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Abstract

Purpose – The purpose of this paper is to empirically explore how the effect of intellectual capital (IC) on organizational performance is indirect and mediated through performance measurement (PM) systems.
Design/methodology/approach – Data were collected from a survey of 128 chief financial officers of Iranian publicly listed companies. Hypotheses were tested using partial least squares regression, a structural modeling technique which is appropriate for highly complex predictive models.
Findings – Results from the structural model indicate that, in general, companies with a higher level of IC place a premium on the balanced use of PM systems in a diagnostic and interactive style. Furthermore, the results provide some evidence that IC is indirectly associated with organizational performance through the intervening variable of the balanced use of interactive and diagnostic PM systems.
Practical implications – This study sheds light on the issue of how senior management should use PM systems to take full advantage of intellectual assets which could lead to improved organizational performance.
Originality/value – This is the first study of its kind to synthesize a model which examines IC, PM systems, and organizational performance. Although the effect of different types of intangible assets on performance has been substantially examined in the literature, less effort has been devoted to understanding the role of PM systems in leveraging an organization's IC.

Keywords Social capital, Performance management, Iran, Intellectual capital, Performance measurement systems, Management control

Paper type Research paper

1. Introduction

The importance of knowledge resources has increased rapidly in many fields such as accounting, economics, and strategic management (Davison, 2014). In parallel with the long-standing recognition of the prominence of intellectual capital (IC) in determining a firm's value, there is also a growing debate on the role of management accounting and control systems within the IC setting (see among others, Tayles *et al.*, 2002; Tayles *et al.*, 2007; Widener, 2006; Cleary, 2009, 2015; Guthrie *et al.*, 2012; Toorchi *et al.*, 2015; Asiaei and Jusoh, 2017; Novas *et al.*, 2017). This stream of research has enabled a gap in the empirical academic literature to be filled (Roslender and Fincham, 2001). Researchers require further clarification on how management control systems are favorably involved in capturing, measuring and managing organizations' primary competitive knowledge-based assets (Novas *et al.*, 2017).

From a theoretical vantage point, an effective management control system can support and facilitate IC development to fully realize the potential of intangibles (Mouritsen, 2009). However, there is increasing concern that incumbent management control systems tend to be irrelevant as they fail to cater for the distinctive features of knowledge-based companies (Ghosh and Mondal, 2009; Cleary, 2015). It has been argued that one of the major

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impediments to organizations' success is attributed to their inability to develop a systematic and robust management control system (Shields, 2015). This issue becomes more critical in todays' knowledge era where executives require timely and relevant information to augment the effectiveness of their decision making for ensuring success (Bose and Thomas, 2007).

A performance measurement (PM) system as one of the prime dimensions of management control systems is considered an area which has developed in parallel with the evolution of knowledge-related resources (Asiaei and Jusoh, 2017). In effect, a successful PM system plays a predominant role in assisting executives track corporate performance to determine the extent to which strategic goals have been reached (Koufteros *et al.*, 2014). Given the fact that IC and its elements are primary important factors for value creation, the design and nature of PM systems must be innovative enough in order to increase the contributions of those intangible resources (Tayles *et al.*, 2007). According to Simons *et al.* (2000), a PM system is used as a lever to facilitate the management of strategic resources. In this regard, diagnostic and interactive PM competencies are perceived as an important tool in effectively supporting the knowledge capability of a company (Lee and Widener, 2016) and for the pursuit of competitive advantage (Simons, 1995).

Until recently, limited work has been carried out on corporate mechanisms required to support organizations in properly managing their IC. Hence, more research needs to be conducted to provide further insight into what integration of organizational systems and practices can help companies in attaining this strategic goal (Cleary, 2015). Accordingly, this study seeks to contribute to the current debate in the literature, positioning management accounting and control systems within the sphere of IC, through exploring whether, and how, the effect of IC on organizational performance is indirect and mediated through the balanced interactive and diagnostic use of a PM system. Exploring the confluence and existence of complementarities between IC and management accounting systems (Novas *et al.*, 2017) could provide insights and implications which are crucial to managers dealing with the design of relevant PM techniques. This study may also enhance our understanding of whether the emphasis put on the balanced interactive and diagnostic use of PM systems (i.e. two contradictory but complementary perspectives of PM system) "matters" to the organization by examining its relationship with performance.

The remainder of the paper is structured in the following way. The next section presents the relevant literature and hypotheses development along with the proposed theoretical model. The research method and results based on partial least squares (PLS) analysis are discussed afterwards. The final section presents the findings, implications, limitations as well as potential areas for further research.

2. Theoretical background and hypotheses

2.1 IC

The growing extant literature in the field of IC covers a variety of different knowledge resources (Serenko and Bontis, 2013). The most common and standard classification appears to be three-dimensional (i.e. human capital (HIC), structural capital (SIC), and relational capital (RIC)), which has become a cornerstone for the development and measurement of IC (Bontis, 1998; Stewart, 1997; Edvinsson and Sullivan, 1996; Wang *et al.*, 2014; Wang *et al.*, 2016). While human-centered (human) capital represents the employees' characteristics such as skills, knowledge, capabilities, and education, organization-centered (structural) capital contains all of the non-human storehouses of knowledge within an organization (Inkinen, 2015; Bontis, 1999). That is, SIC is the knowledge embedded in information systems and the outcomes and products of knowledge conversion (i.e. documents, databases, process descriptions, plans) and the intellectual properties of the firm (Khalique *et al.*, 2015; Bontis, 2001; Edvinsson and Malone, 1997; Stewart, 1997). On the other hand, the value stemming from an organization's external relationships and connections with all related parties such as customers, suppliers,

distributors, partners, and the local community is deemed to be relationship-centered (i.e. relational) capital (Dzinkowski, 2000; Edvinsson and Malone, 1997; Roos and Roos, 1997).

The RIC concept is quite similar to social networking. Social networking refers to the "customer-centric organization" where a firm develops the "customer relationship" as the most important resources of the firm (Galbraith, 2005). Related to this, Chenhall *et al.* (2011) posited that social networking is part of a management control system that is applied to conduct interorganizational exchanges involving suppliers and customers. In their study, they found that social networking has a positive effect on innovation by acting indirectly through its connection with innovative culture.

While extensive research has been focused on the three-dimensional framework of IC, social capital has been studied to a lesser extent (Delgado-Verde *et al.*, 2011; Subramaniam and Youndt, 2005; Wu and Tsai, 2005; Wang and Chen, 2013; Asiaei and Jusoh, 2015). There are limits to how far the idea of intrafirm networks (Tsai and Ghoshal, 1998) or intra-organizational social capital (Maurer *et al.*, 2011) can be taken to comprehensively conceptualize IC. In parallel with the relationships with outsiders, the network within a company is an increasingly important factor through which tacit knowledge and information is shared (Kogut and Zander, 1992; Nonaka, 1994), trust is reciprocated (Leana and Van Buren, 1999) and resources are exchanged (Tsai and Ghoshal, 1998). As such, this study extends the three-dimensional IC framework with social capital as the fourth component to provide a more comprehensive measurement of IC.

There is no general consensus on the definition of social capital in the literature (Adler and Kwon, 2002). One mainstream definition by Nahapiet and Ghoshal (1998), suggests a broader conceptualization of social capital which encompasses SIC, RIC, and cognitive capital. The second limits the scope of the construct to the level and quality of relationships among people and units inside a company (Yli-Renko *et al.*, 2002; Bolino *et al.*, 2002; Youndt and Snell, 2004). According to Krackhardt (1992), social capital embodies interpersonal relationships that are effective in nature. As Bolino *et al.* (2002) point out, social capital represents affective relationships among organizational members in which co-workers like one another, trust one another, and identify with one another. Given the foregoing argument, the current study follows the latter perspective in which social capital is defined as the informal and personal intrafirm networks that are not predetermined by an organization (Fukuyama, 1997; Pennings *et al.*, 1998; Gupta and Govindarajan, 2000; Burt, 1997; Chow and Chan, 2008; Maurer *et al.*, 2011; Wang and Chen, 2013).

While substantial empirical literature has discussed the direct impact of IC on performance, a number of studies have also explored contingent factors on the relationship. For example, using knowledge management strategies, Wang *et al.* (2016) found that the fit between the three components of IC (i.e. HIC, SIC and RIC) and knowledge management strategies facilitates both operational and financial performance of high-tech firms. Similarly, knowledge strategy was found to moderate the relationship between IC and organizational performance (Ling, 2013). Meanwhile, several IC studies have considered management accounting systems as an important mechanism within knowledge-based organizations that can increase the importance of IC for business performance (e.g. Gowthorpe, 2009; Novas *et al.*, 2012). However, Cleary's (2015) study found that management accounting systems do not have an impact on organizational SIC.

2.2 PM systems

PM itself is perceived as one of the most critical, yet most misunderstood and most complicated functions in management accounting and control systems Atkinson *et al.* (1995), Atkinson (2012). According to Neely (1998), PM refers to the process of quantifying past action. In the same vein, Simons (1990) argues that PM is tracking the execution of corporate strategy through contrasting actual results with strategic targets. For the purpose of this

study, one element of PM is specifically addressed, i.e., the PM system use, which is operationalized as the balanced use of a PM system in a diagnostic and interactive style (Henri, 2006; Kruis *et al.*, 2016). The basic premise of Simons (1994, 1995) levers of control (LOC) framework states that balancing the forces of various type of control levers, such as diagnostic control and interactive control, could support the control of business strategy.

Simons (1995) argues that the power of these different levers lies in how they work together to complement each other and achieve balance. It is asserted that the levers engender positive and negative forces which jointly generate a dynamic tension between innovation and strategic renewal on the one hand, and predictable goal achievement on the other, both of which need to be managed to secure the organization's long-term success (Kruis *et al.*, 2016; Raisch and Birkinshaw, 2008). PM systems reflect two complementary and nested uses which are necessary for managing inherent organizational tensions (Koufteros *et al.*, 2014).

The premise of balance is considered as a core concept in the LOC framework but remains unclear (Martyn *et al.*, 2016). To get a more conclusive insight into the concept of balance, Therefore, further examinations are required to clarify how a balanced use of control levers creates complementarities leading to dynamic tension and how that dynamic tension results in greater organizational performance. From Simons' (1995) vantage point, firms require a balance between unlimited opportunities and limited managerial attention, between self-interest seeking and the desire to contribute, between intended and emergent strategy, and between innovation and predictable goal achievement (Kruis *et al.*, 2016). For the purpose of managing those trade-offs, Simons (1995) argues that companies must place their reliance on the different LOC in a balanced way to generate a proper dynamic tension. This may offer an effective synthesis of compliant behavior and creative search efforts to ensure corporate success (Simons *et al.*, 2000; Kadak and Laitinen, 2016).

According to the conflict literature, tension would probably be advantageous to entities and is not inevitably adverse (Nicotera, 1995). Although conflict and tension are characterized as being disruptive and averse by some basic premises, there is ample empirical evidence from the conflict literature which advocates the notion that tension, may perhaps, be positive to either individual or corporate performance. This implies that innovation, decision quality, product development, and communication are weakened where tension is prevented and suppressed (Nicotera, 1995). A balanced use of PM systems fosters dialogue, encourages innovation, and focuses organizational attention within the company (English, 2001; Henri, 2006; Kruis *et al.*, 2016) which seems to be the more appropriate control system style in knowledge-intensive organizations with more intangible resources (Asiaei, 2014). Furthermore, the importance placed on diverse and complementary performance measures is related to organizational strategy. For example, both conservative and entrepreneurial strategies have been important to the company's choices of performance measures (Malina and Selto, 2004).

2.3 Research hypotheses

It is argued that instead of a particular area, a joint effort of various academic disciplines, such as accounting, human resource management, information systems and strategy, are required to address the contemporary issues within the wide scope of IC and knowledge management (Tayles *et al.*, 2002; Jordão and Novas, 2017). In the same vein, the extant literature shows that IC is typically engaged in the confluence of financial and non-financial techniques and measures (Widener, 2006; Tayles *et al.*, 2007; Novas *et al.*, 2017), which implies that companies require advanced PM systems to effectively deal with the challenges concerning the management of their strategic assets (Asiaei and Jusoh, 2017). PM systems can play a prominent role in managing a business and its fundamental strategic resources by providing relevant and vital information for managers (Widener, 2006).

The famous maxim that "if you can't measure it, you can't manage it" (Kaplan and Norton, 1996, p. 21) assumes that business performance would be positively influenced by the measurement of the organization's fundamental critical success factors such as IC.

With the forgoing argument, it is plausible to assume the presence of complementarities between management accounting in general, and PM systems in particular, and IC. From the theoretical vantage point, the core notion of the "fit-as-mediation" of contingency view (Drazin and Van de Ven, 1985; Venkatraman, 1989) states that knowledge attributes can determine the usage and design of certain organizational systems, such as PM systems. This would, in turn, foster information processing and result in enhanced performance (Asiaei, 2014). Accordingly, this study seeks to examine how IC contributes to organizational performance through the mediating influence of the balanced use of PM system. Figure 1 illustrates the research model of this paper that shows the associations among the variables of interest.

In general, the management accounting literature asserts that there is much variability in the nature and extent to which organizations implement PM systems. Usoff *et al.* (2002) describes that more than 50 percent of Chief Financial Officers (CFOs) surveyed contend that one of the major impediments to organizations' success is attributed to their inability to develop a systematic PM system. According to Usoff *et al.* (2002), there is a possibility that these differences are associated with a firm's attitude towards IC. It is argued that organizations which realize the importance of IC will have employed a robust and systematic PM system to a greater extent for the main purpose of taking full advantages of such intangible assets (Asiaei, 2014).

According to Henri (2006), addressing PM systems from two opposite but complementary perspectives simultaneously could provide a more systematic and robust PM system. A balanced use of PM systems in a diagnostic and interactive mode produces countervailing positive forces which in turn promote organizational dialogue, creativity, decision quality, and product development (Amason, 1996; Tjosvold, 1991; English, 2001).

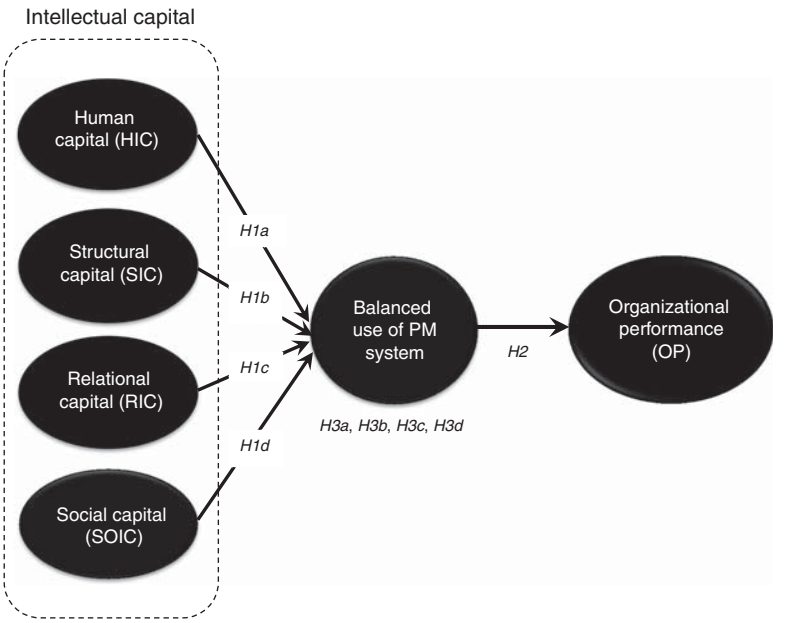

Figure 1.
Theoretical framework of the mediating role of balanced use of PM system

In essence, there is a natural fit between the requirements of knowledge-related resources and such organic use of control systems, i.e., a balanced use of PM systems (Chenhall and Morris, 1995; Van de Ven, 1986). With this discussion in mind, it is plausible to conclude that regardless of which dimension of IC the company relies on, knowledge-intensive organizations (with more IC overall) tend to employ the balanced use of PM systems, as a more systematic and robust system, to a greater extent in order to take full advantage of those strategic resources in today's knowledge-based economy:

H1. The higher the level of IC ((a) human (b) structural (c) relational, and (d) social capital), the higher is the balanced use of diagnostic and interactive PM systems.

Previous studies have investigated PM systems by examining the premise of fit to the context of the firm (Govindarajan, 1988; Govindarajan and Fisher, 1990; Perera *et al.*, 1997; Sim and Killough, 1998). In the same vein, another stream of literature has indicated a significant correlation between the design of PM systems (i.e. emphasizing on a broader set of financial and non-financial information) and performance (e.g. Scott and Tiessen, 1999; Hoque and James, 2000; Davila, 2000; Baines and Langfield-Smith, 2003; Jusoh *et al.*, 2008). However, the precise nature of the linkage between the use of PM systems and performance remains ambiguous (Henri, 2006).

It has been contended that a certain use of PM systems has the potential to contribute to both individual and organizational performance (Simons, 1995; Simons *et al.*, 2000). Speklé and Verbeeten (2014). From the resource-based view, Henri (2006) asserts that an effective integration between diagnostic and interactive use could be regarded as a capability. Specifically, the capacity to achieve a balance between countervailing uses of PM systems which, at the same time, attempt to inspire creativity and innovativeness while trying for predictable achievements reflects a capability which can be labeled as valuable, distinctive, and imperfectly imitable (Kruis *et al.*, 2016). Such aptitude to handle the integration of diagnostic and interactive use relying upon a variety of inside and outside elements is complex and may not be readily transferred. It has been asserted that the levers stimulate positive and negative forces that jointly engender a dynamic tension between innovation and strategic renewal on the one hand, and predictable goal achievement on the other, both of which need to be managed to secure the organization's long-term success (e.g. March, 1991; Raisch and Birkinshaw, 2008; Kruis *et al.*, 2016). The forgoing argument provides the foundation to put forward the following hypothesis:

H2. The higher the balanced use of diagnostic and interactive PM systems, the greater is organizational performance.

Although numerous studies focusing on performance and valuation have posited a positive relationship among IC, a firm's market value (Nimtrakoon, 2015; Chen *et al.*, 2005; Choi *et al.*, 2000) and financial performance (Mondal and Ghosh, 2012; Chen *et al.*, 2005; Wang and Chang, 2005; Youndt and Snell, 2004), some reveal a negative relationship as well. Dženopoljac *et al.* (2016) reported that only capital-employed efficiency has a significant effect on financial performance while there are no significant differences in financial performance among different Serbian ICT subsectors. Huang and Liu (2005) showed a nonlinear association between innovation capital and business performance in examining the association among innovation, IT, and performance. Firer and Williams (2003) detected a negative relationship between HIC and value added intellectual coefficient within the South African context. On the other hand, other studies have revealed that there is no association between specific components of IC and performance (Joshi *et al.*, 2013; Fernandes *et al.*, 2005). These findings could plausibly suggest that some of the advantages attributed to IC may affect corporate performance indirectly through the emphasis put on some other factors such as PM systems. From this vantage point, it is assumed

that knowledge may not *per se* be valuable unless it is effectively captured, measured, and managed through employing appropriate PM systems (Kaplan and Norton, 2001; Widener, 2006).

According to Widener (2006), once organizations acquire their strategic resources or capabilities, PM systems would be employed in order to assist in capturing and managing those crucial strategic resources effectively, which in turn leads to performance improvement. It is expected that knowledge-based organizations with a high level IC will put emphasis on more innovative PM systems conceptualized as the balanced use of diagnostic and interactive PM systems in this study. In turn, PM systems characterized by more innovative characteristics are likely to be associated with enhanced organization performance because such techniques are less narrowly focused and enable managers to focus on the strategic components of organization performance (Joiner *et al.*, 2009). Thus, the authors propose that IC will improve organizational performance because organizations with a higher level of IC will be able to manage their intellectual resources effectively through the balanced use of diagnostic and interactive PM systems. While IC may have a positive and significant effect on organizational performance in isolation, the authors contend that this effect will become more nonsignificant when taking into account the indirect effects of the four dimensions of IC through the mediating variable.

It is hypothesized that organizations evaluate their potential in terms of fundamental critical resources and capabilities and then deploy appropriate PM systems which are aligned with those resources which in turn bring about performance improvement. This is how the premise of "fit as mediation" comes into play in this paper. Venkatraman (1989, p. 428) argued that fit as mediation "specifies the existence of a significant intervening mechanism (e.g. organizational structure) between an antecedent variable (e.g. strategy) and the consequent variable (e.g. performance)." This implies that knowledge qualities could determine the design and implementation of some specific organizational mechanisms (e.g. PM systems) which in turn facilitate information processing (Galbraith, 1973; Thompson *et al.*, 2009). With all the foregoing discussions, the following hypothesis is proposed:

H3. The balanced use of PM system mediates the relationship between IC ((a) human (b) structural (c) relational, and (d) social capital) and organizational performance.

3. Methodology

3.1 Sample

Iran's economy is characterized as diversified with more than 40 industries represented on the Tehran Stock Exchange (TSE) (Asiaei and Jusoh, 2015). As of May 2012, 339 organizations with a combined market capitalization of US$104.21 billion were listed on TSE according to the "Tehran Stock Exchange Monthly Report." As Bontis (1998) suggests a multi-industry sample paves the way for an analysis of inter-industry effects and may possibly increase research generalization. Covering a wide range of companies and industries could augment variation of the variables and potentially broaden the generalizability of the results (Subramaniam and Youndt, 2005). Besides, the population of TSE is rather small.

The authors selected TSE companies for three reasons. First, since most of TSE companies are medium to large-sized organizations, they are supposed to enjoy higher capabilities towards investment in intellectual assets. Second, these companies are more involved in advanced and strategic management accounting systems in that PM is perceived as the most important function in management accounting, and yet it is considered as the most misunderstood and most complex phenomenon (Atkinson *et al.*, 1995). Third, all the companies' information and data are readily available in the TSE database.

The research is based on survey data collected from CFOs in public companies listed of the TSE (see TSE, www.tse.ir/en). Surveys allow contact with otherwise inaccessible respondents at relatively low costs (Cooper and Schindler, 2003). The selection of CFOs as the target respondents is because they are considered as the most appropriate person to provide opinions relating to IC, PM system, and organizational performance. Besides, many prior studies have used top managers, such as the CFO, as their study's key informant (e.g. Bontis, 1998; Bukh *et al.*, 2001; Cabrita and Vaz, 2005).

The authors used a questionnaire that was supplemented by a cover letter explaining the goal and importance of the research, desired respondent and other information. Furthermore, respondents could declare if they desired to receive the report of findings from this study to offer an incentive to participate. A total of 136 responses were returned after two mailings and a follow-up phone call, from which 128 (37.7 percent) were suitable and used for the purpose of data analysis.

As suggested by Cavana *et al.* (2001), the authors performed a pre-testing process in three steps. First, for the purpose of assessing the face validity of the questionnaire, the authors engaged PhD candidates in the pre-test survey to appraise their reaction on the items and receive their feedback about the general structure of the questionnaire. Subsequently, the authors examined content validity by means of judgment of a panel of experts. Considering the acceptable face and content validity, for the purpose of the pilot study, the final draft of the questionnaire was consequently pre-tested through a sample of 35 CFOs within the TSE. In this regard, the Cronbach's α coefficient was used to test the reliability of all the constructs and their specific dimensions. α scores for all the main variables exceeded the recommended cut-off point of 0.70 (Nunnally *et al.*, 1967).

Another technique of assessing the reliability is examining the item-to-total correlations of each variable. As Lu *et al.* (2007) demonstrated, item-to-total correlations provide information on the extent of correlations among indicators of the same scale. An item with a value that is less than 0.5 is considered very low score and cannot play an important role in conceptualizing the related construct. That is, if the correlation value is lower than 0.5, the corresponding item would not represent the scale overall and, consequently, may be dropped. In this research, the item-to-total correlations scores for all the items exceeded the recommended cut-off of 0.5.

3.2 Measurement of constructs

This study is based on perceptual measures for measuring the variables of interest. Perceptual data has been broadly used in the IC and PM setting (Ketokivi and Schroeder, 2004; Verbeeten, 2008; Bontis, 1998; Bontis *et al.*, 2000; Bontis and Fitz-enz, 2002). Ad hoc questions can effectively capture the features of specific and internal phenomenon in comparison with proxies extracted from databases (Delgado-Verde *et al.*, 2011). Moreover, there is a broad consensus about the consistency between performance objective measures and executive's perceptions (Venkatraman and Ramanujam, 1986; Dess and Robinson, 1984).

3.2.1 Organizational performance (dependent variable (DV)). Adopting a multidimensional approach rather than a single-attribute perspective, the authors followed Gupta and Govindarajan (1984) for measuring organizational performance using a seven-point Likert-type scale with anchors "significantly below average" and "significantly above average." These indicators are: return on investment, profit, cash flow from operations, cost control, development of new products, sales volume, market share, market developments, personnel developments, and political-public affairs. Many studies in the context of management accounting have adopted and validated this instrument (Bisbe and Otley, 2004; Chenhall and Langfield-Smith, 1998; Govindarajan and Fisher, 1990; Hoque, 2004).

3.2.2 IC (independent variable (IV)). For capturing IC level, the respondents asked to express their opinions regarding a total of 29 questions adopting from Tayles *et al.* (2007)

as well as Subramaniam and Youndt (2005), which originally drew upon the core ideas of the social structure literature (Burt, 1997), on a range of questions in relation to their organization's emphasis on IC. Specifically, IC was sub-divided into four components, namely human, structural, relational, and social capital which were operationalized with six, nine, ten, and four items, respectively. All the four IVs quantified by using the seven-point Likert-type scale (1: strongly disagree, 4: neither disagree nor agree, 7: strongly agree).

3.2.3 Balanced use of PMS (mediating variable). As mentioned earlier, Simons' (1990) LOC framework (1990, 1991, 1995, 2000) specifies two countervailing types of the use of control systems, namely diagnostic and interactive. The former is defined as the formal feedback systems employed for monitoring predictable objective attainment whereas the latter focuses attention and fosters dialogue and learning throughout the entity through providing signals sent by high level administrators. In this respect, this study took the instrument used by Henri (2006) which was originally adopted from Vandenbosch (1999) in order to measure interactive and diagnostic uses of PM systems. The Vandenbosch (1999) instrument had been developed initially for the purpose of measuring the use of executive support systems. The measurement constituted by a set of dimensions which mainly includes score keeping (diagnostic) and attention- focusing (interactive). This instrument had been developed relying on theories of accounting control (Simons, 1990) prior to its adaptation to a management information setting. This is the rationale behind the preference for the forgoing measurement tool. This instrument consists of eleven items across the two broad dimensions, namely interactive PMS use and diagnostic PMS use. The organizations' CFOs were asked to determine the extent to which their organization's top management team use performance measure for the certain purposes on a seven-point Likert-type scale including one (not at all), four (to a moderate extent), and seven (to a very great extent).

In addition, control variables (e.g. firm size and industry) have been used in previous research on organizational performance, IC and PMS (e.g. Chenhall, 2003; Gosselin, 2005; Hoque, 2004; Hoque and James, 2000). Firm size represents past success and could affect organizational outcomes (Aldrich and Auster, 1986). Bontis *et al.* (2000) argues that larger companies enjoy IC leverage to a greater extent. Further, firms vary from sector to sector in terms of possessing IC and PMS as well as realizing benefits from leveraging such value creation factors (Asiaei and Jusoh, 2015).

3.3 Partial aggregation for the balanced use of the PM system construct

The partial aggregation technique embodies the aggregation of indicators for each dimension of the overall construct (Bagozzi and Heatherton, 1994). In this situation, a composite variable is established from the items of each separate dimension of the construct and become single indicators of a single factor model. Structural equation modeling (SEM) confirmatory factor analysis (CFA) can be conducted afterwards to estimate an overall model. Failure to reject this model implies that each of the composite variables measures a single construct (Bagozzi and Heatherton, 1994). This method to model estimation offers larger substantive content for each variable within a smaller matrix, less distraction from accumulated errors and, thus, superior reliability (Bentler and Wu, 1995; Loehlin, 2012). Baumgartner and Homburg (1996) suggest that these composites be established from scales for which unidimensionality and reliability are developed. Partial aggregation is widely applied to estimate complicated models. For example, Morgan and Hunt (1994) assess their commitment-trust theory of relationship marketing.

Henri (2006) operationalized balanced use of PM system as a product term between diagnostic and interactive PM use. According to Henri (2006, p. 541), "a product term is treated as a construct having its own theoretical meaning […] it can be treated as a variable without any theoretical meaning (to test an interaction) or as a construct based on a

theoretical justification." There are some methods in SEM which enable researchers to generate and estimate multiplicative terms. The interaction of diagnostic and interactive PMS use is treated as the PM Use (balanced use of diagnostic and interactive PM system) in the current study. In the interaction method, the items of each construct are multiplied with each other. In this case, the items of diagnostic PM use (four items) and interactive PM use (seven items) were multiplied. Concerning the 28 manifest variables for the balanced use of PM construct, the partial aggregation method, as explained at the outset of this section, was utilized to reduce the number of items (Bagozzi and Edwards, 1998; von der Heidt and Scott, 2007). Each of the seven items (multiplication of a diagnostic item and interactive items) were examined for reliability and unidimensionality (percent of extracted variance for the only one factor). Given that all four groups were highly reliable and unidimensional, the average of each group was calculated as a manifest variable of balanced use of PM system. The summary of results is presented in Table I.

4. Results

This study used two statistical software programs to analyze the data collected. Descriptive statistics, reliability testing, and exploratory factor analysis were performed using Statistical Package for the Social Sciences. In the same vein, SEM was applied for testing the data collected as the main statistical method in the current research. According to Chin and Newsted (1999), SEM can be advantageous as it allows a simultaneous investigation of both theory and measures through performing path-analytic modeling using latent variables. The usage of SEM is so prevalent in both IC (see, e.g. Bontis, 1998) and management accounting settings due to its capability to support the development of holistic models (Smith and Langfield-Smith, 2004).

Although there are various statistical techniques in SEM, SMARTPLS V2.0 M3 (Ringle *et al.*, 2005), which uses PLS, was applied for CFA and hypotheses testing in this study. PLS is a method to estimate path models that involve latent variables indirectly observed by multiple indicators (Fornell and Cha, 1994). Hulland (1999) argues that PLS maximizes the explanatory power of a conceptual model by examining the R^2 values for the dependent (endogenous) constants. While PLS and LISREL can model structural relations among latent variables and relationships between latent variables and manifest indicators (Seleim and Khalil, 2011), PLS has been adopted in the present study because it is more appropriate for explaining complex models and it imposes minimal constraints in terms of measurement scales, sample size and residual distributions (Chin *et al.*, 2003). PLS is one of the widely used techniques within the sphere of IC (see e.g. Bontis and Fitz-enz, 2002; Cabrita and Bontis, 2008; Bontis, 2002, 1998; Hsu and Fang, 2009; Seleim and Khalil, 2011; Adekunle Suraj and Bontis, 2012; Cleary, 2009, 2015; Cleary and Quinn, 2016). PLS requires the subsequent evaluation of the measurement model (i.e. where the reliability and validity of the measures is assessed) and the structural model (where the "fit" between the theoretical model and the data are assessed (Hair *et al.*, 1998).

Diagnostic and interactive joint effect	Unidimensionality	Reliability
Diag1 × (Int1 – Int7)	95.188	0.991
Diag2 × (Int1 – Int7)	94.735	0.991
Diag3 × (Int1 – Int7)	95.040	0.991
Diag4 × (Int1 – Int7)	95.545	0.992

Notes: Diag, diagnostic PM use includes four items; Int, interactive PM use includes seven items

Table I. Reliability and unidimensionality of the balanced use of PM system construct

4.1 Assessment of the measurement model (reliability and validity)

Unidimensionality is presented by composite reliabilities of the constructs that are shown in Table III. The reliability level is desirable at 0.8 for the basic study while it is acceptable at 0.7 for the exploratory study (Hair *et al.*, 1998). An internal consistency measure (Cronbach's α) developed by Fornell and Larcker (1981), and composite reliability calculated by Bacon *et al.* (1995), are typically reported. The composite reliability in mathematical form is the sum of the square of standardized loadings divided by the summation of the sum of the square of standardized loadings and measurement errors of indicators (Hair *et al.*, 1998). It is similar to Cronbach's α (Barclay *et al.*, 1995) and can be similarly interpreted. Among six constructs, four constructs have a Cronbach's α in the 0.90 s, and two constructs (HIC and social capital) are in the 0.80 s. The composite reliabilities are shown in Table III and range from 0.88 (social capital) to 0.99 (balanced use of PM system) which are acceptable by the guideline suggested by Hair *et al.* (1998).

Construct validity can be assessed through the estimation of each measure's convergent, discriminant validity or factor loadings of each item in each construct. Construct, convergent and discriminant validity were demonstrated in several studies (e.g. Ko *et al.*, 2005; Karimi *et al.*, 2004; Teo *et al.*, 2003; Chin *et al.*, 2003; Chwelos *et al.*, 2001). A generally accepted rule of thumb is to accept items with loadings of 0.70 and higher, that implies that there is more shared variance between the construct and its measures than error variance (Barclay *et al.*, 1995; Hair *et al.*, 1998). According to Bollen (1989), the larger the factor loadings, the stronger the evidence of unidimensionality. In this study, the factor loadings were all above 0.70 except for items SIC1, RIC1, RIC10, and OP10 which were in the 0.60 s. These items were dropped in four iterations, in each iteration just one item was dropped, since their factor loadings were lower than 0.70. Eventually, the results became satisfactory following the carrying out of the second calculation of the overall measurement model and after deleting aforementioned items. Besides, as can be seen in Table II, no significant cross loadings are found, thereby providing evidence of scale unidimensionality.

Convergent validity is defined as the extent to which constructs which must be associated theoretically are actually interrelated (Campbell and Fiske, 1959) whereas discriminant validity is defined as the extent to which constructs which must not be associated theoretically are not interrelated in effect (Campbell and Fiske, 1959). Convergent validity is obtained when the average variance extracted (AVE) between the constructs exceeds 0.5 (Chin, 1998). AVE provides a measure of the variance shared between a construct and its indicators. In Table III, the lowest AVEs (0.59 and 0.60) contribute to SIC and HIC, and other constructs have their ranges between 0.63 (RIC) and 0.96 (balanced use of PM system).

This research drew upon the suggestion of Fornell and Larcker (1981). In order to assess discriminant validity: the square root of AVE must be larger than the correlations of the constructs. Hence, the value of diagonal elements must be higher than those of off-diagonal elements (Fornell and Larcker, 1981; Hulland, 1999). Using this criterion, the results in Table IV show adequate discriminant validity for all constructs.

4.2 Structural model assessment

4.2.1 Direct effects. The PLS estimates of the structural model are reported in Table V which includes standardized path coefficients (β) as well as their relevant t-statistics. The authors performed the bootstrap resampling procedure with 5,000 resamples to assess the standard errors. The results show that there is a significant positive association between the level of HIC and the balanced use of PM system, supporting *H1a*. A statistically positive relationship was found with a path coefficient of 0.3907 ($t = 3.452$, $p < 0.01$).

H1b is also supported as there is a significant positive association between the level of SIC and the balanced use of PM system. The path coefficient is 0.2612 and the t-score is

	PMS	HIC	OP	RIC	SIC	SOIC
PMS1	*0.9759*	0.6301	0.5986	0.5355	0.6161	0.5125
PMS2	*0.9824*	0.6497	0.5863	0.5101	0.6003	0.5103
PMS3	*0.9858*	0.6734	0.5943	0.5124	0.6237	0.5446
PMS4	*0.9872*	0.6563	0.5997	0.5224	0.6075	0.5251
HIC1	0.6133	*0.7469*	0.4651	0.5196	0.6474	0.6521
HIC2	0.5860	*0.7549*	0.3550	0.5040	0.5336	0.6271
HIC3	0.3644	*0.7361*	0.4812	0.4103	0.5619	0.4667
HIC4	0.5024	*0.8358*	0.5853	0.4739	0.5933	0.5428
HIC5	0.4593	*0.7913*	0.5027	0.4296	0.6172	0.5600
HIC6	0.5477	*0.8076*	0.6108	0.5115	0.6345	0.6010
OP1	0.5745	0.5887	*0.9270*	0.5936	0.5657	0.4882
OP2	0.5712	0.5546	*0.8923*	0.5496	0.5160	0.4618
OP3	0.6093	0.5916	*0.9188*	0.5853	0.5743	0.5157
OP4	0.4897	0.5584	*0.8123*	0.5331	0.5094	0.4682
OP5	0.5593	0.6355	*0.8615*	0.5637	0.6370	0.5080
OP6	0.4285	0.4821	*0.8486*	0.3985	0.4536	0.3176
OP7	0.4182	0.5079	*0.8912*	0.5243	0.5006	0.4117
OP8	0.5129	0.5858	*0.9241*	0.5370	0.5518	0.4591
OP9	0.6242	0.6128	*0.9162*	0.6012	0.5989	0.5361
RIC2	0.4719	0.4457	0.5958	*0.8283*	0.4918	0.4516
RIC3	0.3442	0.4257	0.4922	*0.8390*	0.4494	0.4536
RIC4	0.4453	0.4715	0.5277	*0.8033*	0.5041	0.4294
RIC5	0.3572	0.3686	0.4013	*0.7419*	0.4458	0.2941
RIC6	0.5127	0.6474	0.6004	*0.8097*	0.6395	0.6107
RIC7	0.3179	0.3756	0.4134	*0.7880*	0.3881	0.4319
RIC8	0.3778	0.4342	0.3211	*0.7644*	0.3776	0.4650
RIC9	0.4603	0.6078	0.4748	*0.7705*	0.5295	0.6429
SIC2	0.5232	0.6726	0.4664	0.5120	*0.7502*	0.6193
SIC3	0.3756	0.6418	0.5148	0.4448	*0.7804*	0.5774
SIC4	0.3997	0.5694	0.3314	0.3488	*0.7527*	0.4485
SIC5	0.4081	0.6180	0.4334	0.5073	*0.8407*	0.5359
SIC6	0.3692	0.6133	0.3795	0.3688	*0.7851*	0.5512
SIC7	0.5885	0.5374	0.5193	0.4684	*0.7281*	0.4515
SIC8	0.5829	0.6244	0.6283	0.6098	*0.8245*	0.5759
SIC9	0.5608	0.4594	0.4906	0.4968	*0.7102*	0.4359
SOIC1	0.4341	0.5837	0.5299	0.6901	0.4487	*0.7995*
SOIC2	0.5877	0.7170	0.4499	0.4840	0.7338	*0.7850*
SOIC3	0.3033	0.5044	0.3305	0.4129	0.4658	*0.8000*
SOIC4	0.3060	0.5249	0.3363	0.3181	0.4920	*0.8372*
SOIC4	0.5249	0.4998	0.3365	0.3176	0.4924	*0.8424*

Notes: HIC, human capital; SIC, structural capital; RIC, relational capital; SOIC, social capital; PMS, balanced use of PM system; OP, organizational performance. Italic values are loadings > 0.7

Table II.
Matrix of loadings and cross loadings

Constructs	Average variance extracted (AVE)	Composite reliability	Cronbach's α
Human capital (HIC)	0.607	0.902	0.870
Structural capital (SIC)	0.597	0.922	0.903
Relational capital (RIC)	0.630	0.931	0.916
Social capital (SOIC)	0.650	0.881	0.823
Balanced use of PM system (PMS)	0.965	0.991	0.988
Organizational performance (OP)	0.789	0.971	0.966

Notes: HIC, human capital; SIC, structural capital; RIC, relational capital; SOIC, social capital; PMS, balanced use of PM system; OP, organizational performance

Table III.
Internal consistency and convergent validity

2.452 with a 0.05 level of significance. Also, there is a positive relationship between RIC and the balanced use of PM system that was shown a path coefficient of 0.1387 ($t = 1.729$, $p < 0.1$), thus *H1c* is supported.

Conversely, there is no significant association between the level of social capital and the balanced use of PM system. R^2 in the balanced use of PM system for the structural model was 48.3 percent, which was explained by the following factors: HIC, SIC, RIC, and social capital.

As hypothesized, organizational performance is significantly associated with the balanced use of PM system ($\beta = 0.2113$, $p < 0.05$), which in turn offers support for *H2*. R^2 for organizational performance for the structural model was 53.5 percent.

4.2.2 Indirect effects. Tests of mediation utilize the suggested four-step procedure argued in Baron and Kenny's classic publication (Baron and Kenny, 1986). Following Barron and Kenny, the Sobel test has been used for testing the significance of an indirect effect. However, this test assumes normality, which has caused many authors to subsequently question its adequacy (Zhao *et al.*, 2010). The current study relies specifically on another technical study to test mediation hypotheses (Zhao *et al.*, 2010). There is general consensus currently about amended recommendations for best practices in testing mediating effect (Hayes, 2009; MacKinnon *et al.*, 2007; Shrout and Bolger, 2002; Zhao *et al.*, 2010). This stream of literature questions Baron and Kenny (1986) for mediation while highlighting the superiority of bootstrap procedures for testing the significance of mediation instead of the Sobel test. For example, Preacher and Hayes (2008) recommend a bootstrap test, particularly when the model involves the simultaneous test of more than one mediator, as the case in this study.

Variables	HIC	SIC	RIC	SOIC	PMS	OP
HIC	*0.779*					
SIC	0.769	*0.773*				
RIC	0.612	0.617	*0.794*			
SOIC	0.742	0.684	0.611	*0.806*		
PMS	0.663	0.622	0.529	0.532	*0.982*	
OP	0.644	0.618	0.616	0.527	0.605	*0.888*

Table IV.
Discriminant validity – correlation of constructs

Notes: HIC, human capital; SIC, structural capital; RIC, relational capital; SOIC, social capital; PMS, balanced use of PM system; OP, organizational performance. Italic values are correlations

No.	Hypothesis	Path	Parameter estimate (β)	Sample mean	SE	*t*-statistics
1	*H1a*	HIC → OP	*0.2474***	0.2598	0.1137	*2.1758*
2	*H1b*	SIC → OP	0.1571 ^{ns}	0.1503	0.1261	1.2458
3	*H1c*	RIC → OP	*0.2909****	0.289	0. 0898	*3.2336*
4	*H1d*	SOIC → OP	−0.0528 ^{ns}	−0.0597	0.0979	0.5394
5	*H2a*	HIC → PMS	*0.3907****	0.3826	0.1132	*3.452*
6	*H2b*	SIC → PMS	*0.2612***	0.2648	0.1063	*2.4527*
7	*H2c*	RIC → PMS	*0.1387**	0.1408	0.0802	*1.7293*
8	*H2d*	SOIC → PMS	−0.01156	−0.0071	0.0948	0.1641
9	*H3*	PMS → OP	*0.2113***	0.2153	0.0885	*2.3873*
10	Control V.	Size → OP	−0.029 ^{ns}	−0.027	0.0642	0.4517
11	Control V.	Industry → OP	0.0572 ^{ns}	0.0546	0.0689	0.8301

Table V.
Results of the SEM estimation (direct paths)

Notes: HIC, human capital; SIC, structural capital; RIC, relational capital; SOIC, social capital; PMS, balanced use of PM system; OP, organizational performance. Italic values are statistically significant parameters. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

As explained above, the decision tree and a step-by-step procedure for testing mediation from Zhao *et al.* (2010) were employed in order to examine the indirect effects in this study (Figures 2 and 3). Figure 2 is an illustration of a mediator model. As can be seen, the direct effect of the IV towards the assumed mediator is depicted with path "a," while the direct effect of the assumed mediator into the DV is shown with path "b." The indirect path is derived from the interaction between path "a" and "b." This implies the path where mediation through the assumed mediator is established. Besides, path c illustrates the direct effect of the IV on the DV (Zhao *et al.*, 2010).

The following figure (Figure 3) is called a decision tree. Zhao *et al.* (2010) comprehensively describe all the conditions for establishing mediation as well as understanding different types of mediation and even non-mediation. However, the two most common and relevant types of mediation are partial and full mediation which are referred to as complementary and indirect-only mediation respectively. Specifically, Zhao *et al.* (2010) show that the presence of significant direct effect suggests a potential partial mediation or so-called complementary mediation (i.e. the IV effects the DV and the effect is strengthened by the mediator). On the other hand, the lack of a direct effect suggests a potential full mediation or so-called indirect-only mediation (i.e. the IV effects the DV only when the mediator is present).

Based on the foregoing discussion, the recommended 5,000 bootstrap samples were performed in order to test the mediating effects in this study. Overall, the results reveal that the 95 percent bootstrap confidence intervals for the total effects and those of balance use of PM system (mediating variable of the current study) are all positive and do not include zero. The related results of mediation model are comprehensively presented in Table VI below.

As presented in Table VI, bootstrapping the model with the balanced use of PM system as mediating variable resulted in a 95 percent confidence interval (0.0949, 0.0993) for the indirect effect of HIC on organizational performance. This confidence interval does not include zero, so the indirect effect a × b (0.0739) is significant and mediation through the balanced use of PM system is established (*H3a* is supported). The direct effect c (0.247**) is also significant ($p < 0.05$). Since a × b × c is positive, it is a complementary mediation (partial mediation) according to the decision tree for establishing and understanding types of mediation and non-mediation (Zhao *et al.*, 2010, p. 201). These findings, therefore, provide support for *H3a*. The same approach was performed to test the mediating effect of balanced use of PM system on the relationship between SIC and organizational performance (*H3b*). The results reveal a 95 percent confidence interval (0.0938, 0.0972) for the indirect effect of SIC on organizational performance. This confidence interval does not include zero, so the indirect effect a × b (0.0975) is significant and mediation through the balanced use of PM system is determined. However, the direct effect c (0.1571) is not significant. In this case, indirect-only mediation (based on Zhao's model) or full mediation is established which consequently lends support to *H3b*.

In the same vein, the procedure of bootstrapping for the purpose of exploring the indirect effect of RIC on organizational performance through the balanced use of PM system shows a 95 percent confidence interval (0.0513, 0.0542). This confidence interval does not include zero, so the indirect effect a × b (0.0527) is significant and therefore mediation through the balanced use of PM system is confirmed. The direct effect c (0.2909***) is significant as well ($p < 0.01$). Accordingly, the complementary mediation (partial mediation) is established as

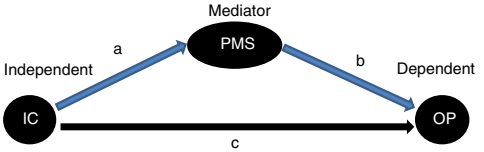

Figure 2.
A three-variable nonrecursive model

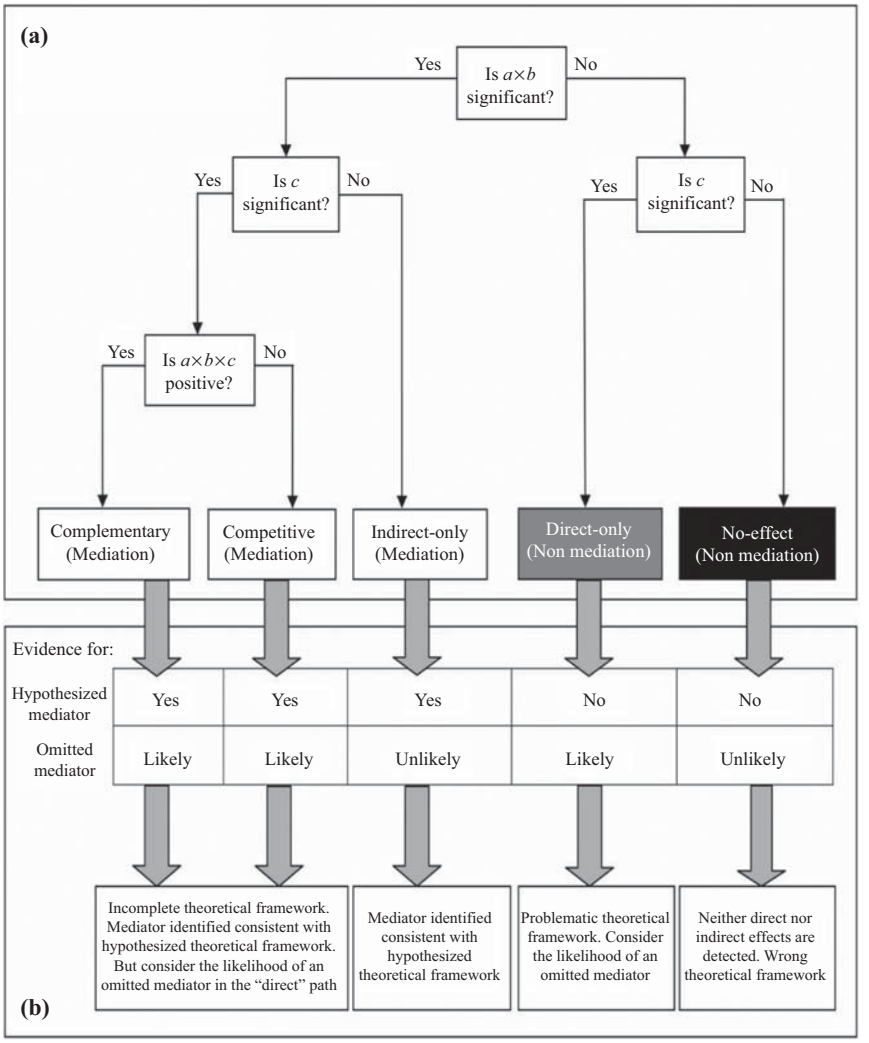

Figure 3.
Decision tree for establishing and understanding types of mediation and non-mediation

Notes: (a) Establishing mediation and classifying type; (b) understanding mediation's implication for theory building
Source: Zhao *et al.* (2010, p. 201)

a × b × c is positive. *H3c* is also supported. Conversely, *H3d* (the balanced use of PM system mediates the relationship between social capital and organizational performance) is not supported due to the fact that the initial condition for establishing the mediation effect was not fulfilled. That is, there was no significant association between the IV (social capital) and mediating variable (the balanced use of PM system).

5. Discussion and conclusion

Although the effect of IC on firm performance has been substantially studied, less effort has been devoted to understanding the role of PM systems in leveraging organization's most

valuable asset, i.e., IC. In line with the argument that organizational performance is positively influenced by the appropriate measurement and management of the underlying critical success factors (Kaplan and Norton, 1996; Simons *et al.*, 2000), this paper provides empirical evidence that the level of IC is related to the use of PM systems in a balanced diagnostic and interactive style. Furthermore, this balanced use of PM systems mediates the relationship between IC and organizational performance. As expected, organizations that have higher levels of IC would achieve significantly superior performance when they put more value on the balanced use of PM systems.

The first set of hypotheses investigates whether the level of IC components are associated with the balanced use of PM systems from managers' vantage point. The joint use of PM systems is generated by the balanced use in a diagnostic and interactive manner (Henri, 2006). Such desirable integration reflects competition (positive against negative feedback) and complementarity (concentrate on intended and emergent strategies). In this respect, the significance of the path coefficients of three IC components (i.e. HIC, SIC, and RIC,) and that balanced use of PMS provide support for the *H1a* ($p < 0.01$ level), *H1b* ($p < 0.05$ level) and *H1c* ($p < 0.1$ level).

However, no significant relationship was found concerning the association between social capital and the balanced use of PM systems in the context of this study (*H1d*). This result presents an unexpected finding, which could be attributed to the different characteristic of organizations' social capital (i.e. differences in the nature of informal interactions and communication among organizational members within an organization) in the Iranian context compared with Western studies (e.g. Widener, 2006; Usoff *et al.*, 2002). The other plausible explanation is that social capital (without the support of the other main components of IC) may not be effective enough to make a major breakthrough within companies. In this respect, some recent IC scholars (e.g. Isaac *et al.*, 2010; Nazari *et al.*, 2009; Choo Huang *et al.*, 2010) do not separate the components of IC and use an aggregate IC concept owing to the strong inter-correlation among the IC components. Future research might seek to clarify the basis of this inconsistency by considering both aggregated and disaggregated scores of IC. Overall, these findings imply that knowledge-intensive organizations with more intangible resources and capabilities tend to employ more organic control mechanisms. In other words, there are positive outcomes related to the balanced use of PM systems in order to take full advantage of strategic resources. The result is consistent with the extant literature (Amason, 1996; De Dreu, 1997; English, 2001; Henri, 2006; Nicotera, 1995; Tjosvold, 1997; Van Slyke, 1999).

The second hypothesis examines whether the balanced use of PM systems is positively associated with organizational performance. As mentioned earlier, the balanced or joint use of PM systems in a diagnostic and interactive manner reflects competition (positive against negative feedback) and complementarity (concentrate on intended and emergent strategies). In this regard, the significance of the path coefficients between the balanced use of PM systems and OP provide support for *H2* ($p < 0.05$ level). This indicates that, organizations

Indirect effect – hypothesis	Mean (a × b)	SD	Lower bound of confidence interval	Upper bound of confidence interval	Type of mediation
HIC-PMS × PMS-OP (*H4a*)	0.0971	0.0507	0.0949	0.0993	Complementary (partial)
SIC-PMS × PMS-OP (*H4b*)	0.0955	0.0392	0.0938	0.0972	Indirect-only (full)
RIC-PMS × PMS-OP (*H4c*)	0.527	0.0327	0.0513	0.0542	Complementary (partial)

Notes: HIC, human capital; SIC, structural capital; RIC, relational capital; SOIC, social capital; PMS, balanced use of PM system; OP, organizational performance

Table VI. Results of mediating model

which employ the balanced use of diagnostic and interactive PM systems to a greater extent tend to be superior in terms of OP. This result is consistent with the conflict literature which suggested that tension is not inevitably adverse in essence but alternatively might be favorable to entities (De Dreu, 1997; Nicotera, 1995). Despite some underlying notions which assume that conflict and tension is adverse and destructive, ample evidence within the conflict literature asserts that they are likely advantageous to either individual or corporate performance. This literature suggests that refusing and repressing conflict attenuates creativity, decision quality, product development, and communication (De Dreu, 1997; Nicotera, 1995).

The analysis also showed that the balanced use of PM systems mediates the relationship among the three components of IC (i.e. HIC, SIC, and RIC) and organizational performance, thereby providing support for hypotheses (*H3a*) (*H3b*), and (*H3c*), respectively. In general, *H3* (the mediating effect of PMS) are hypothesized based on the premise that organizations tend to utilize the appropriate PMS that is aligned with their capabilities in order to manage those resources more effectively, thereby enjoying more desired organizational outcomes. These findings show that some of the advantages stem from IC would affect OP indirectly through the emphasis put on the usage of PMS. Once organizations acquire their strategic resources and capabilities, PMS would be employed in order to assist in the capturing and managing such vital resources. This could provide useful feedback and information on those fundamental resources that eventually results in performance improvement (Widener, 2006).

The findings are consistent with the resource-based view of the firm which assumes that organizations are not able to realize their benefits if their strategic intangible resources are not managed appropriately. According to Simons *et al.* (2000), PM systems are perceived as a powerful lever to support management of strategic resources. As Kaplan and Norton (1996) claimed, appropriate management and measurement of the underlying critical success factors (e.g. IC) could influence business performance positively. In this regard, managers ought to adopt appropriate organizational control system that offer relevant information concerning the company's underlying strategic resources that are perceived as critical success factors (Kaplan and Norton, 1996; Simons *et al.*, 2000). The result of the current research is also in harmony with the ideas of some seminal earlier works in the PM literature.

5.1 Research and practical implications

The results of this project provide some theoretical and practical implications. While the effect of different types of intangibles on performance has received considerable attention, little is known about the important role of management control systems, in particular the PM system, in facilitating the management of knowledge resources. In this regard, this study contributes to theory by providing additional evidence on the importance of the balance use of diagnostic and interactive PM systems in supporting and leveraging the organizations' strategic resources. This study suggests the importance of PM system that stresses both financial and non-financial performance measures and works in an interactive style that promotes search, innovation, and coordination in supporting IC. The findings show that the diagnostic and interactive uses of PM systems act in combination to produce the dynamic tension which contributes to the effective management of organizational resources, which in turn improves the organizational performance.

This study contributes to the extant body of research at the boundary between IC and organizational performance. It synthesizes a robust framework from the contingency lens, resource-based view, and management accounting literatures. This theoretical model offers fascinating insights about the dual roles of IC either in making a major breakthrough in the evolution of organizational control systems or predicting organizational outcomes.

Moreover, unlike the popularity of the general dimensions of IC including HIC, SIC, and RIC, the social capital has been studied to a lesser extent. Hence, this study endeavors to conceptualize a multidimensional concept of IC by developing and validating an IC measurement instrument incorporating social capital. In this respect, this study provides a more comprehensive set of empirical evidence to shed light on the role of IC in fostering desired organizational outcomes through synthesizing the multiple aspects of IC in one research model. This study also offers further insights into whether the emphasis put on the use of PMS, from two individual but complementary aspects, "matters" to the organization through examining the relationship with organizational performance. Addressing PM systems from two separate but complementary aspects simultaneously provides a more systematic view which in turn could determine the organizational outcome positively.

As for practitioner implications, the findings are pivotal to management accountants in designing relevant PM systems that exploit intangible assets. The findings provide insights into the way practitioners adopt appropriate types of PM systems, which are aligned with the level of IC in an organization. To take full advantage of the significant and distinctive effects of IC on organizational performance, accountants and managers are encouraged to have the balanced use of diagnostic and interactive PM systems.

The results from this research are not without limitations. First, the findings provided in the current study are based on associations (i.e. correlations) rather than causal impacts. Second, the results are based largely on perceived opinions of key informants. Such perceptions are likely to be insufficient in understanding the full extent of latent constructs (Verbeeten, 2008). Although the development of validated instruments and the pre-tests on survey experts and CFOs could alleviate this issue, further investigation would be helpful in validating the findings of this research.

Moreover, the institutional differences in various types of organizations could explain some of the findings in the current study since the paper is based on a cross-sectional survey of all publicly listed companies instead of one particular type of organization. Future studies may carry out a series of in-depth case studies to explore exactly how different types of organizational control systems could illuminate IC at an organizational level.

Furthermore, the use of quantitative study approach is not able to provide answers as to "why" and "how" certain linkages work or mechanisms cause certain things. Future studies may carry out a qualitative study approach through interviews or in-depth case studies to better understand the context and environment of a company that provide details about human behavior, emotion, and personality characteristics relating to IC and PM system.

Further research may also consider a longitudinal examination of the causality and interrelationships among factors that are pivotal to IC and PM system development. Finally, in undertaking studies examining the role of management control systems in knowledge-intensive organizations, scholars may consider the recent warning highlighted by Leif Edvinsson (2013, p. 169), when he commented that, "we need to go beyond IC reporting, to think in terms of cross-disciplinary systematized perspectives that will increase the IC consciousness."

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