EXAMINING THE JOINT EFFECTS OF STRATEGIC PRIORITIES, USE OF MANAGEMENT CONTROL SYSTEMS, AND PERSONAL BACKGROUND ON HOSPITAL PERFORMANCE

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Submitted to *Management Accounting Research 2015*

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Abstract

This study aims to respond to recent calls for a better understanding of the factors that support the effectiveness of formal control practices in hospitals. Based on survey data from 117 top-level managers in Belgian hospitals, the study investigates the performance effects of the alignment between the use of performance measurement systems (PMS), strategic priorities, and the particular role top-level managers' personal background plays in this context. The quantitative results suggest that it is the top-level managers' personal background that brings to life the benefits of the alignment between the use of PMS and strategic priorities in hospitals. Specifically, this paper shows that when the emphasis on partnership or governance strategic priority is high, the effect of the interactive use of PMS on hospital performance is more positive for top-level managers with a clinical background than for those with an administrative background. This study offers value for practitioners in that it supports the argument that hospitals can benefit from involving physicians in the top-level management team.

Keywords

Performance measurement systems; strategic priorities; personal background; hospital performance; interactive use

1. Introduction

Hospitals face growing regulatory and competitive pressures to develop management control systems (Cardinaels and Soderstrom, 2013). However, formal management control systems (MCS) are seen to be problematic in hospitals (Aidemark and Funck, 2009). Questions about the use of monetary incentives for goal congruence, the power of physicians and nurses over operational processes, various priorities imposed by a large diversity of influential stakeholders, and austere budgets that constrain expansion and restructuring combine to create unparalleled complexities for the effective use of MCS (Abernethy et al., 2007). Previous research in management accounting thus calls for a better understanding of MCS in hospitals (e.g., Bai et al., 2010; King and Clarkson, 2015), especially factors that influence the effectiveness of formal performance measurement systems (PMS) (Ballantine et al., 1998; Cardinaels and Soderstrom, 2013).[2]

Over the past two decades, the literature on MCS in hospitals has emphasised the importance of aligning the use of MCS with hospital strategies (e.g., Aidemark and Funck, 2009; Ballantine et al., 1998; Chilingerian and Sherman, 1987; Wardhani et al., 2009), an alignment that should lead to positive organisational outcomes, such as hospital performance

[2] Management control systems are defined as "formal, information-based routines and procedures managers use to maintain or alter patterns in organisational activities" (Simons, 1995, p. 5). Formal performance measurement systems are an essential aspect of formal management control systems (Chenhall, 2005; Henri, 2006).

(King et al., 2010). Inherent in these arguments is the implicit assumption that the individual behaviour of clinicians dominating the core operations of a hospital can be controlled towards the successful achievement of hospital strategies. However, several management accounting studies (e.g., Abernethy and Stoelwinder, 1991, 1995; Jones, 2002) report that regular conflicts between the professional objectives of administrators and clinicians curtail the effectiveness of MCS. Coombs (1987, p.391) notes that bureaucratic control mechanisms attempted by administrators have "the potential to substantially affect the motivations and practices of a relatively cohesive and powerful occupational group who frequently defend their professional autonomy quite effectively". Therefore, our knowledge of how PMS are effectively used to support hospital strategies remains incomplete and fragmented.

In the hospital management literature, significant attention has concentrated on the role of "doctor managers" (i.e., managers with a clinical background) in the management team and the implications for hospital effectiveness (Bai and Krishnan, 2014). Previous empirical findings suggest that greater participation of doctors in management teams is positively associated with increasing engagement in quality improvement initiatives and improved strategic decisions (Veronesi et al., 2013). In contrast, there are relatively few empirical studies in the management accounting literature that assess the effectiveness of PMS used by doctor managers, despite clear evidence that the use of bureaucratic control mechanisms in hospitals differs according to the top-level managers' personal background (Abernethy et al., 2007). This paper aims to fill this gap.

We suggest that the involvement of doctor managers in the use of PMS is likely to affect dialogue between top-level managers and clinicians and is one potential solution for an effective use of PMS in the support of certain hospital strategies. These top-level managers with a clinical background, educated and socialised with different values and perspectives than top-level managers with an administrative background, would preserve freedom in professional and medical judgement and at the same time address the financial and organisational concerns of the physicians. Therefore, this paper seeks to extend previous studies at the interface between MCS and hospital strategy and to explore how top-level managers with different personal backgrounds (i.e., clinical vs. administrative) use PMS to successfully support hospital strategies.

In line with previous studies on MCS-strategy relationships in a healthcare setting (e.g., Abernethy and Brownell, 1999; Naranjo-Gil and Hartmann, 2007), we explore two dimensions of the use of PMS, namely, diagnostic and interactive, which have been extensively described by Simons (1995, 2000). A diagnostic use of PMS entails formal,

information-based routines and procedures that emphasise the development of critical performance variables to translate the organisation's intended strategy, identify pre-set performance targets, measure deviations, and implement corrective actions. In contrast, an interactive use of PMS (e.g., Henri, 2006; Marginson, 2002; Widener, 2007) involves top-level and operating managers using formal, information-based routines and procedures to debate face-to-face, with a focus on strategic uncertainties, in a non-invasive, facilitative, and inspirational manner (Bisbe et al., 2007).

In this study, we build on management control theory, mostly focused on healthcare organisations, to develop and test two research models: (i) a preliminary MCS-strategy fit model detailing the joint effect of strategic priorities and use of PMS on hospital performance, and (ii) a more comprehensive model detailing the joint effect of strategic priorities, use of PMS, and personal background on hospital performance. The first research model aims to examine whether adopting a contingency-based perspective helps predict the effectiveness of PMS in the healthcare sector. The objective of the second research model is to explore the role of top-level managers' personal background, identified as important in understanding behaviour in hospitals, in MCS-strategy relationships. We test the two research models with survey data from 117 top-level hospital managers in Belgian hospitals.

Our study contributes to the extant management accounting and healthcare literatures by producing empirical evidence on the use of MCS by healthcare managers. This research improves our understanding of factors that influence the effectiveness of PMS in hospitals, recognising different strategic priorities and the tensions that emerge when doctors engage in management. Additionally, our findings shed more light on the complex relationships that exist between individual, structural and contextual variables and hospital performance. Specifically, we propose and present quantitative evidence that the personal background of top-level managers is an important moderator of the relationship among the use of PMS, strategic priorities, and organisational effectiveness in healthcare. Hence, this research calls for caution in generalising the expected effects of MCS on hospital performance and identifies scenarios for reconciling different perspectives on how PMS should be effectively used in hospitals through the explicit consideration of personal background. This study also extends previous research by developing a more comprehensive and integrated model specifying the background of the performance information user under which PMS use and strategic priorities will produce favourable outcomes. There has been relatively little empirical evidence on this relationship in the literature to date.

The remainder of this article proceeds as follows. After we review the literature on

hospital strategy, the styles of PMS use, the effects of strategy and PMS on performance, and top-level managers' personal background, we formulate and explain the research hypotheses. The subsequent section presents the research design, variable measures, and validity analyses. This section is then followed by the presentation of results. Finally, we provide conclusions, limitations, and some research extensions.

2. Literature review

2.1. Hospital strategy

Empirical research in management and accounting notes the implications of strategic orientation for managerial practices (e.g., Chenhall and Langfield-Smith, 1998; Ittner et al., 2003; Mintzberg, 1990; Porter, 1980) and other elements of the control systems in hospitals (Abernethy and Lillis, 2001). A relevant stream of literature (e.g., Abernethy and Brownell, 1999; Naranjo-Gil and Hartmann, 2007) uses Miles and Snow's (1978) strategic patterns, classified as prospectors, analysers, and defenders. Others use Porter's (1980) framework to examine strategy contributions to control system designs (e.g., Pizzini, 2006).[3] However, there is general congruence between Miles and Snow's and Porter's categories (Langfield-Smith, 2007; Shortell et al., 1990), although Porter's (1980) framework is difficult to adapt to professional service organisations because of its central focus on product characteristics (Chenhall, 2005), limited representation of multidimensional organisational strategies (Ittner and Larcker, 2001), and inability to discriminate cost leaders from differentiators in quantitative empirical research (Langfield-Smith, 2007).

Previous literature also offers healthcare-specific strategic frameworks (e.g., Goldstein et al., 2002; Nath and Sudharshan, 1994; Wells and Banaszak-Holl, 2000). Zelman and Parham (1990) characterise four strategies hospitals use to define their business focus (i.e., generalist, market specialist, service specialist, or super specialist). Recognising that each business can undertake a strategic orientation, Butler et al. (1996) also synthesise Miles and Snow's (1978) pattern with hospital-specific strategic orientations: pacesetter hospitals are at the forefront of medical knowledge and technology, pacemaker hospitals are at (or near) the

[3] According to this framework, firms have two strategic priorities, representing two extreme points on a spectrum: low cost production to be a cost leader or superior product quality, flexibility, customer service, delivery, and design to achieve differentiation leadership (Chenhall and Langfield-Smith, 1998).

state of the art in every department offered, and provider hospitals are usually small and emphasise operations management and cost control as key to their competitive strategy.

However, hospitals often use multiple strategies simultaneously rather than adopting a single set of stable practices focused on a sole strategy (Goldstein et al., 2002), largely because of the coercive influences of various powerful stakeholders with diverse and complex objective functions and work methods (Abernethy et al., 2007; Chenhall, 2007; Eldenburg and Krishnan, 2007). These stakeholders include local authorities, central governments, public sickness funds, private insurance companies, pharmaceutical corporations, universities, monastic orders, donors, patient groups, and nurses and physicians with multiple hospital affiliations, to name a few. Because these parties exert pressures on hospitals to shape how they allocate and manage resources (Braithwaite, 2004; Cardinaels and Soderstrom, 2013), hospitals are constrained to place emphases on various strategic priorities. Strategic priorities are diverse (e.g., Brown et al., 2005; Joshi et al., 2003); therefore the existence, importance, and relationship of each strategic priority with a style of PMS use should not be identical. To improve our understanding of how hospital strategies affect styles of PMS use, we specify separate strategic priorities in this study.

According to organisation theory (Diesing, 1962; Quinn and Rohrbaugh, 1983; Smith et al., 1985), priorities are organisational concerns that can be observed by focusing on the organisational attention and resources deployed. Smith et al. (1985) argue that authors drawing on this theory usually describe very similar typologies of priority, typically containing a rational goal category (i.e., planning and setting organisational goals for improved productivity and efficiency), an internal process category (i.e., coordinating and distributing information and communication for stability and security), an open system category (i.e., developing flexibility and readiness for resources acquisition and external support), and a political support category (i.e., maintaining cohesion and morale for a better human resources development). These categories of priorities are useful in terms of identifying strategic priorities in hospitals. Drawing an analogy with these categories based on the hospital management literature (e.g., Adler et al., 2003; Brown et al., 2005; Butler and Leong, 2000), strategic priorities in hospitals are organisational concerns with a long-term perspective that designate ways to create expectations and values for hospital stakeholders. Hence, four strategic priorities in hospitals can be identified:

- *Administration*. This strategic priority involves monitoring the costs and productivity of hospital internal resources (e.g., finance, human) to maintain a basic financial viability (Abernethy et al., 2007; Shortell et al., 1985). This day-to-day result-oriented focus is

increasingly important for all modern hospitals due to recent regulatory and competitive changes in the industry (Eldenburg and Krishnan, 2007; Vandenberghe, 1999).

- *Operations*. This strategic priority focuses on ensuring the hospital's internal operational activities, such as patient care, research and education, and meeting safety and quality requirements, which reflect an important long-term priority for hospitals (Brown et al., 2005; Goldstein et al., 2002; Nath and Sudharshan, 1994; Young et al., 1992). This priority involves the ongoing effort to improve valuable, high quality services that meet or exceed patient expectations (Carman et al., 2010).
- *Partnership*. This strategic priority addresses the process of managing a hospital's formal boundary-spanning activities. In response to recent developments that move modern medicine increasingly outside hospitals, this strategic priority seeks to integrate and coordinate different health delivery organisations and self-employed professionals to build an integrated health delivery system such that a hospital's healthcare activities are complementary to those of its partners (Lega, 2007). Emphasising a partnership priority allows hospitals to realise economies of scale, support innovation, share administrative services, and remain structurally independent (D'Aunno and Zuckerman, 1987; Fauré and Rouleau, 2011; Goes and Park, 1997; Provan, 1984), all of which require a long-term outlook.
- *Governance*. This strategic priority involves implementing administrative rules and legal regulations that describe the rights and duties of each employee. An emphasis on governance ensures that hospitals are accountable for their recruiting, hiring, and promotion practices because they recruit and promote people into specific positions in a way that ensures they possess the expertise, skills, and experience required for those positions (Bunderson et al., 2000). Governance is a contemporary strategic concern (Brown et al., 2005; Eldenburg and Krishnan, 2007; Young et al., 1992) because of the need to safeguard the continuity of historical healthcare values, address increased hospital scale and scope, and move from healthcare supply to patient demand (Eeckloo et al., 2004).

Although recent health system reforms broadly observed in many Western countries follow the same pattern (Eldenburg and Krishnan, 2007; Cutler, 2002), variations between national healthcare systems and policy contexts can potentially lead to different professional

responses to these reforms (Cardinaels and Soderstrom, 2013). Thus, after considering the literature, we explored these various complex and highly context-dependent categories, represented in the contemporary meaning and importance of hospital priorities, in discussions with industry experts in the Belgian national healthcare context[4] to verify the suitability of these categories in literature to a particular setting (see the "Research methodology" section). It emerged from these discussions that administration priority constitutes a common (non-strategic) platform developed by most Belgian hospitals, regardless of the specific long-term directions pursued by the hospital. This administration category therefore constitutes a (non-strategic) priority in Belgium[5].

In our research setting, we do not assume that contemporary hospitals pursue only one strategic priority at any given time; rather, we acknowledge that they are often pressed to implement various strategic priorities simultaneously (Naranjo-Gil and Hartmann, 2006). These categories thus are complementary rather than mutually exclusive.

2.2. Styles of PMS use

Pressures on hospitals (e.g., from policymakers, patients, and insurance companies) to account for and improve their effectiveness and efficiency have prompted the widespread emergence of PMS (e.g., balanced scorecard, traditional financial performance measurement tools, tableau de bord, and performance prism) as a facet of MCS (Van der Geer et al., 2009). These systems comprise financial, strategic, and operational metrics (Bisbe and Malagueño, 2012; Ittner and Larcker, 1998) designed to capture various hospital activities to facilitate planning and decision-making as well as to produce desired hospital outcomes effectively (Abernethy et al., 2007). Not only are PMS widely used in practice (Ittner and Larcker, 1998;

[4] Hospitals are critical to the Belgian economy, accounting for approximately 11% of the Belgian gross domestic product (the Organisation for Economic Co-operation and Development [OECD] average is 9.6%) and with an average annual growth rate of 4% in the first decade of the twenty-first century (OECD, 2011).

[5] In Belgium, there are private (non-profit) and public hospitals. In both cases, healthcare is largely publicly financed (more than 80%) (see Schokkaert and Van de Voorde, 2005). In this institutional environment, all hospitals are pressed to conform to the administration system imposed by the government and adopt this same short-term organisational priority, regardless of specific value creation for hospital stakeholders. Our sample seems to confirm this Belgian institutional environment. The raw scores on strategic priorities (average of all items used for calculating factor scores as described in Table 2) range from 1.00 to 5.00, with a median for the total sample of 3.75. This suggests that hospital managers' emphases on different strategic priorities vary greatly across organisations. An exception seems to be the administration priority. Of the 117 observations in our final sample, 86 present raw scores for administration priority above the median. For the other priorities, the results show fewer than 52 observations per strategic priority to be above the median. The abundant number of respondents who have highly rated items associated with administration priority provides some evidence that the administration priority constitutes a common (non-strategic) platform across all hospitals, regardless of specific value creation for hospital stakeholders. Therefore, we excluded the administration category from the strategic priorities and do not formulate a hypothesis on the indirect effect of the administration priority on hospital performance.

Widener, 2007), but they appear to have become important to the management of hospitals (Adler et al., 2003; Li and Benton, 1996).

We turn to Simons' (1995) framework to describe styles of PMS use in hospitals. This framework, which describes styles of MCS use (Ahrens and Chapman, 2004) and incorporates the notion of organisational strategy (Kober et al., 2007; Marginson, 2002; Widener, 2007), has been tested empirically (e.g., Widener, 2007) in hospital settings (e.g., Naranjo-Gil and Hartmann, 2007). The framework describes two styles of PMS use, namely, diagnostic and interactive, reflecting opposite forces of routines and procedures, respectively (Henri, 2006; Marginson, 2002; Mundy, 2010). When managers make diagnostic use of MCS, the formal, information-based routines and procedures lead them to establish guidelines, identify performance variables and targets, measure any deviations from this performance level, and take corrective actions. This traditional feedback system, typically viewed as an "answer machine" (Burchell et al., 1980), primarily reflects a cybernetic use of routines and procedures because it denotes a self-correcting mechanism that tends to reduce any deviations from pre-set standards of performance, contributes to a top-down strategy execution, standardisation, and efficiency (Simons, 1995) and because organisational attention to new opportunities is limited (Mintzberg, 1990).

In contrast, when managers use MCS interactively, the formal information-based routines and procedures encourage debate to resolve strategic uncertainties and inspire organisational members (Bisbe et al., 2007). Instead of the answer machine of the diagnostic method, we observe a "learning machine," in that members use these routines "to explore problems, ask questions, explicate presumptions, analyse the analysable and finally resort to judgement" (Burchell et al., 1980, p. 14-15). Therefore, unlike diagnostic use, interactive use represents an opposite force of routines and procedures because it designates a self-reinforcing technique that seeks to promote innovation by offering a higher degree of freedom of actions, encourages the development of bottom-up strategies and experimentation of new ideas (Simons, 1995), and emphasises organisational attention to opportunities for learning (Mintzberg, 1990).

2.3. Effects of strategy and PMS on performance

An extensive research tradition, rooted in the contingency literature, investigates the impact of the fit between MCS and strategy on organisational performance (Chenhall, 2007; Langfield-Smith, 2007; Tucker et al., 2009). This literature stream first suggests that the

execution of any set of strategic priorities within the same organisation may rely on the combination of different uses of MCS; different strategic priorities require particular uses of MCS to support their achievement (Govindarajan, 1988). For example, Ahrens and Chapman (2004) suggest that the mechanistic and organic characteristics of MCS can be combined to help achieve a set of efficiency- and flexibility-related priorities. In addition, Simons (1987) provides empirical evidence that although firms prioritising efficiency rely more on the diagnostic uses of MCS, firms prioritising flexibility place more emphasis on the interactive use of MCS. Similarly, Widener (2007) shows that operational uncertainties have the largest impact on the diagnostic use of PMS; competitive uncertainties better explain their interactive use. Moreover, the MCS-strategy fit literature suggests that different uses of PMS instil different behaviours and that aligning the use of PMS to strategic priorities facilitates effective strategy execution, thereby improving organisational performance (Chenhall, 2005; Ittner et al., 2003; Van der Stede et al., 2006; Verbeeten and Boons, 2009).

Previous accounting studies, drawing on these contingency tenets in a healthcare setting, have empirically examined the interaction between hospital strategy and the use of MCS, such as management techniques aimed at improving hospital operations (Chilingerian and Sherman, 1987), total quality management programmes (Carman et al., 2010), budgeting systems (Abernethy and Brownell, 1999), and PMS (Ballantine et al., 1998) such as balanced scorecards (Aidemark and Funck, 2009). Other accounting studies have also focused on the performance effect of the alignment between hospital strategy and the use of MCS. For example, King et al. (2010) designed a cross-sectional research study with survey data from small private primary healthcare businesses, showing significant results linking contingency factors (such as strategy), budget use, and performance of healthcare organisations. Abernethy and Brownell (1999) in turn used questionnaire responses from CEOs of large public hospitals to provide empirical evidence that matching the style of budget use with strategic change leads to the highest performance. Finally, Kaplan (2001) reports longitudinal evidence of the positive impacts of developing and using a balanced scorecard for the strategy of Duke Children's Hospital, a 138-bed in-patient facility. Although these findings, taken as a whole, help provide theoretical support to predict the performance effect of the interactions between the use of PMS and hospital strategic priorities, a limited number of studies have empirically tested this specific contingency relationship in hospitals.

Much of this contingency literature implicitly assumes that all hospital members are committed to the achievement of hospital strategic priorities and will, therefore, adopt rational behaviour in line with bureaucratic control mechanisms designed to support these

priorities. However, another stream of literature sheds light on empirical evidence depicting regular tensions and conflicts between the professional objectives of administrators and clinicians viewed as 'dominant professionals' (Raelin, 1986), which prevent the effectiveness of these mechanisms. In this paper, we build on previous research (e.g., Abernethy, 1996; Abernethy and Stoelwinder, 1991) on the use of bureaucratic control mechanisms in hospitals and suggest that these two streams of research can be reconciled when integrating members of the medical profession within the management team.

2.4. Top-level managers' personal background

The extant literature in strategic management helps explain strategic choice and courses of action by referring to the idiosyncrasies of top-level managers, such as their education and experience (e.g., Hambrick and Mason, 1984). Managers' actions are governed by their individual interpretations of the strategic situations they face, which in turn depend on their cognition, values, and personality (Hambrick, 2007). In this respect, courses of action can be explained by referring to the biases and dispositions of powerful actors in the organisation. Measuring top-level managers' cognitive frames is a complicated task, but education and experience offer observable personal characteristics that can be appropriate proxies for psychological constructs (Carpenter et al., 2004), and thus might explain variations in organisational processes (Michel and Hambrick, 1992; Smith et al., 1994) such as the uses of the performance information provided by MCS (Naranjo-Gil and Hartmann, 2006).

The behavioural relevance of personal backgrounds is widely accepted in management literature (Carpenter et al., 2004; Hambrick, 2007; Von Nordenflycht, 2010) and increasingly acknowledged in management accounting literature (Schaeffer and Dossi, 2014). Specifically, top-level managers' personal backgrounds represent their individual experiences, obtained over time, and summarised as their educational and work experience (Hambrick, 2007). Whereas education measures typically refer to diplomas (e.g., medical degree, MBA, military education) granted by a higher education institution, organisational researchers usually define work experience as the sum of events the person undergoes that relate to his or her job performance (Quiñones et al., 1995). Each event generates tacit and explicit knowledge that can be internalised or encouraged by organisational routines. The sum of events shapes idiosyncratic, individual features, which affect managers' actions, decisions, and behaviours (Avolio et al., 1990).

In hospitals, top-level managers' personal backgrounds can typically be classified as either clinical or administrative (Kurunmäki, 2004; Witman et al., 2010). Hospital managers with a clinical background are usually former physicians or healthcare providers who graduated from a medical school, thus suggesting an emphasis on autonomous (rather than team-based) and competitive (rather than cooperative) behaviours (Garman et al., 2006; Von Nordenflycht, 2010). The length of their mandatory education, emphasis on high grade point averages, and need for extensive and complex professional knowledge lead to the substantial power and influence of this group of workers (Adler et al., 2003; Teece, 2003; Von Nordenflycht, 2010). They accumulate professional experience through continuous involvement in the core operational activities of the hospital and routine contact with patients. This educational and professional experience shapes their interest in and knowledge of the primary processes of hospitals. In contrast, top-level managers with an administrative background have typically graduated from a business, economics, or law school and gain administrative experience with general, accounting, and financial management, rather than specific medical processes. These managers have likely been trained in accountability and control and are governed by performance indicators (Garman et al., 2006).

3. Hypotheses formulation

In this section, we first develop hypotheses concerning the performance effect of the interactions between hospital strategic priorities (i.e., operations, partnership, and governance) and use of PMS (i.e., diagnostic and interactive). Secondly, we explore the extent to which our understanding of the performance effect of these interactions is improved by accounting for the different personal backgrounds of top-level hospital managers.[6]

3.1. Joint effect of strategic priorities and use of PMS on hospital performance

The emphasis placed by hospitals on operations priority ensures that valuable patient-centred activities, such as patient safety, high-quality patient care delivery, and quality improvement, are achieved (Brown et al., 2005; Teisberg et al., 1994). Work rules and standardised procedures, with their emphasis on prescriptive guidance, are then developed, communicated, and tightly controlled (Langfield-Smith, 2007). In this respect, safety, quality assurance, and operating productivity can be captured by routine PMS (Flynn, 2002). The mechanistic logic behind the diagnostic use of PMS suggests that it supports operations priority. The diagnostic use of PMS requires performance measures to meet certain conditions. It must be possible to translate the strategic priority into set standards, allow for simple measures of actual outputs, support calculations of the deviations, and standardise procedures (Daft et al., 1988; Widener, 2007). Otherwise, performance measures could be unstable due to noise or imprecision (Banker and Datar, 1989). Managers look for variations between results and established standards on internal operations and then build a feedback channel to allow top-level managers to communicate exception reports on internal operations

[6] In this study, we hypothesise interaction effects rather than main effects because there is no a priori reason why a given hospital strategic priority, style of PMS use, or personal background, in itself, should have a positive or negative effect on hospital performance. The impact of each variable will be limited unless these variables are combined and interact. We summarise these expectations in H1–H6. Similarly, in this research, we do not hypothesise two-way interactions for the relationship between strategic priority and personal background and styles of PMS use and personal background. First, the combination of strategic priority and personal background alone might not result in enhanced performance. The best-laid strategic priority coupled with the most relevant personal background is not sufficient to achieve competitive advantage and lead to superior hospital performance unless top-level managers use management tools and other administrative mechanisms of effective strategy implementation (Govindarajan, 1988), such as PMS (Chenhall and Langfield-Smith, 1998). Second, performing well in terms of successfully achieving hospital objectives is not due to the combination of styles of PMS use and personal background itself. Operating in a healthcare context without the consideration of strategic priorities creates ambiguity for top-level managers with clinical and administrative backgrounds about where to commonly focus their attention and effort (Abernethy and Brownell, 1999; Naranjo-Gil and Hartmann, 2006). These managers may not recognise the appropriate actions and decisions and could individually encourage separate developments of short-term priorities and unrelated local initiatives, which will prevent the successful achievement of organisational objectives of the hospital.

as well as how to get back on track (Widener, 2007), thus improving the decision-making process and facilitating the successful achievement of operations objectives (Chenhall, 2007).

In a hospital setting, partnership and governance priorities appear largely unrelated to the diagnostic use of PMS. Performance measures reflecting these strategic priorities may facilitate discussions among top-level managers, but are unlikely to be sufficiently routine (Widener, 2007) or informative in regard to managerial actions and decisions (Hartmann, 2000). Moreover, an increasing emphasis on governance priority implies reviewing the current structure (e.g., restructuring managerial roles and responsibilities) to pursue a new organisational structure focused on patients and their diagnoses (Hyer et al., 2009). This process leads top-level managers to adjust their traditional attributions of responsibilities (i.e., who is responsible for which performance measures) and the associated reward and incentives systems, which render the diagnostic use of PMS inappropriate. Similarly, the implementation of partnerships involves the creation and extension of interdependencies with partners, which also renders a rigid use of PMS inappropriate (Otley, 1980). In contrast, management control studies argue that to be successfully implemented, some strategic priorities seem to attach a great deal of importance to a combination of coordination, autonomy, decentralisation (Bouwens and Abernethy, 2000), and an adequate use of PMS (Verbeeten and Boons, 2009), which is central in hospitals in which medical services are strongly compartmentalised and powerful and influential actors are engaged in boundary-spanning work.

A partnership priority necessitates the use of a coherent set of performance metrics that assess strategic issues such as collaborations with academics and training facilities for human resource planning, vertical and horizontal integration, and relations with other healthcare providers or facilities (Brown et al., 2005; Gunasekaran, 2002). These measures are process-oriented (cf., result-oriented) and suggest the need for liaisons to facilitate discussions of these measures among different functional managers. The interactive use of PMS, with its focus on face-to-face challenges and debates across the organisation as well as its non-invasive, facilitative, and inspirational aims allows and stimulates the development of fluent vertical and horizontal liaison groups (Adler et al., 2003). According to the contingency literature, adopting an interactive use of PMS to develop a partnership priority enables top-level managers to make decisions more effectively, thereby resulting in better hospital performance.

Finally, hospital governance poses challenges to the orthodox power bases of physicians, nurses, and managers. Previous research notes that cultural and behavioural

reluctance present threats to top-level managers and boards trying to implement hospital governance (Flynn, 2002; Hackett et al., 1999). Physicians perceive hospital governance as threatening to their professional freedom and as a new top-down vehicle to impose managerialism, which increases the likelihood of goal conflicts. Management control theory suggests that such a strategic priority, which is not widely accepted by influential and powerful actors in the firm, needs to be complemented by organic controls, characterised by loose control over operations and open channels of communication (Burns and Stalker, 1961). In a hospital setting, both Abernethy and Vagnoni (2004) and Naranjo-Gil and Hartmann (2006) show that top-level managers use accounting information systems interactively, which is an associated form of organic control (Henri, 2006), to address goal conflicts by enforcing communication, dialogue, and coordination, thereby leading to better hospital performance (De Dreu and Weingart, 2003). This discussion suggests the following hypotheses:

Hypothesis 1. The emphasis placed by hospitals on operations priorities is positively associated with performance when top-level managers use performance measurement systems diagnostically.

Hypothesis 2. The emphasis placed by hospitals on partnership priorities is positively associated with performance when top-level managers use performance measurement systems interactively.

Hypothesis 3. The emphasis placed by hospitals on governance priorities is positively associated with performance when top-level managers use performance measurement systems interactively.

3.2. Joint effect of strategic priorities, use of PMS, and personal background on hospital performance

In this section, we hypothesise and explain that combining specific hospital strategic priorities with certain styles of PMS use will be more effective in terms of hospital performance when top-level managers' personal backgrounds are considered in hospital management structure. In other words, the effects of personal background (i.e., clinical or

administrative) on hospital performance will be influenced by the emphasis placed on specific hospital strategic priorities and certain styles of PMS use.

Superior hospital performance occurs when the information provided by PMS and appropriate individual experience helps top-level managers facilitate the implementation of hospital strategic priorities (Abernethy and Lillis, 2001). Because top-level managers' personal background influences their attitudes towards information obtained from operations, partnership, and governance priority contexts, different personal backgrounds should relate systematically to organisational requirements for dealing with different hospital strategic priorities and styles of PMS use (e.g., Gupta and Govindarajan, 1984; Joshi et al., 2003). Therefore, we examine whether top-level managers' personal backgrounds are an important factor influencing the effectiveness of PMS in the support of strategic priorities.

Operations priority, diagnostic use of PMS, and personal background

We posit that an operations priority accompanied by a diagnostic use of PMS will be more effective in enhancing hospital performance when top-level managers present an administrative rather than clinical background. On the one hand, some empirical findings seem to suggest that clinical performance measures are closely monitored by former physicians with managerial activities (Andersen, 2009). Professionals and top-level managers with a clinical background share similar interests in diagnostic measures related to patient safety, high-quality patient care delivery, and quality improvement because both groups recognise the importance of aims that ultimately help cure people. This standardised procedure refers to the intra-occupational norms and values encouraged by the profession itself (Abernethy and Stoelwinder, 1991).

On the other hand, although top-level managers with an administrative background may have less specific expertise in regard to the development of standardised operating procedures that might be relevant for clinical tasks (Abernethy and Lillis, 2001; Llewellyn, 2001), they are more accustomed to dealing with abstract numbers, distant controls, and management-by-exception. As such, they might be more suitable to monitor and coordinate the achievement of pre-established goals following a traditional mechanistic approach to control that focuses on correcting deviations from pre-set standards of performance. In line with this mechanistic reasoning related to traditional PMS (e.g., Henri, 2006), including tight controls over operations and highly structured communication channels (Burns and Stalker, 1961), top-level managers with a clinical background—typically former physicians—may be reluctant to

impose formal mechanistic controls on their professional colleagues (Abernethy and Lillis, 2001; Naranjo-Gil and Hartmann, 2006; Raelin, 1986). When executing operations priority, the importance of the medical habitus (i.e., the liturgy of the clinic with meetings, patient rounds and the importance of medical talk) and its associated dilemmas (e.g., professional identity, patient care vs. costs, time allocation on managerial activities vs. medical practice) (Witman et al., 2010) prevents them from an effective use of diagnostic measures. Top-level managers with an administrative background, in turn, are not influenced by this medical habitus and the associated dilemmas. Therefore, the diagnostic use of PMS when facing an operations priority is likely to be more effective when the information provided by PMS is used by top-level managers with an administrative rather than clinical background.

Hypothesis 4. A three-way interaction among operations priority, top-level managers' personal background, and diagnostic use of PMS explains performance: when the emphasis on operations priority is high and the personal background is administrative, the diagnostic use of PMS has the strongest positive relationship with performance.

Partnership priority, interactive use of PMS, and personal background

We predict that a partnership priority accompanied by an interactive use of PMS will be more effective in improving hospital performance when top-level managers present a clinical rather than administrative background. Performance measures associated with a partnership priority refer to issues such as integrating partners, aligning strategies, promoting connectivity, and developing partnerships, which require liaison devices to facilitate discussions between managers and partners and/or among functional managers (Fauré and Rouleau, 2011; Gunasekaran, 2002). Top-level managers with a clinical background should be more familiar with such process-oriented issues (Naranjo-Gil and Hartmann, 2006) than their peers with an administrative background. These managers' affiliations with multiple healthcare organisations and membership in the professional culture suggest that they can more easily handle collaborations with academic and training organisations, integrations of other healthcare organisations, and relations with healthcare providers (Brown et al., 2005; Gunasekaran, 2002) than can those with an administrative background. In this partnership context, the interactive use of PMS, with a focus on information exchange across different functional and hierarchical members of the hospital (Abernethy and Brownell, 1999;

Naranjo-Gil and Hartmann, 2007), is likely to be more effective when top-level managers with a clinical background use it than when those with an administrative background do so.

Hypothesis 5. A three-way interaction among partnership priority, top-level managers' personal background, and interactive use of PMS explains performance: when the emphasis on partnership priority is high and the personal background is clinical, the interactive use of PMS has the strongest positive relationship with performance.

Governance priority, interactive use of PMS and personal background

We predict that a governance priority accompanied by an interactive use of PMS will be more effective in improving hospital performance when top-level managers present a clinical rather than administrative background. Adopting or improving hospital governance mechanisms, which physicians may perceive to be a threat to their professional freedom (Flynn, 2002; Hackett et al., 1999), necessitates more intense communication, dialogue, and coordination among physicians and managers to mitigate goal and relationship conflicts. The conflict could be aggravated when top-level managers with an administrative background try to implement this governance priority. Their initiatives could create the sense that they are trying to control physicians' behaviour based on their formal authority and position in hierarchical structures. In contrast, physicians are more willing to accept and identify with these bureaucratic control mechanisms, such as PMS, used interactively to support governance priority when the user of these mechanisms has a clinical background reflecting shared professional values and objectives. We then expect fewer conflicts because they belong to the same professional group as the physicians they manage (Raelin, 1986). As a result, a decrease in goal and relationship conflicts leads to superior team member satisfaction and organisational performance (De Dreu and Weingart, 2003).

Hypothesis 6. A three-way interaction among governance priority, top-level managers' personal background, and interactive use of PMS explains performance: when the emphasis on governance priority is high and the personal background is clinical, the interactive use of PMS has the strongest positive relationship with performance.

4. Research methodology

4.1. Design

To understand different strategic priorities among hospitals, we relied on cross-sectional field study research (Lillis and Mundy, 2005), specifically, preliminary qualitative field research followed by a quantitative empirical examination.[7]

We initially conducted qualitative field research to develop a comprehensive view of the phenomenon (Yin, 1988). We contacted the chief executive officers (CEO) of two Belgian [8] hospitals (a university-affiliated 900+-bed hospital located in Brussels and a psychiatric 100+-bed hospital located in southern Belgium). With their support, we conducted individual tape-recorded face-to-face interviews on site (May–July 2009) with nine top-level managers (at both hospitals: the CEO, medical director, financial director, and human resources director; at the psychiatric hospital: the chief of nurses) and two external experts in the Belgian hospital sector (a former international hospital management expert at the Belgian Technical Cooperation Bureau and the founder of a Belgian consulting firm operating exclusively in the healthcare sector). These interviews took one hour on average and were semi-structured around a set of open-ended questions related to critical strategic issues for their hospital. Thus, we could also pose follow-up questions adapted to each strategy without losing the general interview direction. In light of existing literature, this approach led to the identification of 18 items that capture the critical priorities of Belgian healthcare organisations. In the second phase of this study, we included these items in a survey.

For the hypothesis tests, we adopted a cross-sectional research design. The data were gathered in structured, written questionnaires (in either French or Dutch), sent to two members of the top-level management team (i.e., CEO and medical director [MD][9]) of every

[7] Using qualitative inquiry before the distribution of the questionnaire as an integral part of developing concepts to be tested in subsequent phases is highly valued when "some constructs, such as task uncertainty and strategy, are highly contextualised and need to be constantly realigned with information from the field in order to avoid, for example, under-specification of survey questions" (Lillis and Mundy, 2005, p. 121).

[8] Due to potential variations between different national healthcare systems, the target sample is geographically restricted to one country. We chose Belgium as our research setting for accessibility reasons. Based on a close collaboration with a Belgian university, we had privileged contacts with top-level managers of Belgian hospitals and financial support for the development of a survey.

[9] Previous research indicates that CEOs and MDs are well informed about how their hospitals use formal, information-based routines and procedures (Daft et al., 1988) as well as the importance of diverse strategic priorities (Hambrick and Mason, 1984).

Belgian hospital.[10] Before sending the questionnaire, we checked the validity of the translations by subjectively estimating question quality (Runkel and McGrath, 1972). First, our extensive literature review enabled us to identify and use previously validated scales to measure styles of PMS use and top-level managers' personal backgrounds. Second, two bilingual accounting researchers (i.e., English–Dutch and English–French) translated the instruments. Third, eight academics with survey experience reviewed the written questionnaire for readability.

Following Dillman et al. (2009), our quantitative data collection included four contacts: (1) a pre-notice letter (sent in September 2009), (2) the survey (one week later), (3) a follow-up letter (two weeks later), and (4) a second copy of the survey (two weeks later). For each contact, the package was personally addressed. The goal of the first contact was to induce early interest and trust in the research. The mail package in the second step included a cover letter, the questionnaire (printed on thicker, coloured paper), and a prepaid reply envelope. To motivate respondents, we promised all participants a summary of the mean scores for each question and some statistical analyses to be sent after the data collection period. A postcard reminder was the first follow-up. The second follow-up included the questionnaire and a new cover letter, sent to only those who had not answered. We received 144 mailed questionnaires (of 387),[11] for a response rate of 37.2%, which is similar to the rates reported in comparable studies (Van der Stede et al., 2005). Thirteen questionnaires had to be discarded: nine because they were incomplete and four because the hospitals they represented were too small to have formal control systems in place (i.e., fewer than 50 beds). Fourteen duplicated surveys completed by a second member of the same hospital's top-level management team enabled us to assess inter-rater reliability.[12] Thus, we had 117 responses for hypothesis testing. We summarise the respondent profiles in Appendix A.

We conducted two post hoc techniques to test for common method bias. First, Harman's one-factor test resulted in eight factors with eigenvalues greater than 1, and no particular factor captured more than 22% of the total variance. The factors account for 68% of the total variance, which suggests common rater bias was not a concern. Second, we

[10] The official website of the Belgian Federal Public Service of Health, Food Chain Safety, and Environment features three lists (one per region) dating back to January 2009. The lists included 300 hospital campuses (195 different hospitals): 40 in Brussels, 159 in Flanders, and 101 in Wallonia.

[11] Although we received 172 responses, 28 managers declined to participate, mostly because they lacked at least three years' experience in their position.

[12] The validation sample included 14 hospitals. We assessed inter-rater agreement using the average deviation (AD) index (Burke and Dunlap, 2002). For the five-item Likert scale, we estimated acceptable inter-rater agreement and practical significance at .83 (Burke and Dunlap, 2002). For all five-item Likert scale questions, the AD ranged from .20 to .76 for each hospital and from .21 to .79 for each questionnaire item.

calculated the first unrotated factor as a proxy for common method variance and subsequently used it as a control variable (Podsakoff et al., 2003). The results obtained for the hypothesised relationships, including the common method factor, were similar to those for our base models.

To assess nonresponse bias, we first compared respondents with non-respondents in terms of hospital (i.e., size, diversity, region, type of hospital, and ownership status) and individual (i.e., position) characteristics. Then, we compared early and late respondents with respect to their strategic priorities (mean), diagnostic and interactive uses of PMS (mean), and personal background. The t-tests (for scale variables) and chi-square tests (for categorical variables) revealed no significant mean differences ($p > .05$, two-tailed), with the exception of one variable (partnership priority, $p = .023$).

4.2. Variable measures

To capture the importance of strategic priorities, we asked the survey respondents to indicate, on a five-point Likert-type scale, the extent to which various problems were the focus of management attention and resources, and considered to be of critical importance. With these individual scores, we ran an exploratory factor analysis (principal component with Varimax rotation) across the 18 items using the full dataset (n = 117) and extracted four factors with eigenvalues greater than 1 (explaining 57.6% of the variance). We used the factor scores to describe the emphasis on strategic priority in the hospital. Three of these factors represent strategic issues, whereas the fourth accounts for only administration (non-strategic) priority.[13] Table 1 contains the questionnaire items, factor analysis, loadings, and reliability statistics for hospital strategic priorities and the diagnostic and interactive uses of PMS.

To measure the diagnostic use of PMS,[14] we used the instrument Henri (2006) describes: respondents indicated, on a five-point scale, the extent to which they used a hospital scorecard to track progress towards goals, monitor results, compare outcomes with

[13] Six items did not load satisfactorily ($\lambda < .6$). The administration priority factor included four items: "Secure financial resources", "Meet the hospital activity targets", "Keep medical stars in the hospital", and "Attain profitability or market share goals" (Cronbach's $\alpha = .763$). The second factor, operations priority, included three items, "Manage information systems," "Reduce the administrative burden and red tape", and "Develop internal control procedures", that loaded on one factor (Cronbach's $\alpha = .726$). The partnership priority factor consisted of "Develop customer services or service support" and "Develop a reliable network of doctors or partnerships" (Cronbach's $\alpha = .662$). Finally, the fourth factor, referring to the governance priority, included "Find new top-level managers", "Define the organisation roles, responsibilities and policies", and "Define the roles and responsibilities of top-level managers" (Cronbach's $\alpha = .814$).

[14] In the questionnaire, we described PMS as dashboards composed of a formal set of data on patients, pathologies, hospital activities, finance, and staff.

expectations, or review key measures. The output of an explanatory factor analysis revealed one factor (eigenvalue > 1), which indicated that this construct is unidimensional. The explained variance and Cronbach's α were 68.3% and .845, respectively, which are well above the generally accepted cut-off values.

For the interactive use of PMS, we applied Naranjo-Gil and Hartmann's (2007) instrument (see also Abernethy and Brownell, 1999). This instrument was already adapted to the healthcare industry. Respondents indicated, on a five-point Likert-type scale, the extent to which they used a hospital scorecard for six types of managerial actions: to set and negotiate goals and targets, debate data assumptions and action plans, signal key strategic areas for improvement, challenge new ideas and ways of performing tasks, engage in discussion with subordinates, and use learning tools. These factor analysis results indicated that five items loaded on a single factor (explained variance = 55.3%). The remaining item was excluded from the final construct. A Cronbach's α of .861 indicated the high internal consistency of the final construct.

We measured top-level managers' personal background with a factual question about their functional experience (Hambrick and Mason, 1984). We identified the respondents' experience (clinical versus administrative) according to their response to the question "In which domain have you accumulated the most work experience?" Thus, we include a dummy variable that takes a value of 1 if the top-level manager has a clinical background and 0 otherwise.

For this research, "performance" refers to the effectiveness (goal attainment) of the hospital (e.g., Govindarajan, 1984). Noting the diversity of hospitals and the potential for widely divergent goals in our sample, we opted to use a multidimensional measure with six items related to overall hospital performance (Abernethy and Brownell, 1999; Abernethy and Stoelwinder, 1991): "Financial health", "Ability to attract doctors and nurses", "Reputation of the hospital", "Undergraduate and graduate medical/health professional teaching", "Research", and "Quality of care" (patients' readmission rate). The instrument asked respondents to exercise their personal judgements by ranking their organisation, on a three-point scale, in terms of the extent to which the performance criteria listed were important and reflected the actual performance of the hospital. Scores for each dimension were determined by multiplying "importance" and "performance" scores. We calculated a final performance score by taking the weighted average of all items.[15]

[15] In this study, we acknowledge that measuring hospital performance based on top-level managers' self-rating is unlikely to be straightforward and that a variety of objective measures have been used in previous research (e.g., after-tax return on total

Table 2 provides the descriptive statistics.

Insert Tables 1 and 2 about here

We included hospital size, status, practice type, respondent's age, and location to control for potential structural differences. Hospital size referred to the number of beds (Abernethy and Lillis, 2001; Naranjo-Gil and Hartmann, 2007). Hospital status equalled 1 for private hospitals and 0 for public hospitals. Practice type was measured as a dichotomous variable, equal to 1 for general practice and 0 otherwise. Hospital location is a dummy variable that equalled 1 if the hospital is located in Wallonia and 0 if it is located in Brussels or Flanders. We also entered the other three categories of priority into the regression analyses as control variables in testing Hypotheses 1–6 to control for the implications of conflicting effects of coexisting emphases in the same institution at a given time.

4.3. Confirmatory Factor Analysis

We conducted confirmatory factor analyses (CFA) to empirically verify discriminant validity. First, we tested alternative one-factor and four-factor models to confirm that strategic and non-strategic priorities were distinguishable constructs. Chi-square differences tested which model fits the data better. The results showed that the four-factor model provided a significantly better fit than the one-factor model ($\Delta\chi^2 = 139.9$, df = 6, $p < .01$). The two sets of fit indexes showed that the four-factor model (CFI = .91, IFI = .91, NFI = .83, RMSEA = .09) fit the data better than the one-factor model (CFI = .63, IFI = .64, NFI = .56, RMSEA = .17).

Second, we checked for discriminant validity between the interactive and diagnostic uses of PMS. Although the conceptualisation of these two PMS uses has been well

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assets, after-tax return on sales, hospital total sales growth, patient mortality, rate of occupancy, rotation ratio, length of stay, and patient satisfaction, to name a few). However, this diversity of measures also reflects the lack of consensus in the healthcare economics literature about what constitutes hospital effectiveness and quality (Eldenburg and Krishnan, 2007). Furthermore, such objective data are not easily comparable across private and public hospitals. In contrast, our instrument allows us to capture the multi-dimensional nature of hospital performance and weight these dimensions differently according to the importance for the hospital. For example, academic hospitals are likely to pay more attention to teaching and research quality than hospitals performing no teaching or research activities. This then overcomes some of the hospital performance measurement difficulties associated with a cross-sectional sample where organisational effectiveness may be affected by other factors.

established (Bisbe et al., 2007; Henri, 2006; Widener 2007), we formed one- and two-factor models and ran a chi-square differences test to determine which model fits the data better. The results showed that the two-factor model provided a significantly better fit than the one-factor model ($\Delta\chi^2$ = 60.3, df = 1, p < .01). The two sets of fit indexes showed that the two-factor model (CFI = .98, IFI = .98, NFI = .93, RMSEA = .06) fit the data better than the one-factor model (CFI = .86, IFI = .86, NFI = .82, RMSEA = .15). Moreover, in the two-factor model, all items significantly loaded on their respective latent variables. These CFA results indicate that the conceptual distinction between the interactive and diagnostic uses of PMS had satisfactory discriminant and convergent validity.

5. Results

Table 3 contains a Pearson correlation matrix. As the table shows, none of the independent variables were significantly related to performance. We used hierarchical moderated regression analyses to test Hypotheses 1–6. Table 4 depicts the results of the regressions in which hospital performance is the dependent variable, and its predictor variables were entered in the following order:

- Model 1: (step 1) control variables, (step 2) the two main effects, and (step 3) the two-way interaction;
- Model 2: (step 1) control variables, (step 2) the three main effects, (step 3) the three two-way interactions, and (step 4) the three-way interaction.

Hypotheses 1 to 3, tested in Model 1, posit a positive effect on performance of the interaction between the styles of PMS use and the emphasis hospitals place on specific strategic priorities. As shown in Panel A (for Hypothesis 1), Panel B (for Hypothesis 2), and Panel C (for Hypothesis 3), none of the incremental R-squares calculated in Step 3 were statistically significant ($\Delta R^2 \leq .005$, $p > .10$). As such, Hypotheses 1 to 3 are not supported.

Hypotheses 4 to 6 are tested in Model 2. Hypothesis 4 predicts a positive effect on performance of the interaction among the diagnostic use of PMS, emphasis on operations priority, and top-level managers' personal background. As shown in Panel A, Step 4, the incremental R-square was not statistically significant (ΔR^2 = .001, p > .10). Therefore, Hypothesis 4 is not supported. Hypothesis 5 predicts a positive effect on performance of the interaction among the interactive use of PMS, the emphasis on partnership priority, and top-level managers' personal background. In support of Hypothesis 5, the results in Panel B, Step

4, show that adding this product term significantly increased the variance explained in hospital performance ($\Delta R^2 = .025$, $p < .01$). Finally, Hypothesis 6 predicts a positive effect on performance of the interaction among the interactive use of PMS, the emphasis on governance priority, and top-level managers' personal background. Panel C, Step 4, contains results that support Hypothesis 6, indicating that adding the three-way interaction significantly increased the variance explained in hospital performance ($\Delta R^2 = .026$, $p < .01$).

Figures 1 to 3 show the results of a simple slope analysis for each regression line used to examine the interactions predicted in Hypotheses 4 to 6, respectively. Figure 1 shows no significant differences in slope between the diagnostic use of PMS and hospital performance when the emphasis on operations priority is high and when the personal background is administrative. In line with Hypotheses 5 and 6, Figures 2 and 3 show that when the emphasis on partnership or governance priority is high and when the personal background is clinical, the interactive use of PMS has the strongest positive relationship with hospital performance.

Insert Tables 3–4 about here

Insert Figures 1–3 about here

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6. Discussion and conclusion

This study is an attempt to respond to recent calls for a better understanding of the factors that support the effectiveness of MCS in healthcare organisations (Abernethy et al., 2007; King and Clarkson, 2015), particularly performance measurement systems in hospitals (Aidemark and Funck, 2009; Cardinaels and Soderstrom, 2013). To do so, we analysed the two following research questions: (1) do the interactions between the use of PMS and strategic priorities have an impact on hospital performance, and (2) do top-level managers' personal backgrounds play a role in these interactions? A hierarchical moderated regression analysis of survey data collected from top-level managers in Belgian hospitals produced several key findings.

A general finding is that the interactions between the use of PMS and strategic priorities (regardless of the personal background) have no performance effect but the interactions between the uses of PMS, strategic priorities, and top-level managers' personal background affect hospital performance. We found that this performance effect is more positive for top-level managers with a clinical background than for those with an

administrative background. This general finding extends previous research on the use of MCS in hospitals in three ways. First, we provide empirical evidence that combining hospital strategies, the use of MCS, and top-level managers' personal background in the same model to shed light on drivers of hospital performance offers greater explanatory power than focusing on one determinant alone or the interactions between hospital strategies and the use of MCS alone. The combination of different theoretical perspectives (e.g., institutional and top-level manager perspectives) seems to offer a more complete understanding of the effectiveness of MCS in hospitals than does one perspective in isolation. This finding is in line with a recent call to adopt a multi-theoretical approach to management control research (Krishnan, 2010). Second, the empirical results in this paper suggest that, in the hospital sector reflected by tensions between dominant operational and administrative forms of management and leadership, MCS-strategy relationships are more complicated than contingency-based research assumes (Schoonhoven, 1981). Our results suggest that it is the top-level managers' personal background that brings to life the benefits of the alignment between the use of PMS and strategic priorities in hospital. These results illustrate the importance of considering the personal backgrounds and traits of the performance information user. Studies that concentrates on only the MCS-strategy fit in hospitals may assert that hospital performance is improved but, when controlling for personal background and traits of the performance information user, the performance effect is no longer significant. Finally, we show that integrating clinicians into the management structure does not harm a hospital's competitive advantage. Top-level managers with a clinical background are not necessarily managers looking for power and influence to circumvent the implementation of some strategic priorities or manipulate elements of MCS, as suggested by the political model of organisational behaviour (Abernethy and Vagnoni, 2004); they are also managers who strive to achieve hospital objectives.

Specific findings also support previous research and offer potentially new insights into controlling healthcare organisations. First, this study indicates that the interaction among operations priority, the diagnostic use of PMS, and personal background has no significant effect on hospital performance. At the two-way interaction level, there is no significant performance effect of the interaction between the diagnostic use of PMS and the operations priority, nor between the diagnostic use of PMS and personal background. However, the results indicate that hospital performance is better when top-level managers with a clinical background implement an operations priority than when their peers with an administrative background do so. These results are consistent with the idea that top-level managers with an

administrative background do not have sufficient clinical expertise to make optimal decisions on clinically related matters compared with their peers with a clinical background (Abernethy and Lillis, 2001; Llewellyn, 2001). In addition, top-level managers with a clinical background tend to make more optimal decisions on operations-related issues (compared with top-level managers with an administrative background) by diagnostically using other formal information-based routines and procedures or more informal sources of information, which is a finding consistent with upper echelons theory and the prediction that clinician managers adopt different approaches to control subordinates and make decisions compared with other managers (Abernethy et al., 2007).

Second, the three-way interaction among partnership priority, interactive use of PMS, and personal background significantly affects hospital performance. This result supports the key role of top-level managers with a clinical background in the creation, development, and maintenance of fluid relationships across various healthcare provider organisations within well-defined communities based on the non-invasive, facilitating, and inspirational use of PMS. Moreover, although the (un-hypothesised) main effect of governance priority on hospital performance is negative, the interaction of this strategic priority, the interactive use of PMS, and personal background seems to benefit hospitals. Therefore, this study informs the debate on how to build effective governance structures in hospitals and helps explain why some hospitals perform better than others, given the governance priority they pursue (Cardinaels and Soderstrom, 2013; Eeckloo et al., 2004).

Third, the (un-hypothesised) two-way interaction between the interactive use of PMS and personal background seems to contribute to hospital performance as well, regardless of the strategic priority the hospital pursues. This result suggests that clinical professionals do not necessarily reject the use of MCS (leading to ineffective strategy implementation), as previous research claims (Abernethy and Stoelwinder, 1991; Naranjo-Gil and Hartmann, 2006; Witman et al., 2010). In turn, this study supports arguments that personal background and interactive use are two factors that when properly combined, facilitate the effective recognition of MCS, such as PMS, in hospitals.

However, this study is subject to some limitations. First, our empirical study considers the strategic priority an exogenous variable, without empirically addressing how the priority has been formulated and emphasised. Second, the results are based on a survey and thus suffer from survey-related limitations (Van der Stede et al., 2005). For example, our use of a cross-sectional survey prevents us from demonstrating causality. Another survey-related issue involves the reliability and validity of measurement instruments. Although we took

precautions before mailing questionnaires (e.g., use of validated scales, pre-tests of the instrument, pilot study) and verifications a posteriori (e.g., construct validity, checks of the measurement model) and did not find any evidence of reliability and validity problems, we cannot rule out the possibility of noise in the construct measures. Third, the generalisation of these results to other organisations operating in different national systems requires caution because Belgian hospitals exhibit important specificities. Although the tensions between operational and administrative forms of management and leadership reported in our study are also observed in other professional service firms (e.g., universities, schools, consultancy firms), different industries and healthcare systems might reveal different specificities potentially leading to different results.

Our empirical study could also be extended in several respects. For this study, we regarded PMS as a package comprising a set of financial and nonfinancial metrics. However, we did not explore the nature of those metrics. Further research could examine which metrics are used interactively or diagnostically and how top-level managers with different personal backgrounds (i.e., clinical versus administrative) react to specific isolated and aggregated metrics. We examined styles of PMS use with quantitative empirical data collected from members of the hospital industry. A longitudinal study might corroborate the relationship among hospital strategies, personal backgrounds, uses of PMS, and performance. Furthermore, despite the substantial stream of literature related to the design of incentive systems for lower-level managers, we note poor attention to the relationship between the use of PMS and incentive systems for physicians in public hospitals. This relationship may be problematic, considering the difficulties associated with aligning performance metrics, organisational strategies, and goals with highly specialised, powerful, and influential physicians who develop professional activities in bureaucratic organisations that are often forced to rely on the decreasing financial resources provided by public authorities. This study could also benefit from further investigations into other (formal and informal) control practices in hospitals. Finally, this study was conducted specifically in the Belgian healthcare system; researchers should perform similar studies in different national healthcare systems to generalise our findings.

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Tables

Table 1
Questionnaire items, factor analysis, loadings, reliability, and validity statistics for the constructs.

Strategic priorities: To what extent are the mentioned problems the focus of management attention and resources and are considered of critical importance now? (Scale: 1 = Not at all, 3 = Average, 5 = To a great extent)				
	1	2	3	4
Secure financial resources	**.652**	.214	-.161	.147
Meet the hospital activity targets	**.686**	.115	.256	.156
Keep medical stars in the hospital	**.706**	.022	.189	.211
Attain profitability or market share goals	**.706**	.309	.092	.111
Manage information systems	.270	**.612**	.081	.262
Reduce the administrative burden and red tape	.071	**.789**	.216	.026
Develop internal control procedures	.105	**.781**	.133	.138
Develop customer services or service support	.280	.382	**.626**	-.081
Develop a reliable network of doctors or partnerships	.178	.234	**.678**	.130
Find new top-level managers	-.031	-.206	.378	**.621**
Define the organisation roles, responsibilities and policies	.328	.286	.041	**.791**
Define the roles and responsibilities of top-level managers	.133	.273	.065	**.874**
Develop a new medical service	.561	.151	.235	-.065
Attract capable personnel	.170	.117	.568	.412
Maintain adequate facilities and/or space	-.020	.245	.491	.233
To have a sufficient number of doctors	.529	.001	.550	-.027
Penetrate new geographic territories	.361	.496	.269	.007
Be a known hospital	.329	.477	.353	.101
Factor loading	6.051	1.651	1.418	1.248
Percentage of variance explained	33.6%	9.2%	7.9%	6.9%
Cronbach's alpha (α)	.763	.726	.662	.814
Diagnostic use of PMS: Currently, to what extent do you use your hospital scorecard to… (Scale: 1 = Not at all, 3 = Average, 5 = To a great extent)				
Track progress towards goals	**.851**			
Monitor results	**.789**			
Compare outcomes to expectations	**.832**			
Review key measures	**.832**			
Factor loading	2.730			
Percentage of variance explained	68.3%			
Cronbach's alpha (α)	.845			
Interactive use of PMS: Currently, to what extent do you use your hospital scorecard to… (Scale: 1 = Not at all, 3 = Average, 5 = To a great extent)				
	Factor 1	Factor 2		
Set and negotiate goals and targets	**.803**	.135		
Debate data assumptions and action plans	**.848**	.040		
Signal key strategic areas for improvement	**.861**	-.011		
Challenge new ideas and ways of doing tasks	**.764**	.254		
Involve in permanent discussion with subordinates	**.637**	.508		
Serve as a learning tool	.032	.959		
Factor loading	3.321	1.036		
Percentage of variance explained	55.3%	17.3%		
Cronbach's alpha (α)†	.861			

Notes: Table 1 presents the results of factor analysis by construct. We ran a principal components analysis with Varimax rotation run in IBM SPSS Statistics (v.20). We extracted all factors with eigenvalues greater than 1 and indicated the variance explained for each factor. For ease of presentation, loadings > .6, considered in the regressions, are in boldface. The factor loading, percentage of variance explained, and Cronbach's α are reported for each construct. 1 = Administration priority; 2 = Operations priority; 3 = Partnership priority; 4 = Governance priority. †Cronbach's α was calculated with the five items that loaded on factor 1.

Table 2
Descriptive statistics.

Constructs and indicators	Theoretical range	Practical range	Mean	Median	Standard deviation
Diagnostic use of PMS					
To track progress towards goals	1.00-5.00	1.00-5.00	3.79	4.00	.962
To monitor results	1.00-5.00	1.00-5.00	3.83	4.00	.940
To compare outcomes to expectations	1.00-5.00	1.00-5.00	3.68	4.00	.988
To review key measures	1.00-5.00	1.00-5.00	3.98	4.00	.924
Interactive use of PMS					
To set and negotiate goals and targets	1.00-5.00	1.00-5.00	3.51	4.00	1.080
To debate data assumptions and action plans	1.00-5.00	1.00-5.00	3.70	4.00	1.011
To signal key strategic areas for improvement	1.00-5.00	1.00-5.00	3.81	4.00	.899
To challenge new ideas and ways of doing tasks	1.00-5.00	1.00-5.00	3.34	3.00	.969
To involve in permanent discussion with subordinates	1.00-5.00	1.00-5.00	3.15	3.00	1.077
Administration priority					
Secure financial resources	1.00-5.00	1.00-5.00	4.06	4.00	.903
Meet the hospital activity targets	1.00-5.00	1.00-5.00	4.14	4.00	.860
Keep medical stars in the hospital	1.00-5.00	1.00-5.00	3.84	4.00	1.115
Attain profitability or market share goals	1.00-5.00	1.00-5.00	3.79	4.00	.918
Operations priority					
Manage information systems	1.00-5.00	1.00-5.00	3.97	4.00	.890
Reduce the administrative burden and red tape	1.00-5.00	1.00-5.00	3.32	3.00	.963
Develop internal control procedures	1.00-5.00	2.00-5.00	3.64	4.00	.856
Partnership priority					
Develop customer services or service support	1.00-5.00	1.00-5.00	3.28	3.00	1.055
Develop a reliable network of doctors or partnerships	1.00-5.00	1.00-5.00	3.91	4.00	.919
Governance priority					
Find new top-level managers	1.00-5.00	1.00-5.00	3.25	3.00	1.159
Define the organisation roles, responsibilities and policies	1.00-5.00	1.00-5.00	3.80	4.00	.883
Define the roles and responsibilities of top-level	1.00-5.00	1.00-5.00	3.81	4.00	.982
Top-level managers' personal background	.00-1.00				
Hospital performance Σ*(score × weight)*	.00-3.00	1.43-3.00	2.36	2.39	.358
Financial health	.00-9.00	3.00-9.00	6.93	6.00	1.986
Ability to attract doctors and nurses	.00-9.00	1.00-9.00	6.24	6.00	2.066
Reputation of the hospital	.00-9.00	1.00-9.00	6.72	6.00	2.199
(under) Graduate medical/health professional teaching	.00-9.00	0.00-9.00	4.83	4.00	2.805
Research	.00-9.00	0.00-9.00	2.99	2.00	2.904
Quality of care (e.g., patients readmission rate)	.00-9.00	2.00-9.00	7.52	9.00	1.782

Table 3
Pearson correlation coefficients.

	DPMS	IPMS	ADM	OPE	PAR	GOV	BACK	PERF	SIZE	STAT	TYPE	AGE
IPMS	.608**											
ADM	.153	.170										
OPE	.075	.221*	.398**									
PAR	.182*	.240**	.446**	.514**								
GOV	-.029	.104	.375**	.382**	.297**							
BACK	-.215*	-.209*	-.002	.099	.146	.123						
PERF	.102	.126	.154	.051	.087	-.087	-.071					
SIZE	.223*	.153	-.017	.102	.130	-.080	.043	.167				
STAT	-.171	-.108	-.039	-.037	-.148	.147	-.032	.039	-.208*			
TYPE	.028	.141	.107	.053	.036	-.115	-.025	-.071	.288**	.087		
AGE	-.011	-.036	-.019	.053	.145	.133	.142	.110	.141	-.049	-.140	
LOC	.046	.063	-.158	.196*	.117	-.297**	-.032	.043	.136	-.376**	-.042	-.089

Notes: DPMS = Diagnostic use of PMS; IPMS = Interactive use of PMS; ADM = Administration priority; OPE = Operations priority; PAR = Partnership priority; GOV = Governance priority; BACK = Personal background; PERF = Performance of the hospital; SIZE = Size of the hospital; STAT = Status of the hospital (private or public); TYPE = Type of hospital (general or specialised); AGE = Age of the respondent; LOC = Location of the hospital (Wallonia or otherwise). **, *: Significant at $p < .01, .05$, respectively (two-tailed).

Table 4
Hierarchical regression results for Hypotheses 1-6.

	Model 1			Model 2		
Steps and independent variables	**β *(t-stat.)***	**Total R^2**	**ΔR^2**	**β *(t-stat.)***	**Total R^2**	**ΔR^2**
Panel A - Hypotheses 1 and 4						
Step 1. Control variables						
SIZE	.209 (*2.101*)**			.209 (*2.101*)**		
STAT	.180 (*1.791*)*			.180 (*1.791*)*		
TYPE	-.201 (*-2.029*)**			-.201 (*-2.029*)**		
AGE	.107 (*1.126*)			.107 (*1.126*)		
LOC	.050 (*.485*)			.050 (*.485*)		
ADM	.264 (*2.439*)**			.264 (*2.439*)**		
GOV	-.228 (*-2.162*)**			-.228 (*-2.162*)**		
PAR	-.007 (*-.066*)			-.007 (*-.066*)		
IPMS	.123 (*1.302*)			.123 (*1.302*)		
		.145			.145	
Step 2. Main effects						
DPMS	-.054 (*-.452*)			-.061 (*-.506*)		
OPE	-.021 (*-.178*)			-.018 (*-.152*)		
BACK				-.048 (*-.496*)		
		.147	.002		.149	.004
Step 3. Two-way interaction(s)						
DPMS × OPE	.026 (*.260*)			.119 (*1.089*)		
DPMS × BACK				.102 (*.963*)		
BACK × OPE				.183 (*1.717*)*		
		.148	.001		.184	.035
Step 4. Three-way interaction						
DPMS × OPE × BACK				.055 (*.366*)		
					.185	.001
Panel B - Hypotheses 2 and 5						
Step 1. Control variables						
SIZE	.213 (*2.090*)**			.213 (*2.090*)**		
STAT	.175 (*1.719*)*			.175 (*1.719*)*		
TYPE	-.185 (*-1.856*)*			-.185 (*-1.856*)*		
AGE	.102 (*1.080*)			.102 (*1.080*)		
LOC	.059 (*.533*)			.059 (*.533*)		
ADM	.269 (*2.505*)**			.269 (*2.505*)**		
GOV	-.212 (*-1.898*)*			-.212 (*-1.898*)*		
OPE	.000 (*-.002*)			.000 (*-.002*)		
DPMS	.040 (*.425*)			.040 (*.425*)		
		.133			.133	
Step 2. Main effects						
IPMS	.156 (*1.311*)			.147 (*1.221*)		
PAR	.001 (*.005*)			.009 (*.079*)		
BACK				-.048 (*-.496*)		
		.147	.014		.149	.016
Step 3. Two-way interaction(s)						
IPMS × PAR	.080 (*.775*)			.089 (*.837*)		
IPMS × BACK				.206 (*1.978*)*		
BACK × PAR				.016 (*.156*)		
		.152	.005		.191	.042*
Step 4. Three-way interaction						
IPMS × PAR × BACK				.221 (*1.805*)**		
					.216	.025***
Panel C - Hypotheses 3 and 6						
Step 1. Control variables						
SIZE	.216 (*2.082*)**			.216 (*2.082*)**		
STAT	.162 (*1.564*)			.162 (*1.564*)		
TYPE	-.151 (*-1.515*)			-.151 (*-1.515*)		
AGE	.089 (*.916*)			.089 (*.916*)		
LOC	.126 (*1.178*)			.126 (*1.178*)		
ADM	.229 (*2.041*)**			.229 (*2.041*)**		
PAR	-.013 (*-.109*)			-.013 (*-.109*)		
OPE	-.075 (*-.658*)			-.075 (*-.658*)		
DPMS	.053 (*.553*)			.053 (*.553*)		
		.104			.104	
Step 2. Main effects						

IPMS	.156	(*1.311*)			.147	(*1.221*)		
GOV	-.230	(*-2.031*)**			-.226	(*-1.983*)**		
BACK					-.048	(*-.496*)		
			.147	.043*			.149	.045*
Step 3. Two-way interaction(s)								
IPMS × GOV	.038	(*.380)*			.011	(*.108*)		
IPMS × BACK					.214	(*2.119*)**		
BACK × GOV					-.041	(*-.422*)		
			.148	.001			.187	.038
Step 4. Three-way interaction								
IPMS × GOV × BACK					.182	(*1.834*)**		
							.213	.026***

Notes: DPMS = Diagnostic use of PMS; IPMS = Interactive use of PMS; ADM = Administration priority; OPE = Operations priority; PAR = Partnership priority; GOV = Governance priority; BACK = Personal background; PERF = Performance of the hospital; SIZE = Size of the hospital; STAT = Status of the hospital (private or public); TYPE = Type of hospital (general or specialised); AGE = Age of the respondent; LOC = Location of the hospital (Wallonia or otherwise). Max VIF = 2.999. ***, **, *: Significant at $p < .01, .05, .10$, respectively (one-tailed for the variable with predicted sign, two-tailed otherwise). Standardised coefficients are presented for all independent variables.

Appendix A
Profile of the respondents.

	CEO (N = 69)	M.D. (N = 42)
Seniority in the hospital (average in years)	16	23
Tenure in this position (average in years)	10	11
Age (average in years)	52	54
Type of hospital	N (%)	
General hospital	68 (58)	
Psychiatric hospital	36 (31)	
Geriatric hospital	1 (01)	
Specialised hospital	8 (07)	
University hospital	4 (03)	
Status of the hospital	N (%)	
Private	91 (78)	
Public	26 (22)	
Location of the hospital	N (%)	
Wallonia	38 (33)	
Brussels	11 (09)	
Flanders	68 (58)	
Size of the hospital (number of beds)	N (%)	
Fewer than 100	7 (06)	
Between 100 and 199	25 (21)	
Between 200 and 499	53 (45)	
Between 500 and 999	23 (20)	
More than (and equal to) 1 000	9 (08)	
Diversity of the hospital (number of different medical services)	N (%)	
Fewer than 5	20 (17)	
Between 5 and 8	64 (55)	
Between 9 and 12	30 (26)	
Between 13 and 18	3 (02)	

Notes: This appendix reports the profile of 117 identifiable survey respondents. In six cases, the respondents deleted their personal identification code on the questionnaire, which precludes us from describing their profiles. MD = medical director.

Figures

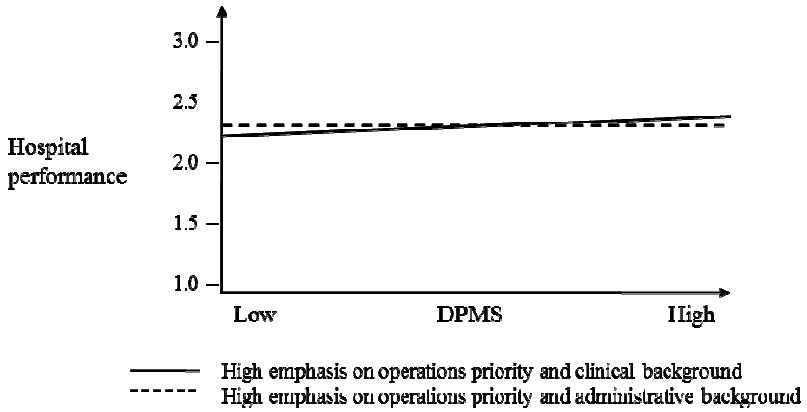

Fig. 1. Performance effect of three-way interaction (high emphasis on operations priority)

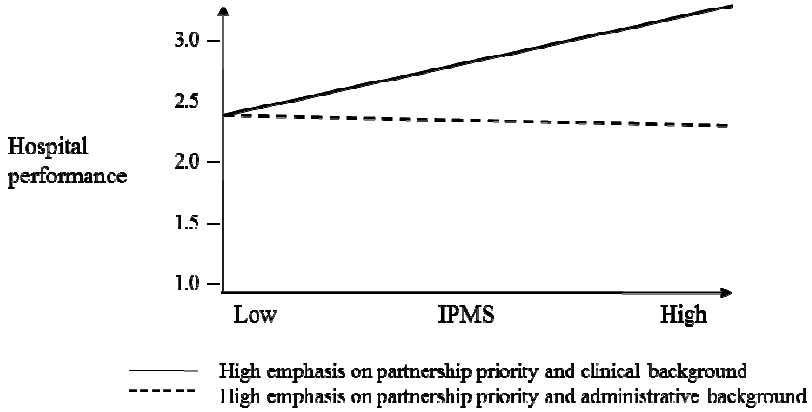

Fig. 2. Performance effect of three-way interaction (high emphasis on partnership priority)

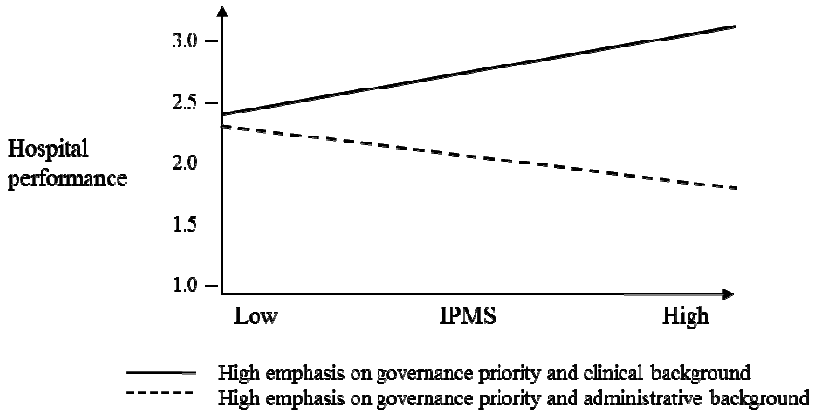

Fig. 3. Performance effect of three-way interaction (high emphasis on governance priority)