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A NOTE ON MARKET COMPETITION, ADVANCED MANUFACTURING TECHNOLOGY AND MANAGEMENT ACCOUNTING AND CONTROL SYSTEMS CHANGE

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Changes in competitive and manufacturing environments have important implications for designing appropriate management accounting and control systems (MACS) in organizations. This paper examines the effect of market competition and advanced manufacturing technology on management accounting and control systems change. Using a sample of 110 Malaysian manufacturing firms, this study investigated the roles of perceived market competition, advanced manufacturing technology adoption and employee attitude toward change in predicting MACS change. Hypotheses were tested using both quantitative and qualitative data collected by a questionnaire survey and post-survey interviews. It was hypothesized that changes in perceived market competition and changes in advanced manufacturing technology adoption directly affect changes in MACS. Since attitude toward change reflects managers' perceptions on change, it was conjectured that attitude toward change also influences MACS change. The results indicate that changes in competition and advanced technology adoption significantly affect MACS change but attitude towards change has no effect on MACS change. The findings of the study have implications for design of MACS for organizations in operating rapidly changing and dynamic business environment.

Keywords: management accounting

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Introduction

Increasing participation from multinational companies through foreign direct investments (FDI) has transformed the Malaysian economy from a raw material producer to an emerging multi-sector economy. Increasing trade liberalization and advancements in manufacturing and information technologies have contributed significantly to increasing competition in Malaysia's business

environment both in the domestic and the international markets. To cope with these changes, manufacturing firms are constantly reviewing and revising their manufacturing strategies, and they typically achieve this through adoption of advanced manufacturing technology (AMT) (Lee, 1996).

The changes in the manufacturing processes and strategies often require appropriate changes in the Management Accounting and Control Systems (MACS) in firms (Burns and Vaivio, 2001; Mia and Clarke, 1999; Libby and Waterhouse, 1996; Yakou and Dorweiler, 1995; Kaplan, 1984). To achieve targeted business performance, firms undertake structural changes including changes in information and communication networks such as MACSs (Williams and Seaman, 2002). For decades scholars have been debating the relevance of the traditional MACS in providing relevant, timely and accurate information to management for planning, control and decision-making purposes in a new manufacturing environment (Bjørnenak and Olson, 1999; Drury and Tayles, 1995, Cooper and Kaplan, 1988; Johnson and Kaplan, 1987; Kaplan, 1984). Apart from the economic factors, behavioral factors such as managers' attitude toward change are argued to influence their perceptions on change including changes in MACS (Elizur and Guttman, 1976).

The remainder of this paper is organized in the following manner. Section 2 provides development of the theoretical framework that depicts the relationships under investigation. Section 3 presents the sample description and measures. The results of the data analysis from the survey and interviews follow in Section 4. Finally, discussion and conclusions are presented in Section 5.

Theoretical Framework and Hypotheses Development

Trade liberalization and advances in Information and Communications Technology (ICT) have transformed the competitive business environment into a global market. ICT has changed the manner in which data and information are being collected, measured, analyzed and disseminated within and between organizations. It has been argued that organizations need to equip themselves with appropriate responses to the impending threats and opportunities in the local and global markets, and ensure that they design and use appropriate control systems for this purpose (Hoque and Hopper, 1994; Simons, 1990), which has led to an increasing need for management accounting change (Burns and Vaivio, 2001). Change is conceptualized as the extent of changes adopted in a given period or as the extent to which changes are integrated in the operations (Damanpour, 1987).

Management accounting systems play a vital role in monitoring the strategic progress of a firm through a feedback information system. The growing concern among accounting professionals and academics on the adequacy of the traditional MACS in meeting the current needs of information in firms, has led to a number of "new or claimed to be new" management accounting systems, such as new product costing systems, strategic cost analysis methods, quality management and others (Libby and Waterhouse, 1996). The traditional volume-based approach of allocation of production costs to products and

services is criticized for not reflecting the current production processes and it is unsuitable because overhead costs are no longer moved by production volume but by complexity of production processes (Johnson and Kaplan, 1987). However, empirical research has shown that the traditional MACS approach is still widely used in practice due to lack of knowledge of other alternatives and high financial switching costs to new costing systems (Drury and Tayles, 1995).

Contrary to the view that MACS are rarely changed due to the resistance to change, Libby and Waterhouse (1996), and subsequently, Williams and Seaman (2001) provided empirical evidence on the extent and determinants of changes in MACS, specifically the five sub-systems for planning, controlling, costing, directing and decision-making. Based on the contingency theory, these two studies (Libby and Waterhouse, 1996; Williams and Seaman, 2001) argue that changes in MACS are dependent on the firm's context and structure, both of which may promote or inhibit change. Using a sample of 24 Canadian firms, Libby and Waterhouse (1996) found that on average, 31 percent of the MACS in the sample firms changed during the period 1991-1992. The greatest number of changes occurred in the decision-making sub-system and fewest changes occurred in the directing sub-system. The change was best predicted by organizational capacity to change, which in turn was positively related to the number of MACS sub-systems in use. Organizational size, structure (decentralization) and intensity of competition did not predict changes in MACS.

Williams and Seaman (2001) replicated Libby and Waterhouse (1996)'s study by examining firms from the manufacturing, industrial and service sectors in Singapore. They found an overall 22.1% rate of MACS change in their sample. Regression results for all the sectors indicated that centralization (replacing decentralization) was the only significant predictor of MACS change, while size and capacity to change variables exhibited mixed results. Similar to Libby and Waterhouse's (1996) findings, decision-making sub-system exhibited the highest number of changes while the lowest number of changes occurred in the costing sub-system. Regression results indicated that increasing centralization, decreasing intensity in competition and greater organizational capacity were significantly associated with the number of changes in MACS while size effect was insignificant.

Using a sample of Malaysian manufacturing firms, this study seeks to provide further insights to the impact of perceived market competition, AMT adoption and attitude toward change on MACS change. In this study, the standard components for planning, controlling, costing, directing and decision-making of a management accounting system are utilized in formulating the research framework. These five components of the management accounting system encompass the critical functions of a MACS to aid managerial decision-making and enhance organizational performance.

Market Competition and MACS Change

One of the first studies on the effect of competition on management control system and organizational performance is by Khandwalla (1972). He found a strong positive relationship between intensity of competition and reliance on the formal accounting

systems, as well as a negative relationship between the firm's profitability and the intensity of price, product and marketing channel competition. On the contrary, Mia and Clarke (1999) found that the profitability of a group of Australian firms improved with increased competition during the period 1993 to 1995. Their findings suggest that increasing market competition has significantly enhanced the use of management accounting information for improving business performance.

In this study, the relationship between change in the level of perceived intensity of market competition and MACS change is investigated. Increasing the intensity of market competition induces firms to re-evaluate their existing competitive strategies. Among the objectives of establishing MACS are to provide information that would facilitate planning, costing, performance measurement and decision-making. Firms operating in a competitive environment need to constantly review their MACS to ensure that the appropriate costing and performance measurement systems are instituted for sustained competitiveness (Libby and Waterhouse, 1996). Thus, it is hypothesized that a greater change in the intensity of market competition will lead to more extensive changes in MACS. Hypothesis 1 ensues:

H₁: There is a positive relationship between the extent of MACS change and the change in intensity of market competition.

Advanced Manufacturing Technology and MACS Change

As part of the strategic responses to escalating market competition and trade liberalization, manufacturing firms have been making significant changes to their manufacturing process through the adoption of Advanced Manufacturing Technology (AMT) and the use of different managerial techniques and practices, such as Just-in-Time (JIT) and Total Quality Management. AMT adoption leads to changes in manufacturing operations and information needs. Since a MACS plays a vital role in scanning the environment through a number of complex systems to gather and report information relating to changes in the manufacturing processes, managers are expected to make greater use of MACS information when the level of AMT adoption increases. Thus, it is conjectured that higher level of adoption of AMT will lead to higher extent of change in MACS to accommodate the changing demand for relevant and timely information. This relationship is stated in the following hypothesis:

H₂: There is a positive relationship between the extent of MACS change and the extent of change in AMT adoption.

Attitude Toward Change and MACS Change

Attitude toward change generally consists of a person's cognition about change, affective reactions to change and behavioral tendency to change (Dunham et al., 1989). Affective responses are a greater or lesser feeling of being linked to, satisfied with, or anxious about change. Cognitive responses reflect the opinion one has about the advantages and disadvantages, usefulness, necessity, and knowledge required to handle the change. Instrumental responses are the actions already taken or which will be taken in the future

for or against change. Responses to a particular change may vary from one individual to another and the process of MACS change may depend on managers' attitude to change. Thus, the following hypothesis is formulated:

H₃: There is a positive relationship between the extent of MACS change and the attitude toward change.

Methodology

Sample

In this study, a between-method triangulation approach comprising a self-administered questionnaire survey and post-survey semi-structured interviews was used to collect both quantitative and qualitative data. The survey findings were used to test the hypotheses about the relationships between the dependent variables and independent variables identified in this research. These findings were then matched with the findings from the semi-structured interviews, to see whether the findings from both methods led to the same conclusions about the phenomena under investigation. A total of 1000 questionnaires were mailed to firms listed in the 2001/2002 Federation of Malaysian Manufacturers (FMM). Out of the total mailed, 110 responses were chosen for the final data analysis, representing a final response rate of 11%. Accountants or managers, who represented the middle-level management, constituted 51.8% of the total respondents. The rest of the respondents were general managers/financial controllers (25.8%), managing directors/CEOs (6.4%), engineers (7.4%) and others (11.8%), who did not clearly specify their job designations.

In addition, the semi-structured interviews provided further insights and supplement the findings from the survey. The main purpose of the semi-structured interviews was to obtain in-depth information relating to MACS change from the key players involved in the change process. The interviewees were chosen based on their experience and in-depth knowledge about the management accounting systems in their organisations. Only eight accountants or the senior managers of both multinational and local firms were selected due to time and cost constraints.

Measures

MACS was measured using the 23 items identified in Libby and Waterhouse (1996). These items were sub-divided into five main system components: planning, controlling, costing, directing and decision-making (see Appendix A). The planning sub-system covers activities such as budgeting, operations planning, capital budgeting and strategic planning. MACS change was measured using a 5-point Likert-type scale ranging from 0 (no change) to 5 (great extent of change) for the three-year period from January 2000 to December 2002.

The instrument for measuring intensity in competition was a modified version of the composite scale for measuring competitive pressure in Khandwalla (1972), as well as in Libby and Waterhouse (1996). This measure consisted of eight items for rating the intensity

and importance of competition in price, product range, quality, new product introduction, advertising and promotion, technological change, marketing distribution and changes in government regulation or policy on scales ranging from 1 (very low) to 7 (very high) and 1 (least important) to 7 (extremely important), respectively. An index of the competitive pressure for each organization was computed by taking the average of the sum of the square root of the product of the intensity and importance of each type of competition.

The instrument consisting of 22 items for measuring AMT adoption was adapted from Snell and Dean (1992). The respondents were required to rate the extent of adoption of each AMT application and the perceived importance of that AMT application on a five-point Likert-type scale ranging from 1 (very low or least important) to 5 (very high or very important). An index of AMT adoption for the current period and one for the past period were computed by taking the average of the sum of the square root of the product of the rating score on the level of AMT application and the rating score on its importance. The extent of change in AMT adoption was the difference between the current and the past indices of AMT adoption. Cognitive, affective and behavioral dimensions of attitude toward change were measured using an 18-item instrument developed by Dunham, *et al.*, (1989). Each dimension was measured by six items, on a seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). Scores for each of the 18 items were totaled and averaged to yield a mean score for the overall measure of attitude toward change.

Results

Survey Results

Descriptive Statistics

Table 1 summarizes the descriptive statistics for the dependent and independent variables, and the correlations of these variables are shown in Table 2. The extent of MACS change was moderate, with a mean of 2.20. The highest level of change occurred in the decision-making sub-system, while the lowest level of change was observed in the costing sub-system. This study measured the extent of change, whereas Libby and Waterhouse (1996) and Williams and Seaman's (2001) studies used the rate of change. Nonetheless, the overall results of this study are fairly consistent with the reported 31% and 22.1% changes in MACS in Libby and Waterhouse (1996) and Williams and Seaman (2001), respectively. Both of these studies also found the highest level of changes in the decision-making sub-system. Williams and Seaman (2001) reported the lowest level of changes in the costing sub-system, while Libby and Waterhouse (1996) found the directing sub-system experienced the least change.

The extent of change in intensity of competition and that for AMT adoption were low, with means of 0.23 and 0.23, respectively. Attitude towards change was fairly high with a mean of 5.23, suggesting that the respondents were quite receptive to changes. The Cronbach alpha coefficients ranged from 0.70 to 0.91 that indicate acceptable levels of scale reliability (Nunnally, 1967) for the variables concerned. The Pearson correlation

Table 1: Descriptive Statistics of Variables (n = 110)

	Mean	SD	Observed Range	Theoretical range
Overall extent of change in MACS	2.20	1.30	0 – 4.73	0 – 5
Planning	2.11	1.43	0 – 5	0 – 5
Controlling	2.40	1.50	0 – 5	0 – 5
Costing	1.85	1.44	0 – 5	0 – 5
Directing	1.20	1.65	0 – 5	0 – 5
Decision Making	2.53	1.50	0 – 5	0 – 5
Overall change in intensity of competition	0.23	0.52	-0.84 – 1.81	-6 – 6
Overall change in AMT adoption	0.23	0.46	-0.41 – 2.82	-5 – 5
Overall attitude toward change	5.23	0.80	3.25 – 7	1 – 7

Table 2: Correlations (*p* values) and Reliability Measures for Variables (n = 110)

Variables	1	2	3	4	Cronbach Apha
1. MACS Change	1				N/A
2. Change in Competition	-0.233**	1			0.70
3. Change in AMT	0.235**	0.047	1		0.90
4. Attitude Toward Change	0.121	-0.015	0.189**	1	0.91

*** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.10$

between MACS change and change in competition ($r = -0.233, p = 0.015$) was positive and significant, but in a direction opposite to that hypothesized. The correlation between MACS change and change in AMT application ($r = 0.235, p = 0.015$) was also positive and significant. However the correlation between MACS change and attitude toward change was not significant. The correlation between change in AMT adoption and attitude toward change ($r = 0.189, p = 0.050$), on the other hand, was significant. The lack of a significant and positive association between attitude toward change and MACS change might be due to the specialized domain of the accounting function and the perceived expertise required to execute any MACS change.

Regression Results

Regression runs were separately carried out using the extent of change in each of the five sub-systems of MACS, as well as the overall MACS change, as the dependent variable. The independent variables were extent of change in competition, change in AMT adoption and attitude to ward change. The regression results, which are summarized in Table 3, show that significant relationships existed for the overall change in MACS, as well as for change in each of the five sub-systems of MACS. Extent of MACS change was significantly associated with decreasing competition, but with increasing change in AMT adoption. There was a positive but insignificant association between MACS change and attitude toward change. Thus, hypotheses H2 is supported, while hypotheses H1 and H3 are not supported.

Table 3: Summary of Results of Regression Analyses

Independent Variables	Dependent Variable: Extent of Changes in MACS					
	Overall MACS	Planning	Control-ling	Costing	Directing	Decision-Making
Change in Competition	-0.239**	-0.060	-0.227**	-0.317***	-0.354***	-0.185*
Change in AMT	0.230**	0.287***	0.140	0.231**	0.059	0.160
Att. Toward Change	0.092	0.031	0.068	0.153*	0.192**	0.072
R2	0.121	0.089	0.076	0.185	0.169	0.066
Adj. R2	0.096	0.062	0.049	0.161	0.142	0.039
F	4.740	3.315	2.760	7.737	6.313	2.408

***p ≤ 0.01, **p ≤ 0.05, *p ≤ 0.10

The extent of changes in the overall MACS, as well as its sub-systems for controlling, costing, directing and decision-making were all significantly associated with decreasing competition. The extent of changes in AMT adoption was significantly and positively associated with the changes in the overall MACS), the planning sub-system and the costing sub-system. Attitude toward change, on the other hand, was significantly and positively associated only with the directing sub-system and its association with the costing sub-system was only weakly significant. Only the costing sub-system was significantly associated with all the three independent variables.

The findings of this study are consistent with the findings by Williams and Seaman (2001), even though they only found significant association between the overall MACS change, changes in controlling and decision making sub-systems and decreasing competition. Libby and Waterhouse (1996), on the other hand, reported a positive but insignificant relationship between MACS change and market competition.

Post-Survey Interview Results

This section presents the results of semi-structured interviews conducted on selected managers. Analysis of the data collected from the questionnaire survey has revealed a significant but inverse relationship between MACS change and perceived change in market competition and a significant positive relationship between MACS change and change in AMT. However, no effect was found for the relationship between attitude towards change and MACS change. The purpose of the interviews was to supplement the information gathered from the survey and to obtain further insights and in-depth information on certain pertinent issues related to MACS change. The interviews aimed to obtain managers' perception on and also to find the rationale for the inverse relationship between perceived change in competition and MACS change, the low level of MACS change, obstacles in the change process, agents in MACS change and roles of attitude towards change in MACS change.

Background Information

Several respondents to the mail survey were chosen as prospective interviewees. Eight managers from selected manufacturing firms in Klang Valley, Malaysia, were interviewed. All the interviews were conducted using an interview guide at the interviewees' offices and each took about 45 minutes to one hour. After each interview session, the results were transcribed immediately. Five of the interviewees held top or senior management positions, while three were middle level managers. All of the managers interviewed had been working with their respective firms for more than 2 years, four of them had been working with the same firms for over 10 years, while three had more than 20 years of working experience. Their senior job positions and long service durations with the firms indicated that they had sufficient background and knowledge related to their firms' operations. The respondents consisted of seven males and one female. Five of them were between 35 to 44 years old, one was between 45 to 54 years old, and two were over 55 years of age.

Table 4 displays the background information of the firms of those interviewees. All the interviewees were attached to manufacturing firms, with four firms producing electrical and electronics products and one producing each of these products; beverages, lubricants, tyres, and fibreboard. All firms had been operating in Malaysia for more than 6 years, with six of them having operated for more than 10 years. Except for one firm, the annual sales turnover for all the other firms was above RM70 million with two firms' turnover as exceeding RM1 billion. In terms of firm ownership, three of them were locally owned, three were owned by the Japanese, and two each were owned by the Americans and the British, respectively. When asked about the organisational structure in their firms, an interview respondent from one of the local firms indicated that the structure was centralised, while

Table 4: Background of Firms

Inter-viewee	Type of Products Manufactured	Years of Operation (years)	Annual Sales Turnover (RM)	No of Employees	Firm Ownership	Org. Structure
I-1	Beverages	> 30	200 mill.	440	Local	Centralised
I-2	Silicon wafer	9	600 mill.	990	Foreign-Japanese	Centralised
I-3	Electrical products	> 10	100 mill	> 1000	Foreign-Japanese	Centralised
I-4	Lubricants	> 20	500 mill	> 1000	Foreign – UK	Decentralised
I-5	Silicon wafer	6	20 mill	318	Foreign-Japanese	Centralised/ Decentralised
I-6	Tyres	> 30	1 billion	1,500	Local	Centralised/ Decentralised
I-7	Semi conductors	> 30	2.4 billion	3,000	Foreign (USA)	Decentralised
I-8	Fibreboard	10	70 mill	160	Local	Centralised

Opinions on Issues Related to MACS Change in Malaysia

the other respondent indicated that decision-making in his firm was both centralised and decentralised. The respondents from the American and British owned firms indicated that their firms used a decentralised organisational structure. Two interviewees from the Japanese owned firms indicated a centralised structure while one firm practised both centralised and decentralised decision-making.

Extent of Changes

Consistent with the results of the questionnaire survey, six of the respondents indicated that their firms had implemented low to moderate level of changes in MACS, while only two indicated high level of changes. When asked for their opinions on whether changes in MACS was needed to respond to the changes in the business environment, all of the interviewees had similar view that MACS need to change if there were demands for such changes. The two respondents, who indicated high levels of changes in their MACS, were from American and British owned firms. However, the other six respondents, from the local and the Japanese owned firms, thought that not much changes was currently needed in the accounting systems as the current systems were sufficient in meeting their information needs, and accounting systems should evolve to adapt to the changes in the manufacturing environment, not drastic change. As one of the interviewees, a senior vice president (Finance and Operations) from a locally owned firm, stated:

I don't think that change is required. Although accounting is an art, it is also like science, accounting is fixed... Accounting needs to adapt to day-to-day business needs. What is important is what accounting, that is the principle of accounting that is sufficient for your organisation. (I-1).

Another respondent, a cost accountant at a Japanese owned firm (I-3), stated "accounting is not changing much since the basic principles are still applicable today." In addition, all of the respondents agreed that changes in MACS were carried out if there were demands for such changes. Interviewee 1, who was a senior vice president (Finance and Operations) at a local beverage manufacturer, gave the following comment related to accounting change:

Accounting can be changed or adapted as a consequence of other things such as changes in technology. (I-1).

Another interviewee, a general accounting manager at the American owned firm, gave the following opinion on the same subject:

We do not embrace changes in accounting simply because they are fashionable, but the most important element is that accountants must be involved in decision making related to day to day operations with people from other sections. (I-7).

Regarding whether or not the traditional MACS were still relevant, seven of the interviewees indicated that the standard costing method was the main method used in their firms, while the interviewee (interviewee 7) from the American owned firm indicated that ABC and

absorption costing had been widely used in the firm for a number of years. Interviewee 7 stressed that the role of costing system had not diminished and all costs, direct and indirect, were fully absorbed. Two other respondents, a local (I-1) and a U.K. (I-3) owned firms, also indicated using some features of ABC.

However, there were also firms which reported certain changes in the traditional MACS to suit the current needs in their organisations. For example, the interviewee (I-7) from the American based firm indicated that the traditional standard costing for inventory evaluation and variance analysis were no longer used in the firm. Inventories were valued at purchase price instead of their standard costs and standard costs were no longer scrutinised for determining performance as in the traditional variance analysis. Instead, performance was determined by examining product yield. Monthly yield reports were prepared specifying the target output levels and the projected associated production costs.

All of the interviewees agreed that costs control was one of the most important factors for their firms' survival. Other factors that were important include continuous improvement in costs, productivity and performance. One of the interviewees (I-2) from a Japanese owned firm cited not serving coffee during meetings as an example of the steps taken to increase cost awareness and to instil cost consciousness among its' employees. Among other MACS changes mentioned by many of the interviewees include more frequent reporting, optimising the use of current systems, automation in bookkeeping, and integration of accounting systems for decision-making.

Market Competition and MACS Change

All interviewees indicated that competition due to decreasing product price and quality due to technological change were the most intense. Few of them also felt that distribution channels, delivery time, shorter product life cycle, and variety of products also significantly contributed to the escalating market competition. The interviewee from beverage manufacturer (I-1) specifically stated that "keeping good credible" staff was one of the challenges faced by the company as staff pinching was quite rampant in the industry. All of the interviewees expected that the competition level would be increased after implementation of ASEAN Free Trade Area (AFTA) on 1 January 2004. In addition, cheaper labour costs in China would also pose significant threats to their competitive positions, as products manufactured in the country would cost less to consumers.

The results from the survey indicate significant and inverse relationship between changes in market competition and MACS change, the relationship was in the opposite direction from what has been suggested in the literature. When asked for their opinions on these findings, all of the respondents agreed that market competition had intensified within the last three years, but only two of them had indicated high level of MACS changes, especially those related with cost controls, had been implemented in their firms. The two firms were the American owned firm and the locally owned fibreboards manufacturer. The other six interviewees commented that not much changes had taken place in their firms' MACS and felt that the change was not urgently needed to cope with the escalating competition. They stressed that other factors such as the right marketing strategies and new product

introduction were much more important in ensuring their firms' success. The pre-occupation to implement other more urgent changes related to production and strategy might have contributed partly to the inverse relationship between change in market competition and MACS change. Even though change in competition was positive, indicating increasing level of market competition, the change in competition did not always result in corresponding significant changes in MACS, many interviewees felt that their current MACS were sufficient for decision making purposes.

AMT Adoption and MACS Change

Five interviewees from electrical and electronics and semi-conductors firms indicated that their firms had been utilising high level of AMT in their production processes. The other three respondents from firms manufacturing beverage, fibreboards, and lubricants indicated moderate level of AMT. The level of AMT adoption depended to a large extent the types of products a firm produced as well as the cost-benefit consideration in using the technologies. Certain types of manufacturing process for products such as beverages, fibreboards and tyres do not require advanced level of automation, while certain types of advanced technology may not justify the cost-benefit considerations. As pointed out by one of the interviewees:

Our production systems do not require a very high technology applications...Use of technology must match the types of products the company produce. Technology is out there but the technology may not be economical to be used in our company for the moment. (I-1)

When asked on change in AMT level within the last three years, seven interviewees also stated that not much changes in AMT adoption had taken place within the period. However, one interviewee from a Japanese silicon wafer manufacturer stated that frequent changes in technology changes had been experienced in the firm and machineries in the firm usually last only for up to 2 years. When asked about the effects of AMT adoption on MACS change, all of them stated that AMT adoption was the main factor driving changes in MACS in their firms. Two of the interviewees indicated that adoption of Enterprises Resource Planning (ERP) system necessitated appropriate changes in MACS in their firms, especially in terms the accuracy of information, speed and frequency of information flows and the amount information required for planning, forecasting and decision-making.

Attitude Towards Change and MACS Change

Related to the role of attitude towards change in MACS change, all of the interviewees agreed that positive attitude was paramount for any change efforts to succeed. However, in the case of MACS change, they felt that the changes would be carried out only when there was a need for them to do so. All of them indicated that they would be very receptive to changes as long as the changes are for the better. One of the interviewees gave the following comment regarding the attitude towards change:

Change is something that is inevitable. If we look at product life cycle, it is getting shorter. So we must embrace change if not we are going to be left behind because we are competing against big companies. (I-7)

Asked for their opinions about the effects of cultural values on attitude towards change, all of the interview respondents felt that cultural values affected employees' attitude towards change. Two interviewees, from the American and the British firms, respectively, stated the employees in the firms were trained to embrace change efforts. One respondent, interviewee 1, commented that the attitude towards change in his previous firm, an American firm was much more positive compared to the attitude in the current firm, a local firm. On the other hand, the interviewees from the Japanese firms (I-2, I-3 and I-5) commented that attitude towards change of Japanese was more positive as a group than at individual level. All of them indicated that the Japanese were risk averse and would not make changes but as a group, they were very receptive to changes. Most of the respondents agreed that the cultural values within their firms could be instilled gradually among the firms' employees but the process might take some time because employees would normally reject drastic changes.

Change Agents

The literature suggests that the leaders of organisations play the most important role in ensuring success of any change efforts and they are often referred to as change agents. Numerous writers have implicated leadership as critical in the process of innovation or change (e.g. Scott and Bruce, 1994). Hence, leaders in an organisation, such as the CEO or financial controller, play the most important role in determining whether changes in MACS can be carried out in the organisation. Out of eight respondents interviewed, six indicated that the top management usually initiated the changes, including MACS change, in their firms. Incidentally, the top persons in all these firms were non-accountants. The other two interviewees, a senior vice president (Finance and Operation) of a local firm and a site general accounting manager of a U.S. owned firm, claimed that both accounting personnel and top management were responsible for MACS change within their firms. The interviewee from the U.S. based firm commented that even though the firm's CEO was not trained in the accounting discipline, he always gave full support for any MACS change efforts. All interviewees from the Japanese owned firms indicated that changes would be carried out only if there were directions from the headquarters and also recommendations from consultants.

The following comment on the role of the top management in change efforts was given by the site general accounting manager of the U.S. owned firm:

Change is ingrained top-down, the need to change is top-down driven like a culture in our company. Beginning of every year, the company will set up key policy deployments which will be then translated to smaller objectives at section or departmental levels. These policies were set up to incorporate responses to changes in the business environment. (I-7).

This leads us to question the accountants' perceptions on change that is how receptive accountants are to changes. Part of the findings of the questionnaire survey discussed in earlier sections suggested that the level attitude towards change among accountants was lower than the non-accountant group, which suggest that accountants are less responsive to changes. This is consistent with Coad (1996) who argued that accountants are not learning oriented, but instead performance oriented, which may partly explain the low level of changes experienced in the accounting discipline compared to other fields. Two respondents who were trained as accountants with the British and a Japanese firms, respectively, commented that they did not think much changes needed in accounting as they felt that the current financial information were sufficient. When asked about who were responsible for MACS change in their firms, they replied that the top management should decide on the changes needed.

Obstacles to Change

All interviewees shared similar opinion with regards to the factors that impede MACS change in their firms. Among the obstacles to change mentioned by the respondents were the high costs of implementing changes, as well as costs for educating and training employees. In addition, they commented that the benefits of implementing the changes might not be transparent immediately. For example, one of the respondents commented that ABC gained a lot of attention after its introduction late 1980's but not many firms were using it now because they were unsure whether the benefits of implementing the system would outweigh its costs. One of the respondents commented that many firms, especially the smaller firms, might not have the expertise and enough knowledge to carry out the changes. Interviewee 1, a senior vice president (Finance and Operations) gave the following view when asked about obstacles to MACS changes:

I think one of the obstacles in changing MACS is the culture and personal values. Employees usually do not like change. They are so used to their ways of doing things. They are also afraid of the consequences of the changes on their performance. (I-1)

Another interviewee, a senior manager (Finance and Administration), expressed the following opinion on obstacles to change:

Most companies especially the small and medium industries do not have the competency in human resource and necessary knowledge to change their MCAS to meet the demands of advanced manufacturing environment. (I-8)

Discussion and Conclusions

The objective of the study is to investigate the relationships between changes in market competition, AMT adoption and attitude toward change and changes in MACS. The survey results indicated a significant direct relationship between change in AMT adoption and the overall MACS change. This is consistent with our expectation that changes in the

extent of AMT adoption should result in changes in the management accounting and control systems. However, the results pertaining to the relationship between change in perceived competition and MACS change are contrary to our earlier expectation.

The survey results indicate that perceived change in competition was a significant predictor of MACS change. However, the direction of the relationship was contrary to that hypothesised in hypothesis H1. There could be several explanations for the inverse relationship between both variables. First, it is possible that firms which are more prepared to face the escalation in market competition by taking strategic changes, including MACS change, would feel less pressure from the impending challenges, thus might perceive the market competition as less intense compared to the 'less prepared' firms. Since changes in MACS generally require a long-term planning, firms need to examine market changes and the effects of those changes on their management accounting information needs, and devise strategic plans to face the new market and manufacturing environments in advance. These firms would be more ready for the changing environments, and hence might not perceive that market competition has intensified as much as it would have, had they not prepared for the competition. The less proactive firms are likely to feel the severe effects of the increasing intensity in market competition, thus might perceive to be more intense. This negative relationship between change in market competition and MACS change, however, is consistent with Williams and Seaman's (2001), but contrary to Libby and Waterhouse's (1996). The mixed findings might be due economic and/or cultural factors. Malaysia and Singapore (Williams and Seaman's study) belong to the developing and emerging economies with Asian cultural values, while Libby and Waterhouse's (1996) study was based on a sample of Canadian manufacturing firms, which were of Anglo-American cultural value and in an advanced economy. Williams and Seaman (2001) had in fact argued that the inconsistent effects of competition on MACS change found in their and Libby and Waterhouse (1996)'s studies could be due to the differences in the economic condition in Canada (severe recession) and Singapore (booming economy) that existed during the test periods. The inconsistent and inconclusive results suggest that more studies may need to be carried out to investigate the role of market competition in predicting MACS change.

Consistent with this finding, the interviews revealed that a majority of the managers perceived that strategic changes, including in MACS, are needed to counter the effects from escalating competition. Even though all interviewees agreed that competition level had intensified, six out of eight interviewees indicated that there was not much changes in the MACS in their firms. These managers viewed that their companies would feel less pressure from the impending global and local markets because they were better prepared to face them, hence perceived the market competition as less intense. However, those which were less proactive in making the required changes in advance perceived the market competition to be more intense.

The Pearson correlation and regression results revealed a significant positive relationship between change in AMT and MACS change, thus providing support for hypothesis H2. This finding is consistent with the prediction that higher adoption level of AMT, which often changes the manufacturing cost structures, should affect the information needs

and thus results in higher level of changes in MACS in manufacturing firms. Since the previous studies mentioned (Libby and Waterhouse, 1996; Williams and Seaman, 2001) did not examine the relationship between AMT adoption and MACS change, this finding adds to our understanding on the role of AMT adoption in MACS change. The interview results also confirmed the findings of the questionnaire survey as all of the interviewees stated that technology adoption was the main factor affecting MACS change in their organisations.

The survey results indicate that the respondents had moderate to high levels of attitude towards change. As to the role of attitude towards change in MACS change, the results did not find any support for the prediction that attitude towards change affects MACS change. The results failed to provide any evidence on the role of attitude towards change on MACS change, thus hypothesis H3 is not supported. These results suggest that attitude towards change of managers did not play a significant role in determining changes in MACS. This is in contrast to what has been suggested in the general management literature that attitude towards change should play a significant role in change efforts. The lack of a significant association between attitude toward change and the overall MACS change suggests a mere positive attitude toward change is insufficient to bring about MACS change. There are barriers that inhibit changes in MACS, such as lack of immediate tangible benefits arising from the change to justify the switching costs, lack of in-house expertise and lack of management support possibly due to inadequate knowledge. Furthermore, the introduction of any change initiatives frequently requires a change in organizational culture and management style (Chang and Sinclair, 2002). Consistent with the survey findings, all interviewees thought that changes in MACS were not related to their attitudes towards change but rather depended on whether or not there was any need for such changes, which were usually triggered by other factors such as technology adoption such as ERP.

For a change effort to succeed, it has to be initiated and supported by the top management. The top management play a pivotal role in ensuring the success of change initiatives in their organisations. However, in order for the top management to devote their undivided support in the change efforts, they need to understand the nature of the required changes. In the case of MACS change, it is possible that the top management's lack of accounting knowledge prevents them from seeing the importance and urgency of the change. Unless the top management are trained in the accounting field, they would not understand the types and nature of changes in MACS that are needed in to meet the changing demands of information, thus would not be aware of the needs for the changes.

Another factor that may explain the lack of changes in MACS is that the accountants' themselves could be more adversed to changes compared to other managers. An analysis on the levels of attitude towards change among accountants showed that the attitude level among accountants was lower than the non-accountant group. This is consistent with Coad (1996)'s proposition that accountants are performance oriented instead of learning oriented and this could partly explain the lack of changes in the accounting discipline compared with another discipline. Accountants are more likely to avoid new challenges such as change and try to maintain the current systems (Johnson, 1992). Since

changes in MACS are within the accountants' domain, it is less likely for them to initiate the changes or to convince the top management of the need to change, which could partly explain the slow change in the accounting discipline (Coad, 1996). In addition, there are many barriers in implementing changes in MACS. Among the main barriers include factors such as high costs of implementing the changes, lack of expertise and lack of facilities. MACS change is generally difficult and costly to implement, while tangible benefits from the changes are not apparent immediately.

The interviews reveal consistent findings with the results of the questionnaire survey. In general, most of the interviewees concurred moderate levels of changes in their MACS and, in most cases, adoption of technologies were cited as the main factor driving the changes. Many of the respondents believed that the current accounting systems were sufficient for their needs. In cases where changes were needed, they commented that adaptation rather than drastic changes in accounting systems were more relevant. Most of the interview respondents agreed that the top management played the most important in initiating any change efforts including MACS changes. In addition, they also pointed out that organisational cultures which were conducive to accommodate change efforts, such as providing adequate training and rewards for all levels of employees, and supports from top level management were also pivotal in ensuring acceptance and success of the efforts.

Overall, the results provide some empirical evidence on MACS changes among Malaysian manufacturing firms role of competition in predicting MACS change in a developing economy. This study provides insights on the roles of other variables, namely, change in AMT adoption and attitude toward change, in the predicting MACS change.

The findings of this study indicate that the extent of changes in MACS of Malaysian manufacturers was relatively small despite the increasingly competitive business environment. Interestingly, even though the costing sub-system was significantly related to changes in the market competition (negatively), extent of AMT adoption and attitude toward change, this sub-system experienced the least overall change for the past three years. One explanation could be that changes in the costing sub-systems were not as wide spread as changes in the other sub-systems and the changes were only undertaken when firms perceived the needs to change their costing approaches.

The results of the study, however, are subject to the several limitations. First, the study is associated with the usual limitations of cross-sectional survey research, namely, data collected at a single point of time. Second, this study covers only manufacturing firms. It is possible that predictors of and their effects on MACS change may be different for other sectors, such as services sector. Third, a majority of the respondents in the survey were middle-level managers and were not the senior or top-level managers as initially planned. Thus there may be differences in perceptions of MACS change between the two groups of managers. In addition, as indicated by the R^2 and adjusted R^2 in the regression models, there may be other important predicting variables that could be added to the model to improve its explanatory power.

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Appendix A

Measures Used for MACS Change

Planning systems

1. Budgeting
2. Operation planning (production)
3. Capital budgeting
4. Strategic planning
5. Other planning systems

Controlling systems

6. Individual or team-based performance measurement
7. Organizational performance measurement
8. Measurement of performance in terms of quality
9. Measurement of performance in terms of customer satisfaction
10. Other performance measures

Costing Systems

11. Direct allocation of manufacturing overhead
12. Direct allocation of marketing costs
13. Direct allocation of other overhead
14. Internal (department or divisional) product transfers
15. Other costing systems

Directing Systems

16. Reward systems – bonuses
17. Reward systems – pay for performance plans
18. Other reward systems

Decision-making systems

19. Information reported more frequently
20. Use of more non-financial measures
21. Information reported more broadly
22. Other changes to reporting systems
23. Other changes to systems that do not appear on this list