

Factors influencing the alignment of accounting information systems in small and medium sized Malaysian manufacturing firms

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Abstract

The concept of alignment or fit between information technology (IT) and business strategy has been discussed for many years, and strategic alignment is deemed crucial in increasing firm performance. Yet few attempts have been made to investigate the factors that influence alignment, especially in the context of small and medium sized firms (SMEs). This issue is important because results from previous studies suggest that many firms struggle to achieve alignment. Therefore, this study sought to identify different levels of alignment and then investigated the factors that influence alignment. In particular, it focused on the alignment between the requirements for accounting information (AIS requirements) and the capacity of accounting systems (AIS capacity) to generate the information, in the specific context of manufacturing SMEs in Malaysia. Using a mail questionnaire, data from 214 firms was collected on nineteen accounting information characteristics for both requirements and capacity. The fit between these two sets was explored using the moderation approach and evidence was gained that AIS alignment in some firms was high. Cluster analysis was used to find two sets of groups which could be considered more aligned and less aligned. The study then investigated some factors that might be associated with a small firm's level of AIS alignment. Findings from the study suggest that AIS alignment was related to the firm's: level of IT maturity; level of owner/manager's accounting and IT knowledge; use of expertise from government agencies and accounting firms; and existence of internal IT staff.

Keywords

Accounting information system; management accounting system; alignment; fit; organisational information processing theory; developing countries.

Earlier version

There are no earlier versions of this paper published elsewhere.

1 Introduction

Many studies have emphasised the need to develop a fit between business strategy and information technology (IT) strategy. Yet many firms struggle to achieve alignment and, to date, there has been relatively few studies of alignment and in particular the factors that influence the alignment in small and medium sized firms (SMEs). Reviews of accounting and information systems literature show that many studies have examined the alignment between contingency factors and accounting information systems (AIS) design (Chong & Chong 1997; Chenhall & Langfield-Smith 1998; Mia & Clarke 1999) or the alignment between contingency factors and IT sophistication (Weill & Olson 1989; Henderson & Venkatraman 1993; Bergeron et al. 2001) particularly among large firms. Chang and Jevons Lee (1992) argued that effects from these factors can be measured by the degree of a firm's information requirements, which according to Bolon (1998) would be made available by firms investing in a more sophisticated information processing system. However, with the exceptions of El Louadi (1998) and Rhee (2001), studies that focus on the alignment between information requirements and information processing capacity are very rare, especially in the context of SMEs.

This study attempted to fill this gap by examining factors that influence AIS alignment in the specific context of Malaysian manufacturing SMEs. This objective was achieved by firstly clustering the SMEs according to whether or not there was alignment between accounting information requirements (represented by AIS requirements) and accounting information system processing capacity (represented by AIS capacity). The alignment groups were then tested against potential influence factors to determine their relationships with AIS alignment. This study focused on AIS alignment because AIS (which covers both the financial and managerial aspects of accounting information) is an important component of modern information systems within SMEs (Mitchell et al. 2000). This exploratory study also aimed to identify fruitful areas of future research in the areas of accounting and information systems.

The status of AIS alignment among manufacturing SMEs in Malaysia is worthy of study for several reasons. First, Malaysia is seeking rapid developments of its IT environment. The establishment of the Multimedia Super Corridor (MSC) and the National IT Agenda (NITA) in 1996 placed a priority on Malaysia to create a new generation of knowledge workers. These efforts are consistent with the increasing globalisation of demand and the utilisation of IT as a competitive weapon. Second, SMEs represent about 91% of the total manufacturing establishments, thus having a significant role in the country's industrialisation program (Ismail & King 2005). Despite this, the extent, mode, and quality of IT adoption among Malaysian SMEs is still an issue of great concern. The usage of accounting information and the utilisation of IT for business decisions were still lagging behind those of developed countries (Ismail et al. 2003). Thus, a study investigating the factors influencing AIS alignment may deepen current understanding of the effectiveness of information systems implementation among firms. It may also highlight the effectiveness of the policies and directions set by the Malaysian government. While this is deemed crucial for Malaysia, it is also important for other developing countries of similar interest and environment.

The next section reviews existing literature on AIS and information system development in SMEs. It shows that there are rather contradictory findings about AIS design in SMEs and there are ambiguous findings about the strategic use of IT in SMEs, which justifies further investigation into the fit of AIS requirements with AIS capacity. The next section will explain the development of the research model, involving six hypotheses about six variables which are identified as likely to be associated with alignment, and explains the chosen method for measuring alignment. In the next section, details of the sample used are provided. Then cluster analysis is used to identify two alignment groups: those with AIS alignment and those which are not-aligned. These two groups are used to test the research hypotheses. In the next section the results are discussed, the theoretical and practical implications are described and the limitations of the study are identified.

2 Literature review

The concept of alignment applied in this study was developed around Galbraith's (1973) information processing (IP) theory. IP theory, which is one of several that can be classified as contingency theory (Bolon 1998), postulates that the IP capacity of an organisation must match its information requirements, if IP capacity is to have a significant impact on performance (Galbraith 1973). The theory assumes that an organisation is "... a complex system whose primary problem of relating to its environment is the acquisition and utilisation of information" (Bolon 1998, p.212) – the greater the uncertainty, the greater the amount of information that needs to be processed to achieve a given level of performance. Organisations would thus respond to the increasing information demand by increasing or reducing their IP capacity (Galbraith 1973). While IP theory was originally developed in the context of large and complex organisations, several studies have successfully applied this concept of fit in the context of smaller firms (see, for example, El Luoadi 1998; Ismail & King 2005; Khazanchi 2005). This study applies IP theory to examine the fit or alignment between AIS requirements and AIS capacity, and to identify factors that might be associated with an SME's level of AIS alignment. This approach is also consistent with Van de Ven & Drazin's (1985) suggestion that an organisational outcome is the consequence of fit between two or more factors. The following paragraphs discuss extant literature relating to AIS and information system development in SMEs.

Mitchell et al. (2000) argued that accounting information could help SMEs manage short-term problems in areas such as costing, expenditure and cash flow by providing information to support monitoring and control. However, the existing literature provides little evidence of AIS development within SMEs. Many studies suggest that SMEs have little management information and poor control, and that decision-making is mostly ad hoc (Marriot & Marriot 2000). McMahon (2001), for example, suggested that financial accounting has remained the principle source of information for internal management in SMEs. Marriot & Marriot (2000) also suggested that financial awareness among managers of SMEs varies considerably and that the use of computers for the preparation of management accounting information is not at its full potential.

Perren & Grant (2000), by contrast, argued that decision-making processes in SMEs are more sophisticated than anticipated. They explained that studies focused on formal accounting techniques would often suggest that SMEs lacked effective accounting information and control systems to support their decisions. However, they state that studies adopting a more subjective approach suggested that SMEs actually relied on sufficient accounting information, including managerial accounting, which was often acquired via informal means, to make their business decisions. Therefore, Perren & Grant (2000) concluded that the contradictory findings actually stemmed largely from the researchers' paradigm rather than any real contradiction. Their argument is supported by the International Federation of Accountants (2006), which reported that despite the variations of use of accounting information among small businesses, there is evidence to suggest that small firms are aware of the importance of accounting information and used it for a variety of purposes. Thus, there is a need to investigate further the levels of AIS requirements in SMEs.

Many studies have also been conducted to understand how IT has been used to support information requirements in SMEs (see, for example, El Louadi 1998; Temtime et al. 2003; Ismail & King 2005). In general, results from past studies indicate that IT adoption has grown tremendously within SMEs. Yet there is considerable evidence to suggest that very few of the resulting systems have had any significant impact on the way management makes decisions (Temtime et al. 2003). Fuller (1996) argued that the key problem of the lack of strategic IT usage in SMEs relates to the relatively poor fit between what the software tools are offering and what is needed, with neither the users nor the suppliers being in a strong position to communicate with each other. The situation is even more crucial within SMEs because they lack experienced internal accounting and IT expertise and support (Mitchell et al. 2000). The consequent lack of expertise limits information understanding, IT specifications and selection policies, and it inevitably leads SMEs to implement or purchase an information system that is inadequate to the firms' needs (Ravarini et al. 2002).

Despite many limitations, IT use in SMEs has become more sophisticated. There is evidence that IT has helped SMEs develop and implement business strategy. For example, Lesjak (2001) and Levy et al. (2001) concluded that SMEs use IT strategically when it was perceived as being integral to the firms' strategy. Cragg et al. (2002) and Ismail & King (2005) revealed that a significant proportion of SMEs had achieved high levels of strategic alignment. Several studies have also found that firms with high levels of strategic alignment performed better than those with low levels of strategic alignment (Cragg et al. 2002; Bergeron et al. 2004). However, apart from Bergeron et al. (2001), Hussin et al. (2002) and Adekoya et al. (2005), very few attempts have been made to examine factors that influence IT alignment in SMEs. Among the factors identified include IT sophistication, management commitment and business environment. Despite this, many researchers have studied the factors that influence IT success in SMEs (see, for example, Thong & Yap 1995; Thong et al. 1996; Igbaria et al. 1997; Thong 2001; Shiels et al. 2003; Raymond & St-Pierre 2005; de Guinea et al. 2005). Although their results are far from conclusive, several factors have received much support: IT sophistication, the role of owners/managers of SMEs, external expertise, and firm size. Hence these factors may well influence SMEs' information system processing capacity and hence AIS alignment.

In summary, IT success has been examined and discussed in the SME context and some recent studies indicate that IT alignment is important for SMEs. However, there are very few studies which have focused on issues surrounding the alignment of information requirements and information system processing capacity in SMEs, including factors that could influence this alignment. Thus, this study aimed to provide further evidence about this issue, with emphasis on accounting information, and the factors associated with an SME's level of AIS alignment.

3 Research model and hypothesis development

Figure 1 depicts the research model, where six variables are seen to be associated with AIS Alignment: IT sophistication, owner/manager knowledge, owner/manager commitment, external expertise, internal expertise, and firm size. The dependent variable is AIS alignment which is viewed as the fit between AIS requirements and AIS capacity. The hypotheses of this model and a justification of the measurement of each variable are presented in the following discussion.

According to Huber (1990, p.65), "... 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". Firms with extensive resources may gain a competitive edge by deploying IT in support of or to strengthen their business (King et al. 1989). Chan et al. (1997) and Hussin et al. (2002) found that an appropriate level of IT sophistication was associated with the capability to align IT strategy and business strategy. Hence, it is expected that firms with more sophisticated IT will have a higher degree of AIS alignment (Hypothesis 1).

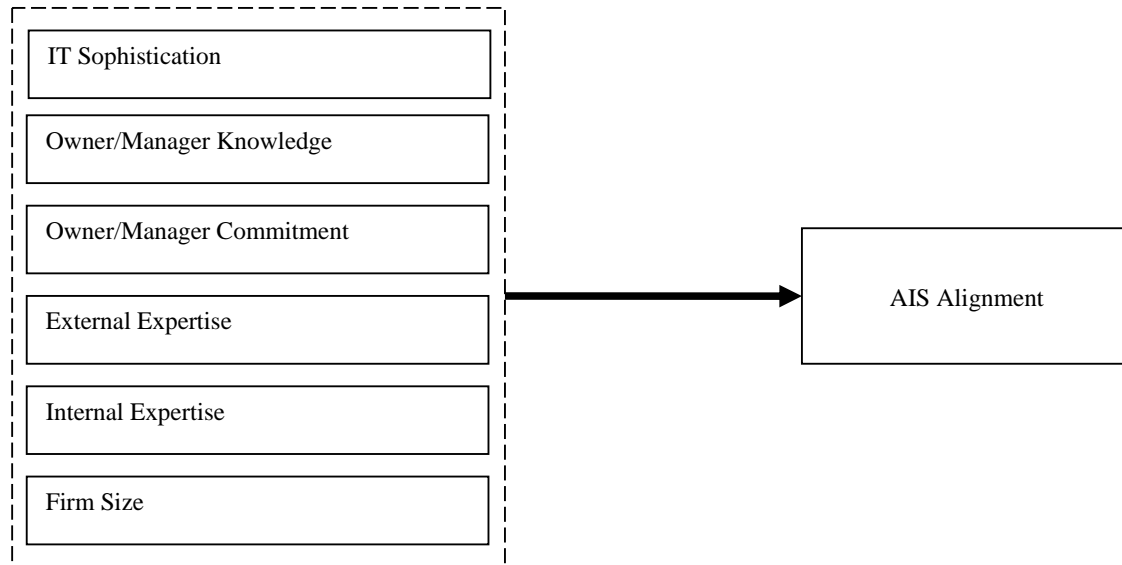


Figure 1: The research model

H₁: Firms that have more sophisticated IT will have a higher degree of AIS alignment than those firms with less sophisticated IT.

In the context of SMEs, an owner/manager's IT knowledge can determine the success or failure of computerisation projects because they play a dominant role in an SME's business decisions (Seyal et al. 2000; Thong 1999; 2001; Hussin et al. 2002). Most often, the owner/manager of the firm is the only person who fully understands the objectives and directions of the firm (Thong 1999). Therefore, owners/managers who are aware of existing and new technologies would be able to choose the right software for their firms (Hussin et al. 2002). In the context of AIS, owners/managers with both IT and accounting knowledge are in a better position than those without this knowledge, because they can understand the firm's AIS requirements and then use their IT knowledge to determine the IT deployment that matches the firm's information needs. Therefore, it is expected that in organisations wherein the owner/manager possesses sufficient IT and accounting knowledge, there will be a higher degree of AIS alignment (Hypothesis 2).

H₂: Firms with owner/managers having high levels of IT and accounting knowledge will have a higher degree of AIS alignment than those firms that with owner/managers having low levels of IT and accounting knowledge.

In addition to knowledge, an owner/manager's commitment also plays a critical role in the effectiveness of information system implementation in SMEs (Thong & Yap 1995; Igbaria et al. 1997; Lertwongsatien & Wongpinunwatana 2003; Seyal & Abdul Rahman 2003). Due to their dominant roles, an owners/managers' commitment can bring IT into alignment with the firm's objectives and strategies (Jarvenpaa & Ives 1991). Owner/manager commitment in the form of participation in computerisation projects would also encourage users to develop positive attitudes towards the IT project, and thus is more likely to result in the SME achieving alignment. More importantly, the owner/manager has the authority to ensure sufficient allocation of resources for the IT project (de Guinea et al. 2005). Therefore, it is expected that in organisations where owner/manager commitment is prevalent, there will be a higher degree of AIS alignment (Hypothesis 3).

H₃: Firms with owner/managers having high levels of commitment will have a higher degree of AIS alignment than those firms with owner/managers having low levels of commitment.

Many researchers have highlighted the importance of vendors and consultants to computerisation projects in SMEs (Igbaria et al. 1997; Thong 1999; 2001; de Guinea et al. 2005). In addition, government assistance has also played a major role in accelerating the adoption of IT among SMEs, particularly in developing economies (Yap & Thong 1997). Accounting firms have also been seen as a potential source of advice for SMEs on the use of accounting and information systems (Davis 1997). These findings were confirmed by Breen and Sciulli (2002) and Hartcher (2003), who found that accountants, the accounting profession, industry associations and IT training professionals have played important roles in encouraging SMEs to computerise their record keeping

processes. The assistance offered by these experts enables SMEs to gain a broader perspective of both their information needs and information processing capacity, so that it is expected that SMEs engaging these external experts will achieve higher degrees of AIS alignment (Hypothesis 4).

H₄: Firms that engage external expertise will have a higher degree of AIS alignment than those firms that do not engage external expertise.

SMEs also have a lack of experienced internal accounting and IT experts (see, for example, Gable & Raman 1992; Mitchell et al. 2000; Ravarini et al. 2002). This often results in a lower level of awareness and understanding of the importance of accounting information and also the capability of IT to generate the information. This in turn inhibits SMEs from adopting strategic accounting information and technologies. Hence, the research model also includes internal expertise as a factor that might influence AIS alignment in SMEs. The existence of accounting staff may help SME owners/managers to understand the importance of accounting information in monitoring their financial performance, whilst IT staff may assist them in identifying the right technology to generate the required information.

H₅: Firms that employ internal expertise will have a higher degree of AIS alignment than those firms that do not employ internal expertise.

Firm size has long been recognised as one of the factors that influence IT sophistication. Generally, larger firms are more likely to adopt or make extensive use of IT (Winston & Dologite 1999). Computerisation projects are also less likely to succeed in smaller firms, when compared to larger ones, because of their limited resources and lack of formalisation of information systems structure (Thong 2001). Most small firms do not have funds readily available to invest in IT and do not have the support to help them choose the right technology. Therefore, it is expected that larger firms are more likely to achieve higher degrees of AIS alignment than smaller firms (Hypothesis 6).

H₆: Larger firms will have a higher degree of AIS alignment than smaller firms.

The following sections will explain how each of the variables in the research model were measured.

3.1 AIS alignment

The concept of alignment or fit has been debated in the literature and a number of approaches have been developed to operationalise the concept. Venkatraman (1989) provided six different perspectives from which fit could be defined and studied. Different approaches require different mathematical models and have different theoretical implications (Bergeron et al. 2001). The moderation and matching approaches have been used by a number of researchers in both the accounting and information system literatures. Other approaches are still in their exploratory stages and thus require further development (Cragg et al. 2002). This study modelled fit using the moderation approach because of the weight of evidence in favour of this approach (see, for example, Chan et al. 1997; Cragg et al., 2002; Hussin et al. 2002). The moderation perspective assumes that alignment reflects synergy. Therefore, alignment is calculated as the interaction between two measures which, in this case, are AIS requirements and AIS capacity. For example, AIS capacity has a different impact on a high value for the AIS requirements compared with a low value. The greater the value of AIS capacity, the higher the effect of AIS requirements on performance (Ismail & King 2005).

In terms of measurement, both AIS requirements and AIS capacity were measured using questions that drew heavily on the instrument developed by Chenhall & Morris (1986). While other instruments are available, their focus is more on the practice of formal accounting techniques. Since many SMEs acquire information via informal means (Perren & Grant 2000), asking objective questions seemed to be irrelevant in the context of SMEs. Other instruments are also restricted to the characteristics of financial accounting information, which is not the only focus of this study.

Chenhall & Morris' (1986) instrument is considered appropriate for use in SMEs because it adopted a more subjective orientation to identify the characteristics of both financial and managerial accounting information. Despite its age, the instrument is the most popular and widely adopted by accounting researchers (see, for example, Mia 1993; Abernethy & Guthrie 1994; Gul & Chia 1994; Chong & Chong 1997). While it was originally developed for use in large organisations, it has been modified and tested in the specific context of SMEs by Gul (1991) and more recently by Ismail & King (2005).

AIS requirement and AIS capacity variables were measured in relation to nineteen accounting information characteristics using two separate five-point scales. First, respondents were asked to indicate their perception of the importance to their business of each of the nineteen information characteristics (1 = not important; 5 = very important). Then they were asked to indicate the extent to which their computer-based systems support each of the nineteen information characteristics (1 = not available; 5 = extensively available).

3.2 IT sophistication

In the SME context, IT sophistication is recognised as a multi-dimensional variable, where different researchers measure the item differently. Raymond & Pare (1992) developed the most comprehensive measure of IT sophistication, which includes all aspects related to technological, informational, functional, and managerial sophistication. They defined IT sophistication as "... a construct which refers to the nature, complexity and interdependence of IT usage and management in an organisation" (Raymond & Pare 1992, p.7). Technological sophistication reflects the number or diversity of IT used, while informational sophistication is characterised by the nature of its application portfolio. Functional sophistication relates to the structural aspects of the information systems function and the implementation process, while managerial sophistication refers to the mechanisms employed to plan, control and evaluate present and future applications. This study adopted only two dimensions of IT sophistication (technological and informational sophistication) to represent IT sophistication. Functional and managerial sophistication are considered less relevant because most SMEs do not have separate IT functions and thus lack IT planning and control (Thong 2001). In addition, Hussin et al. (2002) examined the impact of three dimensions of IT sophistication on IT alignment. The study found a significant relationship between IT alignment and technological sophistication but not with functional and managerial sophistication.

3.3 Owner/manager IT and accounting knowledge

This study measured owner/manager IT knowledge using a list of seven applications commonly found in SMEs. Using a five-point scale (1 = no knowledge; 5 = extensive knowledge), the respondents were asked to indicate the extent to which they were familiar with word processing, spreadsheet, database, accounting, e-mail, Internet and computer-assisted production management applications. Using the same scale, respondents were then asked to indicate their knowledge level relating to financial and managerial accounting techniques.

3.4 Owner/manager commitment

Owners/manager commitment was measured based on the degree of their participation in IT projects. This study adopted a similar instrument used by Hussin et al. (2002) to measure owner/manager participation in information system implementation. The instrument which was originally developed by Jarvenpaa & Ives (1991) was tested and validated by Hussin et al. (2002) in the specific context of SMEs. Using a five-point scale (1 = no participation; 5 = high participation), respondents were asked to indicate their level of participation in the following five areas: definition of needs (information requirements), selection of hardware and software, implementation of systems, systems maintenance and problem solving, and planning for future IT deployment.

3.5 Sources of advice (external and internal expertise)

Four main sources of external expertise identified from the literature were included in the questionnaire: consultants, vendors, government agencies, and accounting firms. The questionnaire asked the respondents to identify the sources of advice used by their firms. In addition to external expertise, the questionnaire also asked respondents to indicate whether they employed full-time accounting and IT staff.

4 Research method

The focus of this study was on AIS alignment in SMEs. This was further restricted to manufacturing firms because the manufacturing sector can provide a range of levels of IT sophistication (Cragg et al. 2002). The Malaysian Small and Medium Industries Development Corporation (SMIDEC) defines SMEs in manufacturing, manufacturing-related services and agro-based industries as enterprises with full-time employees not exceeding 150 or with annual sales turnover not exceeding RM25 million. However, SMEs in this study were defined as any unit with 20 and 150 employees. The number of employees is the most commonly used international definition in the literature, since in some cultures small firms are reluctant to disclose precise financial details. Very small firms (with less than 20 employees) were also excluded to increase the probability of sampling computerised firms and firms that to some degree adopted strategic accounting information.

To achieve this, a mail questionnaire survey carried out from August to October 2005 was used to gather data. The Federation of Malaysian Manufacturers database provides a total of 771 addresses of SMEs as defined in this study. Fifty addresses were used for the pre-test and pilot test, and the remaining 721 were used for the main survey. Following Dillman's (1978) suggestion, the questionnaire was refined in three stages: pre-testing with academics and research students, pre-testing with firm managers, and pilot testing with firm managers. The pre-test aimed to clarify the wording of both the questionnaire instructions and questions, whilst the pilot test attempted to examine patterns of respondents' answers and thus their understanding of the questionnaire.

The questionnaires were addressed to the Managing Directors (MD) of the firms. MDs were chosen to be the respondents of this study because they were more likely to have valid perceptions of the AIS design and IT

approach adopted by the firms. This is because the MD commonly makes most key decisions and is perhaps the only person who can harness IT to achieve the firm's objectives and strategy (Jarvenpaa & Ives 1991). In addition, the MD is typically the owner/manager, and thus it is reasonable to assume the current MD is the same MD who decided on the design of AIS and the IT approach of their firm (Thong 1999).

A total of 230 firms eventually responded to the survey after a period of ten weeks and two follow-up reminders, which were sent a week and three weeks after the initial letter. However, only 214 firms answered both the AIS requirements and AIS capacity items and were thus usable for subsequent analyses, resulting in about a 29% response rate. Non-response was examined using time trend extrapolation (Lindner et al. 2001). The first 30 respondents and last 30 were compared on nineteen AIS requirement and nineteen AIS capacity items. Only one variable proved significantly different. This suggests that non-response was not a significant factor that could bias or affect the conclusions about the variables being studied.

5 Results

The main objective of this paper is to examine the factors that influence AIS alignment. To achieve this, in the next section the alignment between AIS requirements and AIS capacity will be determined using the moderation approach. Then, using cluster analysis, firms will be grouped according to their degree of AIS alignment. Finally, six influence factors will be examined in the context of the different alignment groups in order to test the hypotheses presented in section 3.

5.1 AIS alignment

The moderation approach to measuring fit was initially explored to measure the alignment between AIS requirements and AIS capacity. For each firm and each information characteristic, the AIS alignment was measured by multiplying the rating of an AIS requirement item with the rating of the corresponding AIS capacity item. In this case, a high rating for an AIS requirement item and a high rating for the corresponding AIS capacity item would result in a high alignment score. On the other hand, a low rating for an AIS requirement item and a low rating for the corresponding AIS capacity item would give a low alignment score. Since each item was measured using a five-point scale, the individual result of the multiplications would range over all the possible scores from 1 to 25 (see Chan et al. 1997 for a detailed explanation of the moderation approach). The AIS alignment mean for each information characteristic for the total sample is reported in Table 1, in descending order. The results show that the information characteristics with high alignment scores were: frequency of reporting; summary reports-organisation; summary reports-sections; sectional reports; speed of reporting; and temporal reports. The information characteristics with low alignment scores were: external information; what-if analysis; non-economic information; and sub-unit interaction.

Information characteristics	AIS alignment	SD
Frequency of reporting	14.44	5.41
Summary reports-organisation	13.64	5.73
Summary reports-sections	13.53	5.64
Sectional reports	13.51	5.79
Speed of reporting	13.39	5.90
Temporal reports	13.30	5.46
Future events	12.51	5.89
Immediate reporting	11.77	5.66
Non-financial (production)	11.29	5.71
Automatic receipt	11.16	6.16
Decisional models	11.14	5.57
Organisational effect	10.38	5.64
Precise targets	9.97	5.55
Non-financial (market)	9.81	5.42
Effects of events on functions	9.18	5.23
Sub-unit interaction	8.83	4.92
Non-economic information	8.57	5.12
What-if analysis	8.52	5.04
External information	8.07	5.08

Table 1: Mean rating for AIS alignment items

5.2 Cluster analysis

In order to test our hypotheses it was necessary to determine if there were groups of firms with clear differences in their degree of alignment. The cluster analysis technique is often used to produce clusters or groups of highly similar entities based on some specified variables. In this case, cluster analysis was used to identify similar groups based on the nineteen measures of AIS alignment using the moderation approach. This technique has the advantage of identifying similarity without imposing a specific model. In particular, because this technique splits the population into groups, it was relatively easy to compare and contrast the effect of the moderation approach. Measurement issues also encouraged analysis by types of firms rather than using correlation and regression analysis (Hussin et al. 2002). Importantly, several measures were dichotomous or categorical. Furthermore, it seemed possible that some ratio variables could have non-linear relationships with alignment. Therefore, there was more chance of some relationships being identified using cluster analysis.

Information characteristics	Cluster 1 (98)	Cluster 2 (116)
Frequency of reporting	16.55	12.62
Summary reports-organisation	15.99	11.52
Summary reports-sections	16.34	10.97
Sectional reports	16.09	11.25
Speed of reporting	16.54	10.79
Temporal reports	15.42	11.38
Future events	16.32	9.19
Immediate reporting	14.96	8.97
Non-financial (production)	13.85	9.13
Automatic receipt	13.94	8.66
Decisional models	14.36	8.28
Organisational effect	13.70	7.36
Precise targets	13.42	7.14
Non-financial (market)	13.59	6.67
Effects of events on functions	12.77	6.29
Sub-unit interaction	11.93	6.26
Non-economic information	11.82	5.78
What-if analysis	11.95	5.59
External information	10.97	5.71

Table 2: Mean alignment scores for the two-cluster solution

This study used the cluster analysis routine in SPSS for Windows (release 11). Ward's hierarchical clustering routine was used initially and the distance between objects was measured using squared Euclidean distance. The dendrogram and the change in the Ward's coefficient suggested that a two-cluster solution was appropriate. The stability of the cluster solution was tested by splitting the data into halves. Each half was then analysed separately and 81.1% of the cases were classified consistently, indicating consistency with the full data set. The K-means approach to clustering was adopted to test for replicability of the cluster solution (Green et al. 1988) and 85.3% of the cases were consistent with the Ward's method. This suggested that a stable and valid solution had been found. The results are shown in Table 2.

The data in Table 2 indicated that firms in Cluster 1 had higher AIS alignment on each item than firms in Cluster 2. The patterns of the mean scores in the two clusters are consistent for all nineteen items. For this reason, Cluster 1 was labelled the 'aligned' group and Cluster 2 the 'not-aligned' group. The very clear and significant separation into two groups was a surprise because more groups were anticipated, but the fact that no other groups emerged with combinations of low and high alignment on different items considerably simplified the subsequent analysis. There was no ambiguity in labelling these groups 'aligned' and 'not-aligned' and so these two groups could be used to test the hypotheses. Hence, one possible assessment of alignment is by associating firms into one of these two groups.

5.3 Hypothesis testing of variables influencing AIS alignment

Having clearly identified two groups of firms with different levels of AIS alignment, it was then possible to test the variables that were posited in section 3 to be associated with AIS alignment: IT sophistication; owner/manager knowledge; owner/manager commitment; external expertise; internal expertise; and firm size. To test the hypotheses, the aligned and not-aligned groups of firms were compared for each variable.

5.3.1 IT sophistication and AIS alignment

As explained in section 3.2 this study adopted technological sophistication and informational sophistication from Raymond & Pare's (1992) four-dimensions of IT sophistication to measure the sample firms' degree of sophistication with IT. Each dimension is discussed separately below.

Table 3 summarises the technological sophistication of the aligned and not-aligned groups by showing the percentage of each group that reported using each of the nine specific technologies. The number of technologies used in each firm were totalled, and then averaged over each group so that an independent-sample t-test could be performed on the difference of means. This was found to be not significant, as shown in the final column. The results imply that the two alignment groups do not differ in terms of the number of technologies adopted. The specific technologies were then each tested using a simple Chi-square test on the frequencies of use reported for that specific technology. Only one technology, external network, differs significantly at the 95% level. The results show that the firms in the aligned group have more access (63%) to external networks than firms in the not-aligned group (51%). The result suggests that use of the Internet may help the firms gathered more external information and thus contribute to the AIS alignment process.

Technological sophistication	Aligned (125)	Not-aligned (149)	Sig.
Technology (% of group indicating use):			
Office support system	83	82	.515
Decision support system	67	71	.352
Database system	54	64	.097
Accounting application	98	92	.054
Computer-assisted production management	43	38	.277
Computer-aided design	27	33	.305
Computer-aided manufacturing	16	14	.371
Local area network	65	71	.243
External network	63	51	.046*
Number of technologies used (average over group)	5.18	5.15	.889

* Significance level 0.05

Table 3: Alignment groups and technological sophistication

In terms of technological sophistication the results in Table 3 show that more than 80% of the firms in both groups adopted office support systems such as word-processing and presentation software, while over two-thirds of the firms adopted a decision support system such as a spreadsheet. These findings are not surprising since these two technologies often come in one standard package such as Microsoft Office and Lotus Notes. Local area networks were also adopted by two-thirds of the firms in both groups. This suggests that, for firms in this sample, this technology is becoming more essential for internal communications. However, more sophisticated and expensive software, such as computer-aided design, computer-aided manufacturing and computer-assisted production management, are not widely used by either group of firms.

Table 4 summarises the informational sophistication of the aligned and not-aligned groups. The number of applications used in each firm were totalled, and then averaged over each group so that an independent-sample t-test could be performed on the difference of means. This was found to be highly significant at the 95% level. The result implies that the two alignment groups are well separated based on the number of applications used, where firms in the aligned group use (on average) more applications than firms in the not-aligned group.

The specific applications were then each tested using a simple Chi-square test on the frequencies of use reported for that specific application. Five applications (which can be categorised as analytical-based applications) differed significantly at the 95% level: financial analysis; project management; budget variances; modelling; and personnel management. This implies that the two groups of firms are well separated based on these five applications. Despite the low percentage of firms in both groups using these applications, the results in Table 4 indicate that the percentage of firms in the aligned group adopting these applications is higher than those in the not-aligned group. Other insignificant applications are mostly transactional-based such as general ledger, accounts receivable and payable, billing and order entry, and purchasing and inventory. The results suggest that the adoption of analytical-based applications is important for SMEs to achieve better alignment for the sample firms.

Informational sophistication	Aligned (98)	Not-aligned (116)	Sig.
Applications (% of group indicating use):			
General ledger	94	86	.051
Accounts receivable	96	90	.068
Accounts payable	94	92	.424
Billing	79	69	.076
Order entry	62	61	.495
Purchasing	58	58	.532
Inventory	74	64	.085
Production planning	25	21	.308
Payroll	80	76	.314
Cost accounting	41	34	.208
Financial accounting	59	59	.538
Financial analysis	45	26	.003*
Budgeting	36	25	.060
Project management	18	7	.009*
Production variances	16	10	.138
Budget variances	24	10	.005*
Modeling	8	0	.002*
Personnel management	38	23	.016*
Number of applications used (average over group)	9.45	8.11	.006*

* Significance level 0.05

Table 4: Alignment groups and informational sophistication

5.3.2 Owner/manager knowledge and AIS alignment

It is interesting to note from the results in Table 5 that owners/managers in the sample SMEs believe they possess a good knowledge of e-mail and Internet. In fact, their knowledge of email and the Internet is relatively higher than other IT applications. An independent-samples t-test was then used to examine the relationship between alignment groups and knowledge variables. The results show that only the owner/manager's knowledge of more sophisticated software such as accounting-based and computer-assisted production management contributes to AIS alignment. Other applications did not differ between the two alignment groups. One possible reason is that most businesses, including SMEs, are expected to have knowledge in common applications such as word processing and spreadsheets. The use of e-mail and the Internet is also becoming more of a business necessity for all types and sizes of firms including SMEs.

Owner/Manager knowledge	Aligned (125)	Not-aligned (149)	Sig.
IT knowledge (average over group):			
Word processing	2.90	2.77	.142
Spreadsheet	2.84	2.74	.302
Database	2.45	2.26	.051
Accounting applications	2.80	2.54	.011*
Computer-assisted production management	2.24	1.77	.000*
E-mail	3.06	3.04	.808
Internet	3.08	2.98	.207
Accounting Knowledge (average over group):			
Financial accounting	2.84	2.54	.001*
Management accounting	2.74	2.49	.006*

* Significance level 0.05

Table 5: Alignment groups and owner/manager knowledge

It can be seen in Table 5 that the two alignment groups differ significantly in terms of owner/manager accounting knowledge. The difference is significant at the 95% level. The results suggest an association between the degree of AIS alignment and owner/manager knowledge of financial and managerial accounting techniques. A closer examination of the results also reveals some very interesting patterns. It is observed that the group means of owners/managers that are knowledgeable in IT and accounting for the aligned group is higher than that of the not-aligned group.

5.3.3 Owner/manager commitment and AIS alignment

The results in Table 6 show that the level of owners/managers' participation in information system implementation is relatively high in both alignment groups. However, the results of an independent-samples t-test show very little support for the association between AIS alignment and owner/manager participation. The two alignment groups only differ significantly on one of five stages, which is the 'solving problems' stage. While the results do not support findings from previous studies (Thong & Yap 1995; Thong et al. 1996), the relatively high participation level of owners/managers in both groups suggests IT maturity among the firms.

Owner/manager commitment	Aligned (125)	Not-aligned (149)	Sig.
Type of participation (average over group):			
Information requirements	3.12	3.34	.211
Choice of hardware and software	2.97	3.16	.261
System implementation	3.19	3.09	.533
Solving problems	3.37	2.97	.004*
Future plans	3.39	3.27	.387

* Significance level 0.05

Table 6: Alignment groups and owner/manager commitment

5.3.4 External expertise and AIS alignment

For external expertise, each respondent was asked whether their firm seeks advice from specific external experts such as consultants, vendors, government agencies and accounting firms. A simple Chi-square test was then performed on the frequencies of Yes and No answers to these questions. The results in Table 7 show that the two alignment groups only differ significantly in their usage of the expertise offered by government agencies and accounting firms. The percentage of firms in the aligned group that seek advice from relevant government agencies and accounting firms was found to be higher than those in the not-aligned group. While the finding deviates from common belief and those of previous studies (Thong et al. 1996; Igbaria et al. 1997; Thong 2001; de Guinea 2005), it again indicates IT maturity among the owners/managers of SMEs by choosing the less expensive, convenient and possibly more trusted advisors for their IT projects.

Sources of advice	Aligned (125)	Not-aligned (149)	Sig.
External expertise (% of group indicating use):			
Consultants	62	56	.218
Vendors/dealers	81	82	.473
Government agencies	39	22	.007*
Accounting firms	58	36	.001*

* Significance level 0.01

Table 7: Alignment groups and external expertise

5.3.5 Internal expertise and AIS alignment

For internal expertise, each respondent was asked whether their firm employed full-time accounting staff or full-time information systems personnel. The results in Table 8 show that the percentage of firms that employed accounting staff is much higher than the percentage of firms that employed IT staff. A simple Chi-square test was then performed on the frequencies of Yes and No answers to these two questions to test the difference between the two groups of firms. The results show that the two alignment groups only differ significantly in terms of the availability of IT staff. The percentage of firms reported using IT staff is higher for the aligned group (31%) compared to the not-aligned group (18%). The finding suggests that firms that are hiring IT staff are more aligned than firms that do not have such internal expertise.

Sources of advice	Aligned (125)	Not-aligned (149)	Sig.
Internal expertise:			
Accounting staff employed (% reporting Yes)	96	92	.203
Information system staff employed (% of Yes)	31	18	.024*

* Significance level 0.05

Table 8: Alignment groups and internal expertise

5.3.6 Firm size and AIS alignment

Following the common definition used to define SMEs, this study used the number of employees as a surrogate measure for firm size. An independent sample t-test was carried out to examine the effect of firm size on AIS alignment. Surprisingly, whilst the result indicates a significant difference ($F = 7.195$; $df = 212$; $p = 0.05$) between the mean of employees of these two groups, the average number of employees for the aligned group (64) is lower than the average number of employees for the not-aligned group (79). However, this unexpected finding is consistent with Morikawa (2004) who found that the relationship between IT and firm performance is positively significant only for small firms but not medium sized firms.

6 Discussion

This paper explored the alignment between AIS requirements and AIS capacity and the factors that influence the alignment. Results of the moderation approach to measure fit indicated varying degrees of alignment across the nineteen accounting information characteristics. Using cluster analysis, two significantly different AIS alignment groups were identified which were labelled as aligned and not-aligned. The results of this study suggest that some Malaysian SME manufacturers had achieved alignment between AIS requirements and AIS capacity, while others had not. Finally, the two alignment groups were tested against six potential influence factors: IT sophistication; owner/manager knowledge; owner/manager commitment; external expertise; internal expertise; and firm size.

This study found some support for Hypothesis 1, which proposed an association between AIS alignment and aspects of both technological sophistication and informational sophistication. The results showed support for the association between informational sophistication and AIS alignment but not between technological sophistication and AIS alignment. The evidence suggests that informational sophistication (which relates to the number and types of applications portfolio adopted) is more important than technological sophistication (which relates to the number and diversity of technologies used) for SMEs to achieve AIS alignment. The significant differences between the two alignment groups relating to the adoption of external network and analytical-based applications (such as financial analysis, project management, production variances, modelling and personnel management) also provided evidence that the aligned firms have greater IT maturity. Importantly, this maturity supports Fuller's (1996) argument that SMEs undergo organisational learning related to the utilisation of IT.

The results also provided some support for Hypothesis 2, which proposed a relationship between owner/manager IT and accounting knowledge with AIS alignment. Owner/manager knowledge of accounting was found to be significantly greater in the aligned firms than less aligned firms. The evidence suggests that knowledge of both financial and managerial accounting could be important for AIS alignment. However, the support for hypothesis 2 was limited since the knowledge of only two of seven applications was significantly higher in the aligned firms. Since the two applications (accounting-based and computer-assisted production management) are more sophisticated than the other applications explored, this evidence suggests that owner/manager knowledge of sophisticated applications could be very important for SMEs to achieve AIS alignment.

There was, however, very little support for Hypothesis 3, which proposed a relationship between owner/manager commitment and AIS alignment. Commitment was measured based on the level of the owner/manager's participation in IT projects. Only participation in the problem solving stage was found to be significantly greater in the aligned firms than the not-aligned group. This rather unexpected result could be explained by Jarvenpaa & Ives' (1991, p.206) who found 'executive involvement' (or the degree of importance placed on IT by the managers) was more important than 'executive participation' (or managers substantive interventions). Therefore, as argued by Hussin et al. (2002), possessing good knowledge of accounting and IT could fit into this concept of 'involvement' because this knowledge would help an owner/manager (probably with the help of external experts) to decide on the right software to support information needs and thus make alignment more likely.

This study also found some support for Hypothesis 4, which postulated a relationship between external expertise and AIS alignment. While the percentage of firms in the aligned group that seek advice from government agencies and accounting firms is significantly greater than for those in the not-aligned group, the two alignment groups did not differ significantly when it comes to consultant and vendor expertise. The evidence suggests that gaining expert advice and assistance from relevant government agencies and accounting firms can help SMEs achieve better alignment. This rather unexpected finding could be a reflection of the aligned firms having greater IT maturity and thus seeking less expensive and more convenient advice. The element of trust could also be very important in the context of SMEs. Davis (1997), for example, argued that SMEs rely on accounting firms as their most trusted business advisors. The possible explanation is that accounting firms are more knowledgeable about their clients and their clients' businesses and thus can help them achieve better AIS alignment.

This study also found some support for Hypothesis 5, which proposed a relationship between internal expertise and AIS alignment. While almost all firms in both the aligned and not-aligned groups employed accounting staff, firms that employed IS staff achieved better alignment than firms that did not. The evidence suggests that, in addition to seeking advice from external experts, employing internal IS staff is also important for SMEs to achieve AIS alignment. While accounting staff are becoming more of a necessity for SMEs to help with routine accounting work, the results of this study suggest that owner/manager accounting knowledge, with the help of IS staff, plays a crucial role for SMEs to achieve better AIS alignment.

Finally, results of this study did not find support for hypothesis 6, which postulated that larger firms would achieve better alignment than smaller firms. Interestingly, the study revealed that aligned firms, measured by the number of employees, were smaller when compared to the not-aligned firms. This finding contradicts the common belief that firm size would contribute to AIS alignment. One possible explanation for this finding is that the simple structure of smaller firms may facilitate the tasks of identifying and tailoring the systems to the firm's strategy and information needs (Zarowin 1998). The argument put forward by Thong (1999) is also noteworthy. He argued that despite the financial constraint faced by smaller firms, the less complicated structure of their business, the continuous declining cost of IT, and the availability of more powerful and user-friendly packages, provides an extra advantage to these firms from computerisation compared to their larger counterparts. Thinking in the context of small firms, these advantages may increase their understanding of accounting information and accessibility to sophisticated IT and eventually leads to better AIS alignment.

6.1 Implications for theory

There has been much debate about the best way to measure alignment and, in particular, the alignment or fit of business strategy with IT strategy. Since Venkatraman (1989) discussed the concept of fit, part of the debate has focussed on which approach is best suited to particular types of alignment or fit. Bergeron et al. (2001) stressed that the appropriate measure of fit depends on the particular circumstances under consideration. Chan et al. (1997) and Cragg et al. (2002) considered both the matching and moderation approaches, but favoured the moderation approach. Hussin et al. (2002) and Ismail & King (2005) considered only the moderation approach and found it very useful. Following these studies, this study also used the moderation approach to measure the alignment between AIS requirement and AIS capacity, and found it useful for identifying aligned and not-aligned. Other studies will be needed to explore whether the moderation approach works well in similar situations and whether it might also be effective for other areas of study where fit or alignment is considered.

6.2 Implications for practice

This study suggests that AIS alignment varies considerably, that it can be achieved by SMEs and that alignment is related to IT maturity, owner/manager knowledge, and sources of advice. The study indicates that some SMEs have built their technical capability over the years to meet their firm's needs. More importantly, the study suggests that there is no easy route to alignment. Merely engaging external IT expertise such as consultants and vendors does not guarantee success. Other sources of external expertise such as government agencies and accounting firms coupled with internal IT expertise seem to be more important than delegating all IT decisions to an external expert. Therefore, it is important for SMEs to learn from their use of IT so that opportunities can be recognised and priority given to initiatives that help IT support their information needs. This study found that owner/manager knowledge of accounting and sophisticated IT was associated with the ability to align AIS requirements with AIS capacity. This suggests that the owners/managers of SMEs need to be familiar with both financial and managerial accounting techniques to understand their accounting information requirements, while at the same time being aware of existing, new and advanced technologies to generate the required information.

6.3 Limitations and future research opportunities

It is important to note that this study was exploratory in nature and thus subject to a number of limitations which can be addressed in future research.

The first limitation relates to the sample bias that might affect the generalisation of the findings. The sample was selected from a list of Malaysian manufacturing SMEs, and thus can not be generalised to all SMEs. There are potential differences in the levels of IT sophistication and accounting information practices and thus AIS alignment among manufacturing SMEs and non-manufacturing SMEs, and between manufacturing SMEs in developing economies like Malaysia and manufacturing SMEs in developed economies. For example, manufacturing SMEs in developed countries may have greater access to accounting and information systems benefits and services offered by relevant agencies when compared to those in developing countries.

The second limitation of this study relates to the definition of the SME itself. While it is generally accepted that the number of employees could be used as a surrogate measure for firm size, expanding the definition to include the sales or revenue of the firms may produce different results.

The third limitation of this study relates to the possible limitation of the time trend extrapolation method. While the response rate of 29% is considered excellent in the context of SMEs and the results of time trend extrapolation also suggest that the respondents' characteristics are similar across the time that they choose to respond, this method also assumes that this trend carries forward to the non-respondents.

Fourthly, this study focused on the content aspect of AIS alignment. In other words, AIS alignment was considered by measuring how closely the AIS requirements content matched with AIS capacity. Although some influences on alignment were studied, the process of aligning AIS requirements with AIS capacity was not explored. Future research could investigate planning processes that link AIS capacity to AIS requirements.

Fifthly, this study examined the relationships between six independent variables and AIS alignment separately. Therefore, it is impossible to determine the weight or superiority of a factor compared to others that influence AIS alignment. Future research could employ sophisticated techniques such as structural equation modelling and include external variables such as external business and technological environment and trading partner support.

Finally, the study was based on a survey. This approach has shortcomings because it captures a situation or an event at a specific point in time. Future research could employ qualitative approaches such as case studies or a longitudinal study to further understand the AIS alignment process.

7 Conclusions

This paper examined six hypotheses concerning the achievement of AIS alignment in the specific context of manufacturing SMEs in Malaysia. It has made an important contribution by providing an increased understanding of AIS alignment in SMEs, which has received little attention in the literature. Using a cluster analysis based on the moderation approach, it was possible to identify two groups of SMEs. One group of firms had achieved some success in aligning their AIS capacity with their AIS requirements as measured by the moderation approach, while AIS alignment was lower in the other group. It would appear that the moderation approach adopted was effective in distinguishing two groups with different AIS alignment characteristics. By systematically testing the six hypotheses against these two groups of firms, some associations between the six variables and AIS alignment were confirmed. The evidence suggests that the major factors that influenced AIS alignment among the sample firms were informational sophistication, owner/manager accounting knowledge, advice from relevant government agencies and accounting firms, and the existence of internal IT staff. Firm size measured by the number of employees, however, seemed to have the inverse relationship with AIS alignment, where aligned firms were smaller when compared to the not-aligned firms. This finding is rather surprising and indicates the need for further research into the processes associated with AIS alignment in SMEs.

8 References

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10 Appendix: questionnaire

AIS Requirements and AIS Capacity

The following statements help us understand the *importance* and *availability* of information in your firm. Scales on the left-hand side attempt to measure your perceptions toward the importance of each characteristic of information identified. Scales on the right-hand side attempt to measure the extent to which your computer-based systems provide each of the characteristics of information identified. *(Please circle an appropriate number on each side of the statement)*

Not important					Very important					Information Characteristics	Not available					Extensively available				
1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	Information that relates to possible <i>future events</i> such as future trends in sales, profits, expenses, cash flow etc.	1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	<i>Non-economic information</i> such as customer preferences, employee attitudes, attitudes of government and consumer bodies, competitive threats etc.	1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	<i>Information</i> on broad factors <i>external</i> to your firm such as economic conditions, population growth, technological changes etc.	1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	<i>Non-financial information</i> that relates to <i>production</i> information such as output rates, scrap levels, machine efficiency, employee absenteeism etc.	1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	<i>Non-financial information</i> that relates to <i>market</i> information such as market size, growth share etc.	1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	<i>Sectional reports</i> , information provided on the different sections or functional areas in your firm such as marketing and production, or sales, cost or profit centres.	1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	<i>Temporal reports</i> , information on the effect of events on particular time periods such as monthly/quarterly/annual summaries, trends, comparisons etc.	1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	<i>Effects of events on functions</i> , information that has been processed to show the influence of events on different functions, such as marketing or production associated with particular activities or tasks.	1	2	3	4	5	1	2	3	4	5

1	2	3	4	5	Decisional models , information in formats suitable for input into decision models such as discounted cash flow analysis, incremental or marginal analysis, inventory analysis, credit policy analysis etc.	1	2	3	4	5
1	2	3	4	5	Information in forms that enable you to conduct “ what-if ” analysis.	1	2	3	4	5
1	2	3	4	5	Summary reports-sections , information on the effect of different sections’ activities on summary reports such as profit, cost, revenue reports for other sections.	1	2	3	4	5
1	2	3	4	5	Summary reports-organization , information on the effect of different sections’ activities on summary reports such as profit, cost, revenue reports for the overall firm.	1	2	3	4	5
1	2	3	4	5	Sub-unit interaction , information on the impact that a decision will have throughout the firm, and the influence of other individuals’ decisions on other area of responsibility.	1	2	3	4	5
1	2	3	4	5	Precise targets for the activities of all sections within the firm.	1	2	3	4	5
1	2	3	4	5	Organizational effect , information that relates to the impact that decisions have on the overall performance of the firm.	1	2	3	4	5
1	2	3	4	5	Speed of reporting , i.e. requested information to arrive immediately upon request.	1	2	3	4	5
1	2	3	4	5	Automatic receipt , i.e. information supplied automatically upon its receipt into information systems or as soon as processing is completed.	1	2	3	4	5
1	2	3	4	5	Frequency of reporting , i.e. reports are provided frequently on a systematic, regular basis such as daily reports, weekly reports etc.	1	2	3	4	5
1	2	3	4	5	Immediate reporting , i.e. there is no delay between an event occurring and relevant information being reported.	1	2	3	4	5

Technological Sophistication

Included below is a list of information technologies which can be found in manufacturing sector. Please tick the technologies presently used by your firm. (You may tick one or more boxes if appropriate)

- Office Support Systems
(These applications include wordprocessing, graphics, and presentation packages)
- Decision Support Systems
(These applications include spreadsheets and similar)
- Database Systems
(These applications include personnel and other non-accounting systems)
- Accounting-Based Applications
(These applications include payroll, receivables, payables, general ledger, order entry and billing)
- Computer-Assisted Production Management
(These applications are related to inventory management, raw materials purchasing, production planning and control)
- Computer-Aided Design
(This system facilitate the creation and manipulation of industrial drawings)
- Computer-Aided Manufacturing
(This system automates production by computer operation of numerically controlled machine tools)
- Local Area Network (LAN)
(Communication system which interconnects computers within an organization such as local e-mail, application and data sharing)
- External Network
(Communication system that interconnects computers at geographically dispersed location such as Internet, Electronic Data Interchange and external data sources)

Informational Sophistication

Among the following computer applications, please tick the applications presently implemented in your firm.
(You may tick one or more boxes if appropriate)

- | | |
|--|---|
| <input type="checkbox"/> General ledger | <input type="checkbox"/> Cost accounting |
| <input type="checkbox"/> Accounts receivable | <input type="checkbox"/> Financial accounting |
| <input type="checkbox"/> Accounts payable | <input type="checkbox"/> Financial analysis |
| <input type="checkbox"/> Billing | <input type="checkbox"/> Budgeting |
| <input type="checkbox"/> Order entry | <input type="checkbox"/> Project management |
| <input type="checkbox"/> Purchasing | <input type="checkbox"/> Production variances |
| <input type="checkbox"/> Inventory | <input type="checkbox"/> Budget variances |
| <input type="checkbox"/> Production planning and control | <input type="checkbox"/> Modeling |
| <input type="checkbox"/> Payroll | <input type="checkbox"/> Personnel management |

Owner/Manager Knowledge

Please indicate the level of your knowledge of the following accounting techniques and IT applications, using a five-point scale from 1 = no knowledge to 5 = extensive knowledge.

Financial accounting techniques	1	2	3	4	5
Management accounting techniques	1	2	3	4	5
Word-processing package	1	2	3	4	5
Spreadsheet package	1	2	3	4	5
Database package	1	2	3	4	5
Accounting-based applications	1	2	3	4	5
Computer-assisted production management	1	2	3	4	5
E-mail	1	2	3	4	5
Internet searching	1	2	3	4	5

Owner/Manager Commitment

Please indicate the level of your participation in the following stages of information systems development, using a five-point scale from 1 = no participation to 5 = high participation.

Definition of needs (information requirements).....	1	2	3	4	5
Selection of hardware and software	1	2	3	4	5
Implementation of major systems	1	2	3	4	5
System maintenance and problem solving	1	2	3	4	5
Planning of future IT deployment	1	2	3	4	5

External Expertise

Please indicate the following external expertise that you normally seek on matters regarding computerization of your firm.

Consultant.....	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Vendor/Dealer.....	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Government agency.....	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Accounting firm.....	<input type="checkbox"/> No	<input type="checkbox"/> Yes

Internal Expertise

Please indicate whether your firm employs the following staff.

Accounting staff.....	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Information system staff.....	<input type="checkbox"/> No	<input type="checkbox"/> Yes

11 Biographies

Noor Azizi Ismail is an Associate Professor and Head of Audit and Information System Department, Faculty of Accountancy, Universiti Utara Malaysia. His research interests include the impact of IT on all areas of accounting including IT governance, management accounting systems, and accounting education. Recently, his work has concentrated on the alignment of accounting and information systems within small firms. He has been involved in several accounting and information systems related consultancy projects. He has published articles in both local and international journals in the domains of accounting, management and information systems.

Malcolm King is Professor of Management Sciences in the Business School at Loughborough University. As well as mathematical modeling, his research interests include the impact of IT on all areas of management and the organizational and political aspects of systems development. He has also written on IT acceptance and is particularly interested in IT developments within small and medium sized enterprises. Recently, his work has concentrated on the alignment of IT within small firms and issues surrounding ecommerce. Several PhDs have been supervised in this area.