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THE IMPACT OF INFORMATION TECHNOLOGY ON PERFORMANCE: THE MEDIATING ROLE OF MANAGEMENT ACCOUNTING SYSTEMS

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Abstract. This paper reports the results of a study which offers an explanation for the relationship between Information Technology (IT) sophistication and performance of small and medium sized enterprises (SMEs), by incorporating into the model of the capability of management accounting systems to generate management accounting information (MAS capacity). To assess the relationship, data were collected from 310 (25% response rate) SMEs by way of questionnaire surveys. The results indicate that IT sophistication is a determinant of MAS capacity, which, in turn, is a determinant of firm performance. In other words,MAS capacity plays a mediating role in the relationship between IT sophistication and firm performance. An interpretation of the results is that those firms that employed sophisticated IT can generate sufficient management accounting information and thereby improve performance.

Keywords: Information Technology, information systems, management accounting system, accounting information systems, small and medium enterprises

Abstrak. Kertas kerja ini melaporkan hasil kajian yang menerangkan hubungan antara kecanggihan Teknologi Maklumat (IT) dan prestasi firma yang bersaiz kecil dan sederhana (SMEs), dengan memasukkan ke dalam model kajian, keupayaan sistem perakaunan pengurusan untuk menghasilkan maklumat perakaunan pengurusan (kapasiti MAS). Bagi menguji hubungan tersebut, data telah dikumpul daripada 310 firma menggunakan kaedah soal selidik. Hasil ujian menunjukkan bahawa kecanggihan IT merupakan penentu kepada kapasiti MAS, sementara kapasiti MAS pula akan menentukan prestasi firma. Dalam kata lain, kapasiti MAS memainkan peranan sebagai penghubung antara kecanggihan IT dengan prestasi firma. Interpretasi hasil ujian ini ialah firma yang menggunakan IT yang lebih canggih akan dapat menghasilkan maklumat perakaunan pengurusan yang mencukupi dan seterusnya dapat meningkatkan prestasi firma.

Kata kunci: Teknologi Maklumat, sistem maklumat, sistem perakaunan pengurusan, sistem maklumat perakaunan, industri kecil dan sederhana

1.0 INTRODUCTION

In recent years, many authors have emphasized on the need to invest on sophisticated IT to enhance organizational information processing capability and thus performance (e.g. Huber, 1990; Levy *et al*., 2001; Lesjak, 2001; Shin, 2001). The anecdotal argument is, the use of advanced IT leads to more available information, and thus leads to increased information accessibility to support decision makings. Firms with extensive IT resources

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may gain a competitive edge by deploying them in support of or to strengthen their business (King *et al.*, 1989).

Although considerable emphasis has been placed on potential benefits of IT applications to organizational performance, results from several empirical studies report insignificant relationships between IT sophistication and performance (e.g. Cragg dan King, 1992; Raymond *et al.*, 1995). Raymond and Pare (1992) argued that use of different measures of IT sophistication makes it difficult to make comparisons between studies particularly its impact on performance. Other researchers called for a more indirect approach to measure the relationship between IT and performance (Shin, 2001; Bergeron *et al.*, 2001).

Shin (2001) argued that IT is an essential tool, but not sufficient by itself, to be truly effective. Rather, IT needs to be coupled with other factors such as business strategy to have an impact on performance (Cragg *et al.*, 2002). These factors are often translated in terms of organizational information requirements (Chang and Jevons Lee, 1992). The required information would then be made available by the organization by, among others, invested in more sophisticated IT (Bolon, 1998). This supports Egelhoff's (1982) argument that the effectiveness of IT will be contingent on organizational information requirements, which is reflected by the availability of that information.

Therefore, this study sought to examine empirically the mediating role of the information availability in the relationship between IT and performance,in the specific context of small and medium sized enterprises or firms (SMEs). The type of information was restricted to management accounting information, in which management accounting systems (MAS) is an important component of a modern information system within the SMEs (Mitchell *et al.*, 2000).

The SMEs setting will provide a relatively focused insight into the management needs for management accounting information and IT as an information processing mechanism (Mitchell *et al.*, 2000). Further, very little has been researched about the adoption and practice of management accounting and IT in developing economies particularly in the context of SMEs. Several authors such as Raman and Yap (1996) and Thong (1999) pointed out that developing countries like Malaysia are very different, in many aspects, from those of developed economies, in particular the extent and type of government interventions on IT related issues.

2.0 INFORMATION SYSTEMS IN SMEs

This section reviews extant IT literature to understand how IT has been used to support information requirement in SMEs. In general, results from past studies indicate that IT adoption has grown tremendously within SMEs (e.g. Cragg and Zinatelli,1995; Thong, 1999). Yet there is considerable evidence to suggest that very few of the resulting systems have had significant impact on the way management makes

decisions. For instance, King *et al.* (1991) found limited evidence that IT is used to support decision-making. The most prevalent applications in SMEs are transactional in nature (Raymond, 1992). Recent studies by Temtime *et al.* (2003), Bridge and Peel (1999) and Foong (1999) further confirmed that IT in SMEs are mainly used for administrative and operational tasks. Fuller (1996) argued the key problem of the lack of strategic IT usage in SMEs relates to the poor fit between what the software tools are offering and what is needed, with neither the users nor the suppliers in a strong position to communicate with each other. The situation is even more crucial within SMEs as there is a lack of IT support (Thong, 1999). Despite these limitations, IT use in SMEs has become more sophisticated. There is evidence that IT helps SMEs develop and implement business strategy (e.g. Lesjak, 2001; Levy *et al.*, 2001).

Several studies have also examined the relationship between IT sophistication and performance of SMEs. For example, Garsombke and Garsombke (1989) found computerization to be a significant predictor of the performance of small manufacturing firms. Contradictorily, Cragg and King (1992) found SMEs with sophisticated IT performed not better than SMEs with less sophisticated IT. In an attempt to further understand the issue, Raymond *et al.* (1995) adopted a contingency approach to investigate the relationship between IT sophistication and organizational structure and its impact on performance. The study found IT management was positively related to structural sophistication, and IT usage was positively related to performance. More recently, Cragg *et al.* (2002) examined the alignment between IT strategy and business strategy among SMEs. The study found the groups with high IT alignment achieved better performance than firms with low IT alignment.

The above discussion shows that the impact of IT on performance may not be a direct one but may be intermediated by other factors. Sophisticated IT alone does not guarantee an increase in performance. This ambiguity warrants further exploration of the relationship between IT sophistication and performance.

The management accounting literature has also been reviewed to understand MAS development within SMEs. There is a considerable evidence to suggest that financial accounting remains the principle source of information for SMEs' management (e.g. Holmes and Nicholls, 1988; McMahon and Davies, 1994; Nayak and Greenfield, 1994; Mairead, 1997). These studies suggest that SMEs have little management information, poor control, and decision-making is mostly based on ad hoc basis. Marriot and Marriot (2000) found financial awareness among the managers of SMEs varies considerably and the use of computers for the preparation of management accounting information is not at its full potential. On the contrary, Perren and Grant (2000) suggested that the development and handling of accounting information in SMEs can be more sophisticated than anticipated. Indeed in many circumstances SMEs take rational steps to modify monitoring and control mechanisms, typically by adjusting its information system, to the end of enhancing economic performance (Mitchell *et al.*, 2000). Thus, this study aimed to provide further evidence

about this issue,with emphasis on the relationship between IT sophistication,availability of management accounting information (hereafter referred to as MAS capacity) and performance in SMEs.

3.0 RESEARCH FRAMEWORK

Despite these conceptual and empirical research efforts addressed at a variety of accounting and IT issues in SMEs, there is still a lack of understanding of the relationship between IT sophistication, MAS capacity and performance of these firms. To address this issue,this study will first examine the relationship between IT sophistication and MAS capacity,and then examine the relationship between MAS capacity and performance. The research model is depicted in Figure 1.

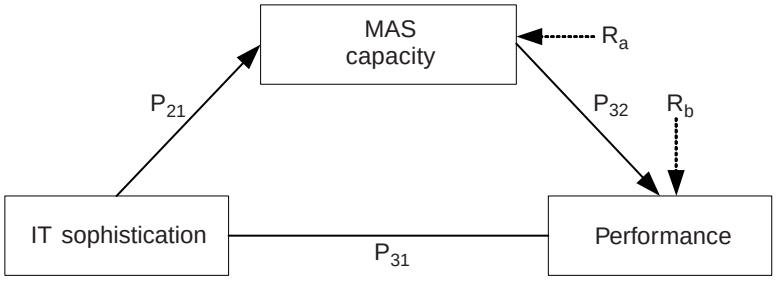

Figure 1 The research model

3.1 IT Sophistication and Performance

Reviews of information systems literature indicate that IT utilization can bring many benefits to organizations, including increased in performance (e.g. Levy *et al.*, 2001; Levy and Powell, 2000). However, information systems researchers have struggled to show a direct impact of IT on performance. The results obtained from several empirical studies show inconclusive findings. Several researchers argued that IT is an essential tool to increase organizational information processing capabilities but needs to be coupled with organizational factors to have an impact on performance. Cragg *et al.* (2002) confirmed this argument when they found that the alignment of IT strategy and business strategy has an impact on performance. The anecdotal evidence suggest that there is a positive relationship between IT sophistication and performance. However, due to the lack of previous research and empirical evidence in this area, particularly incorporating the use of management accounting information, our prediction is tentative. Therefore,the relationship is formally stated in its null form below:

H_{1a}: There is no relationship between technological sophistication and performance

H_{1b}: There is no relationship between informational sophistication and performance

H_{1c}: There is no relationship between managerial sophistication and performance

H_{1d}: There is no relationship between functional sophistication and performance

3.2 IT Sophistication and MAS Capacity

IT is one of the mechanisms that can be used to increase organizational information processing capabilities (Bolon, 1998). Use of advanced IT leads to more available information, and thus leads to more information accessibility to support decision makings (Huber, 1990). Daft and Lengel (1986) also placed particular emphasis on IT as a means by which organizations reduce uncertainty. Based on the result of a survey of 244 SMEs in Canada, El Louadi (1998) confirmed that IT sophistication has a direct effect on the amount of external and internal information provided. Following the above discussions, we argue that as IT sophistication increases, managers have greater accessibility to management accounting information to make business decisions:

H_{2a}: There is a positive relationship between technological sophistication and MAS capacity

H_{2b}: There is a positive relationship between informational sophistication and MAS capacity

H_{2c}: There is a positive relationship between managerial sophistication and MAS capacity

H_{2d}: There is a positive relationship between functional sophistication and MAS capacity

3.3 MAS Capacity and Performance

The use of management accounting information can help managers to improve their organization's performance in two ways. First, the use of such information helps businesses to manage short-term problems in areas such as costing, expenditure and cash flow, by appropriate monitoring and control. Second, the use of management accounting information can also help businesses integrate operational considerations within long-term strategic plans (Mitchell *et al.*, 2000).

Porter (1985) argued that in order for organization to survive and succeed in a competitive market, it must scan and monitor its environment with respect to threats from potential competitors, threats from substitute products and services, the nature and intensity of competition within the industry, and the bargaining power of suppliers and customers. To successfully deal with each of the above threats, an organization

can use the management accounting information to scan its environment and identify any change in the industry and in competitors' strategies. For example, the magnitude of the threat from substitute products and services depends to a large extent on the attributes and costs of such products and services (Mia and Clarke, 1999). The management accounting information can help to assess the attributes, price, and costs of the substitute products in the market. The hypothesis below formally presents the above discussion:

H_3: There is a positive relationship between MAS capacity and performance

The discussion on hypotheses two and three supports the argument that the availability of information plays a mediating role in the relationship between IT sophistication and performance. When the relationship between two variables exists at least partly through a third variable, then the third variable plays the mediating role in the relationship between the other two variables (Mia,1993). For this study, support for hypotheses two and three would suggest managers that use MAS information plays a mediating role in the relationship between IT sophistication and performance (see Figure 1).

4.0 RESEARCH METHODS

Small and Medium Industries Development Corporation (SMIDEC) defines small and medium sized manufacturing, manufacturing-related services and agro-based firms as firms with sales turnover between RM250,000 and RM25,000,000 or full time employees between 5 and 150. However, in this study, SME was defined as any manufacturing unit with between 20 and 250 full time employees. Firms with less than 20 employees were excluded to increase the probability of sampling of computerized firms and firms that to some degree adopted strategic management accounting information. Firms with more than 250 employees were also excluded as they were expected to have their own IT function. The manufacturing sector was selected because it was considered information-intensive and provided the widest usage of computer-based information systems due to the presence of all major business functions (Chan *et al.*, 1997).

A mail questionnaire survey was used to gather data. The Federation of Malaysian Manufacturers (FMM) database provides a total of 1284 addresses of firms as defined in this study. Fifty addresses were used for the pilot survey, and the rest were used for the main survey. Following Dillman's (1978) suggestion, the questionnaire was refined in three stages; pre-testing with academic and research student, pre-testing with firm managers, and pilot testing with firm managers. The questionnaires were addressed to the Managing Directors. 310 usable questionnaires were eventually returned representing a 25% response rate. Non-response was examined using time

trend extrapolation (Lindner *et al.*, 2001). The first 30 respondents and last 30 were compared on 48 major variables. Only one variable proved significantly different. This suggests that non-response was not a significant factor that could affect the conclusions about the variables being studied.

4.1 Measurement of Variables

The research framework referred to links between three constructs: IT sophistication, MAS capacity, and performance. Each of the variables was operationalized on the research instrument as follows.

4.1.1 IT Sophistication

IT sophistication is a multi-dimensional variable. Different researchers used different measures of IT sophistication. Raymond and Pare (1992) define IT sophistication as 'a construct which refers to the nature, complexity and interdependence of IT usage and management in an organisation'. The concept integrates not only the aspects related to IT usage (i.e. technological and informational) but also IT management (i.e. functional and managerial). Technological sophistication reflects the number or diversity of IT used. Informational context is characterised by the nature of its application portfolio. Functional dimension relates to the structural aspects of the IS function and IT implementation process. Finally, managerial dimension of IT sophistication relates to the mechanisms employed to plan, control and evaluate present and future applications. In this study, IT sophistication was measured using questions that drew heavily on the instrument proposed by Raymond and Pare (1992).

4.1.2 MAS Capacity

The definition of MAS has evolved over the years from one focusing on the provision of more formal, financially quantifiable information to assist in decision-making processes to one that embraces a much broader scope of information (Chenhall, 2003). The dimensions used to reflect MAS design include focus, orientation, time horizon, aggregation, integration, timeliness, financial and non-financial, and quantitative and qualitative. In this study, MAS capacity was measured using questions that drew heavily on the instrument proposed by Chenhall and Morris (1986). The variable was measured in relation to 19 management accounting information characteristics using five-point scales. The respondents were asked to indicate the extent to which their computer-based systems supported each of the 19 information characteristics.

4.1.3 Performance

Researchers offered a variety of measures of organizational performance. The study adopted the instrument developed by Khandwalla (1977), based on the manager's assessment of the company's performance relative to its competitors. Four items were used to measure long term profitability, availability of financial resources, sales growth, and image and client loyalty. Each was measured using a five-point scale. Khandwalla (1977) found that these measures correlated fairly strongly with objective performance measures. The instrument has also been validated in the context of SMEs by Raymond *et al.* (1995) and Cragg *et al.* (2002).

5.0 FINDINGS

Preliminary analysis of the sample showed that 71% of firms in the sample were more than 10 years old, with 39% founded between 11 and 20 years ago. Thus most of the firms were mature companies. More than a third of the firms had used computers for between 6 and 10 years, and another third for 11 to 15 years. Thus the sample contained many firms with considerable experience with computers.

5.1 IT Sophistication

Type of IT used was employed to measure the technological sophistication. Table 1 shows the breakdown of the type of IT adopted by the responding companies. The results show that there is a high degree of variability in terms of the frequency with which the types of IT is adopted. The most common technologies adopted are accounting-based applications (96%) and office support systems (84%). This results support findings from previous studies that accounting was the most important and widely used application among SMEs. About two-third adopted Local Area Network (72%), decision support systems (70%), database systems (66%), and external network

Table 1 Technological sophistication

Type of IT	Number of positive (yes) responses	Positive responses as percentage
Accounting-based applications	296	96
Office support systems	260	84
Local Area Network	224	72
Decision support systems	216	70
Database systems	203	66
External network	182	59
Computer Assisted Production Management	134	43
Computer Assisted Design	108	35
Computer Aided Manufacturing	47	15

(59%). Whilst the remaining technologies are considered less frequently, they are all except computer-aided manufacturing still adopted by at least one-third of the participating companies.

The application portfolio is the criterion variable used to measure informational dimension of IT sophistication of the responding companies. Table 2 shows the breakdown of the type of computer applications adopted by the responding companies. The results show that almost every firm maintains the three basic accounting modules, i.e. general ledger (93%), accounts receivable (93%), and accounts payable (91%). More than half of the companies also adopt payroll, billing, inventory, order entry, purchasing, and financial accounting modules. However, the utilization of management accounting type modules such as cost accounting, budgeting, production planning and control, budget variances, production variances, and modeling is still minimal. The adoption of other modules such as financial analysis, personnel management, and project management are also minimal. Consistent with previous studies, this finding indicates that most of the companies in the sample adopted transaction-oriented systems.

The IT planning process is the criterion variable used to measure the managerial dimension of IT sophistication of the responding companies. Table 3 shows the breakdown of the types of IT planning adopted by the responding companies. The results show that about half of the companies in the sample conducted financial

Table 2 Informational sophistication

Computer applications	Number of positive (yes) responses	Positive responses as percentage
Accounts receivable	289	93
Accounts payable	288	93
General ledger	282	91
Payroll	254	82
Billing	233	75
Inventory	223	72
Order entry	191	62
Purchasing	188	61
Financial accounting	173	56
Cost accounting	116	37
Financial analysis	101	33
Budgeting	95	31
Personnel management	30	30
Production planning and control	80	26
Budget variances	59	19
Production variances	53	17
Project management	40	13
Modeling	12	4

Table 3 Managerial sophistication

Types of IT planning	Number of positive (yes) responses	Positive responses as percentage
Financial resources	160	52
Information requirements	154	50
Post-implementation	108	35
Implementation	105	34
Human resources	92	30

resources and information requirements analysis. The remaining three types of IT planning were each conducted by only about one-third of the respondents. These findings suggest that financial resources and definition of needs are two important issues commonly considered by SMEs.

This study includes participation in computerization projects to reflect functional sophistication of IT adopted by the responding companies. Table 4 shows the percentage of each activity that respondents participated. The results show that about a third of the respondents have at least participated in a managerial role of the computerisation projects. About half of the respondents have either closely or highly participated in the planning of further IT developments (47%) and definition of needs (47%).

Table 4 Functional sophistication

Activities/Participation	Not with firm	Not involved	Managerial role	Closely involved	Highly involved
Further plans	8	10	34	35	12
Definition of needs	15	10	29	29	18
Implementation	12	13	32	30	14
Solving problems	8	13	36	35	7
Choice of hardware/software	14	15	29	28	15

5.2 MAS Capacity

This section presents a summary of the MAS capacity of the sample companies. The mean value of the responses for each of the 19 items is shown in Table 5. The results reveal that the mean value for MAS capacity items ranges from 2.29 to 3.47. The highest mean value for MAS capacity is frequency of reporting, followed in descending order by temporal reports, summary reports-organisation, speed of reporting, sectional reports, and summary reports-sections. At the other end, the least available information rated by the responding companies are sub-unit interaction, what-if analysis, non-

Table 5 Mean ratings for MAS capacity items

MAS capacity items	Mean rating	S.D
Frequency of reporting	3.47	1.08
Temporal reports	3.29	1.00
Summary reports-organization	3.29	1.03
Speed of reporting	3.28	0.98
Sectional reports	3.25	1.05
Summary reports-sections	3.25	1.06
Future events	2.95	1.01
Non-financial (production)	2.95	1.11
Immediate reporting	2.95	1.02
Automatic receipt	2.94	1.06
Decisional models	2.86	1.08
Organizational effect	2.75	1.08
Precise targets	2.73	1.08
Effects of events on functions	2.57	1.13
Non-financial (market)	2.56	1.03
Sub-unit interaction	2.48	1.04
What-if analysis	2.41	1.06
Non-economic information	2.29	1.01
External information	2.29	1.09

economic information, and external information, which imply that these types of information received the least support from their computer-based information systems.

6.0 HYPOTHESIS TESTING

Having identified the sophistication of IT adopted and MAS capacity of the sample companies, this section explores the key objective of the research. This was to test the relationship between IT sophistication, MAS capacity, and performance.

The results presented in Table 6 provide preliminary support for hypothesis H_{1a}, H_{1b}, and H_{1d} as the correlation between three of four dimensions of IT sophistication

Table 6 Correlation matrix

	$X1_a$	$X1_b$	$X1_c$	$X1_d$	X_2	X_3
$X1_a$ Technological	1.00	0.59*	0.33*	0.16*	0.19*	0.06
$X1_b$ Informational		1.00	0.25*	0.17*	0.33*	0.03
$X1_c$ Managerial			1.00	0.05	0.20*	0.16*
$X1_d$ Functional				1.00	0.20*	0.06
X_2 MAS capacity					1.00	0.34*
X_3 Performance						1.00

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

(i.e. $X1_a$, $X1_b$, and $X1_d$) and performance (X_3) are not significant. This is consistent with the previous evidence which suggests that there is no direct impact of IT on performance. Since the correlations between all dimensions of IT sophistication (i.e. $X1_a$, $X1_b$, $X1_c$, and $X1_d$) and MAS capacity (X_2), and between MAS capacity (X_2) and performance (X_3) are positive and significant, the results provide preliminary support for hypotheses H_{2a}, H_{2b}, H_{2c}, and H_{2d} and also H_3.

A path analytic technique was used to test the model of the study shown in Figure 1. In the model, the relationships between variables were specified by a series of path coefficients (P_{ij}) which are equivalent to standardized beta coefficients (^{2}) (Mia and Clarke, 1999). The R_n ($n = a$, and b) in the model denotes the unexplained variance associated with X_2 and X_3, respectively. The path analytic technique allows computation (therefore an evaluation) of the magnitude of the relationship between IT sophistication and performance which exists partly through MAS capacity (see Pedhajur, 1982). A computation of the above relationship existing through the MAS capacity allows an evaluation of the mediating role played by the MAS capacity. The model is represented below in equation form:

$$X_2 = P_{21}X_1 + P_{2a}R_a \quad (1)$$

$$X_3 = P_{31}X_1 + P_{32}X_2 + P_{3b}R_b \quad (2)$$

where:

X_1 = IT sophistication
X_2 = MAS capacity
X_3 = performance

The path analysis required the running of two regression equations – one for MAS capacity, and the other for performance. The first equation treated MAS capacity (X_2) as the dependent variable and IT sophistication (X_{1a}, X_{1b}, X_{1c}, X_{1d}) as the independent variable. The results presented in Table 7 indicate a positive and significant relationship ($\beta_{1a} = 0.19$, $\beta_{1b} = 0.33$, $\beta_{1c} = 0.20$, $\beta_{1d} = 0.20$; $p < 0.01$) between all dimensions of IT sophistication and MAS capacity, thereby supporting hypothesis H_2.

The second regression equation treated performance (X_3) as the dependent variable and MAS capacity (X_2) and IT sophistication (X_1) as the independent variables. The

Table 7 Regression of MAS capacity (X_2) against IT sophistication (X_1)

	Variables	Regression coefficient	T value	Significance
X_{1a}	Technological	0.19	3.34	0.001
X_{1b}	Informational	0.33	5.97	0.000
X_{1c}	Managerial	0.20	3.51	0.001
X_{1d}	Functional	0.20	3.39	0.001

results presented in Table 8 reveal a positive and significant relationship (β_{1a}= 0.35, β_{1b} = 0.38, β_{1c} = 0.32, β_{1d} = 0.34; $p < 0.01$) between MAS capacity and performance, providing support for H_3. However, although the relationships between all dimensions of IT sophistication (i.e. $X1_a$, $X1_b$, $X_{1c,}$ and $X1_d$) and performance (X_3) were positive, they were not significant. Therefore, H_1 (i.e. H_{1a}, H_{1b}, H_{1c}, and H_{1d}) could not be rejected. A discussion on this result is offered in the next section.

Table 8 Regression of performance (X_3) against MAS capacity (X_2) and IT sophistication (X_1)

	Variables	Regression coefficient	T value	Significance
X_2	MAS capacity	0.35	6.11	0.000
X_{1a}	Technological	0.01	0.17	ns
X_2	MAS capacity	0.38	6.47	0.000
X_{1b}	Informational	0.10	1.78	ns
X_2	MAS capacity	0.32	5.72	0.000
X_{1c}	Managerial	0.09	1.65	ns
X_2	MAS capacity	0.34	5.99	0.000
X_{1d}	Functional	0.01	0.25	ns

ns = not significant

The results presented in Table 7 and 8 were used to compute the magnitude of the direct and indirect relationships in the model. These results are presented in Table 9. Theoretically, the sum of the magnitudes of direct, indirect and spurious (if any) relationships between the two variables (say, X_1 and X_3, in Table 8) must be equal to the correlation between the same variables. The results presented in Table 9 indicate

Table 9 Decomposition of correlations

Combination of variables	Correlation	Direct relations	Indirect relations	Spurious relations
X_2 with X_{1a}	0.19 =	0.19		
X_3 with X_{1a}	0.08 =	0.01 +	0.19*0.35	
X_3 with X_2	0.35 =	0.35 +		0.01*0.19
X_2 with X_{1b}	0.33 =	0.33		
X_3 with X_{1b}	0.23 =	0.10 +	0.33*0.35	
X_3 with X_2	0.38 =	0.38 +		0.01*0.33
X_2 with X_{1c}	0.20 =	0.20		
X_3 with X_{1c}	0.15 =	0.09 +	0.20*0.32	
X_3 with X_2	0.34 =	0.32 +		0.09*0.20
X_2 with X_{1d}	0.20 =	0.20		
X_3 with X_{1d}	0.08 =	0.01 +	0.20*0.34	
X_3 with X_2	0.34 =	0.34 +		0.01*0.20

the presence of a positive relationship between IT sophistication and MAS capacity (X_2 with X_1); between MAS capacity and performance (X_2 with X_3). Given the statistical significance and the positive direction of these relationships, the results indicate the presence of an indirect relationship between IT sophistication and performance through MAS capacity. In other words, the mediating role of MAS capacity is supported.

7.0 DISCUSSION, LIMITATIONS AND CONCLUSIONS

The main objective of the study was to examine empirically the mediating role of MAS capacity in the relationship between IT sophistication and performance. It was pursued by testing the relationships between (1) IT sophistication and MAS capacity; and (2) MAS capacity and performance. The results reveal that increasing IT sophistication is associated with increasing MAS capacity. The results also reveal that increasing MAS capacity is associated with improved performance. An explanation of the results is that as an organizations' IT sophistication increased, the availability of management accounting information to formulate, implement and monitoring its strategies increased. An outcome of the process is improved organizational performance. Thus, this study provides empirical support for the theoretical argument put forward by Huber (1990: 65) that:

> '... use of advanced IT leads to more available and more quickly retrieved information, including external information, internal information, and previously encountered information, and thus leads to increased information accessibility'.

This study extends prior studies by Garsombke and Garsombke (1989), Cragg and King (1992), and Raymond *et al.* (1995) by offering an explanation for the relationship between IT sophistication and performance. Cragg and King (1992) failed to report significant direct relationship between IT sophistication and performance. The results presented in Table 8 (β_{1a} = 0.01; β_{1b} = 0.10; β_{1c} = 0.09; β_{1d} = 0.01) are not statistically significant, hence consistent with Cragg and King (1992). However, since both hypotheses two and three are supported, the fundamental argument put forward in this study is supported. The argument is that MAS capacity plays a mediating role in the relationship between IT sophistication and performance. For example, the positive and significant correlation (r_{1a3} = 0.08, $p < 0.05$) between technological IT sophistication (X_{1a}) and performance (X_3) (Table 6) is explained by the direct relationship (β_{1a} = 0.01) between technological IT sophistication and performance and the indirect relationship which exists through the availability of management accounting information ($\beta_{1a} * \beta_{2a}$ = 0.19 * 0.35, Table 7 and 8). It is noted that about 0.07 of the total relationship (r_{1a3}) is explained by the indirect relationship (see Table 9). This indicates the importance of the mediating role played by MAS capacity in an organization's attempt to improve its performance. As Bartol

(1983) argued that a β coefficient of the value of 0.06 or greater is important in explaining a relationship in a study using the path analysis technique, we consider that the magnitudes (coefficients) of the indirect relationshv (0.07) and of the direct relationship (0.01) above are enough to be meaningful.

The study also extends previous research on the role of MAS by incorporating firm performance into the model. The importance of incorporating firm performance into the model in a study of the role of MAS has been stressed in the literature (Chenhall and Morris, 1986; Mia and Chenhall, 1994).

Finally, several limitations of the current study may be noted. First, this study used a subjective orientation to measure MAS capacity. Future research could employ a more objective approach by asking respondents about the availability of information of specific management accounting techniques. Second, the study was based on a survey. This approach has shortcomings as it captures a situation or an event at a point in time. Future research could employ a more qualitative approach such as the case study or a longitudinal study. Finally, the study covers only manufacturing firms with between 20 and 250 employees that are registered with FMM and thus could not be generalized to all SMEs in Malaysia. It is possible that the applications of IT and MAS capacity are different between manufacturing firms and non-manufacturing firms and members and non-members of the FMM.

Conditional upon the limitations described above, the study offers empirical support for Huber (1990) theoretical argument that firms employing sophisticated IT can benefit from using MAS information for decision making. Moreover, the study extends prior studies by explaining the mediating role of the MAS capacity in the relationship between IT sophistication and firm performance.

REFERENCES

Bartol, K. M. 1983. Turnover Among DP Personnel: A Causal Analysis. *Communications of the ACM*. 26: 807-811.

Bergeron, F., L. Raymond, and S. Rivard. 2001. Fit in Strategic Information Technology Management Research: An Empirical Comparison of Perspectives. *OMEGA The International Journal of Management Science*. 29: 125-142.

Bolon, D. S. 1998. Information Processing Theory: Implications for Health Care Organizations. *International Journal of Technology Management*. 15: 211-221.

Bridge, J. and M. J. Peel. 1999. Research Note: A Study of Computer Usage and Strategic Planning in the SME Sector. *International Small Business Journal*. 17(4): 82-87.

Chan, Y. E., S. L. Huff, D. W. Barclay, and D. G. Copeland. 1997. Business Strategic Orientation, Information Systems Strategic Orientation, and Strategic Alignment. *Information Systems Research*. 8(2): 125-150.

Chang, C. H. and C. W. Jevons Lee. 1992. Information Acquisition as Business Strategy. *Southern Economic Journal*. 58(3): 750-761.

Chenhall, R. H. 2003. Management Control Systems Design within Organizational Context: Findings from Contingency-based Research and Directions for the Future. *Accounting, Organization and Society*. 28: 127-168.

Chenhall, R. H. and D. Morris. 1986. The Impact of Structure, Environment, and Interdependence on the Perceived Usefulness of Management Accounting Systems. *The Accounting Review*. LXI (1): 16-35.

Cragg, P. B. and M. King. 1992. Information System Sophistication and Financial Performance of Small Engineering Firms. *European Journal of Information Systems*. 1(6): 417-426.

Cragg, P. B. and N. Zinatelli. 1995. The Evolution of Information Systems in Small Firms. *Information & Management*. 29: 1-8.

Cragg, P. B., M. King, and H. Hussin. 2002. IT Alignment and Firm Performance in Small Manufacturing Firms. *Journal of Strategic Information Systems*. 11: 109-132.

Daft, R. L. and R. H. Lengel. 1986. Organization Information Requirements, Media Richness and Structural Design. *Management Science*. 32(5): 554-571.

Dillman, D. A. 1978. *Mail and Telephone Surveys: The Total Design Method.* New York: John Wiley & Sons.

Egelhoff, W. G. 1982. Strategy and Structure in Multinational Corporations: An Information Processing Approach. *Administrative Science Quarterly*. 27(3): 435-458.

El Louadi,M. 1998. The Relationship Among Organization Structure,Information Technology and Information Processing in Small Canadian Firms. *Canadian Journal of Administrative Sciences*. 15(2): 180-199.

Foong, S. Y. 1999. Effect of End-User Personal and Systems Attributes on Computer-Based Information System Success in Malaysian SMEs. *Journal of Small Business Management*. July: 81-87.

Fuller, T. 1996. Fulfilling IT Needs in Small Businesses: A Recursive Learning Model. *International Small Business Journal*. 14(4): 25-44.

Garsombke, T. W., and D. J. Garsombke. 1989. Strategic Implications Facing Small Manufacturers: The Linkage between Robotization, Computerization, Automation and Performance. *Journal of Small Business Management*. 27(4): 34-44.

Holmes, S. and D. Nichols. 1988. An Analysis of the Use of Accounting Information by Australian Small Business. *Journal of Small Business Management*. 26(2): 57-68.

Huber, G. P. 1990. A Theory of the Effects of Advanced Information Technologies on Organizational Design, Intelligence, and Decision Making. *Academy of Management Review*. 15(1): 47-71.

Khandwalla, P. N. 1977. *The Design of Organizations*. New York: Harcourt Brace Jovanovich, Inc.

King, W. R., V. Grover, and E. Hufnagel. 1989. Using Information and Information Technology for Sustainable Competitive Advantage: Some Empirical Evidence. *Information and Management*. 17: 87-93.

King, M., R. A. Lee, J. A. Piper, and J. Whittaker. 1991. Information Technology and the Changing Role of Management Accountants. In D. Ashton, T. Hopper, R. W. Scapens (Eds.) *Issues in Management Accounting.* Hemel Hempstead: Prentice Hall International. 294-311.

Lesjak, D. 2001. Are Slovene Small Firms Using Information Technology Strategically? *Journal of Computer Information Systems*. 41(3): 74-81.

Levy, M. and P. Powell. 2000. Information Systems Strategy for Small and Medium Sized Enterprises: An Organizational Perspective. *Journal of Strategic Information Systems*. 9: 63-84.

Levy, M., P. Powell, and P. Yetton. 2001. SMEs: Aligning IS and the Strategic Context. *Journal of Information Technology*. 16: 133-144.

Lindner, J. R., T. H. Murphy, and G. E. Briers. 2001. Handling Nonresponse in Social Science Research. *Journal of Agricultural Education*. 42(4): 43-53.

Mairead, T. 1997. Accounting Information and Small Firms. A Paper Presented at the 20th/SBA National Conference. Belfast.

Marriot, N. and P. Marriot. 2000. Professional Accountants and the Development of a Management Accounting Service for the Small Firm: Barriers and Possibilities. *Management Accounting Research*. 11: 475-492.

McMahon, R. G. P. and L. G. Davies. 1994. Financial Reporting and Analysis Practices in Small Enterprises: Their Association with Growth Rate and Financial Performance. *Journal of Small Business Management*. 32(1): 9-17.

Mia, L. 1993. The Role of MAS Information in Organizations: An Empirical Study. *British Accounting Review*. 25: 269-285.

Mia, L. and R. H. Chenhall. 1994. The Usefulness of Management Accounting Systems, Functional Differentiation and Managerial Effectiveness. *Accounting, Organizations and Society*. 19(1): 1-13.

Mia, L. and B. Clarke. 1999. Market Competition, Management Accounting Systems and Business Unit Performance. *Management Accounting Research*. 10: 137-158.

Mitchell,F.,G. Reid,and J. Smith. 2000. *Information System Development in the Small Firm: The Use of Management Accounting*. London: CIMA Publishing.

Nayak, A. and S. Greenfield. 1994. The Use of Management Accounting Information for Managing Micro Businesses. In A. Hughes, and D. J. Storey (Eds.) *Finance and the Small Firm*. London: Routledge.

Pedhajur,E. J. 1982. *Multiple Regression in Behavioral Research: Explanation and Prediction.* 2nd Edition. New York: Holt, Rinehart and Winston.

Perren, L. and P. Grant. 2000. The Evolution of Management Accounting Routines in Small Businesses: A Social Constructive Perspective. *Management Accounting Research*. 11: 391-411.

Porter, M. E. 1985. *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: The Free Press.

Raman, K. S. and C. S. Yap. 1996. From a Resource Rich Country to an Information Rich Society: An Evaluation of Information Technology Policies in Malaysia". *Information Technology for Development*. 7: 109-131.

Raymond, L. and G. Pare. 1992. Measurement of Information Technology Sophistication in Small Manufacturing Businesses. *Information Resources Management Journal*. 5(2): 4-16.

Raymond, L., G. Pare, and F. Bergeron. 1995. Matching Information Technology and Organizational Structure: An Empirical Study with Implications for Performance. *European Journal of Information Systems*. 4: 3-16.

Shin, N. 2001. The Impact of Information Technology on Financial Performance: The Importance of Strategic Choice. *European Journal of Information Systems*. 10: 227-236.

Temtime,Z. T.,S. V. Chinyoka,and J. P. W. Shunda. 2003. Toward Strategic Use of IT in SMEs: A Developing Country Perspective. *Information Management and Computer Security*. 11(5): 230-237.

Thong, J. Y. L. 1999. An Integrated Model of Information Systems Adoption in Small Business. *Journal of Management Information Systems*. 15(4): 187-214.