which encompass the cause-and-effect relationships that may exist between their strategic objectives, measures and outcomes. (2) The cause-and-effect PMS includes consideration of financial and non-financial measures, and additionally describes the strategies and measures using cause-and-effect relationships. Given the cause-effect relationship of a PMS, the achievement of strategic goals is of greater attractiveness to managers if and when they are rewarded in terms of their achievement of financial and non-financial goals. (3) The fully developed PMS implements the firm's strategy by defining the objectives, outcomes and connecting incentives with the PMS, while at the same time including integrated performance measures and cause-and-effect relationships between strategies and measures. These three types of PMSs can be interpreted as the three typical evolutionary stages in PMS implementation (Ittner and Larcker, 1998b; Ittner et al., 2003; Kaplan and Norton, 1996, 2001; Otley, 1999).

This paper uses two approaches to assess PMSs. One is the use of an integrated PMS within the four perspectives of the BSC, while the other approach adopts the above three types of PMSs to identify the development stages.

2.2. Organization structure and performance measurement system design

Contingency-based research suggests that the formal organization structure affects the design of MCSs (Foster and Swenson, 1997; Gosselin, 1997; Shields, 1995). A PMS is an integral part of an organization, interacting with the organization structure to enhance control (Waterhouse and Tiessen, 1978). A PMS can therefore be expected to assimilate into the organization structure. The organization structure has been conceptualized on a continuum, ranging from mechanistic to organic (Burns and Stalker, 1961). Mechanistic organizations tend to have more organizational levels, higher centralization, more formal rules, a narrower control range, and a greater reliance on vertical instruction in communication. In contrast, organic structures contain fewer layers in the hierarchy, greater decentralization, fewer formal rules, a wider control range, and a horizontal mode of communication (Tosi and Carroll, 1976; Hage, 1980; Nahm et al., 2003).

Organic structures have two specific features (French and Bell, 1984). One is that they are adaptive and flexible with regards to tackling new problems or opportunities in task assignments. The other feature is that organic structures utilize decentralized authority and control to encourage widespread communication within the firm. These features create greater information processing requirements for proper coordination, communication and control at lower levels (Galbraith, 1973; Gordon and Narayanan, 1984). Integrated information is therefore required to aid the various decisions made by decentralized managers, such as those with respect to pricing, marketing and inventory control (Chenhall and Morris, 1986). A PMS can guide the behaviors of decentralized units through integrated performance measurements in coordinating delegated decision-making (Dossi and Patelli, 2008). Integrated measurements foster the informative value of a PMS as they provide a better understanding of the results of various activities performed by decentralized units. There is evidence that integrated performance measures can provide information on managerial actions that are not fully captured by financial measures (e.g., Lambert, 2001; Lillis, 2002). In addition, an organic structure is likely to be associated with the use of broad and future-oriented information (Gordon and Narayanan, 1984), such as that provided by integrated performance measures.

Since an organic organization has a higher level of integration than a mechanistic one, it is required to integrate and coordinate various departments with different functions. In addition, it uses a PMS that contains non-financial and financial measures, focuses on the external conditions, and can generate extensive information (Kaplan & Norton, 2001; Scott & Tiessen, 1999). The combination of financial and non-financial measures allows various functional departments to have a broad understanding of the performance information in their units which aids communicating the firm's strategic objectives and control operation at each layer.

The above arguments suggest that integrated performance measures enhance decision-making in organic structures by satisfying their information requirements. Thus, the following hypothesis is proposed.

H1a. Organic organizations will make greater use of integrated measures than mechanistic organizations.

In organic structures, decision-making is assigned at lower levels and managers and employees have access to information which is not available to their superiors. However, procedures that increase the visibility of performance drivers enhance organizational effectiveness. The visibility of performance drivers is the degree to which organizations can evaluate the relationship between inputs and outcomes (Waterhouse and Tiessen, 1978). The relationships between efforts and outcomes can be illustrated by the causal models in a PMS.

Apart from decentralization, there is also a need for horizontal communication and an increase in cooperation among departments to achieve the organic organization's objectives (Tosi and Carroll, 1976; Hage, 1980). Prior research highlights the fact that developing and communicating the causal models within PMS can increase the managers' understanding of the underlying drivers of economic performance in their business units (e.g., Gumbus and Lyons, 2002; Malina and Selto, 2001, 2004). As a communication tool, a PMS can be used to facilitate decision-making and influence actions (Malina and Selto, 2004; Zimmerman, 2006). Webb (2004) indicates that the strength of the cause-effect relations between the measures and strategies contained in a PMS has a positive effect on the managers' commitment to their goals.

The literature also suggests that employees in organic structures will have greater commitments to firm policy if communication is open and flows freely (Chenhall and Morris, 1995). Therefore, organic organizations with their higher need for networked communication can be expected to make greater use of PMSs that reveal the causal relationships between measures and strategies. The features of integrated information, communication tools and causal relationships in formal systems, such as a PMS encompassing causal relationships, are not consistent with the formal controls which mechanistic organizations rely on. The specific aspects of formal controls in mechanistic organizations have been described as diagnostic controls (Simons, 1995). They are regarded as either output controls (Merchant, 1985) or a formalized control procedure (Waterhouse and Tiessen, 1978).

Evidently, a PMS provides not only performance information, but also acts as an incentive mechanism. It has been claimed that the linkage between performance measures and incentives can lead to improved goal congruence between organizations and employees (Malina and Selto, 2001; Webb, 2004). In international business contexts, studies have argued that the linkage of a PMS to incentive systems improves the effectiveness of controlling subsidiaries (Dossi and Patelli, 2008; Goold and Campbell, 1987). The more authority is delegated to lower managers, the greater the need for organizations to rely on incentive schemes. It is thus expected that the use of a PMS that is tied to incentives has a positive association with organic structures. In contrast, mechanistic structures are less flexible, and centralized decision-making may limit the range of compensation awarded to managers (Das, 1986). This limitation indirectly reduces the possible incentive effect of linking PMSs to incentive systems in mechanistic structures.

In summary, organic organizations will exhibit a stronger motivation to use a PMS that encompasses causal models and establishes linkages between incentives and strategy for planning, evaluating and controlling purposes.

H1b. Organic organizations will make greater use (than mechanistic organizations) of PMSs that include causal models and establish linkages with incentives.

2.3. Competition and the use of performance measurement systems

Competition is a powerful contextual factor affecting both organizational design and performance. Organizations facing intense competition need to design and use appropriate control systems to maintain viability and prosperity (Cooper, 1995; Kaplan and Cooper, 1998; Khandawalla, 1972; Bromwich, 1990). Prior empirical studies suggest that the intensity of market competition is positively associated with particular uses of the management accounting system (MAS) (Hill, 2000; Mia and Clarke, 1999; Libby and Waterhouse, 1996). For example, Hill (2000) found a positive relationship between the adoption of a costing system and increased competition in the hospital sector. Specifically, Hill found that competition intensity increases demands for accounting information where price-based competition occurs, as price competition induces organizations to reduce costs, which indirectly increases the demand for accounting information to manage costs.

As a result of increased competition, customers have increased demands with respect to quality and efficiency (Anderson and Lanen, 1999; Chenhall, 1997). In addition, firms are concerned with novel ways to differentiate themselves, such as through process technology development and innovation (Dunk, 2004; Berggren and Nacher, 2001). Information on customer satisfaction, process management and innovation is thus becoming increasingly important. The use of financial measures in a PMS is widespread, and the adoption of non-financial measures that focus on a set of operational outcomes and link these with the firm's strategic intentions is becoming increasingly common. Indeed, growing competition has increased the appeal of non-financial performance measures, as these can be leading indicators of financial performance (Amir and Lev, 1996; Banker et al., 2000; Ittner and Larcker, 1998a). Lynch and Cross (1995) argued that performance measures should lead to behavior generating continuous improvement in key areas of competition, such as customer satisfaction, flexibility and productivity.

Scott and Tiessen (1999) also suggested that performance measures should provide a set of integrated information, which is necessary for decision-making and to reward performance in the face of increased competition. As a result, the more competitive the environment in which the firm operates, the more it needs to use integrated measures. Integration of non-financial and financial measures provides reliable feedback for performance evaluation, and thus allows organizations to deal with external competition (Chapman, 1997; Otley, 1999; Kaplan and Norton, 1996). The preceding discussion provides the basis for the

following hypothesis concerning the relationship between competition and the use of integrated measures.

H2a. The intensity of the competition the firm faces is positively associated with the use of integrated measures.

Prior literature is concerned about the potentially conflicting signals from integrated performance measures used as indicators of strategies (Baker, 1992; Malina and Selto, 2004; Van der Stede et al., 2006). An example of this problem is that the conflicting targets of a low defect rate and an increasing number of new product launches could lead to goal incongruence in a competitive market. Another example is that although strategic goals focus on the growth rate of a particular market, the emphasis in the firm's performance reports is placed on the profitability of each production line. Hence, compensation is based on other indicators, and conflicts between strategy, measures and incentives disrupt the formulation and implementation of strategic goals. To foster goal congruence, the use of a PMS should reveal the causal relationships and provide incentives for the achievement of financial goals (Ittner and Larcker, 1998b; Malina and Selto, 2001; Webb, 2004). The reasons can be explained as follows.

Firstly, firms establish PMSs on the basis of causal models which are expected to become effective tools for communicating strategy (Ittner and Larcker, 2003; Kaplan and Norton, 2001; Malina and Selto, 2001). A causal model providing the plausible cause-and-effect relationship between non-financial measures and future economic performance would present clear causal relationship in the face of intensifying competition. For instance, products and services with considerable alternatives in highly competitive markets will reflect a clear relationship between quality and customer satisfaction (Banker and Mashruwala, 2007). Firms facing intense competition will have stronger motivation to use PMSs encompassing causal models to obtain such clearer causal relationships.

Secondly, the provision of incentives for achieving financial outcomes allows organizations facing competitive pressures to match their strategies to their incentive system by motivating employees and to facilitate smoother communication of these approaches (Gupta and Govindarajan, 1984). Based on a causal model, an incentive system that rewards the achievement of pre-defined targets, such as increased product quality, may lead to better organizational outcomes, such as higher quality goods and higher customer satisfaction. Indeed, a means of linking incentives to goals can enhance the communication of strategies, which is regarded as a source of competitive advantage (Malina and Selto, 2001, 2004).

Thus, a PMS which establishes causal relationships and links incentives to outcomes is useful for delineating the relationship between inputs and outcomes, as well as to motivate workers to implement the firm's strategy in the face of intense competition. Based on the above reasoning, the following hypothesis is developed.

H2b. The intensity of the market competition that a firm faces is positively associated with the use of PMSs encompassing causal models and linkages to incentives.

2.4. Organization structure, performance measurement systems, and organizational performance

The relationship between the use of PMSs and organizational performance has been examined in prior research. However, recent studies have provided mixed results on the effects of the adoption of BSC on organizational outcomes (Davis and Albright, 2004; Hoque and James, 2000; Ittner et al., 2003; Malina and Selto, 2001). Contingency theory suggests that the effectiveness of organizational design depends on the match between organization design and contextual variables (Chapman, 1997; Chenhall, 2003). However, the extent to which the fit between PMSs and organization structure affects organizational performance is not well understood.

The implication of contingency theory is that the organization can achieve superior performance when the MAS design meets the specific informational requirements of the organization. Chenhall and Morris (1986) suggest that decentralized managers require integrated information to support their decisions. Similarly, Chia (1995) found that the need for integrated information from the MAS is greater in decentralized organization structures, thereby resulting in better performance. This is because managers in decentralized organizations have different responsibilities and objectives. Integrated information, which provides a coordinating role in the control of organizational units, enables managers to make effective decisions and thus achieve better performance.

Nevertheless, the effectiveness of using PMSs is determined by the implementation process, consisting of both the adoption and implementation stages. It is easier to adopt an innovative management system within an organic organization, while such a system is better implemented in a mechanistic one (Rogers, 1983). A possible reason for this is that as an organic structure is decentralized, with increased interaction and flexibility between departments, coordination problems will appear where different departments have different operational systems. However, there is little research about the effect of implementing a MAS in an organic organization. Gosselin (1997) provides some evidence that while organic organizations may only partially implement an innovative cost system, such a system plays an integral part in mechanistic organizations. This evidence suggests that the implementation of innovation is more difficult in organic organizations, because less formal organizations with less standardized activities that adopt innovation are not likely to go through the implementation process of innovation itself in an efficient manner. Extending this view to the effectiveness of the use of PMSs, it is worth considering whether the limitations of implementing such systems outweigh the benefits of having integrated measurement information, causal models, and linkages to incentives.

An alternative viewpoint suggests that procedural specification would be an efficient means of supervision (Gouldner, 1964). Waterhouse and Tiessen (1978) argued that mechanistic structures (in contrast to organic forms) have more specified procedures, and there is a greater likelihood that such organizations implement evaluations based on specified procedures. In contrast, an organic

structure is not characterized by highly specified or formalized procedures (Burns and Stalker, 1961). Hence, the less formalized the procedures, the more costly it will be to implement evaluations based on measures of specified procedures in organic structures, as opposed to mechanistic ones. The centralization of decision-making authority increases information processing efficiency and effectiveness (Jansen et al., 2006), and thus it could be argued that the effectiveness of using integrated measures is higher in mechanistic structures than in organic ones. Therefore, the third hypothesis is proposed.

H3a. The positive effect of the use of integrated measures on organizational performance is stronger in mechanistic organizations than in organic organizations.

Despite the costly procedures required in taking measurements, PMSs reflecting cause-and-effect relationships might promote positive organizational outcomes such as guidance for subunits' responsibility in decision making (e.g., Ittner and Larcker, 2003; Kaplan and Norton, 1996). Department managers are held responsible for the financial outcomes of investments, the execution of strategy and the management of operations. PMSs have to incorporate these variables into their design (Bruggeman, 2004). When the responsibility of executing strategies is delegated to entity managers, causal models within PMSs are able to influence decisions and predict the outcome of the strategy chosen. Managers having information related to cause-and-effect relationships make a greater contribution to overall performance in organic organizations than in mechanistic structures because they have more authority to make decisions in such organizations.

Besides, less structured organic entities must cooperate and communicate with each other in key areas (Burns and Stalker, 1961; Galbraith, 1973; Hage, 1980). It is important for organic structures that a PMS's causal models be used for the managers to communicate strategic goals. Thus, through reflecting causal models and providing linkages to incentives, the PMS will create more effective motivation by influencing lower managers' decisions in organic structures. In all, such a PMS would make up for the limitations of procedure specification and increase effectiveness in organic organizations.

This study argues that the use of PMSs reflecting causal models and providing linkages to incentives in an organic structure will achieve superior performance compared to those used in a mechanistic structure. This leads to the next hypothesis.

H3b. The positive effect of the use of PMSs, encompassing causal models and providing linkages to incentives, on organizational performance is stronger in organic organizations than in mechanistic organizations.

2.5. Market competition, performance measurement systems, and organizational performance

This section addresses the growing importance of the use of the PMS with increasing competition. The increase in scope of performance measures beyond solely financial ones will provide comprehensive information about market outcomes and enable a firm to achieve advantages over competitors.

Global competition causes organizations to evaluate processes in order to become more competitive in the global economy (Galbraith, 1993). There is also the view that, to compete in the global market, companies need to continually improve their key processes (Lynch and Cross, 1995; Kaplan and Norton, 1996). Monitoring competitive competencies is thus crucial, as it enables firms to identify areas which provide value or non-value added activities to customers (Miles and Snow, 1978; Merchant, 1984). Financial measures might not suffice for evaluating value added activities for gaining strategic advantages. As a result, the firm should supplement these to evaluate past performance with nonfinancial measures to strive for long-term financial and competitive performance (Kaplan and Norton, 1996; Ittner and Larcker, 1998b; Otley, 1999). Organizations using integrated performance measures could monitor and evaluate various processes as well because they also enhance competitiveness. The benefits created by the use of integrated measures would be greater when competition is more intensive.

H4a. The positive association between the use of integrated measures and organizational performance is greater when competition is more intense.

If a PMS could effectively communicate strategy and encourage employees towards achievement of goals, then organizational performance could be improved (Chenhall and Langfield-Smith, 1998; Kaplan and Norton, 1996, 2001). Nonfinancial measures effectively communicate the organization's strategy, as they are the linkages between the financial performance and strategy. For example, customer purchases create financial value. Employee skill can positively affect internal process input and the quality of production, which in turn influences customer buying behaviour, which in turn drives performance. The causal model provides a map to communicate this pathway. This pathway could be clearer as the level of competition becomes higher.

A good illustration of this is found in Banker and Mashruwala (2007). They use five years of operational data from a large department store chain to examine the effect of competition on the relation between nonfinancial information and financial performance. The results suggest that nonfinancial performance information has a stronger relation with financial performance in the presence of higher competition. Given this evidence, it could be suggested that in competitive environments customers change their purchasing behavior more easily, so the leading information provided by nonfinancial measures (e.g., customer satisfaction) is more valuable. The enhanced linkages between different variables in the causal model would provide valuable information about future outcomes in an intensely competitive market.

If the PMS can establish causal models and linkages between incentives and measures, it can increase the organization's awareness of the linkage between input, output, and strategy, and have the ability to motivate employees and then better deal with competitors. It could be argued that the greater the market competition the more

the use of PMSs, which encompasses causal models and establishes linkages to incentives, could result in superior performance. This relationship is presented in the following hypothesis.

H4b. When market competition is more intensive, the use of PMSs encompassing the causal model and providing linkages to incentives is positively associated with organizational performance.

As argued earlier, these hypotheses posit that firms with organic structures or in intensely competitive environments will use more integrated performance measures and PMS with causal models and linkages to incentives. Hence, when the use of PMS is well suited to organization structure and the level of competition, superior performance can be obtained.

3. Research and survey design

3.1. Survey sample and data collection

For firms in emerging economies, the adoption of "Western" MCS practices is seen as a vital factor to compete in the global markets (Luo and Tung, 2007; O'Connor et al., 2004). Taiwanese firms have been exposed to global market competition and operated under international management systems for the last two decades. Thus, the effectiveness of their implementation of innovative PMSs is worth examining. This study is based on questionnaires sent to the executive financial officers (CFOs) of all 667 firms listed on the Taiwan Stock Exchange. This target sample was selected for three reasons. First, listed firms are large firms and representative of various industries. Second, these firms have complex internal operations that are likely to exhibit the integration of strategy, PMSs and incentives with the management of organizational operations. Third, this study is conducted at the corporate level, as the survey was sent to the CFO of listed firms on the Taiwanese stock exchange. In contrast, in contingency related research, most studies have focused on contextual factors such as strategy at the business level, and only a few have focused on the corporate level. Admittedly, some contingency factors are more relevant at the business level, e.g. product life cycle, strategic groups, and other factors often can be considered at both levels (Ginsberg and Venkatraman, 1985). More research is called for to establish the relationship between and the different impacts of these two levels. The results of this study provide insights for top managers involved in the design of corporate-wide management control systems. In addition, the survey was sent to CFOs because they are typically responsible for PMSs and at a high enough level in the organization to be well informed about both the firm and market competition (Baird et al., 2004; Gosselin, 1997; Hoque and James, 2000; Krumwiede, 1998).

In administering the survey, this study followed Dillman (2000) to try and improve response rates. A questionnaire package comprising of a cover letter and a pre-addressed, postage-paid envelope was directly mailed out to each CFO. After two weeks, the first follow-up was a phone call and a reminder letter sent to each CFO to create early interest. After two more weeks, a second reminder letter, which included a cover letter, questionnaire, and reply envelope, was sent to those who had not yet replied. After following these steps, a total of 177 replies were received. In total, there were 168 valid responses (25.19%) after excluding seven with incomplete answers. Sixty three of these 168 valid responses were received after mailing the second reminder letter.

No significant differences were found in the proportion of each industrial category of respondent firms and the original list of firms (Chi-square = 17.38, degrees of freedom = 12, $p > 0.1$). Furthermore, tests conducted on the first and second questionnaire mailing responses, as suggested by Oppenheim (1966), yielded no significant differences in mean scores for the main variables between early and late respondents.

Table 1 reports information on the sample firms' industry classification, size, capital, and strategy.

The greatest proportion of sample firms (33.3%) was from the electronics industry, followed by financial services and insurance (16.7%). Forty-seven percent of the sample firms were in high-tech industries. Fifty-one point eight percent of sample firms had over 800 employees. It can also be observed that approximately 56% of the sample firms pursued a cost leadership strategy.

3.2. Variables

The questionnaire gathered information on performance measures, the stages of PMS development, organizational structure, market competition, and organizational performance, and was developed based on the established literature. The questionnaire was also pretested through interviews with four managers not included in the original sample, all with more than ten years of managerial work experience. Two interviewees were senior managers in the listed Taiwanese firms, one interviewee was the general manager in a manufacturing company, and the other was the human resources manager in an automobile company. The other two interviewees were general managers in consulting firms. The industries the interviewees had worked in previously covered a board range, including food, leisure products, electronics, automobiles, finance and insurance. Each interview lasted about 1 h.

In addition to completing the questionnaire, interviewees were asked about the readability of the instrument, clarity of instructions and to provide any other suggestions they had for improving the questionnaire. We also had discussions with managers on the perceived importance of the factors with respect to their organization structures, their organization's competitors, their use of PMSs, and the assessment of their organizational performance. Their feedback was gathered to modify the instrument and improve its face validity. As a result, items that originally mentioned 'product' were changed to also include 'service', because the interviewees suggested that this is more appropriate for service firms. In addition, the item on the number of competitors was combined with the item stating the competitors' actions in order to measure competitive behavior. This combination was a response to the interviewees' opinion that Taiwan's domestic market is not large

Table 1
Characteristics of respondent companies.

Items	Classification	Frequency	Percentage (%)
Industries	Cement	4	2.4
	Foods	5	3.0
	Plastics	3	1.8
	Textiles	11	6.5
	Electric machinery	14	8.3
	Electrical and cable	2	1.2
	Chemicals and bio-technology	11	6.5
	Glass and ceramics	1	0.6
	Steel and iron	5	3.0
	Rubber	1	0.6
	Automobile	2	1.2
	Electronics	56	33.3
	Construction	9	5.4
	Transportation	5	3.0
	Financial and insurance	28	16.7
	Wholesale and retails	2	1.2
	Others	9	5.4
Capital (New Taiwanese dollar)	3–5 (hundred million)	4	2.4
	5–10	26	15.5
	10–15	21	12.5
	15–20	17	10.1
	>20	100	59.5
Number of employees	<100	6	3.6
	101–250	21	12.5
	251–400	18	10.7
	401–800	36	21.4
	>800	87	51.8
Strategy	Cost leadership	94	56.0
	Others	74	44.0

enough, and thus it is important for Taiwanese firms to enter the international market.[2] As a result, the number of competitors cannot be easily identified. Thus, the item "the actions of competing companies are a great threat to your company" was developed to measure both the number of competitors and their actions. The interviewees also suggested that the achievement of budget is usually used to evaluate budget plans. A budget is one important system of MCSs (Chenhall, 2003) and commonly used in practice. The item "the achievement level of budget goals" was thus added in questionnaire.

During the interviews, the general manager of a manufacturing company, which produces leisure products, e.g. golf clubs and heads, indicated that the use of PMS was influenced by the implementation of the Toyota Production System (TPS). The Toyota production system, originally referred to as just-in-time (JIT), was developed by Toyota Motor Corporation to achieve cost-efficiency and reduce wastage of resources (Kato, 1993; Kennedy and Widener, 2008).[3] The implementation of TPS was a requirement by the company's main customer. TPS not only helps managers to reduce costs but also to shorten the production lead time and the product launch time, improving product quality and providing products to customers according to their orders. With such improvements, this company needs an integrative PMS to evaluate and manage the efficiency and effectiveness of its whole production.

Another interviewee, the human resources manager, indicated that his company emphasizes the job development (OJD) of employees. The PMS can be a communication device to explain business objectives and educate employees and help them in controlling and realizing defects, complementing their training. Generating, organizing, and reporting performance information on projects can help managers to supervise the level of achievement of firm objectives. The use of a PMS is thus affected mainly by internal factors, such as team projects' requirement for performance information rather than market competition. The main reason is that his company, a leader of its industry, prioritizes cost reduction. In order to reduce costs, the information gathered from customer satisfaction and employee satisfaction can help managers to find out problems and improve process loops.

The general managers in the consulting firms said that the use of a broad set of non-financial and financial measures for evaluation is very prevalent. An organization's interactive framework can possibly affect the flow of information and the requirement of communication. This can be supported by the function of PMSs. Another important factor for the development of PMSs is the impact of the competition (e.g. price, competitors' actions, regulation) on

[2] In 2004 Taiwan's exports were US $174.7 Billion (3.1% of the world total), and it was the 14th largest exporter in the world.

[3] The basic idea of this system is to allow greater flexibility to adapt to changes in demand by maintaining a continuous flow of products in the production line. TPM employs less manual labor and emphasizes teams of multi-skilled workers at each level of the organization, coupled with highly automated machines to manufacture a great variety of products. In order to cope with market uncertainty and increases in customer demands, this manufacturing firm was directed by Toyota Motor Corporation to introduce TPM in 2005.

the role of PMSs, such as providing relevant information and controlling strategy. Managers need the information from the results of performance evaluations for management and control. Based on these considerations, a firm can adopt appropriate systems in order to provide information in a format most suitable for the users. The interviewees also referred to company size as a factor affecting the development of PMSs, with greater PMS usage associated with larger companies. This study thus also included the control variable of size.

3.3. Performance measurement systems

The instrument measured the use of PMSs based on two aspects. One part was the extent to which integrated performance measures related to four categories of BSC were used to assess organizational performance.[4] The other part related to the stages of PMS development. First, integrated performance measures related to four categories of BSC were taken from the items developed by Hoque and James (2000), Kaplan and Norton (1996) and Hoque et al. (2001), as well as the interview findings. The modified instrument of integrated performance measures in use included a total of 21 items on a five-point Likert scale. Specifically, respondents were asked to indicate each performance measure currently used by upper management in their firms for evaluating departments based on a five-point Likert scale ranging from 1 (not at all) to 5 (to a great extent).

Strong data in factor analysis means uniformly high communalities without cross loadings and several variables loading strongly on each factor, although these conditions are rare in practice (Mulaik, 1990; Widaman, 1993). Factor analysis using varimax rotation yielded four distinct performance measure dimensions, which were consistent with the four perspectives of BSC provided by Kaplan and Norton (1992) and Hoque and James (2000) (Table 2 Panel A). Eighteen items with loadings greater than 0.5 were retained (Hair et al., 2006). All of these integrated performance measures exhibited acceptable reliability, as indicated by Cronbach alphas above 0.7.

There are no hard and fast rules for item loading on a single factor, but the 0.4 criterion level is most commonly used in judging whether factor loadings are meaningful or not (Ford et al., 1986). Three items (employee satisfaction, practical training hours for the innovation and learning growth perspective, and manufacturing/service lead time for the customer perspective) were found to have a factor loading of more than 0.4 on two factors with a load exceeding 0.5 on one factor (see Table 2 Panel A). Concerns about items with cross loadings may thus emerge. However, a factor with more than three items or more strongly loaded items (0.50 or above) is desirable and indicates a solid factor (Tabachnick et al., 2001). The factors of innovation and learning growth and customer perspectives are consistent with this rule. In addition, the percentage of the total item variance explained above is also important. There are no strict guidelines, but more than 60% could suffice as an acceptable target. In this study, the percentage of the total item variance was 68.61%. If these three items were dropped, the reliability of factors and total item variance would reduce, which would not be desirable. In summary, the factor analysis of performance measures in this study produced the correct factor structure.

The stages of PMS development were measured using the method proposed by Speckbacher et al. (2003). The development of PMSs included integrated performance measures (minimum-standard PMS), establishing the causal model (cause-and-effect PMS), and establishing the linkages among strategy, measures and incentives (fully-developed PMS).

The respondents were asked to indicate the extent of PMS employed in their firms. Respondents could check off measures from these three stages or write none of them. If the respondent expressed that none of these three PMS were used in the firm, then the value of PMS stage is 0. PMS stage is a categorical measure, where 1 = a minimum-standard PMS; 2 = a cause-and-effect PMS; and 3 = a fully-developed PMS. Table 3 reports the respondents by the stages of PMS implementation. Forty-one respondents (24.4%) indicated that they used a minimum-standard system; 18 (10.7%) said they had established causal models added into the minimum-standard system; and 91 (54.2%) indicated that they used a fully-developed PMS which had established a causal model and the linkage between measures and incentives. The remaining 18 firms said they did not use any of these three PMSs.

3.4. Organization structure

Decentralization, formalization, hierarchy and horizontal integration were developed for the dimensions used to operationalize mechanistic and organic structures. Gosselin (1997) selected the first three dimensions as determinants of structure, while this study added horizontal integration. The use of these four dimensions for organization structure can permit a more comprehensive consideration of structure as compared to prior measures in the management accounting literature (Chenhall and Morris, 1986; Chia, 1995; Gordon and Narayanan, 1984; Gosselin, 1997). The reason for choosing this instrument is that it is used in the research on both the adaptation of accounting systems and organizational outcomes. The instrument contains five items on the level of decentralization, four items on the innovative nature of formalization, four items on the layers of hierarchy and six items on horizontal integration. A total of 19 items for the four dimensions were thus developed to measure organization

[4] The simplest approach for developing strategic PMS is to measure and use a broad set of financial and non-financial measures (Ittner et al., 2003). Ullrich and Turtle (2004) and Henri (2006) indicate that providing a broad set of measures covering different parts of the organization's operations is an important aspect of more integrated PMS. Furthermore, this study managed to interview a senior manager in charge of performance management in a firm manufacturing leisure products and supplying them to multi-national companies (MNCs), e.g. Nike and Callaway. He indicated that multi-perspective performance measures are used at the initial stage of BSC development. Such key performance measures are used to monitor whether the target has been achieved for his firm's particular operations. Another interviewee, working as a consultant, also indicated that the use of integrated performance measures is common in the initial stage of PMS development.

Table 2
Factor loadings for integrated performance measures, organizational structure, market competition and organizational performance[a] (the item number is in the parenethes).

Panel A: The use of integrated performance measures[b]				
Factors and Cronbach alphas	Factor loadings			
	I	II	III	IV
I. Innovation and learning growth perspective (α = 0.862) (Eigenvalue = 3.374, % of variance = 18.747)				
Number of new service/product launch (1.15)	**0.871**	0.204	0.073	0.154
Time to market of new products/services (1.16)	**0.761**	0.283	0.132	0.221
Employee satisfaction (1.17)	**0.648**	0.081	0.472	0.200
On job training hours (1.18)	**0.607**	0.060	0.422	0.270
Employees' suggestions (1.20)	**0.594**	0.151	0.331	0.089
II. Internal business process perspective (α = 0.871) (Eigenvalue = 3.207, % of variance = 17.818)				
Number of customer complaints (1.9)	0.131	**0.681**	0.341	0.266
Percent of shipments returned due to poor quality (1.10)	0.123	**0.869**	0.126	0.193
Number of warranty repair requested by customers (1.11)	0.359	**0.675**	0.223	0.054
Ratio of defective output/total output (1.12)	0.135	**0.863**	0.149	0.163
III. Customer perspective (α = 0.875) (Eigenvalue = 3.134, % of variance = 17.411)				
Market share (1.5)	0.359	0.047	**0.516**	0.317
Survey of customer satisfaction (1.6)	0.165	0.188	**0.831**	0.210
Customer response time (1.7)	0.285	0.372	**0.748**	0.126
On time delivery (1.8)	0.229	0.386	**0.672**	0.209
Manufacturing/service lead time (1.13)	0.473	0.398	**0.505**	0.161
IV. Financial perspective (α = 0.792) (Eigenvalue = 2.634, % of variance = 14.634)				
Operating income (1.1)	−0.024	0.322	0.127	**0.757**
Sales growth (1.2)	0.228	0.102	0.071	**0.790**
Return on investment (1.3)	0.311	0.149	0.279	**0.607**
The rate of achieving budget (1.4)	0.229	0.111	0.272	**0.713**
Panel B: Organization structure[c]				
I. Nature of formalization[d] (α = 0.871) (Eigenvalue = 3.352, % of variance = 18.622)				
Your company makes rules and procedures that show how workers can make suggestions for changes. (3.6)	**0.810**	0.203	−0.082	0.072
Your company makes rules and procedures to show the learned experience which the staffs received in previous working condition. (3.7)	**0.870**	0.171	0.114	0.028
Your company makes rules and procedures to lead the staffs to implement the improvement at work. (3.8)	**0.836**	0.165	−0.088	0.087
Your company makes rules and procedures to encourage works to be creative in dealing with problems at work. (3.9)	**0.757**	0.278	−0.046	0.148
The workers of your company can share opinions with supervisors or middle managers, and involve in making decisions. (3.5)	**0.527**	0.331	−0.190	0.365
II. Horizontal integration (α = 0.810) (Eigenvalue = 3.235, % of variance = 17.974)				
The products and services are done through cross-functional teams in your company. (3.14)	0.218	**0.548**	−0.228	0.125
The staffs of your company are assigned to work in the cross-functional teams. (3.15)	0.223	**0.597**	−0.076	0.345
The managers of your company are assigned to lead various cross-functional teams. (3.16)	0.363	**0.608**	0.060	0.141
Long-term and important decisions are done through cross-functional teams. (3.17)	0.130	**0.753**	0.116	0.014
Your company coordinates the goals between each department through the meetings of cross-functional teams. (3.18)	0.167	**0.770**	−0.036	−0.145
Each department in your company exchanges information, technology and resources. (3.19)	0.118	**0.781**	−0.131	0.108
III. Hierarchy (α = 0.868) (Eigenvalue = 3.100, % of variance = 17.224)				
Your company has many management layers (exceed six layers) between staffs at the basic level and CEO. (Reverse)(3.10)	0.059	−0.040	**0.720**	−0.096
There are only few layers in your organizational hierarchy. (3.11)	−0.075	−0.014	**0.902**	−0.082
Your company is a lean organization. (3.12)	−0.124	−0.072	**0.856**	−0.070
Your company has only few management layers between staffs at the basic level and CEO. (3.13)	−0.020	−0.056	**0.906**	−0.154
IV. Decentralization (α = 0.736) (Eigenvalue = 2.236, % of variance = 12.424)				
The employees of your company have the authority to correct problems when they occur. (3.2)	−0.004	−0.112	−0.080	**0.785**

Table 2 (*Continued*)

Panel A: The use of integrated performance measures[b]				
Factors and Cronbach alphas	Factor loadings			
	I	II	III	IV
The work teams of your company have empowerment to control over their job. (3.3)	0.168	0.130	−0.191	**0.815**
Your supervisors or middle managers are supportive of the decisions made by your work teams. (3.4)	0.218	0.339	−0.112	**0.745**
Panel C: Competition (all items loaded on one factor)				
Factor and Cronbach alphas Factor loadings (component matrix)				
Competition (α = 0.823) (Eigenvalue = 2.941, % of variance = 58.820)				
Your company faces high degree price competition for products/services. (4.1)				0.677
There is high degree of market competition in the new product/service development faced by your company. (4.2)				0.796
There is high degree of market competition in marketing and distribution faced by your company. (4.3)				0.707
Your company faces high degree of market competition in gaining market share. (4.4)				0.825
Behaviors of competing companies taking are a great threat to your company. (4.5)				0.818
Panel D: Organizational performance (all items loaded on one factor)				
Factor and Cronbach alphas Factor loadings (component matrix)				
Organizational performance (α = 0.851) (Eigenvalue = 3.13, % of variance = 62.742)				
Your company performance on return on Investment is better than your competitors. (5.1)				0.789
Your company performance on gross margin is better than your competitors. (5.2)				0.801
Your company performance on Customer satisfaction is better than your competitor. (5.3)				0.812
Your company performance on quality of product/service is better than your competitors. (5.4)				0.781
Your company performance on employee productivity is better than your competitors. (5.5)				0.777

[a] For the variables of integrated performance measures, organizational structure, competition and organizational performance, both Bartlett's test of Sphericity at a significant level (p = 0.000) and Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) adequacy of above 0.8 confirms the factorability of the items for each variable.

[b] The items of labor efficiency variance, employees' productivity, and availability of information system with loadings less than 0.5 were deleted in the construct. These three item loadings add very little to the explanatory power of each dimension. The weight average of items within four dimensions was calculated to represent the use of integrated performance measures.

[c] One eliminated item with factor loading less than 0.5 is: 3.1 "The work teams of your company cannot take significant actions without supervisors or middle managers' approval". The test showed that organization structure scale had five factors with eigenvalues greater one, with 18 items loading on the first four factors, and only this item loading on the fifth factor.

[d] The item of 3.5 "The workers of your company can share opinions with supervisors or middle managers, and involve in making decisions" originally belonging to decentralization was assigned to the factor of nature of formalization due to factor loading of 0.527 on this factor.

Table 3
The stages of performance measurement system development.

PMS stage	The extent of PMS stage	Frequency	%
Minimum-standard PMS	A specific integrated performance measurement system that combines financial and non-financial measures grouped into perspectives, e.g., customer, internal business processes, and learning and growth.	41	24.4
Cause-and-effect PMS	A minimum- standard PMS that contains cause-and-effect relationships between measures and firm strategy	18	10.7
Fully-developed PMS	A cause-and-effect PMS that also establishes the linkages between incentives, measures and strategy.	91	54.2
Other	Non system belongs to minimum- standard PMS, cause-and-effect PMS and fully-developed PMS.	18	10.7

structure.[5] According to a firm's practical situation, this study asked the CFO to indicate on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) the extent to which they agreed or disagreed with each item with regard to their firm. To ensure validity, one question in this category was reverse-coded (Suh, 1999).

Factor analysis with varimax rotation was conducted to identify the groups of items within organization structure. Table 2 (panel B) presents the results of this analysis. All 19 items of organization structure are included in the first run to identify four factors, and only one item with factor loadings of less than 0.5 was then eliminated. The results of factor analysis were consistent with our questionnaire design. Cronbach alphas on all four factors were all greater than 0.7, indicating satisfactory internal reliability. This study then obtained the final score of organization structure by averaging the four factor scores.

3.5. Competition

According to the statement of prior studies (Hoque et al., 2001; Khandawalla, 1972), competition refers to

[5] With the insights gained from the interviews with managers, it is argued that most if not all of the factors combined are likely to affect an organization's framework of interactions between employees, information flows, and authority distribution when carrying out firm objectives. Therefore, we conclude that multiple factors together and in combination act as determinants of organization structure. This argument is consistent with the anecdotes gathered during the interviews, which revealed that not single but multiple configurational variables form the interactive framework in organizations.

degrees of market participation. Hoque et al. (2001) summarized prior research related to the level of competition (e.g., Gordon and Narayanan, 1984; Hoque and Hopper, 1997; Khandawalla, 1972; Libby and Waterhouse, 1996; Merchant, 1984) to develop the instrument. Combining the Likert-type instrument from Hoque et al. (2001) and interviewees' suggestions, this study then refined the instrument to measure competition. The five items reflect competition with regard to price, new product development, marketing and distribution, market share, and competitors' behavior on a five-point Likert scale. Table 2 (panel C) indicates that the competition items were loaded onto a single factor. Cronbach alphas of this construct exceeded 0.8.

3.6. Organizational performance

The measures of the four perspectives related to BSC are employed to assess firm performance, derived primarily from Hoque and James (2000), supplemented by the measures developed in the BSC literature (Kaplan and Norton, 1996). Consequently, five major items along the four perspectives of BSC were revised and selected. The items included gross profit, return on investment, customer satisfaction, product/service quality, and employee productivity. As such, the CFOs were asked to rate on a five-point Likert scale (1 = well below average to 5 = well above average) their best subjective estimation of performance as compared to their competitors on each item.

Table 2 (panel D) indicates that the five items loaded onto a single factor and the factor loadings were all more than 0.5. Cronbach alphas of this construct was above 0.85.

3.7. Control variables

Two variables were included to control for the impact of organizational characteristics on the use of PMS. Contingency theory literature indicates that organizational size affects the use of MCS (Burns and Stalker, 1961; Woodward, 1965). Hoque and James (2000) found that organizational size is significantly and positively related to BSC measure usage in the case of Australian manufacturing companies. Firm size and industry membership have also been used to characterize organization structure (Bouwens and Van Lent, 2006). Thus, this study included industry and firm size to control the effect of organizational characteristics on the use of PMS.[6]

In the MCS literature, the number of employees is the most frequently used factor to assess the organization size (Chenhall, 2003). SIZE thus measured the number of employees of the respondent's firm, coded from 1 through 5. The second control variable was the classification of industries. Different industries have their own features in competitive markets. The major characteristics of the high-tech industry include placing a focus on innovation, as well as paying much attention to product precision and professional talent. In addition, the high-tech industry may concentrate on such performance measures as innovation, employee self-study, and time to market, which are different from the ones in non-high-tech industries. In this study, industry type is also added as a control variable. A dummy variable (IND) of the industry was used, 1 if the sample is in a high-tech industry, and 0 otherwise.[7]

In the model of testing the relationship between the use of PMS and firm performance, the control variables for the latter were strategy and capital.[8] Prior studies indicate that these variables have important effects on firm performance (Ittner and Larcker, 1997; Ittner et al., 1997; Said et al., 2003). By looking across the entire value chain, firms' profits are earned based on the difference between the prices paid by customers and the costs of products and services provided by suppliers. Classifying the strategy types to low cost, product leadership, customer solutions, and system lock-in is an alternative way to structure a company's position in the value chain, and the instrument developed by Kaplan and Norton (2004) was used to make this classification. Respondents were asked to select the description that most closely conformed to their firm with comparison to competitors in their industry. A value of 1 was attached to organizations that adopted a low cost strategy, and a value of 0 to organizations that did not. The item "your company offers highly competitive prices combined with consistent quality, ease and speed of purchase, and excellent, though not comprehensive, product selection" is developed to describe low cost strategy.

4. Results

4.1. Descriptive statistics

Table 4 Panel A, presents descriptive statistics for the variables that have been examined. The average score of the integrated performance measure was 3.58. The average scores of organization structure and market competition were 3.55 and 3.85, respectively, showing that the sample firms mostly had organic structures and faced competitive market environments. The mean of organizational performance was 3.50, which indicated that the perceived performance of the sample firms was higher than that of their competitors.

Table 4 Panel B, shows that the highest correlation coefficient is 0.55, and thus there is no problem with

[6] Two main reasons are provided to explain why this study did not consider strategy in the model of the use of PMSs. First, strategy might follow structure (Donaldson, 1987; Chandler, 1962). Often the structural arrangements have important implications for information flows that may shape the future directions of the organization (Bower, 1970). Second, measures used to study strategy have been criticized as mixing up elements of the environment with organizational attributes, making them invalid (Chenhall, 2003; Langfield-Smith, 1997).

[7] This study integrated the definitions used by the Organization for Economic Co-operation & Development (OECD) and Industrial Development Bureau, Ministry of Economic Affairs in Taiwan. The high-tech industries thus included integrated circuits, telecommunications, computers/peripherals, system and software, precision machinery, aerospace, pharmaceuticals, biotechnology, pollution prevention, and optoelectronics.

[8] The organizational performance items were designed to evaluate the organization performance compared to competitors. The industry effect was controlled in measuring organization performance.

Table 4
Descriptive Statistics and correlations among variables ($N = 168$).

Panel A: Descriptive statistics of variables

Code	Variable	Theoretical	Actual range	Mean	Standard deviation
Integrated_PMSU	The use of integrated performance measures	1–5	1.94–5.00	3.58	0.54
PMS stage	The stage of PMS development	0–3	0–3	2.08	1.10
ORG	Organization structure	1–5	1.95–4.88	3.55	0.45
DEC	Decentralization	1–5	1.67–5.00	3.51	0.63
FORMAL	Nature of formalization	1–5	1.80–5.00	3.69	0.61
HIERARCHY	Hierarchy	1–5	1.00–5.00	3.19	0.87
HORIN	Horizontal integration	1–5	2.00–5.00	3.79	0.57
COMP	Competition	1–5	2.00–5.00	3.85	0.55
PERF	Organizational performance	1–5	1.80–5.00	3.50	0.54

Panel B: Pearson correlations and Spearman correlations among variables

Variable	1	2	3	4	5	6	7	8	9
1. Integrated_PMSU	1.000	0.254***	0.472***	0.071	0.039	0.168**	−0.058	−0.134*	0.366***
2. PMS stage	0.262***	1.000	0.310***	0.027	0.147*	0.082	0.083	0.000	0.133*
3. ORG	0.465***	0.317***	1.000	0.158**	0.181**	−0.037	0.061	−0.137*	0.273***
4. COMP	0.191**	0.062	0.081	1.000	0.206***	0.001	0.076	−0.091	−0.115
5. SIZE	0.033	0.177**	0.167**	0.208***	1.000	−0.044	0.550***	−0.103	−0.064
6. IND	0.198***	0.091	−0.017	0.014	0.008	1.000	−0.026***	−0.061	−0.013
7. CAP	−0.020	0.077	0.031	0.110	0.507***	−0.231***	1.000	−0.046	−0.091
8. COST	−0.179**	−0.007	−0.135	−0.109	−0.106	−0.061	−0.042	1.000	−0.174**
9. PERF	0.409***	0.174**	0.349***	−0.132*	−0.053	−0.013	−0.067	−0.191**	1.000

ORG: Organization structure; COMP: Competition; Integrated_PMSU: The use of integrated performance measures; PMS stage: The stage of PMS development; SIZE: Organizational size; IND: Industry dummy variable; CAP: Firm capital; COST: Cost leadership strategy; PERF: Organizational performance. Lower left corner is Pearson coefficients; upper right corner is Spearman coefficients. *** $p < 0.1$ (two tailed), ** $p < 0.5$ (two tailed), * $p < 0.1$ (two tailed).

multicollinearity. The correlation results suggest that both Integrated_PMSU and PMS stage are related to organization structure, market competition and organizational performance.

4.2. The impact of organization structure and market competition on performance measurement systems

OLS regression in Table 5 shows the associations between organization structure, market competition, and the use of PMS. Hypothesis 1a posits that organic organizations will rely more on integrated performance measures than mechanistic ones. To further analyze the relationships predicted in Hypothesis 1a, multiple regressions were additionally run, in which the analysis employed the use of measures for each of the four BSC perspectives. Thus, there are a total of five independent variables of Integrated_PMSU, F_PMSU, C_PMSU, IP_PMSU, and ILG_PMSU used in the regressions. All five regressions represent that organization structure is significant and positively associated with the use of integrated performance measures (Integrated_PMSU), as well as separately with the use of financial perspective measures (F_PMSU), customer perspective measures (C_PMSU), internal process perspective

Table 5
The relationship between organization structure, competition and the use of integrated performance measures.

Variables	Predicted sign	Integrated_PMSU	F_PMSU	C_PMSU	IP_PMSU	ILG_PMSU
Intercept		1.536***	2.160***	1.270**	1.320**	1.346***
		−3.644	−4.979	−2.233	−2.152	−2.837
ORG	+	0.470***	0.389***	0.572***	0.434***	0.493***
		−5.557	−4.457	−5.001	−3.525	−5.173
COMP	+	0.047	0.067	0.035	0.092	−0.001
		−0.681	−0.938	−0.368	−0.910	(−0.081)
SIZE	NP	0.025	0.037	0.007	0.011	0.045
		−0.772	−1.115	−0.157	−0.230	−1.233
IND	NP	0.176**	0.043	0.122	0.441***	0.103
		−2.312	−0.550	−1.193	−3.994	−1.202
Adjusted R^2		0.174	0.099	0.125	0.143	0.134
F-value		9.716	5.561	6.949	7.872	7.434

Integrated _PMSU: the use of integrated performance measures; F_PMSU: the use of financial perspective measures; C_PMSU: the use of customer perspective measures; IP_PMSU: the use of internal process perspective measures; ILG_PMSU: the use of innovation and learning growth perspective measures. The test is significant at the * $p < 0.1$, ** $p < 0.5$, and *** $p < 0.01$ level respectively. The t-values are in the parentheses.VIF (variance inflation factor) is calculated in the regression analyses to test multicollinearity between independent variables. Each value of VIF is less than 2, not indicating multicollinearity would be a problem in the regression analyses.

Table 6
The stage of PMS development tests.

	Ordered logit		Binary logit	
	Coefficients	*p*-value	Coefficients	*p*-value
Constant			−2.462	0.184
ORG	6.729	0.001***	0.628	0.100*
COMP	0.796	0.356	−0.145	0.635
SIZE	1.256	0.065*	0.298	0.033*
IND	1.586	0.137	0.382	0.253
Chi-squared	25.22(df = 4, $p < 0.0001$)		8.118(df = 4, $p < 0.1$)	
Pseudo-R^2	0.065		0.047	

The test is significant at the $^{*}p < 0.1$, $^{**}p < 0.5$, and $^{***}p < 0.01$ level respectively, the *p*-values are reported on a two-tailed test basis. PMS stage=the stage of PMS development; ORG=organization structure; COMP=competition; SIZE=organizational size; IND= industry variable, 1 = high-tech industries, 0 = otherwise. The ordered logit column reports an ordered logit test for three stages: $Y = 0$ minimun-standard PMSs, $Y = 1$ cause-and-effect PMSs, and $Y = 2$ fully-developed PMSs. The cumulative binary logit column assumes each binary outcome defined as 1 if Y = cause-and-effect PMSs or fully-developed PMSs, else 0.

measures (IP_PMSU), and innovation and learning growth perspective measures (ILG_PMSU). Therefore, the results indicate that the degree of organic structure increases the use of integrated performance measures, supporting H1a.

The industry dummy is statistically significant in explaining the use of integrated performance measures. The high-tech industries tend to emphasize the use of integrated performance measures, with relatively low usage in non-high-tech industries. Notably, a significant and positive relation ($p < 0.01$) between the industry dummy and the use of internal process perspective measures is found. The results show that high-tech firms need tighter internal monitoring processes as compared to firms in non-high-tech industries. In terms of organization size, SIZE has no significant influence on the use of integrated performance measures.

H1b posits that organic organizations will rely more on PMSs which include causal models and the linkages between incentives and strategy. This study uses order and binary logit to identify the associations between organization structure, market competition and the stages of PMS development.

Table 6 gives the ordered logit results, which indicate that organization structure significantly affects the use of different stages of PMS development. This suggests that organic structures allow the possibility of moving from no use of an integrated PMS to a minimum-standard PMS; a minimum-standard PMS to a cause-and-effect PMS; and a cause-and-effect PMS to a fully-developed PMS.

The management accounting literature suggests that a causal relationship between measures and strategy in a PMS should be established. It is thus worthwhile to use this feature to separate firms into two categories, one of firms that go through the stage of establishing causal models, and the other firms that bypass this stage. Firms using cause-and-effect PMS or fully-developed PMS belong to the first category. Firms that use minimum-standard PMS or do not use any of the aforementioned PMS are assigned to the other group in the stage of not using a causal model. Binary logit analysis is used to compare the effect of organization structure and market competition on these two groups. The binary logit is expressed in the following model:

$$\mathrm{Ln}\left[\frac{\mathrm{Prob}(Y=1)}{1-\mathrm{Prob}(Y=1)}\right] = \alpha_0 + \alpha_1 \mathrm{ORG} + \alpha_2 \mathrm{COMP} + \alpha_3 \mathrm{SIZE} + \alpha_4 \mathrm{IND}$$

Prob($Y = 1$) is the probability of using a PMS to establish causal models. The binary logit results are shown in Table 6. The results of the ordered and binary logit are the same. Firms leaning towards organic structures rely more on the higher developmental stages of PMS which include causal models. The results of the ordered logit and the binary logit thus support H1b.

To test H2a, it can be noted in Table 5 that the use of integrated PMSs is not significantly associated with the intensity of market competition. Moreover, the use of each of the four BSC perspective measures is not significantly related to the intensity of market competition. These results do not provide support for H2a. This suggests that the competition faced by the firm does not influence the use of integrated performance measures, and this result is consistent with the findings of Hoque and James (2000).

The results from ordered logit and binary logit analysis in Table 6 show that the intensity of competition does not significantly affect the stages of PMS development in the firms, and thus, H2b is not supported. An interesting finding in the ordered logit and binary logit analysis is that both coefficients of SIZE are significant and positive ($p < 0.1$). This suggests that larger firms are more likely to establish PMSs that include the linkages between strategy, measures, and incentives. The rationale is that the more employees a firm has, the greater the use of appropriate systems such as PMSs in order to communicate firm strategy to employees.

4.3. The interaction effect of organization structure, market competition and performance measurement systems on organizational performance

Hypothesis 3a posits that the positive effect of the use of integrated measures on organizational performance is stronger in mechanistic organizations than in organic ones. Table 7 presents the results of regression testing the above prediction according to the interaction terms obtained by crossing organic structure with use of integrated performance measures. These regressions also include the main effects as well as control variables for firm capital and firm strategy.

In terms of the main effect, Table 7 column (1) shows a positive and significant association between the use of integrated performance measures and organizational performance ($p < 0.01$). The significant positive relation

Table 7
The impact of organization structure, competition and PMSs on organizational performance.

Variables	Predicted sign	(1)	(2)	(3)	(4)
Intercept		2.344*** (7.691)	1.765*** (3.083)	3.544*** (22.757)	3.562*** (19.444)
ORG	+	0.101 (1.206)	1.083* (1.949)	0.223*** (2.674)	0.321* (1.789)
COMP	–	−0.182** (−2.380)	−0.113 (−0.211)	−0.167** (−2.039)	−0.431** (−2.465)
Integrated_PMSU	+	0.369*** (4.775)	0.540*** (3.48)		
PMS stage	+			0.071* (1.89)	0.044 (0.765)
CAP	NP	−0.021 (−0.676)	−0.02 (−0.627)	−0.042 (−1.305)	−0.031 (−0.948)
COST	NP	−0.155** (−1.765)	−0.162* (−1.847)	−0.214** (−2.348)	−0.210** (−2.293)
ORG*Integrated_PMSU	–		−0.278* (−1.787)		
COMP*Integrated_PMSU	+		−0.017 (−0.112)		
ORG*PMS stage	+				−0.059 (−0.775)
COMP*PMS stage	+				0.130* (1.744)
Adjusted R^2		0.196	0.202	0.103	0.111
ΔR^2			0.008		0.006
F-value		4.816	3.969	9.003	6.396

The test is significant at the $^{*}p < 0.1$, $^{**}p < 0.5$, and $^{***}p < 0.01$ level respectively. The t-values are in the parentheses. VIF (variance inflation factor) is calculated in the regression analyses to test multicollinearity between independent variables. Each value of VIF is less than 2, not indicating multicollinearity would be a problem in the regression analyses.

between the use of integrated performance measures and organizational performance is an indication that the use of integrated PMSs does provide relevant information and helps firms to obtain competitive advantages. The coefficient of market competition is negative and significant (coefficient = −0.182, $p < 0.05$), indicating that firms facing more intensive competition have lower performance.

Column (2) in Table 7 indicates that the interaction term of the degree of the organic structure with the use of integrated performance measures is significantly and negatively associated with firm performance. It appears that the positive relation between the use of integrated performance measures and organizational performance is lower in organic structures compared to in mechanistic ones, thus supporting H3a.

As shown in column (3) of Table 7, there is a positive and significant association between the stages of PMS development and firm performance ($p < 0.1$). This suggests that firms making greater uses of PMSs with established linkages between strategy, measures and incentives have higher performance. Organization structure is significantly and positively associated with organizational performance ($p < 0.01$). The contextual variable of market competition is negatively and significantly associated with organizational performance ($p < 0.05$).

H3b predicts that the use of PMSs including causal models and providing linkages to incentives is positively associated with organizational performance in organic organizations. The results presented in column (4) of Table 7 indicate that the coefficient on the interaction of stages of PMS development and organic level of organizations is not significantly positive, and thus does not support H3b.

H4a can be tested by the interaction term of the intensity of market competition and the use of integrated performance measures in column (2) of Table 7. The result indicates that firms with greater usage of integrated performance measures do not achieve higher performance when market competition gets more intense, which does not support H4a, but is consistent with Hoque and James (2000).

Notably, the results in column (4) of Table 7 also show a significant and positive effect on performance ($p < 0.1$) from the interaction of intensity of market competition and the stages of PMS development. With the increased use of PMSs encompassing the causal model and providing linkages to incentives, this study finds that firms have superior performance as competition becomes more intense, supporting H4b.

In terms of control variables, the coefficients of cost strategy are significant and negative in the four regressions. This phenomenon is consistent with the idea that firms must have excellent abilities to take advantage of technological changes through innovation to survive in global competition, and not simply depend on cost savings and

Table 8
The relationship between four structure dimensions, competition and the use of integrated performance measures.

Variables	Predicted sign	Integrated_PMSU	F_PMSU	C_PMSU	IP_PMSU	ILG_PMSU
Intercept		1.210*** (3.036)	1.699*** (4.138)	1.056* (1.919)	1.496** (2.399)	0.549 (1.162)
Decentralization	+	−0.013 (−0.216)	−0.023 (−0.370)	−0.032 (−0.381)	−0.048 −0.502)	0.028 (0.397)
Formalization	+	0.319*** (4.547)	0.225*** (3.111)	0.372*** (3.839)	0.219** (2.000)	0.444*** (5.339)
Hierarchy	+	0.016 (0.376	0.059 (1.323)	0.016 (0.272)	−0.046 (−0.676)	0.043 (0.841)
Horizontal integration	+	0.247*** (3.347)	0.308*** (4.058)	0.313*** (3.075)	0.260** (2.238)	0.161* (1.812)
COMP	+	0.061 (0.942)	0.058 (0.866)	0.035 (0.395)	0.097 (0.964)	0.058 (0.760)
SIZE	NP	−0.013 (−0.439)	−0.008 (−0.262)	−0.045 (−0.071)	−0.018 (−0.374)	0.001 (0.023)
IND	NP	0.179** (2.547)	0.051 (0.711)	0.115 (1.184)	0.429*** (3.914)	0.152* (1.821)
Adjusted R^2		0.308	0.237	0.227	0.164	0.284
F-value		11.620	8.418	8.017	5.661	10.359

The test is significant at the $^{*}p < 0.1$, $^{**}p < 0.5$, and $^{***}p < 0.01$ level, respectively. The *t*-values are in the parentheses.

Table 9
The stage of PMS development tests in four structure dimensions.

	Ordered logit		Binary logit	
	Coefficients	*p*-value	Coefficients	*p*-value
Constant			0.100	0.026**
Decentralization	0.121	0.727	0.676	0.235**
Formalization	5.448	0.020**	2.535	0.010**
Hierarchy	3.385	0.066**	1.295	0.252**
Horizontal Integration	3.298	0.069**	1.734	0.145**
COMP	0.388	0.534	0.893	0.730
SIZE	2.736	0.098**	1.183	0.259**
IND	1.747	0.186**	1.454	0.288**
Chi-squared	26.029	(df = 7, $p < 0.01$)	22.841	(df = 7, $p < 0.01$)
Pseudo-R^2	0.144		0.127	

The test is significant at the $^{*}p < 0.1$, $^{**}p < 0.5$, and $^{***}p < 0.01$ level respectively, the *p*-values are reported on a two-tailed test basis.

operation efficiency (Nanni et al., 1992). The regressions also control for the capital of the firms, which is not significant in any of these results.

4.4. Further analyses

In an attempt to better understand the relationship between the use of PMSs and the four structural elements of decentralization, formalization, hierarchy and horizontal integration, further empirical tests were applied.[9]

All of the regressions in Table 8 show that formalization and horizontal integration are significant and positively associated with the use of integrated performance measures. Since this study focuses on the nature of formalization with an emphasis on innovation and adaptation to customer requirements, this form of formalization will assist in guiding employees to invent, work and learn autonomously. The control of integrated performance measures is more diagnostic in comparison to a cause-and-effect PMS. The use of integrated performance measures is facilitated in organizations with a higher degree of formalization, as the rules and instructions within the organization are clearly delineated. The results also suggest that organizations with greater horizontal integration are more likely to use integrated performance measures as departments are functionally integrated into their operations.

Furthermore, ordered and binary logit are used to identify the associations between the four dimensions of organization structure and the stages of PMS development. The ordered logit results in Table 9 indicate that formalization, hierarchy and horizontal integration significantly affect the stages of PMS development, suggesting that they allow for the possibility of moving from not using any form of integrated PMSs to a fully-developed PMS. The results of the binary logit in Table 9 provide support for the idea that all four dimensions of organization structure significantly affect the use of the different stages of PMSs. The results also show that the levels of decentralization, formalization, flat hierarchy and horizontal integration are

[9] An anonymous reviewer is thanked for this suggestion.

positively associated with the use of cause-and-effect or fully-developed PMSs.

In considering these results, it should be noted that organic structures are more likely to use PMSs, including at least the cause-and-effect relationships between strategies and measures. These cause-and-effect relationships communicate the linkages between the strategy and the measurement of workers, which are used to satisfy the requirement for widespread communication within an organic organization. The degree of formalization, flat hierarchy and horizontal integration are positively associated with the use of a fully-developed PMS containing linkages between outcomes and rewards, as well as causal relations. Decentralization is the only organizational determinant which does not have a significant impact on the use of a fully-developed PMS. The results suggest that decentralized organizations may have a greater motivation to adopt the stages of a cause-and-effect PMS if communication is an important factor, and the risk of the effect of linking rewards to performance measures is high.

Principle-agent theory posits that incentive compensation is lower in riskier operating environments (Nagar, 2002). Uncertainty thus results in the delegation of responsibilities, as it is too costly for top management to acquire the necessary information to respond quickly to changes in the environment (Nagar, 2002; Moers, 2006). Performance measures, which form the basis of incentive rewards, are more likely to fluctuate in more uncertain environments. Therefore, the link between outcomes and rewards will impose greater risks on managers, as many factors are beyond their control. Thus, decentralized organizations can only adopt a cause-and-effect PMS instead of a fully-developed PMS. According to Simons' argument (1995), a cause-and-effect PMS is described as a more interactive control system in comparison to integrated performance measures. Thus, the organization structures of decentralization and flat hierarchy can better use of a cause-and-effect PMS than integrated performance measures. As a result, the findings suggest that a cause-and-effect PMS is widely adopted in organic organizations.

5. Discussion

This paper formulates two main research questions. Firstly, this study considered whether organic-structured firms increase their reliance on an integrated PMS, and whether firms increase their reliance on an integrated PMS as market competition increases in intensity. Secondly, this study considered whether mechanistic-structured firms have superior performance with the greater use of an integrated PMS as compared to organic ones, and whether firms achieve superior performance with the greater use of an integrated PMS as the intensity of market competition increases. In particular, consistent with H1a and H1b, the results indicate that firms with a more organic structure rely more on integrated performance measures and a fully-developed PMS, especially those with established causal models and links between strategy, measures and incentives. These results are consistent with the argument that the requirements with regard to integrated information, visibility of consequences, and communication induce organic structures to make use of an integrated PMS (Chenhall and Morris, 1986; Hage, 1980; Waterhouse and Tiessen, 1978). Specifically, firms with organic structures require integrated information to facilitate decision-making (Chenhall and Morris, 1986; Dossi and Patelli, 2008) and open communication channels to increase employee commitment to firm policy (Chenhall and Morris, 1995).

With regard to the effect of competition on the use of PMSs, no significant association is found in this study. This result is consistent with that of Hoque and James (2000), who found no association between market position and BSC measure usage. By taking the stages of PMS development into consideration, beyond that considered in Hoque and James (2000), there remains no conclusive evidence in this study to support a significant relationship between the intensity of competition and the stages of PMS development. Statistics indicate that a significant number of Taiwanese listed firms have not increased the adoption of an integrated PMS despite the fierce market competition they face. A possible reason is that the major sales engaged in by Taiwanese firms are exports, and thus usually face high competition in the development of overseas markets. This might result in firms seeking to enhance their competitiveness by employing other tools instead of an integrated PMS. Future studies may include other countries to test this hypothesis.

In contingency research, the appropriate fit between the design of a PMS and organization structure to achieve organizational goals has rarely been studied (Chenhall, 2008). This study finds that the relationship between the use of integrated performance measures and organizational performance are more positively associated in mechanistic organizations than in organic ones. This phenomenon is consistent with the expectation of H3a. Interestingly, this study suggests that the fit of organization structure with PMS in the adoption and implementation stages may be essential in determining the effectiveness of PMS design.

The results supporting for H1a and H1b indicate that organic structures are flexible enough to adopt an integrated PMS. However, new ventures with higher levels of formalization, greater administrative intensity and multiple bureaucratic layers outperform those with more organic structures (Sine et al., 2006). This is because such new ventures require extensive managerial resources and structural frameworks to increase organizational efficiency. Duncan (1976) suggests that initiating units should transform their structure, become less diverse, and increase formalization and centralization, while organizations implement their innovations into the firm's practice. An integrated PMS is thus an emergent aspect of management. Therefore, the design of integrated performance measures can be viewed as an administrative innovation. In particular, the mechanistic structure's framework efficiently facilitates the implementation of integrated performance measures. This finding provides a better understanding of the increased use of integrated PMSs in organic structures and the better implementation efficiency in mechanistic structures in comparison to organic ones. In some situations, organizations that adopt inno-

vations such as the integrated PMS should also adopt a "hybrid structure" as part of their structural design. As the adoption of an innovative PMS requires organic structures, while its effective implementation and utilization depends on a mechanical structure, there is thus a need for organizations to adopt a hybrid structure.

This study highlights the effectiveness that can be achieved by a joint consideration of integrated performance measures and organization structures, enabling the designer of the organization to benefit from awareness of the PMS design. Presumably, organizations proceeding from the design of integrated performance measures to the implementation of integrated performance measures would require elements of organic and mechanistic structures to effectively match the adoption and implementation of integrated performance measures.

H3b suggests that organic organizations which make greater use of PMSs, that encompass causal models with links between strategic goals, performance measures and rewards, can achieve higher performance. However, the results do not support this hypothesis. One possible reason is that impediments to the implementation of PMSs in organic organizations could influence the effectiveness of the stages of PMS development. The ambidextrous theory proposed by Duncan (1976) indicates that in the implementation phase of an innovative project, firms with a greater mechanical organization structure are more capable of centralizing resources and exerting controls to ensure the success of the project. On the other hand, it is more challenging for firms with a more organic structure to centralize resources to thoroughly implement an innovative PMS. Thus, the benefit organic structures obtain from the causal relationships within the PMS in assisting the decision-making of subunits can be offset by the negative effects of implementing such a PMS.

The empirical results indicate that firms that have implemented a fully developed PMS provide a significantly higher level of performance measures in situations of intense market competition. However, the greater use of integrated performance measures is not significantly associated with better performance as market competition becomes more intense. The main difference between a fully developed PMS and integrated performance measures can possibly provide an explanation for this insignificant association. Davis and Hamann (1988) indicated that the assessment of the success of information systems in meeting competitive environment norms depends on the aggressiveness with which information systems function to achieve competitive advantage. The use of integrated performance measures was measured in this study by surveying respondents on the extent to which each item of the four BSC perspectives was used to assess their organizational performance.

The empirical results suggest that the use of integrated performance measures, which do not capture the cause-and-effect linkages between the operations and strategies, is insufficient for firms dealing with intense competition. The implications of this study are that a reason why some firms have not experienced performance gains from implementing integrated performance measures in the face of competition is the lack of linkages between measures and strategies (Ittner and Larcker, 2003; Malina and Selto, 2001).

In summary, this study contributes to the literature by providing empirical evidence of the fit between the use of PMSs and the contextual variables of organization structure and market competition. This is achieved using the two dimensions of PMSs: integrated performance measures and the three developmental stages of PMSs. However, the results of this study should be considered in light of the following limitations. Firstly, the respondents were mostly from large-sized firms intending to adopt an integrated PMS for their complex operations, and thus may exhibit a bias towards the use of a fully-developed PMS. However, this limitation can be mitigated as the population consists of both mechanistic and organic structured firms, which may use different stages of the integrated PMS and face different levels of competition. Another limitation is that PMS development is a dynamic process and continually affects firm performance. The cross-sectional research design cannot examine any claims regarding this causal possibility. Future studies that use longitudinal data or case studies would assist in addressing this issue. Furthermore, this study's findings are based on the managers' opinions and the manner in which they chose to reveal their firm's conditions in responding to a survey. Future studies should adopt various other methods of data collection, e.g., examining the sample firms' internal documents and public information.

Despite these limitations, the study provides some insights into the design of PMSs as well as the effectiveness of the fit between PMSs and contextual variables of organization structure and competition, and there are some inconclusive results which can be further examined in future studies. The lack of statistical results supporting H3b suggests that it is worthwhile to investigate the effect of an integrated PMS implementation process on performance in organic organizations. Future research can use structural models to examine the indirect effect of organization structures on performance. This effect is achieved through factors related to the integrated PMS implementation, such as managerial support and resource allocation, which are crucial to the implementation of the management accounting system. Further research can also be conducted to uncover the complex relationships between the specific determinants of organizational structure (e.g. centralization, formalization, hierarchy, and networked mode), the use of integrated PMSs, and the achievement of organizational goals. Moreover, the relationship between market competition and the use of PMSs is not statistically significant. Firms can pursue a competitive advantage based on high quality, high technology and low cost relative to competitors. Future research could examine the relationship between particular competitive types (e.g. quality, technology, and cost) and the use of PMSs.

In addition, additional features of the cause and effect relationships within PMSs could be investigated, including links between performance of business units and business strategies, links between the activities of business units and the objectives of the organization, and links between the activities of different business units.

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