



The effectiveness of flexible manufacturing strategies

The mediating role of performance measurement systems

Flexible manufacturing strategies

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Received August 2007
Revised March 2008
Accepted August 2008

Abstract

Purpose – Against a background of a customization imperative embraced by manufacturing firms in industrialised nations and the concomitant call for more balanced performance measurement systems (PMS), this study seeks to examine the mediating role of both non-financial and financial performance measures in the relationship between a firm's strategic orientation of flexible manufacturing and organisational performance.

Design/methodology/approach – A path-analytical model is adopted using questionnaire data from 84 Australian manufacturing firms.

Findings – The results indicate that, first, firms emphasising a flexible manufacturing strategy utilise non-financial as well as financial performance measures; second, these performance measures are associated with higher organisational performance; and third, there is a positive association between a firm's strategic emphasis on flexible manufacturing and organisation performance via non-financial and financial performance measures.

Practical implications – While there is agreement on the beneficial role of non-financial performance measures in supporting strategic priorities associated with customization strategies, equivocal research results have emerged on the role of financial performance measures in this context. The study underscores the importance of both non-financial and financial performance measures in this context.

Originality/value – The paper reinstates the value of financial performance measures for firms pursuing customization type strategies and adds to one's knowledge of PMSs by exploring the intervening role of such systems in linking flexible manufacturing strategy to organisation performance.

Keywords Flexible manufacturing systems, Performance measures, Financial performance, Organisational performance, Manufacturing industries, Australia

Paper type Research paper

Introduction

Intense competition in domestic and international markets, more demanding, assertive customers and rapid advancement of technology (all primarily fuelled by the internationalisation of business) has placed greater pressure on organisations in industrial nations to seek ways to achieve a sustained competitive advantage. Within the manufacturing sector it is becoming increasingly apparent that firms struggle to compete on a low cost basis, favouring flexible manufacturing strategies (and



International Journal of Productivity and Performance Management
Vol. 58 No. 2, 2009
pp. 119-135
© Emerald Group Publishing Limited
1741-0401
DOI 10.1108/17410400910928725

concomitant flexible systems of production) to make customised products (Gerwin, 1993; Terziovski and Amrik, 2000; Lillis, 2002; Baines and Langfield-Smith, 2003; Radnor and Barnes, 2007). Thus, as the cost of labour becomes prohibitively high in developed countries relative to developing countries, manufacturing firms in industrial nations tend to seek competitive advantage by adopting customer responsive strategies, such as flexible manufacturing, which respond to market demands by offering wide varieties of technologically superior products aimed at specific market niches (Gerwin, 1993).

A sustained competitive advantage is not, however, only about strategic choice. Both the management and accounting literatures have emphasised the importance of appropriate organisational structures and systems to support a firm's strategic priority (Porter, 1980; Miles and Snow, 1978; Bouwens and Abernethy, 2000; Abernethy and Lillis, 2001; Hoque, 2004; Van der Stede *et al.*, 2006; Chow and Van der Stede, 2006). Indeed, successful organisations are those that implement organisation structures and systems that facilitate the achievement of their strategic choices (Abernethy and Lillis, 2001). Performance measurement systems (PMS) are increasingly recognised as a vital component of organisation systems that, when aligned with the firm's strategic priorities, lead to superior organisation performance (Abernethy and Lillis, 2001; Hoque, 2004; Chenhall, 2005; Melnyk *et al.*, 2005).

Given that empirical evidence on the appropriate design of PMS is scant (see Chenhall, 2005), we extend prior theory on the performance implications of PMS in a number of ways. First, despite current research that suggests less accounting-centric, non-financial PMS are more appropriate for strategies of differentiation, such as manufacturing flexibility, *vis-à-vis* financial, efficiency based measures (e.g. Hoque, 2004), we argue that non-financial as well as financial measures are critical to the successful implementation of flexible manufacturing strategies. Second, since there is no *a priori* reason to expect that a firm's strategic choices will, in itself, affect organisational outcomes (Abernethy and Lillis, 2001), the model developed here explores the mediating role of PMS. That is, our model aims to demonstrate that a firm's strategic choice is associated with organisational performance via appropriately designed PMS. Thus, PMS become a vital component of effective strategic management. Third, rather than (conventionally) linking PMS to generic organisational performance we explore the link between financial and non-financial performance measures and, financial and non-financial organisation performance, respectively. Finally, we examine PMS within the context of the Australian manufacturing environment where there is an imperative to improve the international competitiveness of this sector.

The remainder of the paper is structured as follows. In the next section, the relevant literature is reviewed and hypotheses are formulated. The research method and variable measurement is presented followed by an analysis of the results of the questionnaire data. Finally, we conclude by raising important theoretical and practical implications in the area of PMS in the context of customised flexible manufacturing, along with limitations and suggestions for further study.

Theory development and hypotheses formulation

This study aims to develop a model to understand the relationships between strategy, performance measurement systems and organisational performance. The model tests:

- the direct association between a firm's strategy and the extent of use of both financial and non-financial performance measures; and
- the direct association between the extent of use of financial and non-financial performance measures and organisational performance (financial and non-financial); and the indirect path from strategy to organisational performance through the appropriate use of financial and non-financial measures.

Strategy and performance measurement systems

Strategy is often considered as the means by which a firm achieves and sustains a competitive advantage over other firms in the industry (Porter, 1980, 1985). One of the most commonly-used strategic typologies was developed by Porter (1980, 1985), who identified two generic strategies: product differentiation and cost leadership. A differentiation strategy involves the firm creating a product or service, which is considered unique in some aspect(s) that the customer values. Cost leadership emphasises low cost relative to competitors.

As raised in the introduction, an industrialised nation's economic future does not lie in the production of low-cost standardised products (cost leadership); rather the only way such manufacturing firms can respond is to adopt a strategy of customer-focussed flexible manufacturing offering diverse, unique and/or technologically superior products to customers (De Meyer *et al.*, 1989; Kotha and Orne, 1989; Miller, 1988; Gerwin, 1993; Kotha and Vadlamani, 1995; Lillis, 2002; Baines and Langfield-Smith, 2003). It is a strategy which attempts to maximise differentiation (Miles and Snow, 1978; Parthasarthy and Sethi, 1993). Firms pursuing a strategy of flexibility aim to respond to customer demands by offering products with unique attributes and/or switching from one product to another through co-ordinated actions to offer product variations (Buffa, 1980; Bowen *et al.*, 1989).

It is widely recognised that organisation and management systems are designed to support the business strategy of the firm in order to achieve competitive advantage (Porter, 1980; Dent, 1990; Simons, 1987, 1990; Miles and Snow, 1978; Kaplan and Norton, 1992; Nanni *et al.*, 1992; Waterhouse and Svendsen, 1999; Hoque, 2004). Concentrating more specifically on PMS, the management and accounting literatures suggest that financial performance measures are less relevant while non-financial measures are more relevant for strategies of differentiation, such as customer-focussed flexible manufacturing (Porter, 1980; Govindarajan, 1988; Abernethy and Lillis, 1995; Ittner and Larker, 1997; Perera *et al.*, 1997; Bisbe and Otley, 2004; Hoque, 2004; Van der Stede *et al.*, 2006). With a focus on supporting product customization (flexibility) rather than product standardization (cost leadership), researchers argue that financial performance measures are incompatible with the creativity necessary for a flexible manufacturing strategy (Perera *et al.*, 1997; Amabile, 1998; Chenhall and Langfield-Smith, 1998b; Hoque, 2004). Further, the complex, multifunctional nature of product customization is antithetical to financial performance measurement systems (Abernethy and Lillis, 1995). Relying on the work of Macintosh (1985), Abernethy and Lillis (1995) explain that in the absence of process standardisation and the need to encourage cross-functional co-operation and creativity, PMS require a shift from narrowly focussed financial measures to broader measures that capture the critical success factors for customer responsive strategies. These measures are likely to be

non-financial and include such measures as customer service satisfaction, delivery performance, and product innovation measures.

An emerging stream of literature has argued, however, that traditional financial accounting information should not be discarded in the context of customer focussed flexibility strategies (Bisbe and Otley, 2004; Chenhall, 2005; Van der Stede *et al.*, 2006). Within the context of a balanced PMS, Bisbe and Otley (2004) argue that non-financial performance measures are expected to encourage creativity (an important aspect of customer focussed strategies) while financial performance measures are expected to block creativity excesses and to help ensure that new ideas are translated into marketable products desired by customers. By placing appropriate boundaries around the creative process, financial measures can provide guidance to effective performance for firms pursuing a customer-focussed flexible manufacturing strategy. Thus, it is expected that such firms will utilise non-financial performance measures, as well as financial performance measures.

The work of Simons (1995, 2000) also suggests that financial (accounting) measures can facilitate firms adopting a strategic commitment to manufacturing flexibility when we consider how these measures are used. While financial measures used in a diagnostic (monitoring) manner may curb processes important to flexible manufacturing, such as creativity and customization, financial measures used in an interactive (opportunity seeking, learning) manner may enhance such processes. Although this study does not distinguish between the mode of use of financial measures, it does lay a theoretical foundation for understanding the effective use of financial performance measures in a context of firms pursuing customer-focussed strategies. Finally, the "revival" of financial performance measures can be further illustrated by more balanced approaches to performance measurement which call for appropriate combinations of both financial and non-financial performance measures to communicate strategic intent and motivate performance against established strategic targets (see Ittner and Larcker, 1998, and more recently, Chow and Van der Stede, 2006; Jusoh, 2008).

Based on the above arguments, firms pursuing a customer-focussed flexible manufacturing strategy are likely to adopt both financial and non-financial performance measures to provide them with information needed for different aspects of operations.

- H1. There is a direct positive association between a firm's strategic emphasis on flexible manufacturing and the extent of use of financial and non-financial performance measures.

Performance measurement systems and organisation performance

Performance measurement systems are designed to provide a set of mutually reinforcing signals that direct managers' attention to strategically important areas that translate to organisation performance outcomes (Dixon *et al.*, 1990). Recent theorising on PMS has an increasingly strategic focus such that these systems are designed to provide a way of operationalising strategy into a coherent set of performance measures (Chenhall, 2005), guiding managers behaviour toward key organisation outcomes. Within this literature (as highlighted in the previous section) there is increasing recognition of the need to develop balanced systems that include both financial and non-financial performance measures.

Previous research, however, has only examined the effects of financial or non-financial performance measures on an organisation's overall effectiveness (e.g. Abernethy and Lillis, 1995; Perera *et al.*, 1997; Chenhall and Langfield-Smith, 1998b; Baines and Langfield-Smith, 2003; Hoque, 2004; Bisbe and Otle, 2004). For example, both Baines and Langfield-Smith (2003) and Hoque (2004) found a positive association between the use of non-financial performance measures and overall organisation performance. Conversely, Simons (1987) found support for the different extent of usage of financial controls between defenders (product standardisation) and prospectors (product customization), however high performers from both strategic groups seemed to use tight controls (i.e. financial measures).

As argued above, firms pursuing a flexible manufacturing strategic focus are likely to use both financial and non-financial performance measures, and therefore, it is important to examine whether financial and non-financial performance measures are associated with different aspects of organisation performance. It is likely that firms adopting a flexible manufacturing strategy will use financial performance measures to evaluate their financial performance (that is how well they have extracted profits from the market), and concurrently use non-financial performance measures to provide additional insight into their non-financial performance (that is, to measure how well they have created value for their customers). By monitoring their financial and non-financial performance measures, flexible manufacturing firms are more likely to achieve sustained competitive advantage in relation to both financial and non-financial dimensions of organisation performance. We, therefore, propose the following hypothesis:

- H2.* There is a direct positive association between a firm's extent of use of financial and non-financial performance measures and financial and non-financial organisation performance, respectively.

Flexible manufacturing strategy, performance measurement systems and organisational performance

Notwithstanding the direct relationships outlined above (strategy and PMS, and PMS and organisational performance), we also hypothesise an indirect path between strategy and organisation performance through the appropriate use of PMS. That is, we expect that managers working in firms emphasising a strategy of customer-focused flexible manufacturing will make use of both financial and non-financial performance measures. In turn, PMS characterised by financial and non-financial measures are likely to be associated with enhanced organisation performance because such measures are less narrowly focused and enable managers to focus on the dual components of organisation performance, creating value (e.g. customer responsive flexibility) and appropriating value (e.g. profits) (Mizik and Jacobson, 2003). Thus, we do not expect a direct relationship between flexible manufacturing strategy and organisation performance; these two variables are connected via appropriate use of PMS, incorporating both financial and non-financial performance measures. The mediating effect of PMS in the relationship between flexible manufacturing strategy and organisation performance can be expressed as follows:

- H3.* There is an indirect positive association between a strategic emphasis on flexible manufacturing and organisational performance through the extent of use of a performance measurement system incorporating both financial and non-financial performance measures.

A summary of the model is presented in Figure 1, where the solid lines represent direct relationships and the dotted line represents an indirect relationship.

Research method and variable measurement

Sample selection

A survey was administered to 200 manufacturing firms selected from the *Business Review Weekly* list of Australia's largest companies. Manufacturing firms were selected because there is evidence that, particularly in Australia and other industrialised nations, the manufacturing sector is facing substantial environmental uncertainty due to intense competition brought about by globalization. One option for manufacturing firms is to increasingly differentiate their product offerings to remain competitive by pursuing flexible manufacturing strategies. Thus, the Australian manufacturing sector seems an appropriate choice to study. Further, the choice was made to enhance comparability with prior work in this field where the majority of work undertaken in this stream of research is in the manufacturing sector. Firms selected were either "strategic business units" (divisions of larger corporations) or independent companies. Each company was initially contacted by telephone to identify the name of the most suitable person within each business unit, his or her job title and the business unit's current address. These people were usually the senior management accountant, financial controller, or chief executive within a business unit. The questionnaires were mailed to the appropriate person with an explanatory cover letter and a reply-paid, self-addressed envelope for the return of the questionnaire. There were 84 usable responses received from the sample of 200 business unit managers, or a favourable response rate of 42 per cent.

Considering size is usually associated with resources available to implement a range of performance measures, including financial and non-financial performance measures, the sample was randomly selected from the population of Australia's largest manufacturing companies. Hence, the findings of this study should not be interpreted as a generalisation to the overall population of manufacturing companies, as it is likely that the sample included a greater proportion of companies employing non-financial performance measures than the total population of manufacturers (Chenhall and Langfield-Smith, 1998a, 1998b). Demographic data related to respondents' organisational position, years of experience, organisation size and industry are detailed in Table I[1].

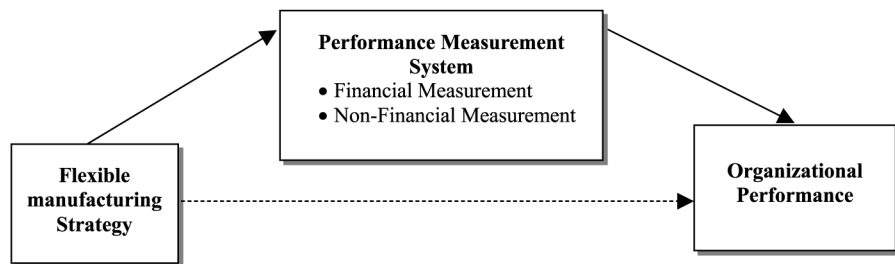


Figure 1.
Hypothesized model

Industry classification	<i>n</i>	%
Company	50	60
Division	31	37
Others	3	3
Total sample	84	100
<i>Industry classification</i>		
Food and beverages	10	12
Wood and paper products	3	4
Chemical products	2	2
Metal industry	10	12
Machinery and equipment	5	6
Textile, printing	1	1
Non-metallic, minerals	3	4
General construction	3	4
Transportation	5	6
Utilities, telecommunications	3	4
Wholesale, retail, distribution	22	26
Financial service	2	2
Mining	6	7
Others	9	10
Total sample	84	100
<i>Position of respondent</i>		
Chief accountant/group controller	44	53
Administrative manager	7	8
General manager	11	13
Senior Management Accountant	11	13
Other	11	13
Total sample	84	100
<i>Size of organisation</i>		
No. of employees		
0-200	20	24
201-500	13	15
501-1,000	10	12
1,001-2,500	18	21
2,500 +	23	28
Total sample	84	100
No. of years in the current position	Mean	7.3

Table I.
Sample demographic
statistics

Variable measurement

While the literature review identified the theoretical relationship among the firm's strategic priority, the extent of use of financial and non-financial performance measures, and the organisation's performance, it was necessary to test the measurement model of these three groups of variables prior to testing the hypothesised model. Hence, in the following section, the instruments chosen to measure the hypothesised variables were examined and their reliability also assessed by using Cronbach's alpha.

Strategy

This study used Chenhall and Langfield-Smith (1998b) strategy instrument, which measures strategic priorities identified by Miller *et al.* (1992). Respondents were asked to indicate the degree of emphasis that their firms had given to flexible manufacturing strategy over the past three years. The Likert-scale ranges from no emphasis (scored one) to high emphasis (scored seven). The factor analysis revealed the instrument was one-dimensional with a Cronbach's alpha of 0.74, which exceeded the acceptable reliability level of 0.70 for exploratory research (Nunnally, 1967). Such a result shows that the multi-item instrument is internally consistent in measuring the same construct.

Use of financial and non-financial measures

A modified version of Le Cornu and Lockett's (2000) instrument was used in this study. Some items were deleted from the original list, and new items, such as Economic Value Added (EVA), working capital ratio and product profitability were added to the list. The final measure contained 37 performance items, and respondents were asked to rate the extent to which these performance measures have been used by their business units on a seven-point Likert-scale scored as "never used" (scored one) to "always used" (scored seven). In order to test the hypotheses in this study, the 37 performance measures were separated into two categories: financial and non-financial performance measures. Classification of the measures into financial and non-financial measures was based on prior classifications by Horngren *et al.* (1994, pp. 890-892) and Waterhouse and Svendsen (1999). To be classified as financial, an item had to be able to be expressed in monetary terms, and/or be specifically or directly reflective of financial value rather than customer-focused factors, such as quality and flexibility. In all, 13 items were classified as financial measures and 24 items as non-financial measures. Reliability tests were also performed to examine reliability of the two sub-scales. The financial measure sub-scale (Fin) had a Cronbach alpha of 0.76, while the non-financial sub-scale (Nonfin) had a Cronbach alpha of 0.91, indicating high reliability of both measures.

Organisational performance

Organisational performance was measured using an instrument developed by Govindarajan and Gupta (1985) and Govindarajan (1988), which measures organisational performance along multiple dimensions, rather than on any single dimension. There are two parts to the measure where SBU managers are asked to rate the degree of importance of each of the performance dimensions as well as the rate their SBU's performance on the specified dimensions, using a seven-point Likert scale with anchors "significantly below average" (score one) and "significantly above average" (score seven). In arriving at a measure for organisational performance, the degree of importance of each dimension was used as weights, with performance on each item being weighted by the relative importance of each item. More precisely, the measure for organisational performance is the aggregation of each dimension's relative importance times its respective performance. This instrument has been widely used in prior research (see for example, Govindarajan and Fisher, 1990; Chenhall and Langfield-Smith, 1998b; Bisbe and Otley, 2004; Hoque, 2004), and was developed in the context of strategy studies. The items comprising this scale were divided into two

subscales, financial organisational performance, and non-financial organisational performance.

Results

Path analysis

Ordinary-least squares regression-based path analysis was used to test the proposed hypotheses. This technique allows a dependent variable in one equation to become an independent variable in another equation (Schumacker and Lomax, 1996). The path model used in the analysis corresponds to the hypothesised model in Figure 1. In Figure 1, each arrow between the variables has a path coefficient (the standardised coefficient or beta weight) that measures the amount of variance in the dependent variable associated with each unit change in the independent variable. For example, the path coefficient for the arrow between flexible manufacturing strategy and PMS indicates the change in flexible manufacturing strategy, measured in standard deviations, associated with a one standard deviation change in PMS. Path coefficients are also used to decompose correlations between dependent and independent variables into their direct and indirect effects to determine mediating effects (Asher, 1983).

The use of multiple-regression requires certain assumptions of the data, especially in relation to distributional characteristics. Data screening was conducted to ascertain that the data satisfied the relevant assumptions for multiple-regression. First, no evidence of multicollinearity was found by considering variance inflation factors for each variable. Second, data was tested for normality. Using Mardia’s test in AMOS 4, it was found that the data approximately followed a multivariate normal distribution.

The descriptive statistics and the zero-order correlation coefficients for all the variables are presented in Tables II and III, respectively.

Variables	Mean	SD	Theoretical range		Actual range	
			Min	Max	Min	Max
Flexible	4.43	1.2	1	7	1	7
Financial measures (Fin)	5.53	0.78	1	7	3.85	7.00
Non-financial measures (Nonfin)	4.27	1.05	1	7	1.42	6.63
Financial effectiveness (Finperf)	31.26	8.73	1	49	6	49
Non-financial effectiveness (Nonfinperf)	22.90	7.32	1	49	3	41.33

Table II.
Descriptive statistics

Variables	1. Flexible	2. Nonfin	3. Fin	4. Finperf	5. Nonfinperf
1. Flexible	1.00				
2. Nonfin	0.406**	1.00			
3. Fin	0.224*	0.531**	1.00		
4. Finperf	0.038	0.293**	0.385**	1.00	
5. Nonfinperf	0.526**	0.573**	0.441**	0.496**	1.00

Table III.
Correlation matrix for all measured variables

Note: *Significant at 0.05 level; **significant at 0.01 level

Two models have been developed to test the studies hypotheses. Models 1 reports regression results for flexible manufacturing strategy, use of non-financial performance measures and non-financial organisation performance; Model 2 reports regression results for flexible manufacturing strategy, use of financial performance measures and financial organisation performance. In both cases, the regression results were used to compute the magnitudes (standardised beta coefficients) of the direct effects in the path models.

Results of Hypothesis 1

Model 1 and Model 2 regressions in Tables IV and V, respectively, report a positive relation between flexible manufacturing strategy and use of non-financial performance measures (beta = 0.41, $p < 0.001$) and a positive relation between flexible manufacturing strategy and the use of financial performance measures (beta = 0.22, $p < 0.05$). These results support *H1* in that SBUs pursuing a strategy of flexibility use PMS characterised by both financial and non-financial performance measures (Figure 2).

Table IV.
Model 1: Regression results for flexibility strategy and non-financial measures/performance

Dependent variable	Independent variables	Associated hypothesis	Path coefficient	t-value	p-value	Adjusted R ² (%)
Nonfin	Flexible	H1	0.406	4.025	0.000	15.5
Nonfinperf	Flexible	H3	0.351	3.830	0.000	41.7
	Nonfin	H2	0.430	4.695	0.000	

Table V.
Model 2: Regression results for flexibility strategy and financial measures/performance

Dependent variable	Independent variables	Associated hypothesis	Path coefficient	t-value	p-value	Adjusted R ² (%)
Fin	Flexible	H1	0.224	2.080	0.041	4
Finperf	Flexible	H3	-0.050	-0.480	0.632	13
	Fin	H2	0.396	3.767	0.000	

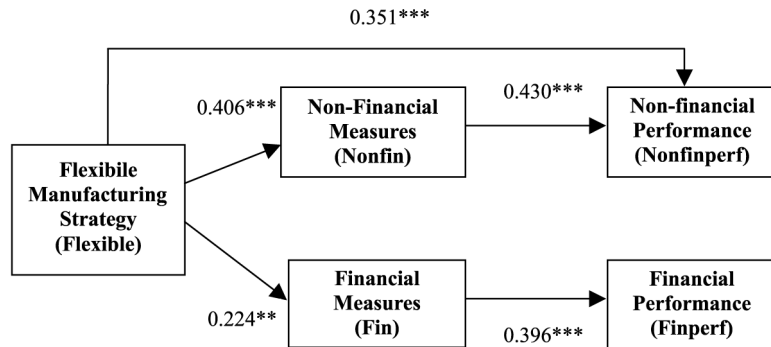


Figure 2.
Final path model for flexible manufacturing strategy

Note: ***Significant at 0.01 level, **Significant at 0.05 level

Results of Hypothesis 2

Referring to Model 1 regression results presented in Table IV shows there is a positive association between the use of non-financial performance measures and non-financial organisation performance (beta = 0.43, $p < 0.001$). Further, Model 2 results in Table V shows similarly that the use of financial performance measures is positively associated with financial performance (beta = 0.40, $p < 0.001$). These set of results support *H2* such that the firm's extent of use of financial and non-financial performance measures have a positive effect on financial and non-financial organisational performance, respectively.

Results of Hypothesis 3

The mediating effect of PMS in the relation between flexible manufacturing strategy and organisational performance is the substance of *H3*. To show support (or otherwise) of *H3* we need to present the decomposition of the direct and indirect effects for both models and also assess the statistical significance of the indirect effects. Referring to Table VI for Model 1, we note that there is a direct positive effect between flexible manufacturing strategy and non-financial organisation performance (beta = 0.35, $p < 0.001$), but also a significant positive indirect effect between these two variables via the extent of use of non-financial performance measures (beta = 0.18, $p < 0.01$). Although not a fully mediated model, the results support *H3*. In addition, Table VII for Model 2 shows no direct effect between product flexible differentiation strategy and financial organisation performance, but a significant indirect effect between these two variables via the extent of use of financial performance measures (beta = 0.09, $p < 0.05$). This is a fully mediated model and provides support for *H3*. Taking these two results together it is clear that PMS characterised by both financial and non-financial performance measure mediates the relationship between a flexible manufacturing strategy and organisation financial and non-financial performance.

Combination of variables	Observed correlation =	Direct effect +	Indirect effect +	Spurious effect
Flexible/nonfin	0.406	0.406	-	-
Flexible/nonfinperf	0.526	0.351	0.175 ^a	-
Nonfin/nonfinperf	0.573	0.430	-	0.143

Note: ^aSignificance of indirect effect (t -value = 3.055, $p < 0.01$)

Table VI.
Model 1: Decomposition
of observed correlations

Combination of variables	Observed correlation =	Direct effect +	Indirect effect +	Spurious effect
Flexible/fin	0.224	0.224	-	-
Flexible/finperf	0.038	-0.050	0.088 ¹	-
Fin/finperf	0.385	0.396	-	-0.011

Note: ^aSignificance of indirect effect (t -value = 1.82, $p < 0.05$)

Table VII.
Model 2: Decomposition
of observed correlations

Discussion and conclusions

The purpose of this study was to empirically explore the relationships between flexible manufacturing strategy, performance measurement systems and organisation performance within the manufacturing sector. Prior research studying the strategy/PMS link has largely assumed that the effectiveness of differentiation type strategies, such as flexible manufacturing strategies, is associated with the increased use of non-financial performance measures *vis-a-vis* financial performance measures (e.g. Bisbe and Otley, 2004; Hoque, 2004). Our study found empirical support for the importance of using both non-financial as well as financial performance measures for firms pursuing flexibility strategies. The findings, while consistent with the conventional view that firms adopting flexibility strategies (or more generically, differentiators) tend to place a high emphasis on the use of non-financial measures (Porter, 1980; Govindarajan and Gupta, 1985; Hoque, 2004), also provide support for the surprising findings of Simons (1987) that financial measures are also useful in this context. Dent (1990) speculated that perhaps it was the need to curb excessive risk-taking activities in the creative process, to encourage employee learning, and/or, to assist managers in achieving their financial objectives in less certain, fluid environments, that have prompted firms pursuing flexible, customization strategies to use financial measures.

Our study also found that firms use both financial and non-financial performance measures to enhance both financial and non-financial organisational effectiveness. Non-financial measures are more actionable and future-oriented, and their use can improve an organisation's capabilities in future planning and strategy implementation. Financial measures, on the other hand, are direct reflections of current profitability, and organisations need to report them to their stakeholders. In other words, PMS provide a map that guides managers' behaviours toward critical financial and non-financial outcomes, such as, profit, cash flow, new product development and personnel development. Hence, a novel finding of this study supports the idea that the use of both financial and non-financial measures can enhance financial/non-financial organisational performance[2].

Our results also develop further insights into the relationship between strategy and organisation performance by exploring the mediating role of performance measurement systems. Consistent with the work of Hoque (2004), we found empirical support for an indirect effect between flexible manufacturing strategic priorities and organisation's performance through the use of performance measurement systems. However, whereas Hoque (2004) examined the mediating role of non-financial performance measures only, our study found support for the mediating role of both non-financial and financial performance measures in the relationship between flexibility strategies and organisation performance.

Upon a closer examination of the mediating role of non-financial and financial performance measures, it is interesting to note that there is a direct relationship between flexible manufacturing strategy and non-financial organisational performance and not financial organisational performance. We can conclude that financial performance measures become pivotal in the relationship between a strategic focus of flexible manufacturing and financial organisation performance. Expressed differently, a strategic emphasis on manufacturing flexibility is not, of itself, associated with high

financial organisation performance; financial organisation performance is only affected through the appropriate design and use of a financial PMS.

These findings add to existing knowledge about the use of performance measurement systems and underscore the importance of designing more broad-based performance measure systems to include both financial and non-financial measures (consistent with the historical mapping of such measures by Radnor and Barnes, 2007). While the performance measurement instrument used in this study does not equate to the use of a “balanced” performance measurement system, the results do indicate that firms adopting a flexibility strategy are deriving performance benefits from more comprehensive PMS. As stated by Chow and Van der Stede (2006), p. 10), there is a “need to be cautious about popular claims that nonfinancial measures are ‘superior’ to traditional financial measures” . . . rather “the challenge is to select the optimal combinations of measures” for the context being considered.

Finally, our study was conducted within the Australian manufacturing sector where firms face domestic and international competition in addition to rapid shifts in customer demands. Many manufacturing firms are realising that to remain viable, strategies of customization may be a more viable option than strategies based on efficiency and price. Our study further demonstrates that customization strategies, designed with appropriate PMS could further enhance the competitive position of Australian firms.

There are a few limitations in this study worth noting. Although we designed our study specifically to examine Australian manufacturing firms, interpreting our results beyond that domain should be done so with caution. Both the strategy and performance measurement systems instruments used here are still relatively new in the literature, and could be refined in future studies. A limitation associated with the measurement of PMS was the focus on the “use” of the performance measure. It is possible that the reported lack (or low level) of use could either mean the measures were not available, or were available, but not found to be useful. Further research is required to improve this measure. Another limitation is that the use of self-assessed performance has been criticised due to the potential for bias, and therefore, the results must be interpreted in light of this potential bias. Further, there may have been variables omitted from the model in this study that in fact moderate, or mediate, the relationship between use of performance measures and organisational performance. Anecdotal evidence would suggest that not all organisations experience improved performance through the development of performance measures, indicating the need for further research, which identifies potential mediating or moderating variables. Finally, the path model implies causality. We are unable to assess the possibility of alternative causal directions among some of the variables. Future research could consider the use of longitudinal data, or carefully designed experiments, with causes clearly preceding effects in time, to enable causal statements to be made. Longitudinal data could also be useful in helping researchers determine the nature of any “lags” between changes in the use of non-financial performance measures, and organisational performance.

Despite the above limitations, the results of this study add to the scant empirical findings that have used mediation approach to test the relationship between flexible manufacturing strategy, the design of performance measurement systems, and their

impact on organisational performance. In particular this study highlights that in an environment where manufacturing firms are attempting to find ways to compete successfully in a globalised world, a strategic emphasis on customised flexible manufacturing can lead to improved organisational performance through appropriately designed, balanced PMS that include both financial and non-financial measures.

Notes

1. To test the possibility that financial controllers may rate the extent of use of measures differently to other managers, *t*-tests were conducted to test for significant differences between their responses, and those of other managers. No significant differences were found.
2. Additional analyses were undertaken to assess the effect of the use of non-financial performance measures on financial performance, testing the argument that by paying increased attention to non-financial performance measures improved financial performance can result. In the analysis, this path was not significant, possibly due to time “lags” between non-financial and financial performance that cannot be picked up by cross-sectional research methods.

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