

Management information systems and strategic performances: The role of top team composition

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ARTICLE INFO

Keywords:

Management information systems
Information characteristics
Strategic performance
Top management team composition

ABSTRACT

Organizations adopt sophisticated management information systems, which provide top managers with an ample range of information to achieve multiple strategic performances. However, organizations differ in the extent to which they improve their performance. This paper analyzes the role of top management team in the relationship between management information systems and strategic performance. Using data collected from 92 top management teams, it analyses how different team compositions interact with a sophisticated management information system, and how this interaction affects strategic performances, which are focused on cost reduction and flexibility. The findings show how the effect of management information system on strategic performance (focused on flexibility) is moderated by top management team diversity.

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1. Introduction

The enhanced competition in the private and public sector has spurred organizations into delivering greater efficiency, quality and more flexibility of services (Kaul, 1997). This condition imposes additional demands on the organization's information processing capabilities. In trying to achieve these strategic objectives, organizations adopt more sophisticated and comprehensive management information systems (MISs) (Choe, 1996; Ghorab, 1997). These provide top managers with a comprehensive and broad range of information about multiple dimensions of the firm's operations (Choe, 1996, 2004), facilitating decision-making and performance achievement (Kaplan & Norton, 1996; Kim & Lee, 1986). Organizations, however, differ in the extent to which they achieve strategic performance successfully. This paper addresses the relationship between sophisticated MIS and top management teams (TMTs), as the set of managers ultimately responsible for strategy management and organizational performance. Management literature has recognized that TMTs with different demographical characteristics (e.g. age, tenure, experience and education) are generally expected to gather diverse information and display higher-quality decisions (Carpenter, Geletkanycz, & Sanders, 2004; Finkelstein & Hambrick, 1996). Management and information literatures have recognized (implicitly) the use of information by managers, and the question that remains is how (explicitly) different top managers use

MIS for strategic management (Lin, 2006; Hagan, Watson & Barron, 2007).

Although the effect of MIS on performance is widely recognized, prior findings on the direct and indirect relationship between and (strategic) performance far are mixed and confused (Fuller-Love & Cooper, 1996; Choe, 2004). The present study attempts to provide some clarification of the relationship between MIS design and strategic performance, by explicitly analyzing the role of TMT composition. Our general hypothesis is that diversity of TMT composition supports more sophisticated MIS in ways that contribute to multiple strategic performance, which are focused on cost control and flexibility (Gupta & Govindarajan, 1984; Lederer & Smith, 1989). We follow upper echelon literature, which views organizations as a reflection of their TMT (Hambrick & Mason, 1984). Upper echelon theory focuses on observable, demographic characteristics of TMT members to explain organizational outcomes (Finkelstein & Hambrick, 1996). This study also uses a contingency approach for analyzing the interaction fit between MIS sophistication and TMT composition. Contingency approach is the only one which asserts that performance depends on the existence of an alignment between several organizational characteristics, such as information systems, organizational structure and strategy (Choe, 1996; Kim & Lee, 1986).

Data were collected from 92 TMTs in public hospitals in Spain, where organizations have to implement strategies focused both on cost-efficiency, flexibility and quality of service (Naranjo-Gil & Hartmann, 2006). This paper attempts to contribute to the management and information literature in several ways. First, this research provides evidence of the important role of TMT composition in the

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effectiveness of MIS on strategic performance. While prior research suggests that the MIS design enables organizations to enhance strategic performance, this paper directly tests the presence of this relationship and examines a strategic performance outcome of the enabling effect. Second, the present study offers a more integral explanation of the alignment between MIS design and performance by explicit consideration of different characteristics of the TMT (Hagan et al., 2007). Third, we test our hypotheses in a setting where similar organizations have to achieve multiple strategic performances, albeit to different extents (Madorrán & Val Pardo, 2005; Brittain & Macdougall, 1995). Thus, this context provides an opportunity to analyze the interactive effect of TMT diversity and MIS design on strategic performance, as it control the diversity as an antecedent of management information use and processing (Yoo & Alavi, 2001). Fourth, this paper adds to the limited knowledge on the relevance of management information system design for firms achieving multiple strategic objectives.

The remainder of this paper is structured as follows. Section 2 develops the hypotheses about the relationships between TMT, MIS and performance. Section 3 describes the empirical survey study and the measurement of variables. Section 4 presents the results. Finally, Section 5 presents the discussion and conclusions of this study.

2. Theoretical development and hypotheses formulation

2.1. MIS and strategic performance

Managers operating in competitive contemporary environments need comprehensive information in order to manage the important parts of the organization's operations and thus achieve different strategic goals (Kaplan & Norton, 1996). Managers' perception is an important factor that influences the actual use of MIS and the acceptance of new information systems (Ghorab, 1997, p. 250). MIS can provide managers with a variety of information, thus Choe (1996) identified MIS design according to the perceived usefulness of four information dimensions: scope, aggregation, integration and timeliness (Chenhall & Morris, 1986; Choe, 1996). These dimensions have been analyzed extensively in management and information system literatures (Choe, 1996, 2004; Lederer & Smith, 1989). Scope refers to the type and extension of MIS information in time and space. Narrow-scope information is derived from financial information internal to the organization and with a historic orientation. Alternatively, broad-scope information includes external, non-financial and future oriented information (Choe, 1996). Aggregation refers to the way data is aggregated over time periods, departments or functions. Integration refers to the interaction and coordination of information among different functions in the organization. Finally, timeliness refers to the frequency and speed of reporting (e.g., short or long run). Several authors have extended the four information characteristics to describe accounting systems in terms of MIS sophistication (Choe, 1996; Ghorab, 1997; Naranjo-Gil, 2004). MIS sophistication refers to a range of information available for managers, which is perceived as being useful. The sophisticated MIS design provides information which has a high average level of information content in the four information dimensions. That is, it provides information which is broad-scope, high coordinated, high reporting frequency, and integrated among different organizational functions (Choe, 1996, 2004).

A sophisticated MIS provides managers with a comprehensive range of information to achieve different strategic goals (Fuller-Love & Cooper, 1996; Kaplan & Norton, 1996). Following Porter (1985) and Miller (1988) we distinguish two strategic goals, such as cost reduction and flexibility strategic goals. In this vein, Fuller-Love

and Cooper (1996) asserted that increases in expenditure on public firms have led governments worldwide to attempt to reduce these costs and to increase organizational flexibility to be more competitive (Miller, 1988; Madorrán & Val Pardo, 2005). A cost-based strategic objective focuses on internal efficiency and cost control, and thus tends to emphasize current organizational structures rather than adopt new ones (Miller, 1988; Porter, 1985). A flexibility-based strategic goal focuses on diversification, coordination and decentralization within the organization (Fuller-Love & Cooper, 1996; Porter, 1985). Organizations are unlikely to achieve one strategic performance (e.g., cost reduction) to the extent of excluding the other (Porter, 1985). Furthermore, organizations may often perform better on one strategic objective than the other since they have different organizational capabilities (Gupta & Govindarajan, 1984; Miller, 1988).

As flexibility-related strategic goals require cross-functional interaction and decentralization, it allows relationships between inputs and outputs of activities to be less clear (Miller, 1988; Porter, 1985). Managers will require an extended set of management information that provide more insight in the various parts of the transformation processes (Fuller-Love & Cooper, 1996; Kyung, 1990). In contrast cost-related strategic performances focus on standardization and comparability of activities and processes (Naranjo-Gil & Hartmann, 2006), which demands the use of a narrow set of information, which expresses cost control objectives in financial (monetary) and aggregated terms (Choe, 1996), facilitating comparability of tasks and outputs across the organization (Chang, Chang, & Paper, 2003, Kyung, 1990). Thus, we argue that a sophisticated MIS supports strategic performances in overall, but that this support may be more crucial for achieving flexible-related strategic performance than cost-related strategic performance. Therefore, we propose the following hypotheses:

H1. There is a positive relationship between a sophisticated MIS and strategic performances focused on (a) flexibility and (b) cost reduction.

H2. A sophisticated MIS is more positively related to strategic performance focused on flexibility than to strategic performance focused on cost reduction.

2.2. MIS, TMT diversity and performance

The MIS provides the same information to each manager in a TMT, but the actual selection and use of information is determined by personal preferences. Upper echelon literature argues that these preferences are based on managers' characteristics, such as experience, age, tenure and educational background (Hambrick & Mason, 1984). One important determinant of TMTs' ability to process information and optimize decision-making is the TMTs' diversity in terms of demographic background (Carpenter et al., 2004; Finkelstein & Hambrick, 1996). Heterogeneous TMTs, consisting of managers with varying skills and demographic profiles, have been argued to process different types of information and make better-informed decisions (Carpenter et al., 2004; Hagan et al., 2007). In contrast, homogeneous TMTs, consisting of managers with similar demographical characteristics, have been associated to high group cohesiveness and enhanced control over members (Finkelstein & Hambrick, 1996; Hambrick & Mason, 1984).

A heterogeneous TMT has a greater variety of professional perspectives, know more of operations, and can pay more attention to different organizational activities (Carpenter et al., 2004; Simons, Pelled, & Smith, 1999). A diverse TMT will search, interpret and gather information from a variety of sources, as determined by their background and cognitive make-up (Hagan et al., 2007; Wiersema & Bantel, 1992). We argue that sophisticated and broad

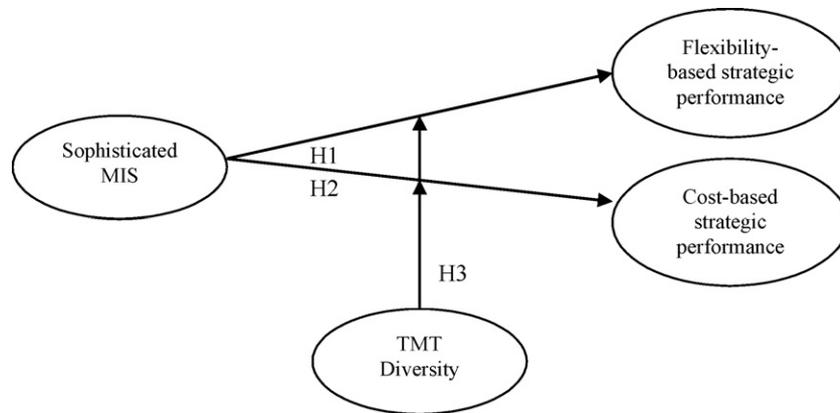


Fig. 1. The general model.

management information system will be especially valued by TMT with a diverse composition. One reason is that TMT is more effective in complex decision-making when composed of individuals having a variety of knowledge, abilities and perspectives (Gupta & Govindarajan, 1984; Carpenter et al., 2004), and thus a heterogeneous TMT will understand the relevance of sophisticated information to achieve multiple strategic performances. We expect that TMT diversity not only spurs managers to broad information but also enables managers to process a comprehensive range of management information (Young, Yang & Shortell, 2001). A diverse TMT will attach higher value to sophisticated MIS, which provide a broader range of information to achieve multiple strategic performances. Thus, we can expect that sophisticated MIS contribute more to strategic performances when diversity is high in the TMT. Therefore, we will test the moderating effect of TMT diversity on the relationship between sophisticated MIS and strategic performances focused on both flexibility and cost reduction (see Fig. 1). The following hypothesis is formulated:

H3. Top Management Team diversity will moderate the relationship between sophisticated MIS and strategic performances focused on (a) flexibility and (b) cost reduction.

3. Empirical study

Data were collected in a survey study among 884 members of top management teams in 218 hospitals in Spain. The Public Hospital sector has been the object of some recent studies exploring the relationship of management information systems, performance and strategy (Zheng et al., 2006; Lorence & Spink, 2004). Furthermore, the health care industry, not only in Spain but also worldwide, is undergoing fundamental shifts in managing and operating demand changes into an effective and flexible new health care system (Liang, Xue, Byrd, & Rainer, 2004; Madorrán & Val Pardo, 2005). Spanish authorities encourage public hospitals to achieve performance goals focused on controlling cost and increasing organizational flexibility and decentralization. This assures that the issues central to this study are relevant for the target population. This also had positive consequences for the willingness to cooperate.

The TMTs data was obtained through the Spanish National Catalogue of Hospitals, and updated through Internet and telephone calls. TMTs consist on average of a CEO, a Medical director, a Nursing director, and an Administrative-Financial director. We sent the questionnaire to every member of a TMT individually, following the distribution and recollection procedures suggested by Dillman (2000). A satisfactory response rate was achieved with 496 (56.10%) questionnaires returned of which 473 (53.51%) were deemed useful

for further analysis. From these data, 92 full TMTs were formed for which all members responded.

3.1. Measurement of variables

Sophisticated MIS was measured following Chenhall and Morris (1986) and Choe (1996). We developed an instrument to measure the usefulness of available management accounting information. We asked questions regarding different informational dimensions, such as scope, timeliness, aggregation and integration. Managers had to state the extent to which they perceived that their hospital's MIS provided each of the dimensions identified. We treated all information characteristics as complementary to construct the variable sophistication of MIS design by averaging the scores for all items (Naranjo-Gil, 2004). The Cronbach alpha for the overall scale was 0.782, exceeding the recommended minimum level (Nunally, 1978). The appendix contains details of variables and questions included in the questionnaire.

Top management team diversity was measured following the upper echelons tradition (Carpenter et al., 2004; Finkelstein & Hambrick, 1996), which focuses on four demography characteristics of TMTs, such as age, tenure, education and experience. Regarding age and tenure, managers were asked to indicate their age and tenure in management position in their actual organization¹. Then age diversity and tenure diversity were measured using the coefficient of variation (standard deviation divided by the mean), which is the superior measure as it provides a direct, and scale-invariant measure of dispersion (Allison, 1978). Scale invariant measures are desirable because they are sensitive to relative rather than absolute differences. Regarding education and experience, managers were asked to indicate their educational university degree and their years of functional experience; the responses were coded in two broad areas (Wiersema & Bantel, 1992)²: External-Administrative Oriented (e.g. Business, Economics, Law) and Internal-Process Oriented (e.g. Medicine, Nursing, Biology and Chemistry). Educational diversity and experience diversity were measured using Blau's (1977) index of heterogeneity, since categorical variables are not amenable to the coefficient of variation measure. Blau Heterogeneity Index is calculated as $(1 - \sum \pi_i^2)$, where π_i is the proportion of the team in the i th educational (or functional) category. A score of zero would

¹ Managers' tenures lie between 2 and 11 years. Managers' ages lie between 30 and 56 years.

² We used two categories since the vast majority of managers (89.1%) indicated to have a degree related to either Business-Economics-Law or Medical-Nursing.

Table 1
Descriptive statistics for variables ($n = 92$).

Variable	Mean	S.D.	Theoretical range	Actual range
1. Age diversity	0.78	0.08	0.00–1.00	0.72–0.91
2. Tenure diversity	0.65	0.15	0.00–1.00	0.59–0.71
3. Experience diversity	0.51	0.11	0.00–1.00	0.00–1.00
4. Education diversity	0.56	0.09	0.00–1.00	0.00–1.00
5. MIS sophistication	3.61	0.22	1.00–5.00	1.00–5.00
6. Cost-based strategic performance	2.91	0.44	1.00–5.00	1.56–4.00
7. Flexibility-based strategic performance	3.05	0.47	1.00–5.00	2.00–4.20

indicate perfect managerial homogeneity (functional or educational). Higher scores on this index indicate higher diversity on functional background between members of the TMT. We measured TMT diversity as a construct formed by the following four variables: age, tenure, education and experience diversity. The reliability and validity analyses showed that all items were loading higher in this construct. Since members in every TMT have different demographical characteristics, we computed inter-rater reliability coefficient for assessing the appropriateness of aggregation of individual members' characteristics to a team level. All coefficients computed were above 0.70, which indicates good agreement among judgments made by the team members (cf. James, Demaree and Wolf, 1984).

Strategic performance focused on cost and flexibility was measured with a nine-item instrument, based on the works by Govindarajan (1988) and Gupta and Govindarajan (1984). We adapted the instrument to the Spanish context, thus respondents were asked to indicate the extent to which the following dimensions fit their personal situation: decentralization of responsibility, programs of cost reduction and cooperation with others units or departments inside the hospital and others institutions. The factor analysis revealed two factors: flexibility-based strategic performance (explaining 31.24% of variance) and cost-based strategic performance (explaining 24.98% of variance). The Cronbach-alphas were of 0.71 and 0.76 respectively, exceeding the recommended minimum level (Nunnally, 1978).

We included a control variable: hospital size, which was measured by the number of beds (Madorrán & Val Pardo, 2005). The test for potential non-response bias involved comparing survey respondents to the original mailing list and comparing early and late respondents (Pedhazur & Pedhazur, 1991). Chi-square tests and independent-samples t -tests did not reveal any sign of non-response bias³.

4. Results

The hypotheses were analyzed using the Partial Least Squares technique (PLS), which is a second-generation statistical technique for the estimation of path models involving latent constructs indirectly measured by several indicators (Chin, 1998). Different from covariance-based structural models (e.g. LISREL, EQS), PLS explains variance and resembles ordinary least squares regression, with regard to output and assumptions (Chin, Marcolin, & Newsted, 2003). As such, PLS allows smaller sample sizes than covariance-based models. PLS does not report on the fit of the whole model (Yoo & Alavi, 2001; Chin et al., 2003), and thus overcomes some of the theoretical and estimation problems associated with the use of covariance-based models. The path coefficients in the PLS structural model are interpretable as β -statistics from ordinary least

Table 2
Correlations from PLS model ($n = 92$).

	1	2	3	4
1. MIS sophistication	1.000			
2. TMT diversity	0.152	1.000		
3. Cost-based strategic performance	0.188 ^a	0.209 ^b	1.000	
4. Flexibility-based strategic performance	0.304 ^c	0.257 ^c	0.412 ^c	1.000

^a Significant at 0.1 level (two tailed).

^b Significant at 0.05 level (two tailed).

^c Significant at 0.01 level (two tailed).

Table 3
Results from PLS analysis (path coefficients, $n = 92$).

From	To	
	Cost-based strategic performance	Flexibility-based strategic performance
MIS sophistication	0.192 ^a	0.271 ^c
TMT diversity	0.158	0.233 ^b
TMT diversity \times MIS sophistication	0.169	0.226 ^b
R^2	0.211	0.258

^a Significant at 0.1 level (two tailed).

^b Significant at 0.05 level (two tailed).

^c Significant at 0.01 level (two tailed).

squares regression, and are comparable with principal component analysis as regards the measurement model. Table 1 shows the descriptives of the variables and Table 2 shows the correlation analysis. The PLS analysis confirms the reliability and unidimensionality of the variables, with general loadings of manifest variables on latent variables exceeding 0.60. We also assessed for discriminant validity of the measurement model by calculating the Average Variance Extracted (AVE) and comparing this with the squared correlations between constructs. Results showed that discriminant validity was satisfactory because the AVE's were higher than the correlations in all cases (Yoo & Alavi, 2001; Chin et al., 2003).

Fig. 2 displays the PLS model tested. Table 3 contains the detailed output statistics of the analysis of the path coefficients in the structural model and reports on the significance of the standardized β_s that resulted from this analysis, based on a bootstrapping procedure that used 500 samples with replacement. This table also reports the R -squared statistic for the dependent variable⁴.

Consistent with expectations, Table 3 shows support for H1, since the path coefficient between sophisticated MIS and strategic performance focused on flexibility is positive and significant ($p = 0.001$). Table 3 also shows a positive but marginally significant path coefficient ($p = 0.092$) between sophisticated MIS and strategic performance focused on cost reduction. Thus, results in Table 3

³ The result of the Chi-square test for the size of the original mailing list and survey respondents was $\chi^2 = 4.729$ ($p = 0.152$). The result of the Chi-square test for the size comparing early and late respondents was $\chi^2 = 1.921$ ($p = 0.336$).

⁴ The control variable size did not reveal any significant path with MIS sophistication, TMT diversity, or strategic performances.

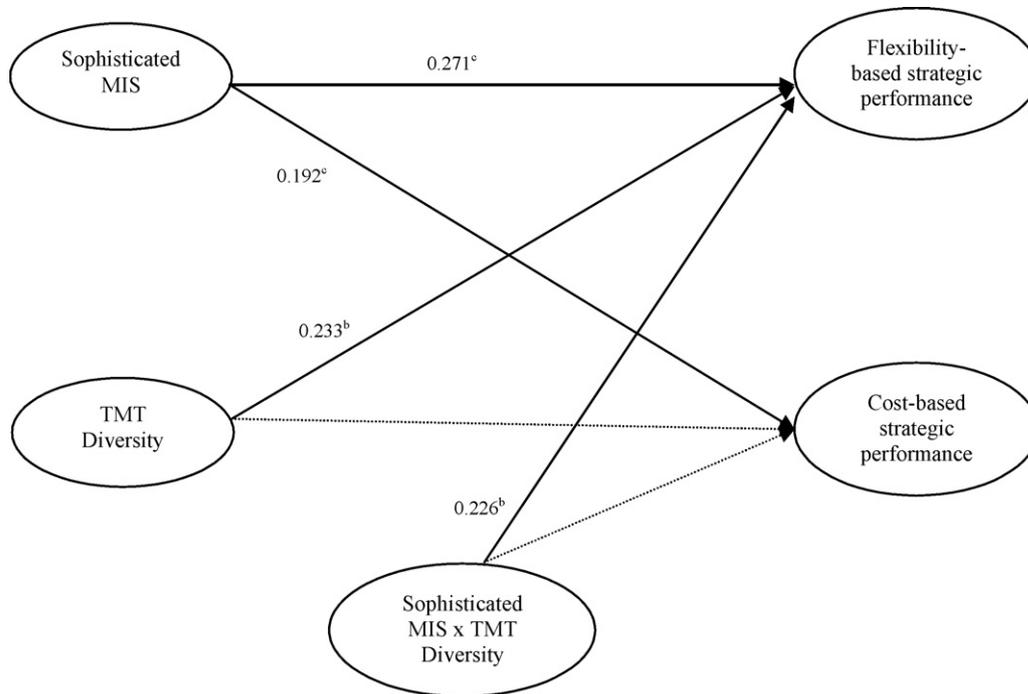


Fig. 2. PLS model: sophisticated MIS, TMT diversity, strategic performances.

show support for H2 since the path coefficient between sophisticated MIS and strategic performance focused on flexibility is higher than the path coefficient between sophisticated MIS and strategic performance focused on cost reduction.

Regarding the role of TMT diversity on the relationship between sophisticated MIS and strategic performances, results in Table 3 provide support for the moderating effect of TMT diversity on the relationship between sophisticated MIS and strategic performance focused on flexibility. In this case the path coefficient of the interaction term was positive and significant. Summarizing, support was found for hypothesis 3a. However, Table 3 shows no support for hypothesis 3b, which posed a moderating effect of TMT diversity on the relationship between sophisticated MIS and strategic performance focused on cost reduction. In this case, the path coefficient of the interaction term was positive but not significant. We calculated the explicative power of the interaction model, through comparison of the R^2 for the significant interaction model with the R^2 for the main effects model (without the interaction term). The difference between the squared multiple correlations is used to assess the overall effect size f^2 for the interaction (Chin et al., 2003, p. 211)⁵. Results show that the interaction construct has an effect size f of 0.21, which is between a medium and large effect. Thus, the results suggest a good fit of the data to the moderation model. To gain a better understanding of the shape of the interaction we found between sophisticated MIS and TMT diversity, the relationship between these two variables was also assessed using a two-way ANOVA. Sophisticated MIS was split on the basis of the median scores to create two groups: high sophisticated MIS (above median) and traditional or low sophisticated MIS (below median). TMT diversity was also split at the median to create two groups: TMT heterogeneity (above median) and TMT homogeneity (below median)⁶. The mean scores for flexibility-based

Table 4

ANOVA results: mean flexibility-based performance scores ($n=92$).

	TMT heterogeneity	TMT homogeneity
High sophisticated MIS	3.24 $n=24$	2.91 $n=29$
Low sophisticated MIS	2.95 $n=21$	3.16 $n=18$

strategic performance shown in Table 4 indicate that performance is highest when sophisticated MIS is matched with TMT diversity. That is, performance is highest when sophisticated MIS is high and TMT diversity is also high, and when sophisticated MIS and TMT diversity are both low. The results of the ANOVA provide general support that these differences are indeed due to the interactive effect of sophisticated MIS and TMT diversity⁷ (also see Fig. 3).

To add some intuitive appeal to the results and extend the PLS findings, we assessed a model relating the four characteristics of TMT diversity (age, tenure, experience and education diversity) directly to strategic performance focused on flexibility and cost. Table 5 shows that education diversity and experience diversity are positively related to strategic performance based on both flexibility and cost reduction. However, results in Table 5 shows that age and tenure diversity are not related to strategic performance focused on flexibility and cost reduction. These results are in line with some findings from previous studies (Carpenter et al., 2004; Wiersema & Bantel, 1992). Finkelstein and Hambrick (1996) argued that occupational TMT diversity (e.g. experience and education), rather than temporal TMT diversity (e.g. age and tenure) has a stronger influence on innovativeness and firms' long-term performance. Wiersema and Bantel (1992) also concluded that age and tenure diversity are less important than experience and education diversity in capturing the underlying constructs of diversity of information.

⁵ $f^2 = (R^2 \text{ interaction model} - R^2 \text{ main model}) / (1 - R^2 \text{ main model})$. Interaction effect sizes are small if 0.02, medium if 0.15, and large if 0.35.

⁶ Since ANOVA assumes equality of variance between groups, previously we checked the variance using the Levene test. The significance value of

the Levene statistic was 0.177 (higher than 0.05), showing homogeneity of variance.

⁷ The two-way interaction was significant ($F=7.01, p<0.05$).

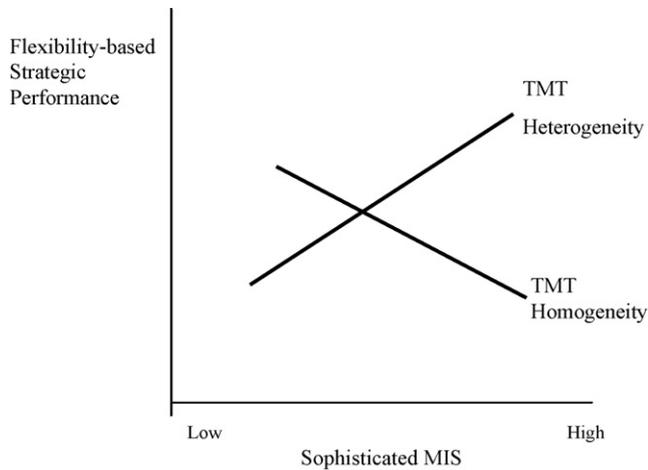


Fig. 3. The moderating effect of TMT diversity in sophisticated MIS and flexibility-based strategic performance.

Table 5
Results from PLS analysis (path coefficients, $n = 92$).

From	To	
	Cost-based strategic performance	Flexibility-based strategic performance
Age diversity \times MIS sophistication	0.111	0.149
Tenure diversity \times MIS sophistication	0.143	0.162
Education diversity \times MIS sophistication	0.231 ^b	0.268 ^c
Experience diversity \times MIS sophistication R^2	0.197 ^a	0.326 ^c

^a Significant at 0.1 level (two tailed).

^b Significant at 0.05 level (two tailed).

^c Significant at 0.01 level (two tailed).

5. Discussion and conclusions

The objective of this paper was to analyze the effect of TMT diversity on the direct relationship between sophisticated MIS and strategic performances. Our findings showed that a sophisticated MIS facilitates organizations to achieve strategic performance based on both flexibility and cost reduction. The results also show support for the moderating effect of TMT diversity on the relationship between sophisticated MIS and flexibility-based strategic performance. This is a relevant finding because organizations are struggling to find ways to deliver greater quality and more flexibility of services and products. Thus, this paper extends the previous management information literature by analyzing explicitly the role of TMT composition and MIS sophistication in a fit affecting organizational performance. This paper has showed that TMT recognize the importance of receiving more sophisticated management information to achieve multiple performances. This is consistent with previous studies on TMT diversity, which found that TMT heterogeneity is related to diversification, innovation and change (Carpenter et al., 2004; Wiersema & Bantel, 1992). These results are also in line with Choe (1996) and Kaplan and Norton (1996) arguments that a broader design of MAS overcomes the lack of relevance of MIS information for managing flexibility and decentralization.

The findings of this paper also show that educational and functional diversity in TMTs, rather than age and tenure diversity, has

a moderating effect on the relationship between sophisticated MIS and strategic performance. We can conclude that TMT with diverse educational and experience background can manage a broader range of information provide by sophisticated MIS. Thus, organizations can achieve strategic performance based on both flexibility and cost control. In this line, Simons et al. (1999) made a distinction between job-related TMT diversity (e.g. education and functional) and non-job-related TMT diversity (e.g. age). They found that job-related diversity increased debate in TMTs and affect positively on performance. However, non-job related diversity was not related to performance. In this vein, Smith et al. (1994) found that TMT diversity in terms of functional and educational background enhanced the effectiveness of TMT facing complex decision-making. Thus we can concluded that TMT diversity in terms of functional and educational has a high task-related skills and perspective to manage more comprehensive information, which represents a potential for enhancing strategic performance (Simons et al., 1999; Smith et al., 1994).

Overall this study has shown that TMT diversity is an important variable influencing the relationship between MIS sophistication and strategic performance. The issues of management organizational performance are critical problems confronting top managers in public organizations. The findings of this paper provide a fruitful avenue for improving our understanding of strategic performance in hospitals and other organizations. Governmental authorities have to design the MIS to provide a broad range of information to health care managers. Thus, top management teams can face the challenge of balances and coordinates patients, financial, organizational and community needs (Fuller-Love & Cooper, 1996; Brittain & Macdougall, 1995; Shortell et al., 1996).

An important practical consequence of this study is that not only a sophisticated MIS design matter for achieving different strategic performances, but also an alignment with the TMT composition. A TMT with a wide set of skills, perspectives and background could optimize the effect of sophisticated MIS on strategic performance. Thus, organizations should design their MIS to cater for individual differences of TMTs, specially educational, training and functional backgrounds. Moreover, boards of directors, as responsible of appointing managers in the TMT, will require more detailed information on their job-related background to proper balance the strategic goals of the organization.

As any empirical study, this paper has its limitations, such as the lack of testing of the directions of causality due to the cross-sectional nature of the study and the focus on a single industry. Although we believe that the hospital sector is well suited to test our hypotheses, it may contain idiosyncrasies that have been overlooked. Clearly, empirical testing of our hypotheses in a different industrial setting may add to the external validity of the results.

Appendix A

Questionnaire items

1. Manager's characteristics

- Age
- Tenure in management position in this organization
- University degree and title
- Years of health care postgraduate education (e.g. seminars, special courses on clinical issues)
- Years of business administration postgraduate education (e.g. seminars, special courses, MBA)

2. MIS sophistication

Please indicate the extent to which you perceive that your hospital's MIS is providing each of the following characteristics:

- Information that relates to possible future events (for example new legislation).
 - Internally oriented information, such as efficiency, output rates, etc.
 - Information on broad factors external to your organization, such as economic conditions, population growth, technological development, labour market, etc.
 - Non-financial information, such as employee attitudes of government and consumer bodies, competitive threats, etc.
 - Information provided on the different sections of functional areas in your organization.
 - Information on the effect of events on particular time periods (e.g., month/quarter/annual summaries).
 - Information that relates to the impact that your decisions have on the performance of other departments.
 - Presence of precise targets for each activity performed in all sections within your department.
 - Requested information arrives immediately upon request.
 - Reports are provided frequently on a systematic, regular basis; e.g. daily/weekly.
 - Economic information (e.g. cost and price) of the departments of your organization.
 - Information supplied to you automatically upon its receipt into information systems or as soon as processing is completed.
3. Strategic performance focused on cost and flexibility
- Please indicate the extent to which you perceive that next year you will achieve the following strategic performances:
- Decentralization of responsibilities.
 - Programs of cost reduction and programs by products or services lines.
 - Customer participation in management.
 - Continuous updating of staff's knowledge.
 - Programs of enhancing budget performance.
 - Cooperation with others units or departments inside hospital.
 - Coordination and cooperation with others organizations relate to hospitals (e.g., social services, environmental services).
 - Programs of harmonization and cooperation inside your department.
 - Actualization and use of management information (focused on the cost of medicines and healthcare appliances).

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