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Decentralization, perceived environmental uncertainty, managerial performance and management accounting system information in Egyptian hospitals

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Abstract

Purpose – The purpose of this paper is to provide empirical evidence concerning: the relationships between decentralization, perceived environmental uncertainty, and management accounting systems (MAS) information and the relationships between MAS information and managerial performance within Egyptian hospitals.

Design/methodology/approach – Data were collected using questionnaires that were sent personally to the managers or heads of departments of Egyptian hospitals. Departmental level was used as the unit of analysis. Data obtained from 200 hospital managers were analyzed using partial least squares.

Findings – The study reveals that decentralization and environmental uncertainty, to some extent, are essential factors in designing efficient and effective MAS. Hospitals with decentralized structure make better use of timely, aggregated and integrated MAS information. Environment in which the hospitals operate does have significant influence on the type of information provided by the MAS.

Research limitations/implications – Using personally administered questionnaires causes the sample to be rather limited and not comprehensive enough.

Practical implications – The current study offers the hospital managers some useful aspects related to the function of MAS information that can be used to enhance their managerial performance. The provision of broad-scope and timeliness of MAS information can facilitate more effective managerial decisions. MAS designers and Egyptian policy makers should emphasize on decentralized decision-making by delegating sufficient authority to lower level managers as much as possible.

Originality/value – This study is one of the few studies done in Africa in the field of MAS, particularly in the context of Egyptian hospitals.

Keywords Egypt, Hospital, Management accounting system, Decentralization, Perceived environmental uncertainty, Managerial performance

Paper type Research paper



1. Introduction

In the last few decades, the healthcare sector has grown rapidly. As a result, more attention has been paid by citizens and the government to healthcare services and their providers with the aim of achieving higher service quality, lower costs, and better performance. Since hospitals must provide higher service quality and lower costs for large numbers of patients in order to survive, they have to maintain rigorous control over their operations (Ramsey, 1994). In addition, governments are compelled to focus on assessing and improving hospital efficiency due to the increasing trend in health spending (Watcharasriroj and Tang, 2004). To measure and improve the efficiency of healthcare organizations, particularly hospitals, a comprehensive and effective management information system is deemed necessary in today's dynamic and competitive environment. Information systems such as management and cost accounting must be able to support basic control processes and increase organizational effectiveness and efficiency (Kettelhut, 1992).

Within the context of hospitals, a study by Pizzini (2006) has shown that management and cost accounting information plays an important role. In a similar vein, Jones and Mellett (2007) argue that accounting has always been part of healthcare, where the philosophy now underpinning accounting has moved from being customized and inward-looking, through being control-based, to being market-based. Further, Lehtonen (2007) suggests that successful implementation of new accounting and control systems in the healthcare sector requires integrated clinical and financial accountability, assignment of responsibility to clinicians, freedom in choosing appropriate control tools, and flexibility in adoption.

To address the importance of management accounting information in the hospital context, the current study focuses on four information characteristics of management accounting systems (MAS) design: scope, timeliness, aggregation, and integration (Chenhall and Morris, 1986). Managers tend to perceive these information characteristics to be useful in facilitating decision-making (Chenhall and Morris, 1986; Mangaliso, 1995). The contingency theory contends that the design and use of control systems are contingent upon the context of the organizational setting in which these controls operate and function (Fisher, 1995; Otley, 1980). In line with this theory, the current study aims to investigate how contextual variables, such as organizational structure and environmental uncertainty, influence the design of MAS information characteristics, and how these characteristics, in turn, influence the performance of Egyptian hospital managers.

It is worth mentioning some general background information about the Egyptian healthcare system in order to provide context. The system is considered highly pluralistic and complex (Hammad *et al.*, 2010; Rannan-Eliya *et al.*, 1997). In fact, many healthcare systems in developing countries are poorly managed. This is evident from the 2009 report by the World Health Organization (WHO), which stated that:

[...] health policies and strategies are not supported by evidence, regulatory mechanisms are not well developed, health system remains highly centralized, and coordination within the Ministry of Health and Population (MOHP) and with other related agencies and ministries remains weak (Hammad *et al.*, 2010, p. 764).

As a result, the MOHP took the initiative to reform and reorganize the Egyptian healthcare system in terms of efficiency, quality, and equity improvements so that it is in line with the development of new public management (NPM) carried out in other developed

countries (Hassan, 2005). Hassan (2005) reports that various international agencies, such as the World Bank and the International Monetary Fund, have worked together to develop better management accounting and accountability systems so as to bring about the improvements required in the efficiency of Egyptian health service delivery.

This study obtained data from a cross-sectional survey of 200 heads of departments or clinical units of 50 selected Egyptian hospitals. The results generated from partial least squares (PLS) reveal that decentralization has significant positive relationships with timely, aggregated, and integrated MAS information. However, environmental uncertainty, which was perceived to be rather low by clinical unit managers, shows significant negative relationships with broad-scope, timely, and aggregated MAS information. broad-scope and timely MAS information show positive associations with managerial performance.

The remainder of this paper proceeds as follows. The following section reviews the literature on MAS, and its link to organizational structure, perceived environmental uncertainty (PEU), and managerial performance. Subsequently, in the same section, hypotheses and a theoretical framework are developed within the context of hospitals. The following three sections describe the research methods, followed by an analysis of the results of the statistical tests and a discussion of the findings. Finally, a conclusion is presented by discussing the implications of the research findings, as well as some suggestions for future research.

2. Literature review and theoretical framework

2.1 Management accounting systems

Like all accounting systems, MAS serves as part of an information system providing useful information to decision makers. It is important that managers, being the users of MAS services, are satisfied with the information quality provided. MAS information quality, which is an aggregation of three characteristics (accuracy, timeliness, and relevance), is associated with user satisfaction (Fleischman and Walker, 2010). Moreover, the value of MAS information can also differ between functional areas (Mia and Chenhall, 1994; Pierce and O'Dea, 2003). Mia and Chenhall (1994) report that a higher usage of broad-scope information is associated with enhanced performance for marketing managers, but not for production managers.

Following Chenhall and Morris (1986), four information characteristics were used for the current study: scope, timeliness, aggregation, and integration. Scope relates to the focus, quantification and time horizon of the information. Scope can be narrow or broadened depending on whether the information is internal or external to the organization, financial or non-financial, and past – or future-oriented. Timeliness refers to how quickly the information can be provided upon request. Aggregation refers to the categorization of information by time period or functional area. Aggregated information also refers to summation in formats consistent with formal decision-making. Integration deals with data that crosses functional boundaries that helps coordinate various segments within a sub-unit.

In recent years, the use of MAS in hospitals has been receiving increasing attention (Nyland *et al.*, 2009). The costing of clinical activities and the use of budgets in hospitals are the most common issues discussed in previous studies (Coombs, 1987; Jacobs, 1998; Lapsley, 1994; Nyland and Pettersen, 2004). Ramani (2004) argues that a comprehensive hospital management information system which includes patient

flow management, inventory management, and a billing system, is necessary to help managers plan and monitor hospital services efficiently and effectively. In addition, the success of MAS information quality in public hospitals depends greatly on the use of information technology (Cheong Fong and Quaddus, 2010). Cheong Fong and Quaddus (2010) reveal that there is a direct positive effect of intranet user information satisfaction on the information quality of MAS in Hong Kong public hospitals. Cheong Fong and Quaddus (2010) also found that intranet users dealing with unstructured tasks and task variety show more reliance on MAS information quality in terms of scope, timeliness, and aggregation.

2.2 Organizational structure and MAS

Ghani *et al.* (2002) define organizational structure as the formal allocation of work roles and administrative mechanisms to control and integrate work activities. Interestingly, the success of MAS innovation depends largely on organizational structure (Sisaye and Birnberg, 2010). Organizational structure is considered as one of the contextual variables in the contingency theory of management accounting (Otley, 1980). The current study chooses decentralization to represent the organizational structure mechanism. This is in line with the argument by Abernethy and Bouwens (2005), in which decentralization choices are important for the effective implementation of accounting innovations. Waterhouse and Tiessen (1978) view decentralization as the level of autonomy delegated to managers, where managers have greater responsibility over planning and control activities, and greater access to information that is not available to the corporate body.

To explain the relationship between decentralization and MAS, Chenhall and Morris (1986) argued that decentralized managers are likely to use information that is aggregated in a way that reflects their areas of responsibility, and information that reflects the integrated nature of their sub-unit activities. Chia's (1995) study reveals that a high degree of decentralization promotes a high information processing capability, as more managers require more sophisticated information in making decisions. Meanwhile, Choe (1998) discovered that when the organizational structure is organic (low centralization/formalization), broad-scope, timely and aggregated information, through high user participation, has a positive impact on MAS performance.

There has been little empirical research on how MAS is used within decentralized healthcare organizations. Hospitals provide an interesting setting as their diversity of structural arrangements and strategic orientations can have some implications on control system design (Abernethy and Lillis, 2001). A study on Australian public hospitals reveals that the level of autonomy granted to clinical units is positively related to the importance attached to both measures of resource management and clinical management (Abernethy and Lillis, 2001). Hence, the following hypothesis is developed:

- H1.* There is a positive relationship between decentralization and the extent to which managers use MAS that provide broad-scope, timely, aggregated, and integrated information.

2.3 PEU and MAS

Duncan (1972, p. 318) defines environmental uncertainty as:

The lack of information regarding the environmental factors associated with a given decision-making situation, not knowing the outcome of a specific decision in terms of how

much the organization would lose if the decision were incorrect, and inability to assign probabilities with any degree of confidence with regard to how environmental factors are going to affect the success or failure of the decision unit in performing its function.

Scholars in psychological decision theories and theories of organizational design suggest that the important determinant of behaviour is the level of uncertainty faced by decision makers (Duncan, 1972; Thompson, 1967). When the level of environmental uncertainty is high, organizations must survey the environment and search for information to make analyses and interpretations in order to decrease the level of uncertainty (Thompson, 1967; Daft *et al.*, 1988).

Khandawalla (1972) found that there is a positive association between competition (an environmental variable) and the use of sophisticated management controls. According to Gordon and Miller (1976), accounting systems seem to incorporate more non-financial information (indicating a broad-scope of information) as the level of environmental dynamism and heterogeneity increases. Similarly, Gordon and Narayanan (1984) found that higher PEU is positively associated with the higher importance of external, non-financial, and *ex-ante*-type information. Chenhall and Morris (1986) provide evidence that the relationships between PEU and both broad-scope and timeliness of MAS information are positive. Also, Mia (1993) and Chong and Chong (1997) reveal that PEU has a significant positive relationship with broad-scope MAS information. Moreover, Mangaliso's (1995) study shows that the relationships between management information characteristics (scope, timeliness, aggregation) and PEU are all significantly positive. Lal and Hassel (1998) argue that when the environment is uncertain, managers of large organizations with a high tolerance for ambiguity perceive sophisticated MAS information to be most useful. In the Egyptian context, HassabElnaby *et al.* (2003) found a strong and positive relationship between accounting development and both economic and political factors (environmental variables).

Within the hospital context, Hill (2000) found that environmental uncertainties in the form of changes in the medical reimbursement system and increased competition influence hospitals' decisions to utilize more advanced costing control systems. As environmental uncertainty increases, decision-makers seek more extensive and detailed accounting information for planning and control. Hospitals without adequate detailed cost information may make uninformed choices that can reduce the quality of care and/or net income, and threaten hospital survival (Hill, 2000). Therefore, to control costs, these hospitals may need sophisticated accounting systems that can provide more cost details, classify these costs according to behaviour, and report them more frequently (Pizzini, 2006). Therefore, it is expected that:

- H2. There is a positive relationship between PEU and the extent to which managers use MAS that provide broad-scope, timely, aggregated, and integrated information.

2.4 MAS and managerial performance

Managerial performance may have to be distinguished from the economic performance of the unit for which the manager is responsible. Laitinen (2009) argues that the nature of managerial work (e.g. negotiating, recruiting, training, innovating, and contacting individual managers) strongly affects the importance of information because each managerial work has specific information needs and there is no ordered or systematic

way to carry out these works. Empirical evidence for the direct effect of MAS on managerial performance is rather lacking, as the exact nature of accounting information and performance relationships is ambiguous (Baines and Langfield-Smith, 2003; De Haas and Algera, 2002). Soobaroyen and Poorundersing (2008) found that the relationship between all MAS information characteristics (broad-scope, timeliness, aggregation, and integration) and managerial performance is significantly positive. Pizzini (2006) found that hospitals achieve better performance when they have accounting systems that provide greater detail and classification capabilities compared to other hospitals and their peers. Similarly, Hill (2000) argues that hospitals that have less detailed information may make incorrect choices, which, in turn, lead to decreased quality of care and net income, and affect hospital existence. Hence, the following hypothesis is formulated:

- H3.* There is a positive relationship between the extent to which managers use MAS that provide broad-scope, timely, aggregated, and integrated information and managerial performance.

2.5 Theoretical framework

Based on the foregoing discussion of the literature, a theoretical framework is developed, as shown in Figure 1.

3. Methodology

Data for this study were collected using questionnaires that were personally addressed to the managers or heads of departments of 50 Egyptian hospitals. Departmental level was used as the unit of analysis. A total of 200 responses were obtained and used in the data analysis.

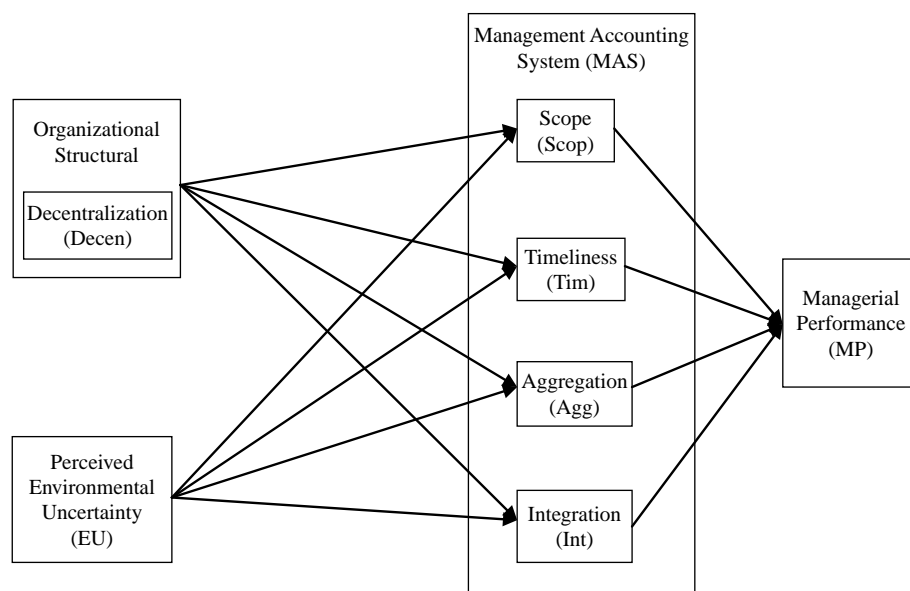


Figure 1.
Theoretical framework

3.1 Measurement of research variables

MAS information characteristics. Following Chia (1995), the MAS instrument for this study measured the perceptions of the respondents regarding the information received from the MAS. As shown in Table I, the questionnaire includes 19 items related to four MAS information characteristics: scope, timeliness, aggregation, and integration. On a seven-point Likert-type scale with 1 – never, 2 – rarely, 3 – sometimes, 4 – often, 5 – very often, 6 – frequently, and 7 – always, the respondents were asked to rate the extent to which they use the MAS information available to them. As presented in Table IV, the Cronbach's α values for all MAS dimensions are well within the acceptable range of 0.60 or above (Nunnally, 1978).

Organizational structure. Using Abernethy and Lillis's (2001) study conducted in the hospital context, a four-item measure based on Govindarajan's (1988) instrument was used to capture decentralization. On a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), the extent to which these decisions are delegated to the managers of clinical units was identified. The Cronbach's α value is 0.851, which is also within the acceptable range (Table IV).

<i>Scope</i>	
1	Information that relates to possible future events
2	Quantification of the likelihood of future events occurring
3	Non-economic information
4	Information on broad factors external to your hospital
5	Non-financial information that relates to the efficiency, output rates, employee absenteeism, etc.
<i>Timeliness</i>	
6	Requested information to arrive immediately upon request
7	Information supplied to you automatically upon its receipt into information systems or as soon as processing is completed
8	Reports are provided frequently on a systematic, regular basis
9	There is no delay between event occurring and relevant information being reported to you
<i>Aggregation</i>	
10	Information provided on the different sections or functional areas in your hospital
11	Information on the effect of events on particular time periods
12	Information that has been processed to show the influence of events on different functions
13	Information on the effect of different sections' activities on summary reports for your department and the overall hospital
14	Information in forms that enable you to conduct "what-if" analysis
15	Information in format suitable for input into decision models
16	Costs separated into fixed and variable components
<i>Integration</i>	
17	Information on the impact that your decision will have throughout your department, and the influence of other individuals' decisions on your area of responsibility
18	Information on precise targets for the activities of all sections within your department
19	Information that relates to the impact that your decisions have on the performance of your department

Table I.
MAS information
characteristics

Perceived environmental uncertainty. Duncan's (1972) instrument was used to measure PEU through three dimensions:

- (1) lack of information on environmental factors;
- (2) not knowing the outcome of a decision in terms of how much the firm would lose if a set of decisions were incorrect; and
- (3) the inability to assign confident probabilities as to how the environment will affect the success or failure of a decision unit in performing its function.

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The first dimension contains five scale items measured by a seven-point Likert-type scale ranging from 1 (never) to 7 (always), while the second dimension is composed of six scale items measured by a seven-point Likert-type scale ranging from 1 (always) to 7 (never). Finally, the third dimension consists of a question made up of two components. Similar to Duncan (1972), the first component asks the respondents to indicate how sure they are about how each of the eight factors will affect the success or failure of their work groups in carrying out their functions. The first component uses a ten-point Likert-type scale ranging from 0 per cent (completely sure) to 100 per cent (completely unsure). The second part of the question asks the respondents to indicate how confident they are in their estimates, by giving a range between 0 and 1.0. Table IV shows that overall PEU produced a Cronbach's α value of 0.78, which is above the lower limits of normal acceptability (Nunnally, 1978).

Managerial performance. Managerial performance was measured using the instrument developed by Mahoney *et al.* (1963, 1965). The managers or heads of departments were asked to rate their own perceived performance on eight sub-dimensions: planning, investigating, coordinating, evaluating, supervising, staffing, negotiating, and representing. Their responses were captured using a seven-point Likert scale ranging from 1 (well below average) to 7 (well above average). Managerial performance provides a Cronbach's α value of 0.89, which is also well above the acceptable limit (Table IV).

4. Results

The results of the demographic profile of the respondents were summarized as shown in Table II. The majority of the hospitals are government-owned (34), followed by private (14) and semi-government-owned (2). There were 139 respondents from governmental hospitals, 55 from private hospitals, and only six from semi-government-owned hospitals.

The majority (43 per cent) of departments had a total of around 200-299 beds, while 37.5 per cent of departments contained around 100-199 beds. The respondents were quite experienced, with 74.5 per cent having held their position for more than ten years. There were more male (85 per cent) than female (15 per cent) respondents. The majority of the respondents (71 per cent) were aged over 45 years. In terms of educational level, approximately 38.5 per cent of the respondents held a PhD degree, and 36 per cent had a master's degree.

Table III provides summary statistics such as mean, standard deviation (SD), and actual and theoretical range for all variables. For MAS dimensions, integrated MAS information has the highest mean score (4.64), followed by timeliness (4.42), scope (4.16) and aggregation (4.09). The mean score of decentralization is fairly high (4.94), indicating that the managers of clinical units are given a moderate level of autonomy. However, PEU has a mean score of 3.17, which indicates that the managers of clinical

Variables	Category	Frequency (<i>n</i> = 200)	%
Number of respondents according to hospital ownership	Government (34)	139	69.5
	Private (14)	55	27.5
	Semi-government (2)	6	3.0
	50-99 beds	14	7.0
Hospital size (number of beds in department)	100-199 beds	75	37.5
	200-299 beds	86	43.0
	300-399 beds	16	8.0
	400-499 beds	7	3.5
	500-599 beds	0	0.0
	> 600 beds	2	1.0
Period of experience	< 5 years	10	5.0
	5-10 years	41	20.5
	> 10 years	149	74.5
Gender	Male	170	85.0
	Female	30	15.0
Age	< 30	2	1.0
	30-45	56	28.0
	> 45	142	71.0
Educational level	Bachelor's degree	14	7.0
	Diploma	37	18.5
	Master' degree	72	36.0
	PhD	77	38.5

Table II.
Profiles of respondents

Note: (*n* = 200)

Variables	Theoretical range	Actual range	Mean	SD
Scope (Scop)	1-7	1.67-7.00	4.16	1.09
Timeliness (Tim)	1-7	1.00-7.00	4.42	1.25
Aggregation (Agg)	1-7	1.29-6.57	4.09	1.01
Integration (Int)	1-7	1.67-7.00	4.64	1.17
Decentralization (Decen)	1-7	1.75-7.00	4.94	1.24
Perceived environmental uncertainty (PEU)	1-7	2.13-4.07	3.17	0.40
Managerial performance (MP)	1-7	2.00-7.00	5.30	0.93

Table III.
Descriptive statistics

Note: (*n* = 200)

units perceive Egypt's environmental uncertainty to be rather low. In addition, managerial performance receives the highest score, with a mean of 5.30.

PLS was used to estimate the measurement and structural models. PLS has been increasingly used by MAS researchers because of its ability to model linear relationships without the constraints of other methods of structural equation modelling, such as those relating to normality and a large sample size that coordinates with estimated indicators (Chin *et al.*, 2003). PLS allows researchers to analyse the measurement model simultaneously with the structural model, and allows researchers to adopt more complex research models (Lee *et al.*, 2011).

4.1 Measurement model

The relationship between measures and constructs was evaluated via the measurement model by assessing the reliability and validity of the scale measures. Table IV shows the results of the reliability assessment for the model. The reliability values (Cronbach's α) exceed 0.70 for all constructs except integration (0.67). A second test of reliability known as composite reliability index was also performed, as it is considered to provide much more accurate reliability information than Cronbach's α (Chin *et al.*, 2003). The constructs' composite reliability exceed the 0.70 level suggested by Nunnally (1978), with a range from 0.82 to 0.92. The average variance extracted (AVE) was used to assess convergent validity. Chin (1998) states that AVE values of 0.50 or more show sufficient convergent validity. Table IV shows that there is adequate convergent validity because the AVEs for all constructs exceed 0.50.

In PLS, when the construct shares more variance with its measures than with other constructs, the model can be said to have adequate discriminant validity (Hulland, 1999). As shown in Table V, the correlation matrix in the off-diagonal explains the correlation among constructs, and that in the diagonal shows the square root of the AVE values. Since all diagonal elements in the correlation matrix are greater than their respective off-diagonal elements, these are considered to demonstrate sufficient discriminant validity. Therefore, based on the above analysis, the measurement model for this study is reliable and valid.

4.2 Structural model

The structural model was assessed by estimating the path coefficients and the R^2 values. Path coefficients indicate the strength of the relationships between

	AVE	Composite reliability	R^2	Cronbach's α
Aggregation (Agg)	0.63	0.83	0.40	0.71
Decentralization (Decen)	0.69	0.90		0.85
Integration (Int)	0.60	0.82	0.13	0.67
Managerial performance (MP)	0.64	0.92	0.29	0.89
Perceived environmental uncertainty (PEU)	0.70	0.87		0.78
Scope (Scop)	0.81	0.90	0.10	0.78
Timeliness (Tim)	0.61	0.86	0.34	0.79

Notes: $n = 200$; Cronbach's α and composite reliability index

Table IV.
Reliability assessment
for theoretical model

	AVE	Composite reliability	Agg	Decen	Int	MP	PEU	Scop	Tim
Agg	0.63	0.83	0.79						
Decen	0.69	0.90	0.58	0.83					
Int	0.60	0.82	0.50	0.35	0.77				
MP	0.64	0.92	0.30	0.22	0.22	0.80			
PEU	0.70	0.87	0.37	0.21	0.13	0.62	0.84		
Scop	0.81	0.90	0.00	0.11	-0.08	0.41	0.31	0.90	
Tim	0.61	0.86	0.60	0.42	0.08	0.41	0.49	0.40	0.78

Note: ($n = 200$)

Table V.
Inter-construct
correlations, AVE, and
square root of AVE for
theoretical model

independent and dependent variables, while the predictive power of a model for the dependent variables is measured by the R^2 value (Ko *et al.*, 2005; Chin *et al.*, 2003). In addition, significant path coefficients provide support for the hypothesized relationships (Bentler, 1989). In this study, the significance of the paths within the structural model was determined by using a bootstrap re-sampling method (500 re-samples). Figure 2 shows the overall results of the analysis. According to Chin *et al.* (2003), standardized paths, in order to be considered meaningful, should be at least 0.20, and ideally above 0.30.

Figure 2 shows that decentralization is significantly and positively associated with timeliness ($\beta = 0.328$, $p < 0.001$), aggregation ($\beta = 0.523$, $p < 0.001$), and integration ($\beta = 0.340$, $p < 0.01$). However, decentralization is not significantly associated with scope. Hence, the results reasonably support *H1*. Meanwhile, PEU shows significant negative associations with scope ($\beta = -0.303$, $p < 0.001$), timeliness ($\beta = -0.416$, $p < 0.001$), and aggregation ($\beta = -0.264$, $p < 0.001$), but no significant association with integration. Accordingly, the results do not provide support for *H2*.

Figure 2 also shows that only scope ($\beta = 0.333$, $p < 0.001$) and timeliness ($\beta = 0.223$, $p < 0.05$) are significantly positively associated with managerial performance. Thus, these results partially support *H3*.

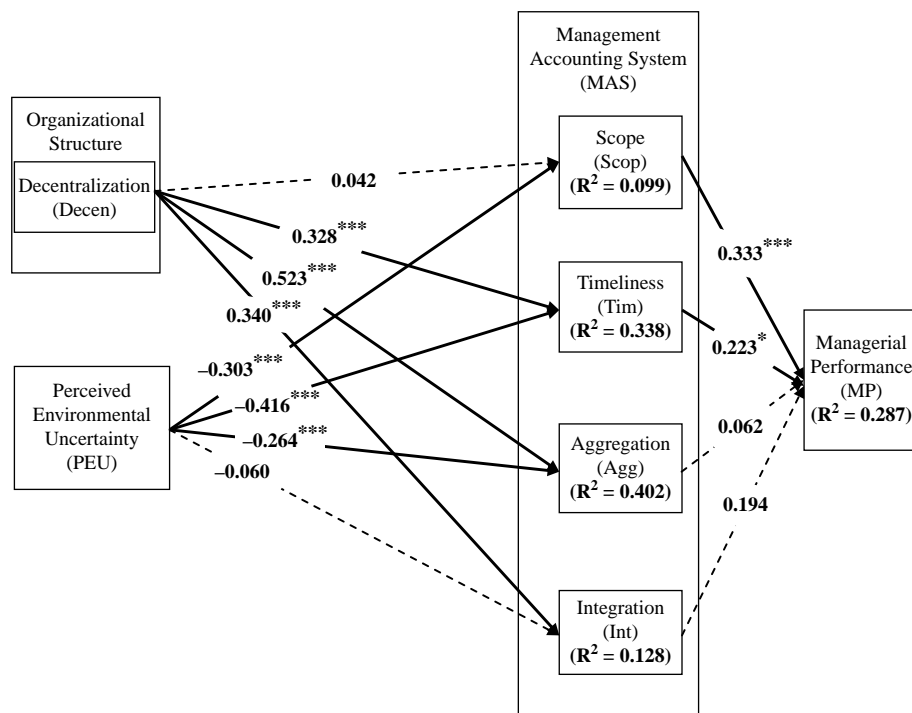


Figure 2.
PLS results for
theoretical model

Notes: Significant at: * $p < 0.05$ level ($n = 200$, t critical value = 1.960); ** $p < 0.01$ level ($n = 200$, t critical value = 2.576); *** $p < 0.001$ level ($n = 200$, t critical value = 3.291)

5. Discussion

The results indicate that there are positive relationships between decentralization and the extent to which managers use MAS that provide timely, aggregated, and integrated information. The positive relationship between decentralization and the use of timely information indicating that managers, who are responsible for both costs and targets, need more timely information in terms of frequency and speed of reporting. Timely information is also very much needed by those clinical unit managers that deal with specialized services such as clinical wards, operation theatres, and laboratories, where patients' lives are given the highest priority.

The results for positive relationships between decentralization and both aggregated and integrated information are consistent with those found by Chenhall and Morris (1986). Clinical unit managers are more likely to use information aggregated in various forms, such as by time period, functional areas, or decision models, as their units receive more autonomy. These managers also use more integrated MAS information to coordinate between their sub-units in a highly decentralized hospital, and to explain the impact of their decisions on other sub-units throughout their hospital. They also require only certain types of important information on the different sections or functional areas of their hospital so as to reduce information overload during their decision-making.

Furthermore, the insignificant relationship between decentralization and the scope of MAS information is consistent with the results of Mangaliso (1995). Such result is perhaps due to the use of traditional costing systems, such as full costing and standard costing, which tends to de-emphasize the use of broad-scope information, which is externally, non-financially and future-oriented.

Moreover, the results reveal that PEU has significant negative relationships with broad-scope, timely, and aggregated MAS information. The results indicate that clinical unit managers tend to have more use for the broad-scope of MAS information when the environment is perceived to be less uncertain. This is because clinical unit managers are able to determine the outcomes and consequences of making decisions, as it is often easy to get broad-scope MAS information related to both internal and external hospital environments, and information that is non-financial and future-oriented in nature. This is particularly true for those departments that have high levels of task variability, such as accounting and medical supply departments, which provide administrative support services to various other departments. However, this finding is not consistent with those of Chenhall and Morris (1986), Mangaliso (1995) and Mia (1993). Furthermore, the findings indicate that in less uncertain environments, clinical unit managers tend to use information that arrives immediately upon request, at frequent intervals, on a systematic and regular basis. This indicates that timely information is essential in running the services and operations of hospitals, even within less uncertain environments. However, this finding is contradict with those of Chenhall and Morris (1986) and Mangaliso (1995), who report a positive relationship between PEU and the timeliness of MAS information.

Also, contrary to expectations, the results show that there is a significant and negative relationship between PEU and the aggregation of MAS information, indicating that clinical unit managers in less uncertain environments require high levels of aggregated information on the different functional areas and activities within their units, and within the hospital as a whole. Given the fact that many Egyptian

hospitals have poor management information systems, obtaining detailed information may still not be possible under such conditions. It may be that only those departments that provide administrative support services have a higher need for aggregated information, due to their higher task variability.

The insignificant relationship between PEU and integrated MAS information indicates that the managers place less emphasis on the use of integrated MAS information in coordinating between their departments in situations of low PEU. This is particularly true in more specialized departments where less emphasis placed on information that crosses functional boundaries.

Furthermore, the results reveal that only two MAS dimensions are significantly positively associated with managerial performance, namely scope and timeliness, while aggregation and integration have insignificant paths to managerial performance. These results indicate that the broad-scope and timeliness of MAS information enhances clinical unit managers' managerial activities, namely coordinating, investigating, representing, evaluating, supervising, and planning. These results are quite consistent with those found by Soobaroyen and Poorundersing (2008). However, information that is too broad may be less useful for those highly specialized clinical units.

In contrast with Soobaroyen and Poorundersing's (2008) study, the current study indicates that aggregated and integrated information does not seem to influence the clinical unit managers of Egyptian hospitals. One plausible explanation for this outcome is that it is perhaps due to the unique characteristics of each clinical department in the hospitals, where each provides a specialized and different service. Hence, the use of aggregated data or information may be less useful under such conditions when evaluating clinical unit managers. This argument is in line with Ramani's (2004) remark that hospital performance needs to be monitored at the level of each individual clinical department. For example, the performance of each laboratory department (e.g. pathology, biochemistry, microbiology, etc.) and each radiology department (e.g. X-ray, sonography) requires independent monitoring due to the basic differences in the nature and type of investigations carried out by the investigation departments (Ramani, 2004). It may be the case that, for these types of departments, the ability to monitor more detailed costs, rather than merely aggregating them, is critical because it allows hospitals to track the costs by patient (Hill, 2000). However, too much detail (less aggregated information) may cause dysfunctional decision-making and hamper performance of clinical unit managers. The results also show that even though integrated information is used to a large extent within Egyptian hospitals, it still cannot influence managers' performance. This reflects the fact that the hospitals' current management information systems are not implemented in a meaningful way so as to support decision-making.

6. Conclusion and implications

This study provides a better understanding of the relationships between the contextual variables, MAS information use and managerial performance within the context of healthcare organizations. The results provide hospital managers with some useful aspects relating to the function of MAS information, which can be used to enhance their managerial performance. The results may provide Egyptian policy makers with some direction in terms of reorganizing Egyptian hospitals and identifying the important elements for improved performance. With the increasing magnitude of

healthcare costs, it is essential that Egyptian hospitals adopt new management accounting and costing systems as part of their management information system, so as to provide better data and greater insights for cost control and cost management for better decision-making.

As this study focuses only on two contextual variables (PEU and decentralization), it is suggested that future studies use more or different contextual variables (e.g. business strategy, technology, and organizational culture) and different measurement instruments. It would be interesting to replicate a similar study in other types of service industries, such as banking, education, IT and communication, and tourism, in order to gain a better understanding of MAS concepts and applications. It would also be interesting for further studies to look at the interactions between MAS information characteristics, and their impact on managerial performance. As empirical studies investigating both users and providers of MAS are still limited (Fleischman and Walker, 2010), it is suggested that future studies include both users and providers of MAS information together, so that comparisons can be made in terms of MAS information usage, usefulness, and levels of satisfaction.

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Further reading

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