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The effectiveness of management accounting systems

Evidence from functional managers in a developing country

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Abstract

Purpose – This study aims to examine the availability and effectiveness of management accounting systems (MAS) for functional managers located in an African developing country (Mauritius).

Design/methodology/approach – Based on the MAS dimensions defined by Chenhall and Morris, a contingency-based "intervening" model is proposed whereby available MAS play a significant intervening role between task uncertainty (TU) and decentralization (DEC) on managerial performance. Using survey data from production and marketing managers in manufacturing companies and regression-path analysis, the MAS dimensions (scope, aggregation, integration, and timeliness) are collectively analyzed in relation to the situational variables and managerial performance.

Findings – A significant positive relationship was observed between all MAS characteristics and managerial performance. However, only DEC proved to be a contextual variable of interest, in that DEC policies appear effective only via the availability of broader scope, timely, highly aggregated and highly integrated MAS. The absence of findings for TU is suggestive of an "uncertainty paradox," previously referred to in the literature, and is indicative of the need to re-consider TU as an element of "technology" rather than "uncertainty."

Research limitations/implications – This study focused only on manufacturing companies and its findings may not be applicable to other organizational contexts, e.g. service enterprises.

Originality/value – This study focuses on actual availability of MAS as perceived by users in manufacturing companies rather than on studies which rely on accountants' perceptions, on hypothetical "usefulness" perceptions of MAS or on the sole use of the scope dimension.

Keywords Management accounting, Uncertainty management, Decentralized control, Mauritius, Accounting systems

Paper type Research paper

Introduction

This study examines the effectiveness and adequacy of management accounting systems (MAS) in an African developing country context. It seeks to bring evidence on the existence and appropriateness of "modern" and "contemporary" management accounting (MA) information from a users' perspective, particularly those who are

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located in a socio-economic environment which is different from developed countries, i.e. differences in terms of the lower influence of a MA profession, the objectives of MA in companies (Blake *et al.*, 2003), and the training of non-accounting managers in MA techniques. Conventional wisdom, as expressed amongst mainstream MA researchers and practitioners (Johnson and Kaplan, 1987; Bromwich, 1990; IFAC, 1998[1]; Abdel-Kader and Luther, 2004; Sulaiman *et al.*, 2004), argues that the traditional characteristics of MA information (e.g. historic and internally-oriented, provided at regular intervals, and on "need to know" basis) have become increasingly and universally inadequate for effective decision-making. Allegedly, factors such as the increasing competition in the market, modern manufacturing technology, loose management models, deregulation of economic sectors, privatization of government owned enterprises, and changing consumer behavior not only make the use of MA information more critical but also leads to a increasing demand for higher "quality" and "sophisticated" MAS (Lucas, 1997; Granlund and Lukka, 1998; Mia and Clarke, 1999).

However, the evidence on the use of more contemporary and more sophisticated MA tools and techniques in emerging and/or developing nations remains mixed and is currently not suggestive of a "natural" evolution as argued by the above-mentioned authors (van Triest and Elshahat, 2007; Sulaiman *et al.*, 2005; Haldma and Laats, 2002; Joshi, 2001). Whilst it is common for certain researchers who study MA in emerging/developing countries to make a priori association between such findings and "culture" (Joshi, 2001), there is little consideration of other more mainstream contextual factors such as uncertainty, decentralization(DEC) (organization structure) and strategic priorities. Alternatively, other researchers associate the recent findings to a mismatch between the country's "historical regimes," its national factors and the Western-based assumptions under which MA techniques are based upon (Hopper *et al.*, 2004). Crucially however, Shields (1998) contended that whilst convergence could occur in terms of an increasing use of the same terminologies and techniques (i.e. what is nominally being used?), there would be less convergence in the purposes and styles of using MA techniques (i.e. as opposed to how is it actually used?). In other words, whilst there are now some emerging findings on the existence or absence of MA practices in developing countries, there is relatively little evidence on how MA information is actually perceived by managers in those countries and how these would impact on their performance. An understanding of this is both beneficial to the target organizations and to the consultants/professionals involved in setting up systems and practices, especially when anecdotal evidence suggests these are sometimes installed with little consideration of the needs of local managers, with no consequential improvement on their performance.

Consequently, this papers aims to develop an understanding of the above by relying on an already established[2] strand of the literature that studies MAS dimensions (devised by Chenhall and Morris, 1986), as informed by the mainstream contingency perspective (Otley, 1980; Galbraith's, 1973, 1977) information processing theory, and by focusing on the effect of two contextual variables, namely task uncertainty (TU) and DEC. Also, there have been very few attempts at considering MA and MAS in African developing nations (recent notable exception is van Triest and Elshahat, 2007) on the grounds that data collection in such countries remains tortuous. In addition, there is a need to consider the impact of contextual factors on MA using more rigorous statistical

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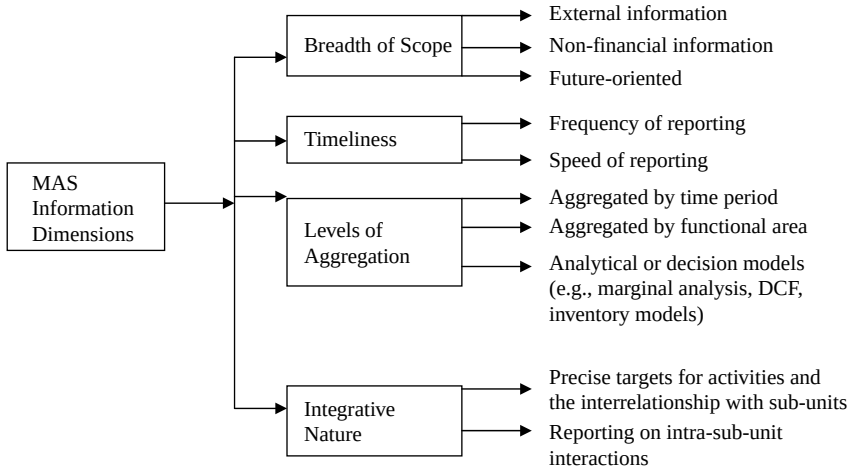
analysis in those countries (Sulaiman *et al.*, 2004). Hence, the case of Mauritius can provide additional insights as a representative country study of other developing nations in the region. A former British colony since 1968, Mauritius is an island economy and a member of African political and trade blocks. In contrast to many of its sub-Saharan counterparts, it has until recently performed well in terms of economic growth and employment as a result of industry diversification policies, political stability, sustained foreign investment and a successful textile manufacturing export sector[3]. At the same time, anecdotal evidence suggests that MA practices have appeared to be less predominant within companies and/or at least less diffused amongst non-financial managers[4]. Most of the companies consider MA to be a subset of the financial accounting function and the MA profession does not appear to be particularly active in the country. In addition, in spite of recent foreign-led developments (e.g. adoption of international accounting and corporate governance standards), any detail of accounting and financial information is still considered to be very confidential and commercially sensitive (even to be disseminated internally amongst managers) – perhaps partly as a result of the relatively small size of the country and a tightly-knit business community.

The remainder of the paper is structured as follows; first, relevant and theoretical literature are reviewed; second, the relevant hypotheses are formulated; third, the research findings are explained and discussed; finally, the conclusion and relevance of the findings to the MAS literature will be provided.

Literature review

Chenhall and Morris (1986) first formalized the four key informational characteristics of MAS. Figure 1 shows a summary of the information characteristics, namely scope (narrow to broad), timeliness (slow/standard to fast/customized to requests), aggregation (from summarized to very detailed) and integration (information for the department only to information from other departments). Whilst this breakdown of



Source: Adapted from the summary of the information characteristics made by Chenhall and Morris (1986)

Figure 1.
Classification of the MAS information dimensions

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MAS dimensions is useful in appreciating how MAS information is viewed from a users' perspective and allows for a reliable measurement from the field, one can also take a broader perspective in that these four dimensions can collectively describe a level of quality (Keller and Staelin, 1987) and sophistication for a MAS (broad scope, high timeliness, high aggregation, and high integration). Thus, whilst broad scope information might be viewed as an important dimension of any MAS, the absence of evidence on its actual timeliness, aggregation and integration may limit the benefits of knowing how far broad scope information has had an impact in the first place.

As mentioned previously, the contingency argument has been at the core of most MAS studies and has been empirically examined using "interaction (or moderating)" or "mediation (or intervening)" contingency fits (Gerdin and Greve, 2004). Some of the contingency variables used in MAS studies were perceived environmental uncertainty (PEU) (Gordon and Narayanan, 1984; Mia, 1993), strategic orientations (Chong and Chong, 1997), DEC (Chia, 1995), national culture (Tsui, 2001), TU (Chong, 1996) and interdependence (Chenhall and Morris, 1986; Bouwens and Abernethy, 2000). Also, Bouwens and Abernethy (2000, p. 221) contended that the understanding of antecedent conditions influencing the design of MAS is very limited, as it would be important for MAS designers to understand the relevant antecedent variables that may have resulted in a particular MAS design in an organization. This is in contrast to previous research which had looked at the moderating impact of a situational variable on the relationship between MAS and an outcome variable. As an illustration of this, Chong (1996, p. 419) concludes on his findings concerning the interacting effect of TU and states the (obvious) point that "... when task uncertainty is high, managers will require more information." In fact, a more relevant question would be whether the level of TU is actually contributing to the level of available MAS information or not. To our knowledge, this has not been explored.

A review of empirical-based MAS studies[5] – summarized in Appendix 1 – resulted in a number of observations. Firstly, the majority of previous MAS studies have focused on identifying MAS usefulness or importance from the point of the view of the users of information (10 of 13 studies). These may imply that respondents may have replied to hypothetical conditions (as opposed to actual conditions) and this could undermine the practicality/validity of results. As previously pointed out by Gul and Chia (1994, p. 415) and Chia (1995, p. 817) and more recently by Tsui (2001, p. 132), it is the perceived availability of MAS by users which can actually influence (or not) outcomes. This difference is important in light of the often stated motivations for MAS research, i.e. to help consultants design tailor-made MAS in response to an organization's environment and structure. Also, there has not been any research considering the impact of situational variables on the state of available MAS but rather on the level of perceived importance or usefulness of MAS.

Secondly, only three studies sought to measure all four MAS dimensions. Scope was the most researched dimension, because it supposedly represented an important aspect in the supply of management information to decision-makers, i.e. historical internal-focused vs future- and external-oriented. It is not clear whether all four dimensions were sought from respondents or whether there were issues in hypothesizing relationships for say, integration, timeliness or aggregation. In fact, this is one of the main limitations of the majority of previous MAS studies, whereby they focus on one or two MAS dimensions. Surprisingly, enough, there is also little evidence

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on the direct links between the four MAS dimensions and managerial performance, other than for scope (Mia, 1993; Chong and Chong, 1997; Mia and Clarke, 1999).

Thirdly, and partly as a result of the above-mentioned limitations, evidence on the influence of contingent variables in the relationship between MAS and managerial performance remains incomplete and of limited usefulness. In the case of the DEC variable, it is argued that the level of autonomy delegated to managers in terms of greater responsibility over planning/control activities and greater access to information (Waterhouse and Tiessen, 1978) matches with a higher MAS quality and sophistication. The MAS acts as a supportive mechanism and is consistent with the structural set-up of an organization (Watson, 1975). Hence, the degree of available MAS sophistication facilitates the provision of different types of relevant and timely information required in a decentralized organization to meet the managers' different needs. This will enable the managers to decide effectively, thereby resulting in higher managerial performance. However, DEC is initially not linked to two of the MAS dimensions (scope/timeliness: Chenhall and Morris, 1986), and is later found to be moderating variable between the MAS dimensions and performance – but only so far applicable to the Singaporean context (Gul and Chia, 1994; Chia, 1995). Thus, there is little empirical support as to whether DEC can indirectly lead to better performance via the availability of a higher quality and sophisticated MAS.

In a similar vein, the role of TU in the MAS-performance relationship remains yet to be fully investigated. The conceptualization of TU is related to the central concept of information processing. Galbraith (1973, p. 4) argues:

> ... if the task is well understood prior to performing it, much of the activity can be pre-planned. If it is not understood, then during the actual execution of the task more knowledge is acquired which leads to changes in resource allocations, schedules, and priorities. All these changes require information processing during task performance.

Galbraith's (1973) writings on the role of uncertainty in information processing have influenced related areas of accounting research, and remain topical amidst contradictory empirical findings (Chapman, 1997; Hartmann, 2000). However, only two of the reviewed studies (both done in Australia) have considered TU and have modeled it as a moderating variable with the scope dimension. Also, attention needs to be drawn on the differences in uncertainty perceptions and measurement between the different management levels (Tymon *et al.*, 1998; Chenhall, 2003, pp. 137-41). For instance, there is an inherent mismatch between PEU and functional management levels (or between TU and senior management level) and this is an issue which has been observed in some of the reviewed studies (Chenhall and Morris, 1986; Mia, 1993; Chong, 2004) – which thus questions the validity of some of the findings.

Finally, MAS studies have been carried in a relatively small cluster of mainly developed countries (notably in Australia with 8 of 13 studies) with little attempt at making valid replications in other countries, particularly in developing/emerging nations. Tsui (2001) alludes to, and finds some empirical support, for the effect of national/cultural differences when she compared the perceptions of Chinese vs the so-called "Western" managers. There is therefore an issue of generalization on whether MAS practices and effects would differ across a greater number of countries and contexts. As mentioned in the introductory section, there are now more published findings of MA practices in developing and emerging countries context, and these are indicative of the current debate and uncertainty as to whether these practices are

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existing, are operating or are effective in a similar way as found in developed nations. The interest particularly lies in not only how managers perceive the quality of the MAS information supplied to them but also how effective these can be within such environments, taking into consideration the contextual variables previously mentioned. In the absence of sufficient evidence to date, we however formulate our hypotheses on the "null" grounds that the linkages between the antecedent variables, MAS dimensions and managerial performance will be similar to the previously published findings. In addition, in the interest of providing an opportunity for reliable comparisons, this study adopts variables and constructs that have been previously used in the reviewed studies.

Hypothesis development

In light of the above review, the arguments and hypotheses for relating antecedent variables, MAS characteristics and managerial performance are formulated. This paper also adopts an intervening (or mediation) approach in which MAS is the enabling mechanism that indirectly links the contextual variables to performance (Gerdin and Greve, 2004).

The direct relationship between task uncertainty and MAS

TU is the difference between the amount of information required to perform the task and the amount of information already possessed. Thus, the amount of MAS information that managers have for decision-making is likely to be a function of their perceived TU (Chong, 1996, p. 416; Galbraith, 1973, 1977). A high-TU situation implies insufficient information for completing the task at hand and MAS can partly fill this gap by providing information that enables managers to understand the current situation and achieve optimal decisions for the company. From the review of MAS studies, TU has traditionally been modeled as a moderating variable that influences the relationship between MAS usefulness (scope only) and an outcome variable (Mia and Chenhall, 1994; Chong, 1996, 2004; Chong and Eggleton, 2003) and the results confirmed the expectation that a high (low) TU interacted with high (low) scope to lead to better performance.

However, there is little evidence on how high (low)-TU levels can actually lead to higher (lower) availability of sophisticated MAS, especially if one considers that none of the reviewed research studied the other MAS dimensions. The MA information not only needs to be broader in scope, but it also needs to be updated more frequently, to be more aggregated to allow managers to process large volumes of data, as well as provide more integrated information for better co-ordination across departments (Bouwens and Abernethy, 2000, p. 226). More information about the actions, decisions and consequences of other interdependent sub-units can mitigate the TU at a sub-unit level and thus, one could expect a match between the degree of TU and a resulting higher level of MAS integration. In addition, the increased supply of inter-departmental information fosters closer inter-relationships and collaboration amongst sub-units, which can play a crucial role under conditions of high TU, thereby improving managerial performance. On the other hand, the use of sophisticated MAS in a low TU situation could lead to an information overload situation – in terms of broad scope data, too frequent, and highly-integrated information (Chong, 2004, p. 4; Schick *et al.*, 1990) – and the providing of highly-aggregated information, which would not be

detailed enough to help managers – particularly in terms of providing pre-determined rules, policies and standards for task performance (Tushman and Nadler, 1978). Consequently, the following formal and "composite"[6] hypothesis is formulated:

H1. There is a positive relation between TU and the level of quality and sophistication of MAS, as conceptualized by the MAS dimensions of (i) scope, (ii) timeliness, (iii) integration, and (iv) aggregation.

The direct relationship between decentralization and MAS

DEC is one of the parameters of organization structure that has received significant attention in accounting research (Chia, 1995, p. 813) as well as in management/organizational research (van de Ven, 1976). It refers to the extent to which decision-making and authority within organizations are resolved at a lower hierarchical level, i.e. high DEC. Galbraith (1973) (also in Simon *et al.*, 1954) argues that more DEC will enable decision-making/information-processing closest to the source of an event and will thus improve performance. However, this would be dependent on the concurrent access to relevant, timely, aggregated, and integrated information. Hence, the level of DEC is expected to have some impact on availability of sophisticated MAS. However, findings on the "generic" relationship between structure and performance have been described as ambiguous and tenuous (Dalton *et al.*, 1980) and this is to some extent reflected in the reviewed studies on MAS and DEC.

Chenhall and Morris (1986) found that only two MAS dimensions were positively associated to DEC: aggregation and integration. The authors concluded that the scope and timelines of information was as important for both centralized managers and decentralized managers although the former had a more limited decision set (1986, p. 31). However, different results emerged from Gul and Chia (1994) when they modeled DEC as a moderating variable for the relation between MAS scope/aggregation to managerial performance. The authors concluded that scope was more important to decentralized managers, but only under conditions of high-PEU (i.e. a three-way interaction). Using what seems to be the same data set from Gul and Chia (1994) and Chia (1995) found additional support for the interactive role of DEC in enhancing the positive link between all four MAS dimensions and performance. Whilst both studies have focused on the perceived availability of MAS (rather perceived usefulness or importance), these results have only been found in one context, are based on responses from managers described as senior than functional middle-level managers, and largely drawn from a sample of non-manufacturing companies (refer to Gul and Chia, 1994, p. 418; Chia, 1995, p. 818).

As mentioned earlier, managers operating in a decentralized organization expect a broad scope MAS to cater for the increased diversity of informational needs in decision-making, particularly in the context of an increasing globalization process and DEC across international borders (Haka and Heitger, 2004, p. 23). Hence, the information characteristic of broad scope may be needed to match the specific needs of the various sub-units on matters ranging from pricing, marketing, financial statistics, inventory control, and labour negotiations from different environments. In this respect, the decision to devolve additional powers and responsibilities must thus be supported by an actual supply of sophisticated MAS information. At the same time, more information will flow to lower levels of management and the use of aggregated reports could prevent information overload, whilst providing appropriately aggregated data

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for input in decision-models (Chia, 1995, p. 815). However, DEC does not in itself foster a spirit of cooperation, interdependence and understanding between departments and sub-units. The coordination of activities remains an issue in some organizations, with managers setting their own targets and attempting to attract more resources at the expense of other sub-units. In this respect, the "internal transparency" via the availability of integrated information can enhance coordination and reduce undue competition for resources. There has been prior evidence that sub-unit managers do welcome such integrated information (Pick, 1971; Chenhall and Morris, 1986). This reasoning suggests the following hypothesis relating to level of DEC to MAS dimensions:

H2. There is a positive relation between DEC and the level of quality and sophistication of MAS, as conceptualized by the MAS dimensions of (i) scope, (ii) timeliness, (iii) integration, and (iv) aggregation.

The relationship between MAS and managerial performance

The "universal" and "beneficial" effects of a higher quality and more sophisticated MAS on organizational and/or managerial performance are compatible with the arguments of the mainstream MA researchers and practitioners (Johnson and Kaplan, 1987; IFAC, 1998; Chenhall and Langfield-Smith, 1998). The development and use of the so-called "contemporary" MA techniques and tools, e.g. activity-based costing, balanced scorecards, benchmarking, quality systems are the direct result of the efforts to leap beyond the "traditional" subset of accountant-focused tools and focus instead on the informational needs of managers.

Some of the MAS studies (Chenhall and Morris, 1986; Gordon and Narayanan, 1984; Chia, 1995; Fisher, 1996; Bouwens and Abernethy, 2000) did not explicitly study the likely influence of MAS on performance, but rather focus on the moderating effects of situational variables. However, other MAS studies – influenced by the study of intervening rather than moderating effects – have considered the outcome effects and at first glance, there seems to be little debate on the direct positive effects between MAS and managerial performance (the most preferred outcome metric), e.g. Chong and Chong (1997) and Mia and Clarke (1999). Other authors concur, stating that an organization's information system acts a learning system for improving managers' performance (Ferris and Haskins, 1988) and that higher performance will result from the supply of the needed information (Hiromoto, 1988). However, on closer inspection, the evidence appears to be widespread only for the scope dimension except for one study that, respectively, considers aggregation (Gul and Chia, 1994) and timeliness (Tsui, 2001) as a second MAS dimension. Interestingly, also, Mia (1993, p. 281) found a negative association between MAS scope and job satisfaction (but positive to managerial performance), concluding that this may be due to personal issues arising from salary, bonus or promotion factors – rather than being the result of the MAS information.

In considering the features of contemporary MA techniques and practices, it has been argued that these could be more conceptually associated to the broad scope dimension of MAS. At the same time, however, none of these techniques could have a definitive effect on performance if the other dimensions of timeliness, aggregation and integration remained at a low level. The only study that has found for the positive effects on performance for all MAS dimensions is Chia (1995) but only under conditions of high DEC, i.e. low DEC leads to a negative relationship between MAS

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and performance. However, this would require additional validation. Indeed, given comparable decision-making skills, the managers' application of the broad information should provide a relative advantage in performing their managerial tasks and assist in improving their performance. At the same time, integrated information that relates to the inputs, outputs, operating processes and the technology employed by other departments can be of significance to the functional managers. Similarly, the use of aggregated information can help him/her to process the information in a more effective and efficient way. For instance, the result of a decision to introduce a new input can be evaluated in terms of its effect on the unit's efficiency and production quality over a period of time. There would be no further benefit in providing information on the effects of this new input using numerous measures and indicators. Therefore, aggregated information can be advantageous for managers in making decisions. Finally, timeliness is intuitively a key factor towards enhancing managerial performance. Whatever be the level of available aggregated, integrated or scope information, the simple expectation is that the information must be made available on a timely basis to ensure correction action or decisions, as well as being made available on an *ad hoc* basis is also of relevance. In addition, if one supports the arguments put forward by the proponents of contemporary MA tools techniques:

H3. There is a positive relation between the level of quality and sophistication of MAS, as conceptualized by the MAS dimensions of (i) scope, (ii) timeliness, (iii) integration, and (iv) aggregation and managerial performance.

The intervening role of MAS in the relationship between task uncertainty and decentralization with managerial performance

In light of the arguments made in the context of *H1-H3*, and in the absence of evidence supporting the relevance of TU and DEC as antecedent variables affecting MAS quality and sophistication, this paper adopts, and plans to empirically test for, an intervening/mediating model and approach whereby MAS acts an intervening variable between each of the two antecedent variables and managerial performance. Indeed, when the relationship between two variables exists at least partly through a third variable, then this third variable plays this mediating role between the other two variables (Chenhall and Brownell, 1988; Mia, 1988, 1993). There is generally an expectation that the direct relationships between the antecedent variables and managerial performance are minimal, if not insignificant (Mia and Clarke, 1999). This thus leads to the following hypotheses:

H4. MAS, as conceptualized by the MAS dimensions of (i) scope, (ii) timeliness, (iii) integration, and (iv) aggregation have a significant intervening effect on the relationship between TU and managerial performance.

H5. AS, as conceptualized by the MAS dimensions of (i) scope, (ii) timeliness, (iii) integration, and (iv) aggregation, have a significant intervening effect on the relationship between DEC and managerial performance.

Research method

Country context

As mentioned earlier, there is a need to replicate MAS studies more frequently in nationally, economically and/or culturally diverse contexts. The study is set in an

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African developing country context, and this is argued to be a representative case of other countries with similar economic, social and historical characteristics. From the beginning of the 1980 s, Mauritius has greatly benefited from the globalization of investment and business, as foreign manufacturers seek overseas locations that can provide cheaper labour, political stability, dependable infrastructure and a favorable fiscal regime – usually structured as export processing zones (EPZ). Although the form and types of incentives offered to foreign investors may have changed over time, EPZ "bases" are still popular on the African continent (e.g. Malawi, Mozambique, Lesotho), particularly with the advent of free trade agreements with USA and Europe. Whilst some of the EPZ companies were set up by entrepreneurs from Asian countries (e.g. Hong Kong, Malaysia and China) seeking cheap labour and preferential access for their goods, other manufacturing companies are local family-owned companies which have diversified from their import substitution manufacturing towards an export-oriented one. However, the relatively remote location of Mauritius and its quasi-complete reliance on imported raw materials has always been a critical issue amongst manufacturing companies. Hence, very early on, they sought to maximize efficiency and productivity to reduce costs and adopted a more appropriate mix of non-financial and financial performance measures (Taylor *et al.*, 2001). Also, there remains a prevalence of a few influential groups in the ownership structure of the private-sector companies in Mauritius. Local financial accounting and reporting practices – although heavily influenced by UK-based principles and training – are not applied consistently (World Bank, 2003) and there is a tendency to view any accounting information to be confidential and not to be divulged extensively, even within the enterprise. Recently, however, there are indications of increasing computerization and use of enterprise resource planning (ERP) systems in some of the major manufacturing enterprises.

Sample selection

The selection of manufacturing companies in Mauritius proved to be difficult since there are no comprehensive published business directories (such as Kompass). Company details (e.g. number of employees, addresses) also varied across various sources and databases. In this respect, the following lists and databases were used to triangulate and identify a reasonably full and reliable list of manufacturing companies:

- *The Top 100 Companies in Mauritius.* This is a yearly business publication identifying the biggest companies in Mauritius in terms of turnover and net assets. It also provided information on number of employees, type of activities and contact details.
- *Member companies of the Mauritius Export Processing Zone Association.* Since, a significant majority of the manufacturing companies in Mauritius are export-oriented, this list provided details of relevant companies, activities and number of employees.
- *Registered companies with the Export Processing Zone Development Authority and Mauritius Investment and Development Authority.* These two government agencies publish a directory of registered companies and provide basic particulars.

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After removing some defunct or closed-down enterprises, the above exercise yielded a total of 75 companies with more than 150 employees. Anecdotal evidence suggests that a company of this size and type of activity in Mauritius would have the minimum organization structure and accounting systems. All the companies in the final selection were principally export-oriented enterprises, with the majority (60) being involved in the manufacturing and export of textile and wearing apparel. A further issue was that there was no information on the actual structures of companies (i.e. how many functional departments) and the names of functional managers. It was thus decided to focus on the "Sales/marketing manager" and "Production/operations manager" titles as they would have the highest chances of being applicable to the target company. This thus leads to two questionnaires being sent to each identified company, i.e. a total of 150 potential respondents. From Appendix 1, a number of studies also restricted their choice to production and marketing functions (Mia, 1993; Bouwens and Abernethy, 2000). Also, Mia and Chenhall (1994) formulated hypotheses in relation to functional differences (marketing vs production) and found some support for the scope dimension of MAS being more appropriate for marketing managers. However, evidence of significant differences have not been found or supported in other studies in relation to these two categories of managers (Mia, 1993; Bouwens and Abernethy, 2000, p. 234)[7]. In this respect, we do not expect any difference in MAS perceptions as a result of differences in marketing vs production functions. Instead, our focus lies with the perceptions of non-financial managers and these two categories of managers happen to be the most notable examples of non-financial managers.

Questionnaire design and survey administration

Each potential participant was sent a questionnaire together with a covering letter and a stamped self-addressed envelope, with a request to respond within three weeks. There was a total of 41 questions which were divided into five parts relating to MAS information characteristics, TU, DEC, managerial performance and background information about the respondent. In a bid to ensure an acceptable level of comparison, the questions were adapted from previous studies as mentioned below. A pilot study was conducted amongst a total of three managers (not included in the final sample) and two university lecturers to ensure that the questions presented in the questionnaire were intelligible to the respondents. In the end, only slight changes were made to reflect the context of manufacturing within a Mauritian environment and it is not expected that these will impact on the comparability of this study to previous ones. A copy of the finalized questionnaire is provided in Appendix 2.

The instrument for measuring the MAS information characteristics is based on Chenhall and Morris (1986), which sought to measure the perceived usefulness of the MAS dimensions. There were in total 19 questions relating to the four MAS information characteristics of scope (Section 1, items 1, 3-6), timeliness (Section 1, items 2, 7, 8, 9 and 11), aggregation (Section 1, items 10, 13-15 and 17) and integration (Section 1, items 12, 16, 18 and 19). As argued and done previously in Tsui (2001, p. 132), Chia (1995) and Gul and Chia (1994), a critical amendment was made in the wording of the anchor points for the 19 items, which is now referred to as "never made available" (1) to "always made available" (5). This allowed for the actual measurement of MAS availability as opposed to usefulness. The four questions (Section 2) relating to TU were selected from the nine item of Whitney *et al.* (1983). The instrument for measuring DEC is adapted from the questions on a similar variable found in Gordon

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and Narayanan (1984). Five questions (Section 3) are used to measure the degree of DEC of decision-making, namely, the development of new products or services, the hiring and firing of managerial personnel, major investments decisions, budget allocations and pricing decisions. The measurement of performance used in this study is the personal performance evaluation measure developed by Mahoney *et al.* (1963). The measure provides eight sub-dimensions of managerial performance and a ninth dimension as an overall rating (Section 4). This measure has been and continues to be frequently used in MA and control studies (Gul, 1991; Tsui, 2001; Chong and Eggleton, 2003; Chong, 2004). Whilst it is legitimate to question the validity of using such a fairly dated self-rating measure, our review of MAS studies has demonstrated that there is a need to replicate studies in different contexts to gauge the degree of generalization for the findings linking MAS to performance and to other contextual variables. In this respect, the use of more a contemporary performance measures would have limited our ability to conclude and/or confirm the existence of such generalization.

After the initial three weeks, a reminder was sent to all respondents. In total, the mail survey yielded 63 complete and valid responses, thus representing a response rate of 42 percent. There were no discernable differences or bias in the responses pre- and post-reminder. In consideration of the response rates achieved in some of the studies listed in Appendix 1 (Gul and Chia, 1994; Chia, 1995; Chong, 1996; Chong and Chong, 1997) and their use of analytical techniques (such as regression-path analysis or moderated regression analysis), it is argued that the number of responses achieved is acceptable to satisfy the statistical assumptions and to test the hypotheses. From the 63 respondents, there were 18 female managers, of which 12 were responsible for marketing and six from production. Among the male respondents, there were 20 marketing managers and 25 production managers. The majority of the respondents were aged between 30 and 45 years[8].

Findings and analysis

Descriptive statistics, reliability, and validity

The descriptive and reliability statistics for each of the MAS information characteristics, the contextual variables, and managerial performance are detailed in Table I. Following the procedures adopted in Chia (1995) and Chong (2004), a factor analysis of the items for scope, timeliness, integration, aggregation, TU, DEC, and managerial performance was carried out using varimax rotation. These indicated that for each variable, all items factored in one component on the basis of the initially

Variables (factored items)	Mean	SD	Actual range	Potential range *	Cronbach α
Scope (5 items)	4.26	0.71	2.60-5.40	1.00-6.00	0.79
Timeliness (5 items)	4.19	0.71	2.75-5.75	1.00-6.00	0.66
Aggregation (5 items)	4.02	0.62	2.83-5.67	1.00-6.00	0.72
Integration (4 items)	4.08	0.70	2.75-5.50	1.00-6.00	0.72
Task uncertainty (4 items)	2.98	0.56	1.75-4.25	1.00-5.00	0.60
Decentralization (5 items)	2.90	0.55	1.60-4.20	1.00-5.00	0.74
Managerial performance (8 items)	4.22	0.54	3.11-5.25	1.00-6.00	0.80

Note: *From low to high for all items/variables

Table I.
Descriptive and reliability statistics

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expected theoretical groupings. In addition, the Cronbach α coefficients for the internal reliability for all the measured variables were all at an acceptable level (0.60 or above, Nunnally, 1978). Skewness and kurtosis tests were also carried out and deviations from the normal distribution were found to be minimal.

It is noted that the MAS-related measures indicate a higher than average level of availability for broad scope, timely, aggregate, and integrated information for the surveyed companies and managers. This result ties in with the recent evidence that the local manufacturing companies have invested in new ERP systems and other financial software to access on broader, timely, and aggregated information – probably in a bid to respond to increasing market competition and changes in cost conditions. Hence, this is evidence supporting the existence of more sophisticated MA practices within Mauritian companies from users' perspective rather than solely relying on evidence provided from an accountant's (or preparer's) perspective. Nevertheless, the higher level of integration in the information being provided to managers is relatively surprising, and indicative of a higher level of sophistication than previously expected amongst manufacturing companies in Mauritius. As an illustration, and purely on an indicative basis, the scope "score" over the last ten years or so (rated 0 – low to 1 – high to allow some comparison) was 0.46 for Chia (1995) in Singapore, 0.63 for Bouwens and Abernethy (2000) in The Netherlands, and 0.71 for Chong (2004) both in Australia and the Mauritian sample. The integration score for this study (0.68) was close to that Bouwens and Abernethy (0.71), and both are arguably higher than Chia's results (0.55). In the absence of other recent evidence on all MAS dimensions from other contexts, it would be difficult to make any conclusion but this nevertheless suggests an increasing availability of quality and sophisticated MAS on a cross-national basis, thus lending some credence to the prediction of an increasing convergence of sophisticated MA practices in the business world (Granlund and Lukka, 1998; Sulaiman *et al.*, 2004).

An independent samples *t*-test was run for all variables to compare the means of the marketing vs production sub-sample. There were no significant differences and there is therefore support using the whole data set for investigating the formal hypotheses. In addition, the correlation matrix (Table II) indicates some very significant and strong correlations but also no significant correlations between the contextual variables and managerial performance. This is already suggestive of indirect effects.

Variables	Scope	Timeliness	Aggregation	Integration	Task uncertainty	Decentralization
Scope	1.000					
Timeliness	0.629**	1.000				
Aggregation	0.618**	0.707**	1.000			
Integration	0.574**	0.695**	0.542**	1.000		
Task uncertainty	−0.171	−0.158	−0.303*	−0.156	1.000	
Decentralization	0.323*	0.317*	0.255	0.363*	0.023	1.000
Managerial performance	0.613**	0.463**	0.467**	0.561**	−0.209	0.281

Notes: *Correlation is significant at the 0.05 level (two-tailed); **correlation is significant at the 0.01 level (two-tailed)

Table II.
Correlation matrix

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Hypotheses on direct and intervening effects: using regression-path analysis

Path analysis is more formally known as a regression-path analysis (Wolfle, 2003) and is a statistical technique aimed at testing the direct, indirect (or intervening) and spurious effects of the situational variables on managerial performance via MAS. As such it can be viewed as a straightforward extension of the multiple regression technique and its aim is to provide estimates of the magnitude and significance of hypothesized causal connections between sets of variances (Stanley, 2001). This technique is extensively used in MA research such as Chenhall and Morris (1986), Mia (1993), Chong and Chong (1997), Mia and Clarke (1999) and Bouwens and Abernethy (2000) to assess the significance of relationships between dependent and independent variables. One useful application of path analysis is to find the best regression model by elimination of variables that contribute little to the equation. Based on the use of regression and correlation analysis for coefficient estimations (Asher, 1983), the output of the path analysis is a series of path coefficients. These are standardized β coefficients found by regressing the outcome variable on the appropriate contextual variable(s)[9].

At the same time, the procedures involved in path analysis allow for the exploration of the direct relationships:

- between the contextual variables and the MAS dimensions (*H1* and *H2*); and
- between the MAS dimensions and managerial performance (*H3*).

Finally, the indirect effect of DEC and TU on managerial performance via through the MAS information characteristics of scope, integration, aggregation and timeliness can be ascertained (*H4* and *H5*). Hence, taking managerial performance as the endogenous variable and the others as exogenous, the regressions can be formulated as follows:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e_y \quad (1)$$

where Y – endogenous/dependent variable of managerial performance, X_1 – exogenous variable of MAS information characteristic, X_2 – exogenous variable of TU, X_3 – exogenous variable of DEC, e_y = error term.

By dropping the managerial performance as dependent variable and taking each MAS information characteristics instead and the other two antecedents variable as independent variable the regression will be as follows:

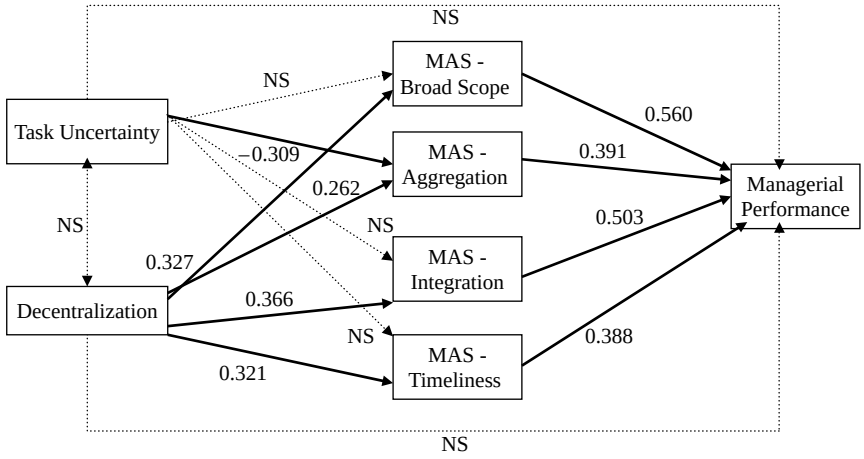
$$Y = \beta_2 X_2 + \beta_3 X_3 + e_{x1} \quad (2)$$

These two models were run using the OLS regression for each MAS characteristic (denoted by X_1) and the results obtained have been shown in Figure 2. The detailed regression results for equations (1) and (2) are reported in Appendix 3.

The bold arrows represent the actual significant relations whereas the non-significant ones are represented by dotted/lighter arrows. It is also noted that there are no direct and significant relationships between the dependent variable and the antecedent variables: TU and DEC.

Analysis of results

Table III summarizes the results relating to the tested hypotheses, and the analysis is elaborated below.



NS – Not Significant

Figure 2.
The path coefficients

H1 considered whether a higher level of TU caused a higher availability of quality and sophisticated MAS within the companies. Based on the regression results of equation (2) (Appendix 3), there was no significant relationship between TU and three of the MAS dimensions (scope, timeliness, and integration) whilst there was a strong negative relationship between TU and aggregation, i.e. a higher (lower) level of TU led to a reduction (increase) in the level of aggregated information. The literature (Chapman, 1997; Chenhall, 2003) has traditionally attached much importance to the role of "uncertainty" variables in the shaping, design and effectiveness of MAS. Based on an intervening model approach, PEU was previously found to be positively linked to MAS (Gordon and Narayanan, 1984; Mia, 1993; Chong and Chong, 1997; Mia and Clarke, 1999) from a senior managers' perspective. However, this relationship does not seem to "cascade down" to the operational level. This alludes to the possibility that the level of MAS sophistication and quality supplied to marketing and production managers is unaffected by the variations in uncertainty at the functional level. As noticed earlier, the initial findings in MAS dimensions seemed to indicate that a relatively high level of MAS was being made available to managers in Mauritius, perhaps as a result of increasing adoption of ERP systems and other computerized accounting software systems. A second possibility is that the majority of the responding managers operates in the textile and wearing apparel sector and as such are faced with similar TU levels, which may in turn affect the statistical power of the relationship between TU and MAS. Nevertheless, this lack of relationship also implies that some managers facing lower TU are provided with too sophisticated MAS, thereby increasing the opportunity for information overload and a potential negative impact on decision effectiveness (Chong, 2004; Keller and Staelin, 1987). Finally, the negative link between TU and aggregation is odd but on its own, it is not necessarily counter-intuitive. As the level of TU increases, managers might respond by seeking less aggregated (i.e. more detailed) information to identify opportunities, options, and evidence on which to act. Nevertheless, this remains contradictory in light of previous results and in consideration of the expected relationship between MAS and uncertainty.

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Table III.
Summary of hypothesis and results

Hypotheses	Expected	Observed	Conclusion	Comments and possible implications
H1	Significant positive relationship between TU and MAS	Non-significant	Not supported	TU of managers at functional level may have become irrelevant in the context of the study TU is negatively linked to MAS Aggregation. Although intuitively feasible, this may also indicate an issue of ambiguity with the low (high) aggregation dimension
H2	Significant positive relationship between decentralization and MAS	Significant positive	Supported	A weak but positive relationship is observed for MAS Aggregation and Decentralization. Again, the issue of ambiguity could have influenced the results
H3	Significant positive relationship between MAS and managerial performance	Significant	Supported	All MAS dimensions are conclusively and positively related to managerial performance. MAS quality and sophistication beyond the 'mere' scope is critical, in terms of timeliness, aggregation and integration
H4	Significant intervening effect for MAS between TU and managerial performance	Non-significant	Not supported	Is task uncertainty the appropriate variable as the absence of results seem to allude to the 'uncertainty' paradox (Hartmann, 2000)? Task uncertainty may have less to do with uncertainty but rather more to do with complexity and technology
H5	Significant Intervening Effect for MAS between decentralization and managerial performance	Significant	Supported	Decentralization policy has a beneficial effect on the quality and sophistication of MAS provided at functional level, which in turns has a combined positive effect of managerial performance

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Furthermore, there is an issue as to whether the availability of low- (or high) aggregated information may have been ambiguously interpreted by managers when they responded to the questionnaire. Consequently, and in view of the results for all the MAS dimensions, we conclude that *H1* is not supported.

H2 examined whether a higher level of DEC led to a higher availability of sophisticated MAS. The results support a strong positive relationship between DEC and the characteristics of scope, timeliness and integration. A barely significant relationship between MAS aggregation and DEC is also noted. Firstly, this result provides more definitive evidence on the direct effects that were first examined by Chenhall and Morris (1986) – where aggregation and integration only were found to be significantly associated to DEC. In adopting a moderating model for MAS and DEC, later studies by Chia (1995) and Gul and Chia (1995) had also (implicitly) expected that there were no direct effects. However, it appears that local companies not only associate the level of DEC with a (nominal and sometimes fashionable) transfer of authority and decision-making but also "follow through" their DEC policies with the establishment of a higher quality and sophisticated MAS for their functional managers. In consideration of the local context, this is indicative of a higher level of actual information sharing and processing at the source of the decision-making rather than it being in reality centralized due to the absence of sufficient data/information. This also indicates that the perceived opacity of management and financial affairs within the local enterprises may be gradually improving, as senior managers and owners perceive that more information must be made available to remain effective and competitive. In addition, the ownership profile of some of the companies in the export manufacturing sector does pre-suppose that a relatively high level of DEC was inherently required. Indeed, as mentioned earlier, a number of Asian investors (e.g. Taiwan, Hong-Kong, China) have set up a number of export-oriented enterprises but remain much involved in business activities from their home base. Finally, the level of aggregation was not as significantly related compared to other MAS dimensions and consistent with our first interpretation for the TU to aggregation relationship. This weak result may indicate some ambiguity from the point of view of the respondents on the appropriateness of high (low) aggregation of information. However, the results are overall conclusive enough to argue that H2 is supported.

H3 related to the relationship between MAS and managerial performance. It is observed that all the four MAS dimensions positively influence managerial performance, with path coefficients being close to 0.4 and above. This brings confirmatory evidence on the positive effects of all MAS dimensions rather than being simply associated to the broader scope of MA information. None of the previous studies have found such direct and unambiguous evidence relating to all MAS dimensions and the fact that the current study has been carried in a developing country context lends credence to the a priori universalistic benefit of contemporary MA tools and techniques for managers – as advocated by IFAC (1998), Johnson and Kaplan (1987), Abdel-Kader and Luther (2004) and Sulaiman *et al.* (2004) – provided that the outputs from these tools/techniques are supplied in a accordingly timely, aggregating and integrating manner. The strength of these direct relationships in the Mauritian context may be in some way expected since these results may have been influenced by the concentration of the sample on the export-oriented textile and wearing apparel sector. Traditionally, this sector has been known to develop technologically faster than other sectors of the economy as it needs to compete internationally with other companies operating in an EPZ-style regime.

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H4 argued for the intervening effect of MAS dimensions between TU and managerial performance. In the absence of significant results for three of the dimensions (i.e. except aggregation) between TU and MAS, there is a *de facto* conclusion that the available MAS does not have an intervening effect in the presence of TU. At the same time, there is a significant but inverse relationship between TU and MAS aggregation. A study by Chong (2004, p. 9) found a significant positive link between TU and the MAS dimension of scope as well as conclusive evidence of the relevance of TU in the MAS scope to performance relationship. However, this direct link was not found in a previous study by Chong (1996, p. 419). The absence of consistent findings on the significance (or not) of TU may be connected to the debate on what are exactly the effects of uncertainty. For instance, a number of authors within the management control area (Chapman, 1997; Hartmann, 2000) have commented on the sometimes baffling results relating to the influence of uncertainty (whether at functional or top management level) and this has been dubbed as the "uncertainty paradox" (Hartmann, 2000, p. 472). In addition, there have been suggestions towards using other more "precise" measures of TU level such as task difficulty (Lau and Buckland, 2000). More recently, Chenhall (2003, p. 139) argued that TU may be more associated to the generic concept of technology (and thus to variables such as interdependence and complexity) rather than being "closer" to PEU. This possibility of a conceptual "muddling" between the generic notions of uncertainty and technology may thus need to be considered, perhaps as part of a study using both qualitative and quantitative methods.

Finally, *H5* examined the impact of DEC on managerial performance via four MAS dimensions. It is worth noting that Chenhall and Morris' (1986) initial study of functional managers showed only some significant direct relationships between MAS aggregation and MAS integration and DEC (but not for scope and timeliness). But more importantly, the authors (Chenhall and Morris, 1986, p. 31) suggested that the effects on performance must be investigated to identify the different situations in which MAS can be made available to improve effectiveness and appropriateness. As mentioned earlier, the research design and context adopted by Chia (1995) did not provide conclusive evidence on the effects of DEC, particularly because it focused on senior level rather than functional level managers. What is clearly apparent from this study (Appendix 3 and 4) is that DEC policies are effective at functional level via the availability of quality and sophisticated MAS. This is conceptually different from – but equally important to – the moderating effects of DEC found by Chia (1995) in the case of senior managers in Singapore, where the author modeled organizational structure as a control sub-system and argued for the implications of the results in matching different control sub-systems to ensure an overall and effective organizational control "package" (Otley, 1980). In this study, we have however modeled DEC as a policy that leads to the broadening and increased dissemination of information flow to lower levels of management – at the source of activity and decision-making – thereby leading to higher performance.

Conclusion

This study aimed to understand the impact of available quality and sophisticated MAS. Rather than relying on surveys on the existence of "traditional" vs "contemporary" MA practices, it focuses on the users' perspective of the

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information – based on Chenhall and Morris' (1986) conceptualizations – made available to them and the impact these would have on their perceived performance. Furthermore, as informed by the mainstream MAS literature, we also considered the effects of two antecedent variables: TU and DEC. In light of the findings, this paper has contributed to the literature in the following ways.

Firstly, the findings on MAS expand beyond the very limited set of contexts and countries that have characterized the previous studies and provide indirect evidence on the so-called convergence and application of modern contemporary MA techniques worldwide. Also, in our opinion, such linkages could not have been made by simply considering scope but by considering and including all four MAS dimensions. We also noted that over time, there seems to be an increased "broadening" of the scope dimension when comparing the scores from various studies in the last ten years[10]. Whilst the authors had expected a lower incidence of sophisticated MAS in local companies as a result of issues relating to the general transparency/availability of accounting data and opacity of business dealings, this has not been the case amongst the sample of export-oriented textile enterprises. However, we would be the first to acknowledge that the profile of those companies is not necessarily representative of other non-export oriented (and other non-manufacturing activities) businesses in Mauritius.

Secondly, there was surprisingly little evidence on the direct impact of a quality and sophisticated MAS on managerial performance. From the review of previous studies (Appendix 1), a number of researchers have argued for a contingent perspective whilst others have not necessarily considered the "fit" or "follow-on" impact on the outcome variable such as managerial performance. The fact that an overwhelming number of studies only considered scope was also an issue. Consistent with the mainstream expectations initially put forward by authors like Johnson and Kaplan (1987), Chenhall and Langfield-Smith (1998) and Sulaiman *et al.* (2004), the four MAS dimensions were collectively perceived to have a positive impact on performance. However, more cross-national evidence could prove useful. In a similar approach adopted by the comparative studies of MA practices (Guilding *et al.*, 2000; Sulaiman *et al.*, 2004), further comparative research could focus on the national differences in MAS dimensions and explore the national factors (economic and social) leading to such differences.

Thirdly, DEC is confirmed as an important variable in MAS design which in turn leads to better performance. The impact of DEC on MAS is greatly clarified in that Chenhall and Morris' (1986) study found only positive links for aggregation and integration. This therefore brings stronger support for the re-structuring of company management, towards some level of DEC. This devolution of authority from centralized management and the transfer of responsibilities must be matched with appropriate information flows and facilities to ensure appropriate management action and decision-making. In addition, these results appear contradictory to earlier studies such as Gul and Chia (1994) and Chia (1995) in terms of their modeling of DEC as a moderating variable. In our opinion, the use of responses from senior managers (rather than functional managers) may have downplayed the direct effects between DEC and MAS. In future, there may be a need to seek confirmation of the intervening vs moderating effect of DEC.

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Fourthly, the role of TU as a variable of interest for MAS remains problematic. In a recent study, Chong (2004, p. 9) found a strong positive correlation between scope and TU, i.e. higher TU leads to the use of broad scope. However, Chong (2004) modeled TU as a moderating variable, notwithstanding the fact that a moderating variable is inherently viewed as non-correlated to the independent variable (Gerdin and Greve, 2004), and there was little discussion on the implications of the TU-MAS relationship. There is also no other published evidence on a link between other MAS dimensions and TU. To some extent, this is an additional illustration of the paradoxical findings involving TU, which seemed to have been documented as well in studies of management control systems (Chapman, 1997; Hartmann, 2000; Chenhall, 2003). From our perspective however, the absence of findings regarding TU in this study compels us to re-consider the notion of "uncertainty" and how this pertains to a functional manager's context. The suggestion, that TU may have more to do with technology rather than uncertainty, deserves further exploration. The qualitative interview-led approach previously adopted by Mia and Chenhall (1994) to explore differences in functional duties may be a useful example to follow in this case.

Finally, some limitations of the study should be noted. In comparison to some of the more recent MAS studies (Chong, 2004; Tsui, 2001; Bouwens and Abernethy, 2000), this study has relied on a relatively low number of responses and this may limit the findings of the research. However, this is perhaps expected within an African developing country context (van Triest and Elshahat, 2007) and the number of responses was sufficient enough to test the hypotheses. Furthermore, and as a result of the inherent structure and nature of manufacturing activities in Mauritius, this study has focused on a restricted category of businesses, i.e. export-oriented and textile products. Generalizing the results to other industries (such as service industries) may be difficult and there may be issues in securing enough responses from other local sectors. Also, the use of self-rating scales to measure managerial performance may imply higher mean values (higher leniency error), a restricted range (lower variability error) in the score (Thornton, 1968) and may be criticized on the grounds of objectivity (Chong, 2004, p. 18), but its further use can be improved by the incorporation of superiors' ratings. Finally, whilst the theory and prior literature may argue that the independent variables (e.g. TU, MAS) precede the dependent variable (e.g. managerial performance), such an assumption is purely theory-driven and cannot be inferred from a cross-sectional survey method. As suggested by Chong (2004, p. 18), future research may seek to employ qualitative methods to investigate the theoretical propositions implicit in the directions of such relationships.

Notes

1. The International Federation of Accountants (IFAC) issued a Statement on Management Accounting Concepts, which also described the evolution of management accounting from the early twentieth century to current times.
2. Established in the sense that MAS researchers have primarily focused their studies in developed countries (particularly USA and Australia). Also, refer to recent examples, e.g. Chong (2004) and Naranjo-Gil and Hartmann (2006).
3. In 2005, the per capita income was US$5,260. More recently however, an economic slowdown has been observed, due in part to the dismantlement of various preferential trade agreements (mainly in sugar and textile export) and declining foreign direct investment, leaving tourism as the major expanding sector in the economy. Refer to Durbarry (2004) for a more detailed of Mauritius' past economic achievements and implications for the future.

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4. The only notable MA study in Mauritius related to the use of financial vs non-financial performance measures amongst chief executive officers of 20 large companies (Taylor *et al.*, 2001).
5. The surveyed articles were published in Accounting and Business Research, British Accounting Review, Management Accounting Research, Accounting, Organizations and Society, International Journal of Accounting, Journal of Business Finance and Accounting and Pacific Accounting Review.
6. The same format of hypotheses has been used in Bouwens and Abernethy (2000).
7. Similarly, there were other management control-related studies that directly examined the effects of functional differentiation or functional area differences. In spite of the empirical evidence supporting the relevance of the above-mentioned contextual variables, the rationales used seem to relate to a more fundamental variable of interest: task uncertainty.
8. Since, this survey was carried out under conditions of anonymity, the exact number and the precise activity of companies represented in this survey cannot be ascertained. However, we contend that the completed responses have originated from between 31 and 40 companies, the majority of which are involved in the manufacturing of textile and wearing apparel.
9. A more recently used statistical technique to analyze such models is known as structural equation modelling. However, there are clear limitations to its usefulness if the sample size is not large enough, e.g. more than 200 (Jaccard and Wan, 1996, pp. 71-4).
10. However, Chenhall and Morris' (1986) seminal study finds very high scores for their Australian sample namely, 0.77 (scope), 0.78 (timeliness), 0.70 (aggregation), and 0.67 (integration). Chong (2004) only reports 0.71 (scope) for his Australian data nearly 20 years after this initial study.

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Appendix 1

Table AI.
A summary of previous MAS studies

Study (country)	Profile of responding managers	MAS MAS dimension used	MAS importance (I), usefulness (U) or availability (A) Intervening model (situational variables)	Moderating model (situational variables in italics)	Notable findings, relevant to the current study
Gordon and Narayanan (1984) USA	34 senior managers	Scope*	(I) *PEU and organizational. structure*		Study did not consider the "fit" between MAS and performance, but showed the positive links between PEU to MAS as well as PEU and MAS to organizational structure
Chenhall and Morris (1986), Australia	68 functional from 36 manufacturers	All	(U) *PEU, interdependence and decentralization*		Broad scope and timeliness not associated to decentralization. However, the latter is associated to aggregated and integrated information. Study did not consider the "fit" between MAS and performance
Mia (1993), Australia	70 functional managers from eight manufacturers	Scope	(U) *PEU*		PEU is indirectly related to managerial performance (but not job satisfaction) via MAS scope
Mia and Chenhall (1994), Australia	29 marketing and 46 production from five manufacturers	Scope		(U) *Functional differentiation*	Marketing vs Production functions were used as proxies for high vs low task uncertainty. Broad scope MAS enhances higher performance in marketing than compared to production

(*continued*)

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Table AI.

Study (country)	Profile of responding managers	MAS MAS dimension used	MAS importance (I), usefulness (U) or availability (A) Intervening model (situational variables)	Moderating model (situational variables in italics)	Notable findings, relevant to the current study
Gul and Chia (1994), Singapore	48 senior managers (from ten manufacturers and 38 non-manufacturers)	Scope aggregation		(A) *Decentralization and PEU*	Both moderating variables modeled at same time in the relationship between MAS scope/aggregation and performance. The combination of both variables interacting with MAS leads to higher performance
Chia (1995), Singapore	48 senior managers	All		(A) *Decentralization*	Decentralization interacts positively with all MAS dimensions to improve performance but low decentralization lead to negative relationships between MAS and performance
Chong (1996), Australia	42 functional managers from manufacturers	Scope		(U) *Task uncertainty*	Higher task uncertainty and broad scope MAS have an interactive (beneficial) effect on managerial performance

(*continued*)

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Study (country)	Profile of responding managers	MAS MAS dimension used	MAS importance (I), usefulness (U) or availability (A) Intervening model (situational variables)	Moderating model (situational variables in italics)	Notable findings, relevant to the current study
Fisher (1996), Australia	98 functional managers	Scope timeliness		**(U)** *Locus of control (internals vs externals)*	No "fit" to performance in this study. Scope and Timeliness were the outcome variables whilst PEU is the independent variable. Results are contrary to expectations for the interactive effect of *locus* of control. However, it shows that people do not respond in uniform manner to a perceived level of uncertainty
Chong and Chong (1997) Australia	62 business unit (BU) managers from manufacturers	Scope	**(U)** *PEU and strategy*		Both strategy and PEU are found to be significant antecedent (positive) variables for MAS Scope as well have indirect linkages to BU performance via MAS
Mia and Clarke (1999) Australia	61 business unit (BU) managers from manufacturers	Scope *	**(U)** *Market competition*		Increased intensity of market competition is associated to a higher use of broad scope information, which in turns lead to higher BU performance

(*continued*)

Table AI.

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Table AI.

Study (country)	Profile of responding managers	MAS MAS dimension used	MAS importance (I), usefulness (U) or availability (A) Intervening model (situational variables)	Moderating model (situational variables in italics)	Notable findings, relevant to the current study
Bouwens and Abernethy (2000) The Netherlands	170 production and sales managers from 85 BU	All	**(I)** *Interdependence*		No "fit" to performance in this study. MAS dimensions were the outcome variables whilst the level of Customization is the independent variable. As a strategic priority, customization has an indirect relation with MAS via interdependence
Tsui (2001), China and Hong Kong Expatriates	51 Chinese and 38 Western functional managers	Scope and timeliness		**(A)** *National culture and budgetary participation*	Both moderating variables modeled at same time in the relationship between MAS scope/timeliness and performance. The combination of high participation and high MAS significantly reduced the performance amongst Chinese managers as opposed to the case of Western managers
Chong (2004) Australia	131 senior managers from manufacturing companies	Scope		**(U)** *Job-relevant information and task uncertainty*	Both moderating variables modeled at same time in the relationship between MAS scope and performance. Three-way interaction found to be significant

Note: *Although Chenhall and Morris' (1986) measure of scope was not used in these studies, an analysis of the questions used in the study showed that these are very similar to the one used for "scope" characteristic

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Appendix 2. Questionnaire template a study of the management accounting systems in Mauritian manufacturing companies

Kindly complete the five sections of this questionnaire.

Section 1. The MAS information characteristics

Management accounting systems provide information to assist managers in their planning, control and problems solving activities. MAS is defined by certain characteristics of information, in particular breadth of scope, timeliness, levels of aggregation and its integrative nature. Some of the characteristics are used extensively compared to others and we are interested in knowing the extent to which you obtain the following information when you have to make planning, control and problems solving activities. Below are 19 questions that are related to scope, timeliness, aggregation, and integration.

Please circle the number that best describes the characteristics of the information to the extent it is available in your view for every question. Circle "0" if not applicable.

	Never made available					Always available	Not applicable
1 Information relating to possible future events (e.g. new projects)	1	2	3	4	5	6	0
2 The requested information is available immediately on request	1	2	3	4	5	6	0
3 Non-economic information, such as customer preferences, employee attitudes, labour relations, attitudes of government and customer bodies, competitive threats, etc.	1	2	3	4	5	6	0
Non-financial information that relates to the following areas							
4 Productivity information, e.g. employee absenteeism, customer services, etc.	1	2	3	4	5	6	0
5 Market information, e.g. market size, growth market share, etc.	1	2	3	4	5	6	0
6 Information on quantification of the likelihood of future (e.g. probability estimates)	1	2	3	4	5	6	0
7 Information is given to you automatically upon its receipt into information systems or as soon as processing is completed	1	2	3	4	5	6	0
8 Reports are given on a frequent basis, such as daily, weekly reports, etc.	1	2	3	4	5	6	0
9 Is information given to you of different departments activities about its particular summary reports on profit, revenue reports, etc.	1	2	3	4	5	6	0
10 Information on the effect of events on particular time periods (e.g. monthly/ quarterly/annual summaries trend, comparisons, etc.)	1	2	3	4	5	6	0
11 There is no delay between an event happening and relevant information being reported to you	1	2	3	4	5	6	0
12 Information on the influence of other individuals' decisions on your area of responsibility	1	2	3	4	5	6	0

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Information in formats suitable for input into decision models, such as

13 Discounted cash flow analysis	1	2	3	4	5	6	0
14 Incremental or marginal analysis	1	2	3	4	5	6	0
15 Credit policy analysis	1	2	3	4	5	6	0
16 Information on the impact that your decision will have throughout your department	1	2	3	4	5	6	0
17 Information in forms of enabling you to carry out "what if" analysis	1	2	3	4	5	6	0
18 Information on precise targets for the activities of all sections within your department	1	2	3	4	5	6	0
19 Information that relates to the impact that your decisions would have on the performance of your organization	1	2	3	4	5	6	0

Section 2. Task uncertainty

Task uncertainty is the difference between the amount of information required to perform the task and the amount of information already processed. This section seeks to identify the level of uncertainty you perceive in your day-to-day management activities.

Please respond to each of the following questions by circling a number from 1 to 5 (circle "0" if not applicable).

	Very small extent	Modest extent	Moderate extent	Considerable extent	Very large extent	Not applicable
1. To what extent is there a clearly defined body of knowledge which can guide you in doing your work?	1	2	3	4	5	0
2. To what extent would you think that your work is routine?	1	2	3	4	5	0
3. To what extent is there a clearly known way to do the major types of work you normally encounter?	1	2	3	4	5	0
4. To what extent is there an understandable sequence of steps that can be followed in doing your work?	1	2	3	4	5	0

Section 3. Decentralization

Decentralization refers to the level of autonomy delegated to managers with greater responsibility over planning and control activities and greater access to information. Thus, this section seeks to what extent authority has been delegated to the appropriate managers.

Please circle the number that best describes the extent of decentralization for each of the following situations in your organizations.

	No delegation	Small extent	Shared	Considerable extent	Complete delegation
1. Development of new products or services	1	2	3	4	5

2. The hiring and firing of managerial personnel	1	2	3	4	5
3. Major investments decisions	1	2	3	4	5
4. Budget allocation	1	2	3	4	5
5. Pricing decisions	1	2	3	4	5

Section 4. Managerial performance

Managerial performance can be explained as the extent to which managers have accomplished their job effectively. Thus, the following managerial activities below aim at seeking a self-rating of your performance.

Please rate your managerial performance by circling the appropriate one and circle "0" if not applicable.

	Very poor	Poor	Fair	Good	Very good	Excellent	Not applicable
1. Planning	1	2	3	4	5	6	0
2. Investigating	1	2	3	4	5	6	0
3. Coordinating	1	2	3	4	5	6	0
4. Evaluating	1	2	3	4	5	6	0
5. Supervising	1	2	3	4	5	6	0
6. Staffing	1	2	3	4	5	6	0
7. Negotiating	1	2	3	4	5	6	0
8. Representing	1	2	3	4	5	6	0

9. On overall, how would you rate your performance?

Very poor	Poor	Fair	Good	Very good	Excellent
1	2	3	4	5	6

Section 5. Background information

We thank you for participating in this survey. To help us, classify your answers and to make statistical comparisons, kindly provide the following details. Please tick as appropriate.

1. Your gender is: Male ☐ Female ☐

2. Your age is:
   - Less than 30 years ☐
   - Between 30 and 45 years ☐
   - More than 45 years ☐

3. The number of employees in your company is:
   - Between 50 and 100 ☐
   - Between 100 and 500 ☐
   - Between 500 and 1,000 ☐
   - More than 1,000 ☐

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4. What is your functional area of responsibility?

Marketing ☐
Manufacturing ☐
Other (Please Specify) ☐

☐

5. Please use the space provided below to convey your thoughts on any aspects of the use of management accounting system in your company.

☐

Thank you for your participation in this survey.

Appendix 3.

Table AII.
Detailed regression results for equations (1) and (2)

MAS characteristic → variables	Scope	Timeliness	Aggregation	Integration
Panel I (equation (1) – managerial performance as dependent variable				
MAS characteristic (X_1)	0.560** (4.187)	0.388* (2.627)	0.503** (3.544)	0.391* (2.591)
Task uncertainty (X_2)	−0.116 (−0.916)	−0.152 (−1.082)	−0.133 (−1.004)	−0.095 (−0.649)
Decentralization (X_3)	0.103 (0.781)	0.162 (1.110)	0.102 (0.728)	0.184 (1.279)
R^2 (percent)	39.7	25.4	33.9	25.7
Panel II (equation (2) – MAS characteristic as dependent variable				
MAS characteristic (X_1) variables	Scope	Timeliness	Aggregation	Integration
Task uncertainty (X_2)	−0.178 (−1.212)	−0.165 (−1.119)	−0.309* (−2.135)	−0.165 (−1.136)
Decentralization (X_3)	0.327* (2.228)	0.321* (2.171)	0.262*** (1.808)	0.366* (2.526)
R^2 (percent)	13.6	12.8	16.1	15.9

Notes: * Significant at less than 5 percent; ** significant at less than 1 percent; ***significant at less than 10 percent; *t*-values of coefficients in parentheses

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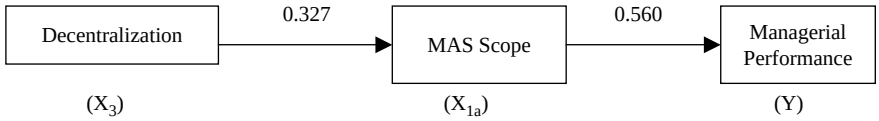
Appendix 4. Measuring the indirect effect of decentralization and managerial performance via MAS

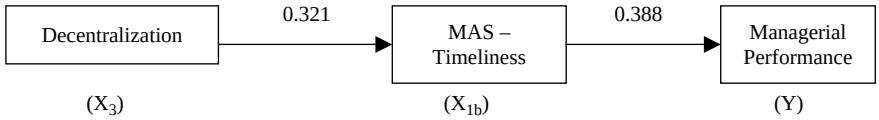
1. Scope



Indirect effect = 0.560 × 0.327 = 0.18312

This indicates that decentralization has an indirect effect of 18.312 percent on managerial performance via MAS scope.

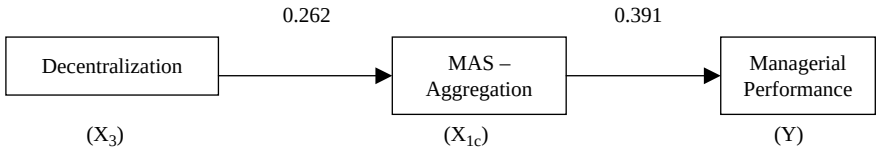
2. Timeliness



Indirect effect = 0.388 × 0.321 = 0.124548

This indicates that decentralization has an indirect effect of 12.4548 percent on managerial performance via timely MAS.

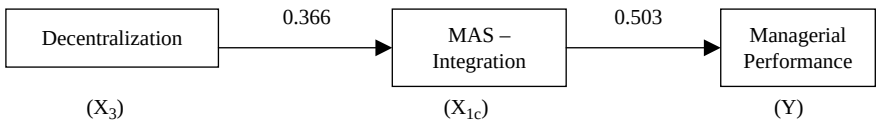
3. Aggregation



Indirect effect = 0.391 × 0.262 = 0.102442

This indicates that decentralization has an indirect effect of 10.2442 percent on managerial performance via aggregated MAS.

4. Integration



Indirect effect = 0.503 × 0.366 = 0.184098

This indicates that decentralization has an indirect effect of 18.4098 percent on managerial performance via integrated MAS.

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