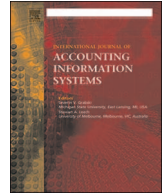


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International Journal of Accounting Information Systems

journal homepage: www.elsevier.com/locate/accinf

Using a robust performance measurement system to illuminate intellectual capital

Kaveh Asiaei^{a,*}, Ruzita Jusoh^b^a Department of Accounting, Mashhad Branch, Islamic Azad University, Mashhad, Iran^b Department of Accounting, Faculty of Business & Accountancy, University of Malaya, Kuala Lumpur, Malaysia

ARTICLE INFO

Keywords:

Performance measurement system
 Measurement diversity
 Social and environmental measures
 Intellectual capital
 Social capital
 Iran

ABSTRACT

The central premise of the “fit-as-mediation” view states that knowledge-related factors could determine the usage and design of specific organizational systems, such as management accounting and control systems. This could, in turn, facilitate information processing and bring about positive organizational outcomes. While the influence of knowledge-based assets on measurable performance has been examined extensively in the intellectual capital literature, little is known concerning the role of an organizational control system in fostering the management of intellectual capital as the most strategic asset for organizations. As such, this study primarily aims to explore what role a performance measurement system plays in terms of the diversity of measurement in the relationship between intellectual capital and organizational performance. We incorporate social capital into the general three-dimensional classification of intellectual capital; namely, human capital, structural capital, and relational capital, to provide a more comprehensive measure of intellectual capital. Further, we conceptualize the diversity of measurement by supplementing the original Kaplan and Norton's BSC model with a new perspective, social and environmental measures. Such integration of financial, customer, internal business process, learning, and growth, along with social and environmental measures could result in an overarching and robust conceptualization of performance measurement; a concept that was barely mentioned in previous literature. We conducted a questionnaire survey involving chief financial officers of 128 Iranian public listed companies. Using the partial least squares (PLS), we find that companies with higher levels of intellectual capital emphasize a greater diversity of performance measures. The findings also show that the diversity of measurement mediates the relationship between intellectual capital and organizational performance. This paper may offer guidance to companies concerning the competencies needed for securing positive organizational outcomes from their knowledge resources, such as intellectual capital.

1. Introduction

In modern knowledge-based economies, the primary source of value creation has shifted from tangible factors of production toward intangible resources (Inkinen, 2015). Companies operating in this so-called intangible economy reap considerable proportions of their benefit from intellectual capital factors, such as the quality of relationships, structures and human capital (Segelod, 1998). As firm performance is primarily grounded upon knowledge-related elements, it is critical for organizations to gain clear insights into the creation, management, and measurement of intellectual capital (Kianto et al., 2014). Nonetheless, there are still many challenges and arguments

* Corresponding author.

E-mail addresses: kave.asia@mshdiau.ac.ir (K. Asiaei), geee@um.edu.my (R. Jusoh).

<http://dx.doi.org/10.1016/j.accinf.2017.06.003>

Received 21 August 2015; Received in revised form 1 June 2017; Accepted 19 June 2017
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concerning the measurement and conceptualization of intellectual capital (Asiaei and Jusoh, 2015). Hence, a need to understand how the multidimensional and comprehensive concept of intellectual capital is discussed and empirically tested is warranted.

A review of the existing literature shows that intellectual capital is an inherently multidimensional concept (Subramaniam and Youndt, 2005; Lee, 2011; Asiaei, 2014). Despite the general consensus about the importance of intellectual capital, a precise conceptualization and definition of intellectual capital remains disputable. Scholars are still unable to agree on the number and type of intellectual capital dimensions to be used (Asiaei and Jusoh, 2015). While Hudson (1993), for example, narrows the scope of the concept to just individual knowledge, other scholars incorporate organizational relationships, infrastructure, culture, routine, and intellectual property into the conceptualization of intellectual capital (Brooking, 1996; Roos et al., 1997). Notwithstanding that extensive work has been carried out on the three-dimensional model of intellectual capital that embraces human, structural, and relational capital, existing research on social capital is much more limited (Wang and Chen, 2013; Delgado-Verde et al., 2011). The inclusion of social capital in the development of intellectual capital is necessary as it provides a better understanding of the intrafirm networks (Tsai and Ghoshal, 1998) or intra-organizational social capital (Maurer et al., 2011). All these are embedded in the quality of interaction among organizational members and between units within a firm. In this regard, this study aims to conceptualize a multidimensional concept of intellectual capital by incorporating social capital as the fourth dimension along with the other three foregoing dimensions. This practice is in line with the conceptualization of intellectual capital that synthesizes all the knowledge and competencies as the means toward sustained competitive advantage (Stewart, 1997).

In practice, organizations are not able to realize their benefits if their strategic resources, primarily intellectual capital and knowledge assets, are not managed appropriately (Coff, 1997; Widener, 2006). Kaplan and Norton's (1996, p. 21) maxim of "if you can't measure it, you can't manage it" signifies that organizational performance would be positively affected through the measurement of the organization's fundamental critical success factors, such as strategic assets. Similarly, Tayles et al. (2007) argue that the design and the nature of management accounting systems, such as performance measurement systems, need to be adequately innovative so that organizations are able to capture the real value and contributions of intellectual capital and other invaluable assets. The performance measurement system, as one of the major elements of management control systems, is perceived as a lever that supports the management of strategic resources (Simons et al., 2000). Relevant information related to the organization's underlying strategic assets is provided through the performance measurement system (Kaplan and Norton, 1996). This implies that some benefits of intellectual capital can influence organizational performance in an indirect manner through the usage of a performance measurement system. As Kaplan and Norton (2001) assert, the effect of knowledge resources is not inevitably direct and immediate. Alternatively, they could affect organizational outcomes via chains of cause-and-effect relationships that involve two or three intermediate stages. Due to this, it is worth examining the mediating effect of performance measurement systems in the association between intellectual capital and organizational performance.

With the foregoing arguments, the contribution of this study is primarily twofold. First, it contributes to understanding the need for all four dimensions of intellectual capital to be integrated to allow a more comprehensive model of intellectual capital. Second, we explore how a comprehensive intellectual capital view, which represents the organizations' most strategic resources, may contribute to improved organizational performance with the support of a robust performance measurement. For this purpose, we conceptualize the performance measurement system as the diversity of performance measures, which is multidimensional in nature. Besides the four original dimensions noted in the diversity of measurement construct that includes financial, customer, internal business process, and innovation and learning, which are largely borrowed from the balanced scorecard framework (Kaplan and Norton, 1992, 2005), the current study also explores an additional dimension termed the social and environmental perspective. Accordingly, this adds another potential contribution to the performance measurement system and intellectual capital literature in that, to date, no study has analyzed all five dimensions of performance measures as the diversity of measurement and linked it to intellectual capital. Incorporating social and environmental measures (Adams et al., 2014) could offer a more comprehensive and robust conceptualization of performance measurement systems, in general, and the diversity of measurement, in particular. This is also in line with the emerging concept of sustainability in that organizations need to have some sustainability indicators for comprehensive organizational performance evaluations covering the economic, environment, and social aspects of performance (Rahdari and Rostamy, 2015). The increased attention on sustainability issues demonstrates the level of interest in many types of organization to use performance measures for both internal and external stakeholders. The inclusion of social and environmental measures also provides the need to embed the sustainability concept into the intellectual capital perspective, which receives less attention in the intellectual capital literature. The results drawn from this study indicate that organizations with higher levels of intellectual capital tend to attach more importance to the diversity of performance measures. Further evidence also reveals that the diversity of measurement mediates the relationship between intellectual capital and organizational performance. Thus, the findings suggest that organizations with higher levels of intellectual capital would achieve significantly superior performance when they use a broader range of performance measures.

The rest of the paper is structured as follows. Section 2 presents a literature review on intellectual capital and the diversity of measurement as well as the development of hypotheses. Section 3 develops the theoretical framework, which explains the mediating role of the diversity of measurement. Section 4 provides the research method, while Section 5 presents the results based on PLS analysis. The final section discusses the findings and implications, as well as the limitations and suggestion for future research.

2. Literature review and hypotheses development

2.1. Multidimensional view of intellectual capital

A new wave of intellectual capital studies was initiated by a number of scholars in the late 1990s whereby it was conceptualized as the synthesis of all the knowledge and competencies that are perceived as a cornerstone for sustainable competitive advantage

(Stewart, 1997). This is in line with prior studies that have debated considerably the key definitions and concepts of intellectual capital in diverse fields that encompass economics, strategy management, human resources, marketing, information systems, operations management, finance and accounting (Lee, 2011; Asiaei and Jusoh, 2014). Intellectual capital embraces information, intellectual property, intellectual material, knowledge, core techniques, customer relationships, technical know-how, corporate technology, and professional capabilities that could bring wealth to an organization, and thereby make it more competitive in the marketplace (Stewart, 1997). In this regard, intellectual capital is defined as the sum of the combined “hidden” assets of the members of a company and the balance of what remains after they depart from the office at the end of the working day (Roos et al., 1997), and the inventory of the knowledge-based resources owned by an organization (Dzinkowski, 2000) or the social collective's knowledge and knowing capability (Nahapiet and Ghoshal, 1998).

The literature shows that intellectual capital comprises various types of knowledge-based assets. A three-dimensional classification of intellectual capital, i.e., human-, organization-, and relationship-centered, was found to be an emergent standard and the basis concerning how to develop the measurement models (Inkinen, 2015). Human-centered capital embodies the collected wisdom, education, capabilities, and features belonging to individuals within an organization (Bontis, 1998; Dzinkowski, 2000; Edvinsson and Malone, 1997). Organization-centered (e.g., organization and structural) capital includes the knowledge that is embedded in information technology systems and the outcomes and products of knowledge conversion, i.e., documents, databases, process descriptions, plans, intellectual properties of the company, and all the non-human storehouses of knowledge in an entity (Edvinsson and Malone, 1997; Bontis, 1998). Lastly, relationship-centered (e.g., relational and customer) capital contains the value and knowledge arising from the company's networks with outsiders consisting of customers, suppliers, distributors, competitors, and all other related parties (Dzinkowski, 2000; Roos et al., 1997).

Surprisingly, the foregoing prevailing classification tends to overlook intrafirm networks (Tsai and Ghoshal, 1998) or intra-organizational social capital (Maurer et al., 2011), which is embedded in the quality of the relationship between people and within units in a firm. As a result, despite a considerable number of intellectual capital studies, the social capital dimension has only been addressed to a limited extent (Delgado-Verde et al., 2011; Subramaniam and Youndt, 2005; Wang and Chen, 2013). In addition to relationships with external parties (i.e., relational capital), relationships among members within an organization is also very important. This is because tacit knowledge and information is shared through that network (Kogut and Zander, 1992; Nonaka, 1994), trust is reciprocated (Leana and Van Buren, 1999), and resources are exchanged (Tsai and Ghoshal, 1998). Accordingly, the three basic dimensions of intellectual capital are further complemented by a fourth component (i.e., social capital as another standard intellectual capital dimension) in the current study. This is to exercise a more thorough measurement of intellectual capital. Nevertheless, the definitions of social capital are somehow varied and not entirely consistent among scholars, resulting in different perspectives and thoughts (Adler and Kwon, 2002). Nahapiet and Ghoshal (1998) offer a broader view of social capital that includes structural, relational, and cognitive capital. Other scholars narrow the scope of the concept to include the degree and quality of interactions among members and units inside an organization (Yli-Renko et al., 2002; Bolino et al., 2002; Youndt and Snell, 2004). Despite the foregoing inconsistency, it is evident that social capital is embedded in the interpersonal relationships, which are inherently affective in nature (Krackhardt, 1992). Therefore, social capital can be said to embody the affective connections between employees whereby co-workers like, trust, and identify with one another (Bolino et al., 2002). A close relationship between social capital and intellectual capital offers a dynamic approach to promote corporate advantage by discussing and communicating between relevant employees in an organization (Nahapiet and Ghoshal, 1998). In the current paper, the notion of social capital is described as knowledge stemming from informal interactions among members, which are not predetermined by the 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).

The current study highlights the multidimensional perspective of intellectual capital by integrating four elements (i.e., human, structural, relational, and social capital). Such a multiple-feature approach to intellectual capital suggests that there are distinctive knowledge assets that could enable organizations to take advantage of their potential human resources, structural assets, cultures, and networks with external parties (Subramaniam and Youndt, 2005). Scholars tend to give human and structural capital more attention, while social and relational are addressed to a lesser extent. It has also been noted that the majority of the studies devote more attention to dimensions that are specific to their fields of study. As an example, studies concentrating on accounting and finance have mainly focused on measurable resources, thereby overlooking the dimension of social capital. Likewise, studies on marketing are more involved with relational and customer capital as they are both critical intangibles that can reap higher yields and profits. Meanwhile, several studies in the area of innovation have examined social capital as either an antecedent or a moderator (Subramaniam and Youndt, 2005; Wu et al., 2008; Elsetouhi et al., 2015). Finally, the area of information systems appears to attach special importance to structural capital like information technology capability, which plays a pivotal role in supporting knowledge management. Hence, it is plausible to conclude that there is a necessity for integrating diverse dimensions of intellectual capital to provide a more holistic view of such knowledge resources. This implies that the scattered discussions of intellectual capital may obscure new insights into the way practitioners detect and fully exploit this important type of intangible (Marr, 2012).

2.2. Diversity of measurement

Performance measurement systems provide information that can be used to assess organizational and individual performance (Burney and Matherly, 2007). An effective performance measurement system also helps to highlight an organization's current market position and support it in planning future strategies and operations (Langfield-Smith et al., 2009). A performance measurement system, in its traditional form, places greater emphasis on financial indicators like profitability and return on investment as a way to appraise the performance of organizational members (Elgazzar et al., 2012). The shortcomings of traditional performance

measurement approaches, along with increasing competitive pressures and shifting external demands, have resulted in a greater orientation toward non-financial measures (Taylor and Taylor, 2013). Both academics and practitioners have acknowledged the use of contemporary performance measurement systems for the purpose of dealing with the issues of traditional financial performance measures and supporting companies in gaining competitive advantages in the ever changing economic environment (Kaplan and Norton, 2006, 2004, 2001, 1996, 1992). This can be exemplified by the balanced scorecard, which is inherently multi-dimensional, as it provides an effective integration of both financial and non-financial measures (Kaplan and Norton, 1996).

Considering the foregoing argument, it can be seen that organizations place emphasis on contemporary performance measurement approaches, which include a greater diversity of measures (e.g., customer, internal business process, learning and growth, and financial) in their performance measurement system, regardless of which intangible resource the firm relies on (Kaplan and Norton, 1996). As a matter of fact, the performance measurement system should be furnished with multidimensional indicators and a greater diversity of measures for the purpose of effectively managing the critical success factors of an organization (Kraus and Lind, 2010). In this study, the diversity of measurement covers four dimensions of the BSC, namely; financial, customer, internal business process, and the innovation and learning perspective (Kaplan and Norton, 1992; Hoque and James, 2000; Henri, 2006). This occurs in addition to a new dimension, which is labelled the social and environmental perspective (Adams et al., 2014). The incorporation of the social and environmental dimension into the performance measurement framework may assist organizations to capture, leverage, and control knowledge resources more effectively. In addition, such a combination provides a more comprehensive and balanced approach to corporate wealth while also shedding light on a company's capability to bring wealth in the future (Adams et al., 2014). The diversity of measurement covering the social and environmental dimension is also in line with the concept of sustainability where organizations need to place greater concern on social and environmental issues. From an intellectual capital perspective, companies should go beyond the eco-efficiency phase of corporate sustainability by mobilizing their intellectual capital toward a more ecologically sustainable and socially equitable enterprise (Wasiluk, 2013). In this respect, the intangible or non-financial benefits, such as the improvement in the company's reputation and image, the enhancement of employee motivation, natural resource conservation and emission levels, employee diversity, and occupational, health and safety, as well as community relations derived from the adoption of environmental or sustainability related practices, should be measured by a performance measurement system that includes social and environmental performance measures. Therefore, from these arguments, it is expected that a knowledge intensive organization that possesses human, structural, relational, and social capital would place high value on multidimensional performance measurement system models in order to take full advantage of such intangible resources. This rationale motivates the following hypotheses:

H1. The higher the level of human capital, the higher is the diversity of measurement.

H2. The higher the level of structural capital, the higher is the diversity of measurement.

H3. The higher the level of relational capital, the higher is the diversity of measurement.

H4. The higher the level of social capital, the higher is the diversity of measurement.

A large and growing body of literature has investigated the effects of performance measures on firm performance (e.g., Homburg et al., 2012; Banker et al., 2000; Hoque and James, 2000; Ittner and Larcker, 2001; Stede et al., 2006; Davis and Albright, 2004; Maiga and Jacobs, 2003; Sim and Koh, 2001; Jusoh and Parnell, 2008; Jusoh et al., 2008; Lee and Yang, 2011). They generally conclude that the use of performance measures, such as BSC measures, and which comprise a wide diversity of performance measures, both financial and non-financial, could result in superior organizational performance. These arguments, which originated from an economic viewpoint of decision-making, emphasize the fact that in uncertain fluid environments, the higher availability of multiple relevant information can result in the more efficient allocation of resources (Baines and Langfield-Smith, 2003) and a positive result probability (Christensen et al., 2003). Meanwhile, Stede et al. (2006) find that more frequent and greater diversity of performance measures employed by manufacturing firms have more effect on superior performance, specifically, when a larger number of objective and subjective non-financial measures are embedded in the system. This is because better information tends to support more effective administrative decisions, which can improve corporate performance (Baines and Langfield-Smith, 2003; Chenhall, 2005). Based on the aforesaid arguments, it can be deduced that the extent to which multiple performance measures, conceptualized as the diversity of measurement, are used, they are likely to have a significant positive impact on organizational performance. Therefore, the following hypothesis is developed:

H5. The higher the diversity of measurement, the higher the organizational performance.

2.3. Mediating role of the diversity of measurement in the intellectual capital and performance relationship

Wang and Chang (2005) argue that intellectual capital is the key factor that drives and creates a firm's value. Thus, the creation and accumulation of intellectual capital must be reflected in an organization's performance. From the theoretical lens, advocates point out that intellectual capital is the value driver that leads to higher profitability (Bismuth and Tojo, 2008) and that organizational knowledge is at the crux of competitive advantage (Bontis, 1998). Nevertheless, empirical and case evidence has been inconclusive without any solid scientific consensus (Dumay, 2013). As a matter of fact, empirically examining the association between intellectual capital and firm performance is not a straightforward process, as, currently, there is no global consensus as to which is considered to be the most appropriate for measuring a firm's intellectual capital (Cleary, 2015).

Numerous studies have identified the positive impact of intellectual capital on financial performance (Perrin, 2000; Chen et al., 2005; Wang and Chang, 2005; Youndt and Snell, 2004; Riahi-Belkaoui, 2003) and the firm's market value (Bismuth and Tojo, 2008; Chen et al., 2005; Choi et al., 2000). Perrin (2000) observed that certain human capital, structural capital and relational capital dimensions are significantly associated with business performance. Sharabati et al. (2010), and Cabrita and Bontis (2008) reported that structural capital and relational capital are positively linked to organizational performance. However, some have revealed the negative impact or non-association of intellectual capital. This is illustrated by Huang and Liu (2005) who studied the association of intellectual capital among innovation, IT, and performance. They find that there is a non-linear association between innovation capital and business performance. In another study, Firer and Williams (2003) indicate no significant relationship between intellectual capital and traditional measures of organizational performance. In their studies, Novas et al. (2012), F-Jardón and Susana Martos (2009), and Ordóñez de Pablos (2002) find that only structural capital is significantly associated with business performance, which has been endorsed by Mention and Bontis (2013) with regards to human capital.

In light of these mixed results, it can be reasonably concluded that some of the advantages drawn from intellectual capital may indirectly affect organizational performance through the emphasis placed on other factors, such as the diversity of measurement. This conclusion supports the argument that intangible assets rarely influence organizational performance directly but that they can do so indirectly through the chain of cause-and-effect relationships (Kaplan and Norton, 1993, 2001). In this respect, Widener (2006) argues that once organizations acquire their strategic resources or capabilities, a performance measurement system would be employed to effectively assist in the capturing and managing of those crucial strategic resources, which, in turn, improves performance. Hence, this study is motivated to substantiate these claims by examining the mediating role of performance measurement systems in the relationship between intellectual capital and performance.

A number of related studies lend support to the mediating role of the diversity of measurement (e.g., Chong and Chong, 1997; Mia and Clarke, 1999; Baines and Langfield-Smith (2003); Hammad et al., 2010; Mia, 1993; Widener, 2006; Joiner et al., 2009). As an illustration, Mia and Clarke (1999) find the mediating effect of management accounting information between the association of market competition and business unit performance. This implies that market competition is capable of influencing performance through the management accounting system. It was believed that an organization is able to position itself correctly in the marketplace and counteract competitive threats through vital information provided by management accounting information. In a similar vein, Baines and Langfield-Smith (2003) examine management accounting change, and they note that firm performance is positively affected by a change in organizational design, technology, and advanced manufacturing practices via changes in non-financial management accounting information. Further, Joiner et al. (2009) observe that a performance measurement system that is characterized by both financial and non-financial performance measures can mediate the relationship between the flexible manufacturing strategy and the organization's financial and non-financial performance. From this, it can be reasonably concluded that a performance measurement system that focuses on diverse performance measures is essential for providing vital information concerning the organization's underlying resources and capabilities for top managers (Simons et al., 2000).

The mediating role of performance measurement systems can be explained by the concept of “fit-as-mediation” as proposed by Drazin and Van de Ven (1985), and Venkatraman (1989). They argue that the attributes of knowledge determine the design and execution of certain systems, thereby fostering the information processing (Galbraith, 1973; Thompson, 2011). From this vantage point, it is assumed that knowledge per se, may not be valuable unless it is effectively captured, measured, and managed through the employment of a performance measurement system (Kaplan and Norton, 1996; Widener, 2006). Based on this premise, the following hypotheses are proposed as follows:

H6a. The diversity of measurement mediates the relationship between human capital and organizational performance.

H6b. The diversity of measurement mediates the relationship between structural capital and organizational performance.

H6c. The diversity of measurement mediates the relationship between relational capital and organizational performance.

H6d. The diversity of measurement mediates the relationship between social capital and organizational performance.

Given the foregoing arguments, a theoretical model was developed as depicted in Fig. 1 showing all the hypotheses. In summary, it is proposed that the two variables – intellectual capital and organizational performance – are probably linked indirectly through the use of diverse performance measures. It is expected that knowledge-based organizations with high levels of intellectual capital will place emphasis on a more innovative performance measurement system that is diverse and multidimensional in nature, which, in turn, will improve organizational performance.

3. Research design

3.1. Survey procedure and sample

We conducted a field survey to obtain data for the hypotheses testing. The Tehran Stock Exchange (TSE) database served as a sampling frame for this study where over 40 industries were listed. The population of the current study embraced all the listed TSE organizations noted in the year 2012. A total of 339 companies, with a combined market capitalization of US\$104.21 billion, were listed on the TSE, which is based on the “Tehran Stock Exchange Monthly Report” (as of May 2012). Due to the limitation of the size of the population, no sampling was performed in order to achieve a more valid, reliable and comprehensive finding from a multi-industry sample. We selected TSE companies as most of them are medium to large-sized organizations and enjoy reasonably higher capabilities toward investment in

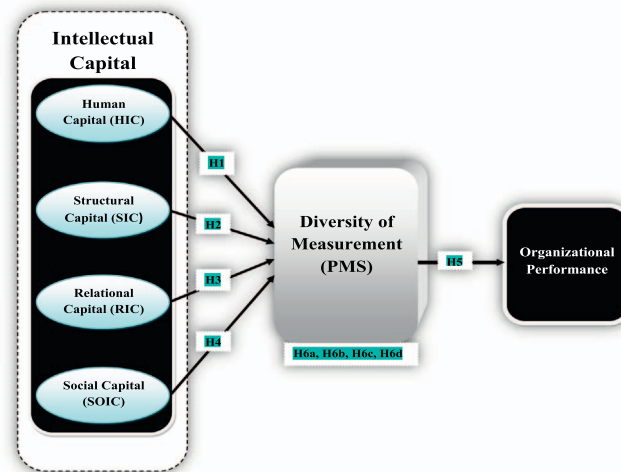


Fig. 1. Research model.

intellectual assets. These companies are also assumed to be more involved in advanced and strategic management accounting systems. A structured questionnaire was applied for the purpose of data collection. The questionnaire included a cover letter explaining the importance of the research and was accompanied by a postage-paid return envelope. These were then sent to the Chief Financial Officers (CFOs) of 339 public listed companies in Iran. A total of 136 responses were returned after two mailings and a follow-up phone call. From the total, only 128 (37.7%) were found suitable for the purpose of data analysis.

Despite the limitations of the ‘key informant’ approach (Phillips, 1981; Kumar et al., 1993), we still used this method due to the fact that top managers are typically the most knowledgeable about the organizational characteristics, such as intellectual capital, performance measurement system, and organizational performance within companies (John and Reve, 1982; Simsek et al., 2005). Furthermore, the intellectual capital literature strongly advocates the use of top level managers as key informants to measure intellectual capital (Bontis, 1998; Bukh et al., 2001; do Rosário Cabrita and Vaz, 2005). Hence, the CFOs were chosen due to their adequate high knowledge of the subject-matter and their hands-on experience with strategic matters. Moreover, they were experts who were closely involved in the administrative process of their respective organizations including financial planning and analysis as well as business development. By focusing on top level management as respondents, the current study endeavors to remedy the bias arising from the key informant methodology.

3.2. Measurement of constructs

In the current study, perceptual data were used in the data analysis. The usage of perceptual data is still prevalent despite its shortcomings such as greater measurement error and its possible mono-method bias (Rhodes et al., 2008). In fact, perceptual data have been widely adopted in the intellectual capital and performance measurement system contexts. Many empirical studies used the subjective perspective based on managers' perceptions (do Rosário Cabrita and Vaz, 2005; Kannan and Aulbur, 2004; Sharabati et al., 2010). Compared to the proxies obtained from databases, ad-hoc questions could properly measure the attributes belonging to a specific and internal phenomenon (Delgado, 2011). Likewise, several studies have also acknowledged that there is a consistency between performance objective measures and executives' perceptions (Venkatraman and Ramanujam, 1986; Dess and Robinson, 1984). Kannan and Aulbur (2004) mention that perceptual data are frequently employed for exploring corporate factors that affect employees' performance, human capital improvement and organizational performance. They also show that perceptual measures are the most dominant measurement technique employed by > 100 intellectual capital related studies. Although objective measures are less prone to respondent bias, both perceptual and objective measures of knowledge-based resources are generally equivalent (Sharabati et al., 2010). Kannan and Aulbur (2004) also assert that using perceptions for both exogenous and endogenous constructs helps balance out any over-inflated response bias. As such, employing proxy metrics and perceptual measures are more prevalent in intellectual capital literature since measuring intellectual properties objectively can be a challenge (Kannan and Aulbur, 2004). The questionnaire, which encompasses the final measurement items for the study's constructs, is presented in Appendix A.

3.2.1. Organizational performance – dependent variable

Following Gupta and Govindarajan (1984), and Govindarajan (1988), the current study measured organizational performance using a multidimensional approach instead of a single-attribute view. The CFOs were asked to rate their company's performance on 10 indicators using a seven-point Likert scale with anchors demonstrating “significantly below average” and “significantly above average.” These indicators include 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. Other studies have used and validated this instrument in the context of management accounting (Bisbe and Otley, 2004; Chenhall and Langfield-Smith,

1998; Govindarajan and Fisher, 1990; Hoque, 2004).

3.2.2. Intellectual capital – independent variable

As one of the main contributions of the study, a questionnaire was developed by synthesizing the questions used in previous studies to capture and measure intellectual capital. Specifically, the concept was measured based on 29 items taken from Burt (1997), Tayles et al. (2007), and Subramaniam and Youndt (2005). These items were then categorized into four dimensions: human (six items), structural (nine items), relational (10 items), and social capital (4 items). A 7-point Likert scale (1 = strongly disagree, 4 = neither disagree nor agree, 7 = strongly agree) was used to assess the level of agreement or disagreement of respondents for each intellectual capital item. The reliability and validity of the instrument were found to be satisfactory as will be demonstrated in the Results section.

3.2.3. Diversity of measurement – mediating variable

In order to capture the ‘diversity of measurement’ construct, the current study used the instrument developed by Henri (2006), which was originally adapted from Hoque and James (2000). Specifically, the measurement embraces 20 performance measures, which belong to four dimensions of the balanced scorecard (BSC); namely, financial, customer, internal business process, and innovation and learning (Kaplan and Norton, 1992, 2005). More importantly, this study supplemented the existing measures of BSC through seven items that come under the heading of the “social and environmental” perspective (Adams et al., 2014) as the fifth perspective. Using a total of 27 performance measures, respondents were asked to rate the extent to which they have used each performance measure through a 7-point Likert-type scale ranging from 1 (not at all), 4 (to a moderate extent) to 7 (to a very great extent). The main scope of the current study was to examine the extent of the use of performance measures that reflect diversity. Thus, the diversity of measurement construct was assessed based on an aggregate score of the 27 performance measures. The same approach has been used by Henri (2006).

3.2.4. Control variables

The control variables of the current research are organizational size and industry type, which could have some effect on performance (e.g., Chenhall, 2005; Hoque, 2004; Hoque and James, 2000). The size of the company represents past success and can affect organizational outcomes (Aldrich and Auster, 1986). This has been pointed out by Bontis et al. (2000) who say that larger organizations can considerably benefit from intellectual capital leverage. Likewise, companies can also vary from sector to sector in terms of the intellectual capital and performance measurement system they possess while also realizing benefits from leveraging such value creation factors (Asiaei and Jusoh, 2015).

3.3. Descriptive information and diagnostics tests

The demographic data presented in Table 1 reveal that the manufacturing industry is Iran's biggest industry, and, in the current study, it represents 80.5% of the responding companies. Concerning the number of employees, 21.1% of the companies have < 100 employees, while the rest (78.9%) employ > 100. This shows that more than half of the responding companies can be considered to be big companies. In looking at the annual turnover, it was noted that most (46.9%) of the companies have a turnover of < 500 billion Riyals while 36.7% exceed > 1000 billion Riyals.

Since the data collection of this study was performed in two phases (early and late responses), an independent sample *t*-test was utilized to ensure the representativeness of the sample. According to Armstrong and Overton (1977), an examination of the existing differences between early and late responses can detect possible response bias whereby late responses are treated as a proxy for non-respondents. In this regard, there was no significant difference between early and late respondents in terms of the main variables. Table 2 shows the results of the *t*-test.

Table 1
Demographics profiles (organization).

Profile	Categories	Frequency	Percent	Cumulative percent
Type of the industry	Manufacturing	103	80.5	80.5
	Non-manufacturing	25	19.5	100.0
No of employees	< 100	27	21.1	21.1
	100–200	26	20.3	41.4
	201–400	17	13.3	54.7
	401–600	27	21.1	75.8
	> 600	31	24.2	100.0
Sales/turnover (based on billion Riyals)	< 500	62	48.5	48.5
	501–1000	19	14.8	62.7
	1001–1500	6	4.7	67.5
	1501–2000	6	4.7	72.2
	> 2000	35	27.3	100.0

Table 2The result of differences (*t*-test) of early and late response on the research variables.

Variables	Mean		t-Value	Sig.
	Early response N = 51	Late response N = 77		
Structural capital	4.686	4.883	– 0.949	0.345
Relational capital	5.117	5.350	– 1.145	0.255
Social capital	4.568	4.623	– 0.226	0.822
Financial - diversity of measurement	4.238	4.413	– 0.638	0.525
Customer - diversity of measurement	4.571	4.640	– 0.323	0.747
Internal business processes - diversity of measurement	4.499	4.709	– 0.858	0.393
Learning and innovation- diversity of measurement	4.382	4.571	– 0.678	0.499
Social and environmental - diversity of measurement	4.409	4.659	– 1.123	0.264
Organizational performance	4.303	4.283	0.073	0.942

Note: Level of significance using *t*-tests; the mean difference is significant at $p < 0.05$.

We also assessed the data using Harman's one-factor test (Podsakoff and Organ, 1986) for the purpose of addressing the concern of common method bias in the current research. Thus, exploratory factor analysis (EFA) was employed for all the variables of interest. According to this technique, if a single factor emerges from the factor analysis, or one-factor accounts for > 50% of the variance in the variables, a common method variance is present (Matilla and Enz, 2002). This test was conducted on all the items and demonstrated that among the factors with eigenvalues > 1, not a single factor emerged from the unrotated factor solution, and it accounted for > 50% of the variance among variables. The first factor accounted for 45.1% (< 50%) of the variance, which did not account for a majority of the variance (Podsakoff and Organ, 1986). Therefore, the results of these analyses confirmed that the common methods variance was not an issue.

4. Results

This study used two statistical software programs to analyze the data. Descriptive statistics, reliability testing, and exploratory factor analysis were performed using SPSS 18.0. In addition, SMARTPLS V2.0 M3 (Ringle et al., 2005), which uses partial least squares (PLS) was also applied as confirmatory factor analysis and hypotheses testing. It appears that PLS was more appropriate for handling small data samples, which seems to be prevalent in the context of intellectual capital research (see Bontis, 1998; Bontis et al., 2000; Cabrita and Bontis, 2008; Cleary et al., 2007). This technique is able to model linear associations, irrespective of the limitations of other SEM techniques, such as normality and large sample size that coordinates with the estimated indicators (Chin et al., 2003).

4.1. Exploratory factor analysis

Exploratory factor analysis (EFA) was only performed for the 'Diversity of Measurement' variable since this construct contains new items that were classified under the heading of "Social and Environmental" (Adams et al., 2014). This is in addition to the four other main perspectives noted by Kaplan and Norton's BSC measures. The other constructs of the current study were not subjected to principal component analysis (PCA) as they were already treated as individual variables. Consequently, factor analysis, under the extraction method of PCA, with varimax rotation and Kaiser Normalization, was used for the 26 items for the diversity of performance measures (see Table 3). The results specify the Bartlett Test of Sphericity (Bartlett, 1954), which met statistical significance (Chi-Square = 3160.988, $p < 0.01$), and the Kaiser-Meyer-Oklin (KMO) measure of sampling Adequacy, which was 0.88; a value greater than the recommended value of 0.60 (Kaiser, 1974). Accordingly, these results indicate that the factorability of the data can be regarded as appropriate. After running factor analysis, five component factors were extracted with eigenvalues that were > 1, which explains a total of 76.7% of the variance, with component 1 (Financial Measures) contributing 45.6%, component 2 (Customer Measures) contributing 14.2%, component 3 (Internal Business Processes Measures) contributing 8.1%, component 4 (Innovation and Learning) contributing 4.9%, and component 5 (Social and Environmental Measures) contributing 3.9%.

The diversity of measurement (DM), as the only second-order construct in the current study, was assessed in the PLS model to determine whether its five dimensions (first-order constructs, i.e., financial, customer, internal business process, learning and innovation, and social and environmental perspectives) were salient dimensions of DM (second-order construct). Fig. 2 illustrates the loadings between the first-order and second-order construct. All the loadings were inspected, and the significance was assessed via 5000 bootstrapped iterations. All factor loadings were significant at the $p < 0.001$ level and most of them (except DMC1) exceeded the 0.7 level as recommended by Chin et al. (2003).

4.2. Measurement model assessment

For the purpose of assessing reliability, the factor loading of the indicators of latent constructs must be > 0.70 to achieve the

Table 3
Exploratory factor analysis of the diversity of measurement.

Factors/items	Factor loading
Diversity of measurement - KMO = 0.880 Barlett's: Sig. = 0.000	
Factor 1: Financial measures	
Operating income	0.793
Sales growth	0.777
Return-on-investment (ROI)	0.712
Return-on-equity (ROE)	0.849
Net cash flows	0.755
Costs per unit produced	0.639
Factor 2: Customer measures	
Market share	0.611
Customer response time	0.783
On-time delivery	0.637
Number of customer complaints	0.731
Survey of customer satisfaction	0.655
Factor 3: Internal business processes measures	
Materials efficiency variance	0.817
Manufacturing lead time	0.807
Rate of material scrap loss	0.746
Labor efficiency variance	0.805
Factor 4: Innovation and Learning Measures	
Number of new patents	0.837
Number of new product launches	0.871
Time-to-market for new products	0.814
Employee satisfaction	0.709
Factor 5: Social and Environmental Measures	
Employee diversity	0.775
Economic impacts (excluding financial measures used in financial accounts)	0.822
Occupational health and safety	0.816
Stakeholder involvement in community, social and environmental issues	0.854
Community relations	0.819
Natural resource conservation and emission levels	0.799
Other community, ethical, social and environmental issues	0.729

desirable reliability (Fornell and Larcker, 1981). Cronbach's alpha was also applied to estimate reliability (see Table 4). The desirable score for Cronbach's alpha was noted as 0.70 for existing constructs and 0.60 for newly created constructs. Among the six constructs, three constructs (structural capital, relational capital, and organizational performance) were found to have a Cronbach's alpha in the 0.90s while three constructs (human capital, social capital, and the diversity of measurement) were in the 0.80s.

Further, the current study used composite reliability and the average variance extracted (AVE) for assessing convergent validity. In this respect, values exceeding the threshold levels of 0.70 for composite reliability imply appropriate internal consistency (Hulland, 1999). Similarly, AVE, which provides a measure of the variance shared between a construct and its indicators, needs to be larger than 0.50 to obtain appropriate convergent validity (Chin et al., 2003). All the values for composite reliability and AVE, as presented in Table 4, show acceptable convergent validity.

PLS was used to perform factory analysis on the survey items. The item factor loadings were all above 0.70 except for four items (SIC1, RIC1, RIC10, and OP10), which were in the 0.60s. These items with lower factor loadings were dropped in four iterations. Following the second calculation of the overall measurement model and after deleting the aforementioned items, the results subsequently became satisfactory. For the purpose of assessing discriminant validity, this study also considered the recommendation of Fornell and Larcker (1981), whereby the square root of AVE must be larger than the correlations of the variables to confirm discriminant validity. In this regard, the value of the diagonal elements should be greater than those of the off-diagonal elements (Fornell and Larcker, 1981; Hulland, 1999). The values shown in Table 5 demonstrate acceptable discriminant validity.

4.3. Evaluation of structural model

4.3.1. Direct effects

SMARTPLS V2.0 M3 (Ringle et al., 2005) was applied to perform a bootstrap resampling technique (5000 resamples), which helps to determine the significance of the paths within the structural model. Table 6 shows the results of the SEM examination, which include standardized path coefficients β as well as their relevant t-statistics resulting from the PLS analysis. The bootstrap resampling procedure was performed with 5000 resamples for the purpose of assessing standard errors. Fig. 3 shows the results of the assessment of the structural properties of data, which helps to determine the fit of the data to the model. As expected, the results indicate that the relationships between the four intellectual capital components and the diversity of measurement are positive and significant. The four intellectual capital dimensions explain 81.30% variance in the diversity of measurement. Relational capital was found to have the strongest association with the diversity of measurement ($\beta = 0.36$, t-value = 7.61). Overall, the results support H1, H2, H3 and H4,

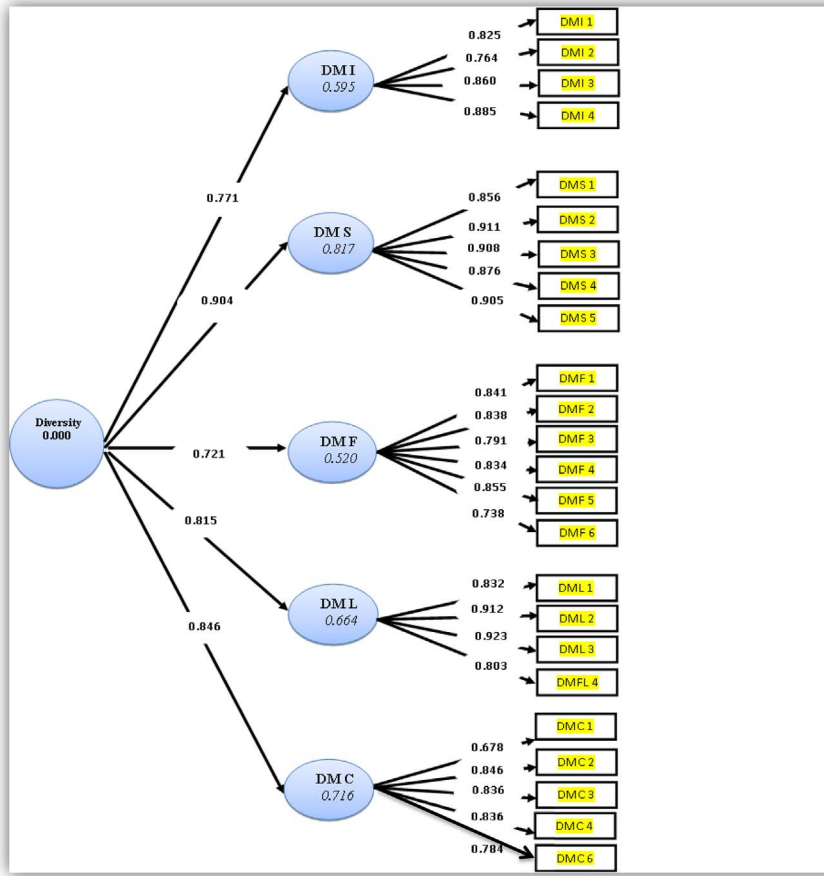


Fig. 2. PLS results for the diversity of measurement 2nd order model.

which predicted a positive association between the four intellectual capital dimensions and the diversity of measurement. The diversity of measurement is also positively associated with organizational performance ($\beta = 0.34$, t -value = 2.39) and explains 54.60% variance in the organizational performance. Hence, the results also support H5. Overall, there appears to be a good fit of the survey data to the proposed research model. The control variables of the industry, as well as firm size did not have any statistically significant association with organizational performance.

4.3.2. Indirect effects

The decision tree and a step-by-step procedure for testing mediation taken from Zhao et al. (2010) were employed to examine the indirect effects noted in the current study. Introducing the decision tree model, Zhao et al. (2010) comprehensively elaborated on all the conditions for establishing mediation as well as for understanding the different types of mediation and non-mediation. However, the two most notable and relevant types of mediation appear to be partial mediation and full mediation. Zhao et al. (2010) refer to these as complementary and indirect-only mediation. Specifically, Zhao et al. (2010) highlight that the presence of significant direct effect suggests a potential partial mediation or so-called complementary mediation (i.e., the independent variable affects the

Table 4
Results of confirmatory factor analysis.

Constructs	Average variance extracted (AVE)	Composite reliability	Cronbach's alpha
Human capital (HIC)	0.607	0.902	0.870
Structural capital (SIC)	0.597	0.921	0.903
Relational capital (RIC)	0.630	0.931	0.916
Social capital (SOIC)	0.650	0.881	0.823
Diversity of measurement (DM)	0.672	0.910	0.876
Organizational performance (OP)	0.789	0.971	0.966

Table 5
Discriminant validity.

Variables	DM	HIC	OP	RIC	SIC	SOIC
DM	0.819					
HIC	0.775	0.779				
OP	0.695	0.644	0.888			
RIC	0.768	0.611	0.615	0.793		
SIC	0.786	0.769	0.617	0.615	0.772	
SOIC	0.730	0.739	0.525	0.609	0.680	0.806

DM: diversity of measurement, HIC: human capital, OP: organizational performance, RIC: relational capital, SIC: structural capital, SOIC: social capital. The square root of the average variances extracted, shown in bold and italics, represents the average association of each construct to its measures, was higher than the correlations between the constructs indicating that the constructs closely relate to their own measures rather than to those of other constructs.

dependent variable 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 independent variable only affects the dependent variable when the mediator is present). The current study did not primarily aim to investigate the direct relationship between intellectual capital and organizational performance. However, testing the direct associations between four intellectual capital components and organizational performance was performed so that these coefficients could be used to determine the types of mediator in this study.

Based on the foregoing discussion, the recommended 5000 bootstrap samples were performed to test the mediating effects. Overall, the results reveal that the 95% bootstrap confidence intervals for the total effects and those of the diversity of measurement (mediating variable) are all positive and do not include zero. The related results of the mediation model are comprehensively presented in Table 7.

As shown in Table 7, bootstrapping the model with the diversity of measurement as a mediating variable resulted in a 95% confidence interval (0.072, 0.075) for the indirect effect of human capital on organizational performance. This confidence interval does not include zero, and, thus, the indirect effect (HIC-DM * DM-OP) is significant (0.073), thereby establishing mediation through the diversity of measurement. As presented in Table 6, the direct effect (HIC-OP) is also significant (0.256), which shows a complementary mediation (partial mediation) according to the decision tree model by Zhao et al. (2010). The above findings therefore support H6a. The same approach was performed in order to test the mediating effect of the diversity of measurement on the relationship between structural capital and organizational performance (H6b). The results reveal a 95% confidence interval (0.101, 0.105) for the indirect effect of structural capital on organizational performance and the indirect effect (SIC-DM * DM-OP) is significant (0.103), thereby suggesting a mediation through the diversity of measurement. However, the direct effect (SIC-OP) is not significant (0.101). In this case, indirect-only mediation (based on Zhao's decision tree model) or full mediation is established, consequently, supporting H6b.

Similar to H6a, the indirect effect of relational capital on organizational performance, as shown through the diversity of measurement, suggests a partial mediation effect where the indirect effect (RIC-DM * DM-OP) (0.120) and the direct effect (RIC-OP) (0.200) are all significant; hence, supporting H6c. As for H6d, the results reveal that the diversity of measurement plays a full mediation role in the relationship between social capital and organizational performance since the direct effect (the path between social capital and organizational performance) is not significant (−0.097) while the indirect effect (SOIC-DM * DM-OP) is significant (0.051).

Table 6
Results of the SEM estimation (direct paths).

No.	Path	Parameter estimate (β)	Sample mean	Standard error	t statistics
1	HIC → OP	0.256**	0.269	0.111	2.296
2	SIC → OP	0.101 ^{ns}	0.098	0.125	0.808
3	RIC → OP	0.200*	0.199	0.104	1.916
4	SOIC → OP	−0.097 ^{ns}	−0.108	0.097	1.006
5	HIC → diversity	0.216***	0.216	0.065	3.329
6	SIC → Diversity	0.305***	0.304	0.067	4.545
7	RIC → Diversity	0.356***	0.358	0.046	7.619
8	SOIC → Diversity	0.147**	0.148	0.061	2.419
9	Diversity → OP	0.336**	0.341	0.140	2.396
10	Size → OP	−0.029 ^{ns}	−0.027	0.064	0.451
11	Industry → OP	0.057 ^{ns}	0.054	0.068	0.830

DM: diversity of measurement, HIC: human capital, OP: organizational performance, RIC: relational capital, SIC: structural capital, SOIC: social capital. Bold figures indicate significant associations. Italics numbers show the control variables.

*** p < 0.01.

** p < 0.05.

* p < 0.1.

^{ns} not significant.

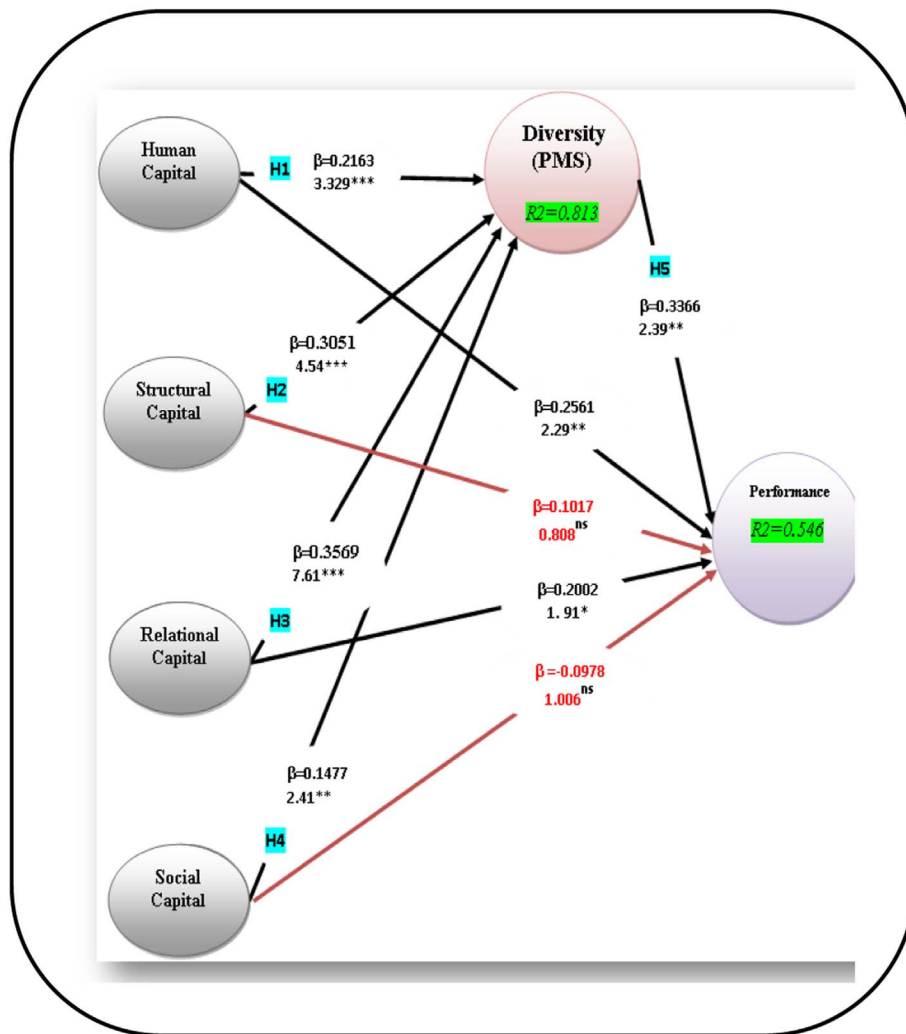


Fig. 3. Assessment of the structural model.

- The path coefficients β are shown above with their corresponding t critical value below. * $p < 0.1$ level (n = 128, t critical value = 1.65); ** $p < 0.05$ level (n = 128, t critical value = 1.96); *** $p < 0.01$ level (n = 128, t critical value = 2.58).
- The black lines indicate significant paths, and the red lines show insignificant ^{ns} paths. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

5. Discussion and conclusion

This study observed strong associations among four components of intellectual capital and the extent of use of the diversity of performance measures with evidence to support H1 to H4. In other words, organizations reflecting a higher level of intellectual capital tend to use the diversity of performance measures to a greater extent. The results suggest that knowledge-intensive companies

Table 7
Results of mediating model.

Indirect effect – hypothesis	Mean	Standard deviation	Lower bound of confidence interval	Upper bound of confidence interval	Type of mediation
HIC-DM * DM-OP (H6a)	0.073	0.038	0.072	0.075	Complementary (partial)
SIC-DM * DM-OP (H6b)	0.103	0.049	0.101	0.105	Indirect-only (full)
RIC-DM * DM-OP (H6c)	0.120	0.049	0.118	0.122	Complementary (partial)
SOIC-DM * DM-OP (H6d)	0.051	0.032	0.504	0.533	Indirect-only (full)

DM: diversity of measurement, HIC: human capital, OP: organizational performance, RIC: relational capital, SIC: structural capital, SOIC: social capital.

that possess more knowledge assets may employ a broader set of non-financial performance indicators for capturing the contribution that arises from intellectual capital. The rationale behind this is that high intellectual capital organizations would reasonably possess a greater level of intangible resources or assets. Since such resources are not easy to measure for financial appraisal (Leadbeater, 2000; Roslender and Fincham, 2001), knowledge-intensive organizations may utilize a broader set of financial and non-financial indicators for the purpose of gaining the unobservable value of the resources' costs, advantages, and contribution.

Furthermore, the results also confirm the hypothesized association between the extent of usage of the diversity of performance measures and organizational performance, thereby, providing support for H5. This means that organizations reflecting a greater usage of multiple performance measures tend to be superior in terms of organizational performance. Similar results were found by prior seminal studies that looked at performance measurement (e.g., Lingle and Schiemann, 1996; Scott and Tiessen, 1999; Hoque and James, 2000; Banker et al., 2000; Davila, 2000; Baines and Langfield-Smith, 2003; Said et al., 2003; Hoque, 2004; Davis and Albright, 2004; Lisi, 2015).

The current study also found significant mediating effects for the diversity of measurement on the relationship between intellectual capital dimensions and organizational performance, thereby supporting H6a, H6b, H6c, and H6d. These results corroborate the notion of fit-as-mediation of contingency theory. Such findings indicate that organizations are more likely to evaluate their potential in terms of fundamental critical resources and capabilities by deploying performance measures to measure and manage those resources more effectively. Such action would, in turn, improve their organizational performance. In this respect, the findings suggest that organizations with high information system capabilities and innovations (structural capital), building good relationships with internal and external stakeholders (social capital and relational capital), and having good human capital are more likely to use diverse performance measures that can potentially contribute to an improved organizational performance. The findings noted here are also in harmony with the arguments of previous scholars who suggest that organizational performance would be significantly affected through the measurement of the organization's underlying critical success factors, such as competencies and assets. Broadly speaking, the findings, which touched on the mediating role of the performance measurement system in the relationship between intellectual capital and performance, appear to support the notion that intangible resources like knowledge and technology are seldom able to directly and immediately affect corporate effectiveness. Instead, they often impact organizational performance through chains of cause-and-effect relationships including two or three intermediate stages (Huselid, 1995; Kaplan and Norton, 2001). Therefore, on the basis of the present and related findings, it can be reasonably concluded that all four dimensions of intellectual capital appear to play prominent roles in the corporate success through the use of diverse performance measures.

5.1. Implications

The findings of this study offer several possible theoretical and practical implications. In general, the importance attached to intellectual capital has grown in today's knowledge-based economy. Thus, examining such knowledge properties is relevant and topical for research (Widener, 2006; Gogan, 2014). The importance of the current study lies in its notability as one of the preliminary studies focusing on intellectual capital in relation to management accounting control systems. Most importantly, by examining the mediating effect of the performance measurement system between intellectual capital and performance, this research presents further evidence concerning the importance of the performance measurement system in supporting and leveraging the organizations' most strategic resources. More specifically, this paper contributes to the existing literature at the boundary between intellectual capital and performance by synthesizing a robust framework from the contingency lens, the RBV, to a management accounting context. This theoretical model offers further insights into the dual roles of intellectual capital either in explaining its relationship with management accounting system, in general, and performance measurement system, in particular, or predicting organizational outcomes.

Furthermore, the current study combines a review of the literature on intellectual capital from various academic areas. A multidimensional measurement of intellectual capital with a more holistic conceptualization offers an effective way for combining multiple knowledge-related drivers toward corporate performance. According to the model, the majority of the earlier studies mainly emphasized particular dimensions of intellectual capital, such as structural capital and human capital. Components, such as relational capital and social capital, have, however, been studied to a lesser extent in the literature (Jansen et al., 2006). Responding to this issue, the current study highlights an effort to conceptualize a multidimensional concept of intellectual capital, which is achieved through developing and validating the intellectual capital measurement by incorporating the factor of social capital. Hence, it can be said that the current study offers more comprehensive empirical evidence, which sheds light on the role of intellectual capital in increasing desirable organizational outcomes through synthesizing the multiple aspects of intellectual capital in one research model.

For the purpose of satisfying the need for a systematic and robust performance measurement system, the current study conceptualizes the diversity of measurement construct by supplementing a new perspective, i.e., social and environmental measures together with the four original perspectives offered by Kaplan and Norton (1992). The integration creates a more comprehensive and robust conceptualization of performance measurement systems, which, in turn, offers different and more important insights. In contrast, previous literature generally considers a dichotomy of financial versus nonfinancial measures. Finally, the current study brings further insights into understanding whether the stress laid on the diversity of measurement matters to the organization when examined through the relationship with organizational performance. Evidence appears to be rather inconclusive as to whether using performance measurement can positively influence organizational performance (Wouters et al., 1999; Widener, 2006; Lisi, 2015); hence, more investigation is certainly warranted.

From the practical perspective, the findings could be useful to management accountants who may use this in designing the relevant performance measurement system that best suits their intellectual capital and organizational performance. The current study contributes as a guideline for practitioners and organizations from another outlook. For instance, they could gain a deeper insight into the formation and

management of intellectual capital, and the types of control system they need to implement, in general, and, in particular, how a performance measurement system could support and facilitate the management of an organization's underlying strategic resources. This can enable them to boost intellectual capital's contribution toward their firm's performance. The findings extracted from the current study also provide insights into how practitioners and organizations adopt diverse types of performance measures to effectively manage and capture the intangibles in an organization, in order to benefit more from those knowledge resources and augment their performance. The linkages noted among intellectual capital, performance measurement system, and organizational performance could serve as a guideline and provide directions for organizations in achieving a competitive advantage. This can be done by using the performance measurement system in line with the level of intellectual capital development. Moreover, the level and shape of intangible resources can also serve as a checklist for companies to assess themselves. This is in line with the extent to which they implement the management accounting practices that are necessary to foster the development of such knowledge-related assets. Furthermore, understanding the effect of intellectual capital and performance measurement on corporate performance would help executives in identifying strategies for future development. More importantly, the current study also underlines the fact that intellectual capital is vital for achieving the success of companies, which could be operating in turbulent and uncertain environments.

5.2. Limitations and suggestions for future research

Despite its contributions, this study is also subject to some potential limitations. First and foremost, the instrument of the study was a questionnaire survey, which relies largely on the perceptions and opinions of the key informants. Although several authors have asserted that perceptual assessments of organizational performance are closely related to more objective ones, they are still subject to the inherent bias, preferences, and perceptual distortions of the assessors (Yang and Lin, 2009). In effect, one of the major issues regarding measurement validity is common method bias in self-report studies. Common method bias (CMB) may arise when data are collected from the same key informants. Moreover, subjective measures were used to capture the variables of interest. However, in the case of the current study, an appropriate method, i.e., single-factor test, was performed to assess whether or not common method bias is a major problem. As stated earlier in Section 4.3, the results generally confirm that CMB is not a serious problem in the current study. Moreover, subjective perceptual measurements were used to capture intellectual capital and performance measurement system given the fact that it was not viable to obtain relevant objective measures that capture these constructs, particularly, the multidimensional concept of intellectual capital. Objective measures tend to be less prone to respondent bias although it is argued that both perceptual and objective measures of knowledge-based resources are broadly equivalent (Sharabati et al., 2010). As mentioned earlier, perceptual data have been widely used in the intellectual capital and performance measurement system literature as a way to measure knowledge-based assets since ad-hoc questions are more appropriate for collecting aspects closer to a specific and internal phenomenon, unlike proxies obtained from databases (Delgado, 2011).

Secondly, the data presented in this research are regarded as cross-sectional. The critical factors were captured and measured just once and at a static point instead of as they were developing, thereby missing the value of time explanation. It is imperative to attach importance to long-term effects, particularly concerning the creation and development of the intellectual capital and performance measurement system. It is noted that survey data derived from cross-sectional analyses are incapable of producing conclusive evidence of causality; thus, the evidence drawn should be regarded in line with the theoretical arguments and expected associations. Future research could embark on a longitudinal survey to investigate the causality and interrelationships among factors that are pivotal to intellectual capital and performance measurement system development.

Thirdly, data were collected in a single country (Iran). Potential culture limitations should be noted, especially concerning the cultural differences between developing countries and developed nations, which could influence the perceptions of knowledge sharing practices. The framework of the current study must be further examined by including samples from other countries in order for the results to be generalizable.

Fourth, having a single-informant per firm is another limitation. Future research may focus more explicitly on micro-foundations of routines, for example, by obtaining self-reports of the level of knowledge resources from the managers of other departments and divisions, such as human resources, and R & D. While gaining multiple respondent data per organization is challenging, the approach would allow for a more rigorous testing of the micro-foundation to intellectual capital and its contributions toward positive organizational outcomes.

6. Conclusion

While the influence of knowledge-related resources on measurable performance has been examined extensively in intellectual capital literature, little is known about the role that organizational control systems play, in general, and, in particular, how the performance measurement system plays in supporting the management of intellectual capital as organizations' most critical resource. In line with the argument that organizational performance is positively influenced by appropriate measurement and management of the underlying critical success factors and strategic resources (Kaplan and Norton, 1996; Simons et al., 2000), this study has provided empirical evidence, which suggests that the level of intellectual capital is related to the extent of use of the diversity of performance measures and that the diversity of measurement mediates the relationship between intellectual capital and organizational performance. The results therefore largely support the central proposition of "fit-as-mediation" of contingency view (Drazin and Van de Ven, 1985; Venkatraman, 1989) in which this study assumes that organizations with a higher level of intellectual capital may achieve significantly superior performance if they put more value on the use of multiple and diverse performance measures. It is worth mentioning that, although the samples are taken from companies in Iran, except for cultural differences, companies in other regions

of the world may gain benefit from this study. The nature of intellectual capital and performance measurement and their relationships found in this study are probably similar to those that may be found throughout the world.

Appendix A. Survey instrument

Measurement items

Section 1: Intellectual capital (IC)

The following items explore aspects of intellectual capital. Please rate (by ticking the box provided) to what extent do you agree with the following items describing your organization's intellectual capital? Please use 4 sparingly (1 = strongly disagree; 7 = strongly agree).

Variable	Item
Human capital (HIC)	1. Our organization selects managers and staff according to their brightness and creativity.
	2. Our organization gets the most out of the managers and staff.
	3. Our organization requires knowledge sharing among managers and staff.
	4. Our managers and staff are generally experts in their particular jobs and functions.
	5. Our managers and staff are generally able to develop new ideas and knowledge.
	6. Our managers and staff are generally able to focus on the quality of service provided.
Structural capital (SIC)	1. Our organization's data systems make it easy to access relevant information.
	2. Our organization's systems and procedures support innovation.
	3. Our organization requires knowledge sharing and encourages learning.
	4. Our organization has relatively high investment in innovation.
	5. Our organization keeps track and makes full use of our intellectual assets, such as patents and copyrights.
	6. Our organization has a high rate of generation of new ideas and products compared to our competitors.
	7. Our organization provides a sufficiently high annual information technology allocation (for personnel, hardware, software, etc.) to allow us to provide quality service.
	8. Our organization documents knowledge in manuals, databases, etc.
	9. Our organization protects vital knowledge and information to prevent loss in the event of key people leaving the organization.
	10. Our organization maintains long-standing relationships with a number of important suppliers.
Relational capital (RIC)	1. Our organization has customers loyal to our organization/product.
	2. Our organization is market-oriented/customer-focused.
	3. Our organization is efficient in satisfying customer's needs and requirements
	4. Our organization has most managers and employees who generally understand the organization's targeted market segments and customer profiles.
	5. Our organization gets as much feedback from our customers as we can.
	6. Our organization has marketing managers and staff who continually meet with customers to find out what they want from the organization.
	7. Our organization listens and responds to/manages customer complaints.
	8. Our organization has good relationships with its suppliers.
	9. Our organization devotes considerable time to vetting and approving suppliers.
	10. Our organization maintains long-standing relationships with a number of important suppliers.
Social capital (SOIC)	1. Our employees are skilled at collaborating with each other to diagnose and solve problems.
	2. Our employees share information and learn from one another.
	3. Our employees interact and exchange ideas with people from different areas of the company.
	4. Our employees apply knowledge from one area of the company to problems and opportunities that arise in another.

Section 2: Diversity of measurement (PMS)

B1. The following items explore aspects of Performance Measurement System in terms of the type of measures. Please rate (by ticking the box provided) the extent to which each of the following measures is used by your top management team (1 = not at all; 7 = to a very great extent).

Variable	Item
Financial measures	1. Operating income
	2. Sales growth

	3. Return-on-investment (ROI)
	4. Return-on-equity (ROE)
	5. Net cash flows
	6. Costs per unit produced
Customer measures	1. Market share
	2. Customer response time
	3. On-time delivery
	4. Number of customer complaints
	5. Number of warranty claims
	6. Survey of customer satisfaction
Internal business processes measures	1. Materials efficiency variance
	2. Manufacturing lead time
	3. Rate of material scrap loss
	4. Labor efficiency variance
Innovation and learning measures	1. Number of new patents
	2. Number of new product launches
	3. Time-to-market for new products
	4. Employee satisfaction
Social and environmental measures	1. Employee diversity
	2. Economic impacts (excluding financial measures used in financial accounts)
	3. Occupational health and safety
	4. Stakeholder involvement in community, social and environmental issues
	5. Community relations
	6. Natural resource conservation and emission levels
	7. Other community, ethical, social and environmental issues

Section 3: Organizational performance (OP)

Please respond (by ticking the box provided) to the following items with regard to your perception about your organization's recent performance (last three years) relative to key competitors' in the industry (1 = "significantly below average"; 7 = and "significantly above average")

Variable	Item
Organizational Performance (OP)	1. Return on investment
	2. Profit
	3. Cash flow from operations
	4. Cost control
	5. Development of new products
	6. Sales volume
	7. Market share
	8. Market developments
	9. Personnel developments
	10. Political-public affairs

References

- Adams, C.A., Muir, S., Hoque, Z., 2014. Measurement of sustainability performance in the public sector. *Sustain. Account. Manag. Policy J.* 5 (1), 46–67.
- Adler, P.S., Kwon, S.W., 2002. Social capital: prospects for a new concept. *Acad. Manag. Rev.* 27 (1), 17–40.
- Aldrich, H.E., Auster, E., 1986. Even dwarfs started small: liabilities of age and size and their strategic implications. *Res. Organ. Behav.* 8, 165–198.
- Armstrong, J.S., Overton, T.S., 1977. Estimating nonresponse bias in mail surveys. *J. Mark. Res.* 396–402.
- Asiaei, K., 2014. Intellectual Capital and Organizational Performance: The Mediating Role of Performance Measurement System. University of Malaya (Doctoral dissertation).
- Asiaei, K., Jusoh, R., 2014. Antecedent conditions for leveraging intellectual capital: a contingency perspective. *Int. J. Res. Bus. Technol.* 4 (1), 354–366.
- Asiaei, K., Jusoh, R., 2015. A multidimensional view of intellectual capital: the impact on organizational performance. *Manag. Decis.* 53 (3), 668–697.
- Baines, A., Langfield-Smith, K., 2003. Antecedents to management accounting change: a structural equation approach. *Acc. Organ. Soc.* 28 (7), 675–698.
- Banker, R.D., Potter, G., Srinivasan, D., 2000. An empirical investigation of an incentive plan that includes nonfinancial performance measures. *Account. Rev.* 75 (1), 65–92.
- Bartlett, M.S., 1954. A note on the multiplying factors for various χ^2 approximations. *J. R. Stat. Soc. Ser. B Methodol.* 296–298.
- Bisbe, J., Otley, D., 2004. The effects of the interactive use of management control systems on product innovation. *Acc. Organ. Soc.* 29 (8), 709–737.
- Bismuth, A., Tojo, Y., 2008. Creating value from intellectual assets. *J. Intellect. Cap.* 9 (2), 228–245.
- Bolino, M.C., Turnley, W.H., Bloodgood, J.M., 2002. Citizenship behavior and the creation of social capital in organizations. *Acad. Manag. Rev.* 27 (4), 505–522.

- Bontis, N., 1998. Intellectual capital: an exploratory study that develops measures and models. *Manag. Decis.* 36 (2), 63–76.
- Bontis, N., Chua Chong Keow, W., Richardson, S., 2000. Intellectual capital and business performance in Malaysian industries. *J. Intellect. Cap.* 1 (1), 85–100.
- Brooking, A., 1996. *Intellectual Capital*. Cengage Learning EMEA.
- Bukh, P.N., Larsen, H.T., Mouritsen, J., 2001. Constructing intellectual capital statements. *Scand. J. Manag.* 17 (1), 87–108.
- Burney, L.L., Matherly, M., 2007. Examining performance measurement from an integrated perspective. *J. Inf. Syst.* 21 (2), 49–68.
- Burt, R.S., 1997. The contingent value of social capital. *Adm. Sci. Q.* 339–365.
- Cabrita, M.D.R., Bontis, N., 2008. Intellectual capital and business performance in the Portuguese banking industry. *Int. J. Technol. Manag.* 43 (1), 212–237.
- Chen, M.C., Cheng, S.J., Hwang, Y., 2005. An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance. *J. Intellect. Cap.* 6 (2), 159–176.
- Chenhall, R.H., 2005. Integrative strategic performance measurement systems, strategic alignment of manufacturing, learning and strategic outcomes: an exploratory study. *Acc. Organ. Soc.* 30 (5), 395–422.
- Chenhall, R.H., Langfield-Smith, K., 1998. The relationship between strategic priorities, management techniques and management accounting: an empirical investigation using a systems approach. *Acc. Organ. Soc.* 23 (3), 243–264.
- Chin, W.W., Marcolin, B.L., Newsted, P.R., 2003. A partial least squares latent variable modeling approach for measuring interaction effects: results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Inf. Syst. Res.* 14 (2), 189–217.
- Choi, W.W., Kwon, S.S., Lobo, G.J., 2000. Market valuation of intangible assets. *J. Bus. Res.* 49 (1), 35–45.
- Chong, V.K., Chong, K.M., 1997. Strategic choices, environmental uncertainty and SBU performance: a note on the intervening role of management accounting systems. *Account. Bus. Res.* 27 (4), 268–276.
- Chow, W.S., Chan, L.S., 2008. Social network, social trust and shared goals in organizational knowledge sharing. *Inf. Manag.* 45 (7), 458–465.
- Christensen, P.O., Feltham, G.A., Şabac, F., 2003. Dynamic incentives and responsibility accounting: a comment. *J. Account. Econ.* 35 (3), 423–436.
- Cleary, P., 2015. An empirical investigation of the impact of management accounting on structural capital and business performance. *J. Intellect. Cap.* 16 (3), 566–586.
- Cleary, P., Kennedy, T., O'Donnell, D., O'Regan, P., 2007. Positioning management accounting on the intellectual capital agenda. *Int. J. Account. Audit. Perform. Eval.* 4 (4), 336–359.
- Coff, R.W., 1997. Human assets and management dilemmas: coping with hazards on the road to resource-based theory. *Acad. Manag. Rev.* 22 (2), 374–402.
- Davila, T., 2000. An empirical study on the drivers of management control systems' design in new product development. *Acc. Organ. Soc.* 25 (4), 383–409.
- Davis, S., Albright, T., 2004. An investigation of the effect of balanced scorecard implementation on financial performance. *Manag. Account. Res.* 15 (2), 135–153.
- Delgado, M., 2011. The role of intellectual capital assets on the radicalness of innovation: direct and moderating effects. In: UAM-Accenture Working Papers, Madrid.
- Delgado-Verde, M., Martín-de Castro, G., Navas-López, J.E., 2011. Organizational Knowledge Assets and Innovation Capability: Evidence from Spanish Manufacturing Firms. *J. Intellect. Cap.* 12 (1), 5–19.
- Dess, G.G., Robinson, R.B., 1984. Measuring organizational performance in the absence of objective measures: the case of the privately-held firm and conglomerate business unit. *Strateg. Manag. J.* 5 (3), 265–273.
- Drazin, R., Van de Ven, A.H., 1985. Alternative forms of fit in contingency theory. *Adm. Sci. Q.* 514–539.
- Dumay, J., 2013. The third stage of IC: towards a new IC future and beyond. *J. Intellect. Cap.* 14 (1), 5–9.
- Dzinkowski, R., 2000. International Management Accounting Study: the measurement and management of intellectual capital. *Manag. Account. Lond.* 78 (2), 32–37.
- Edvinsson, L., Malone, M.S., 1997. *Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower*. vol. 225 HarperBusiness, New York, NY.
- Elgazzar, S.H., Tipi, N.S., Hubbard, N.J., Leach, D.Z., 2012. Linking supply chain processes' performance to a company's financial strategic objectives. *Eur. J. Oper. Res.* 223 (1), 276–289.
- Elsetouhi, A., Elbeltagi, I., Haddoud, M.Y., 2015. Intellectual capital and innovations: is organizational capital a missing link in the service sector? *Int. J. Innov. Manag.* 19 (2), 1–29.
- Firer, S., Williams, S.M., 2003. Intellectual capital and traditional measures of corporate performance. *J. Intellect. Cap.* 4 (3), 348–360.
- F-Jardón, C.M., Susana Martos, M., 2009. Intellectual capital and performance in wood industries of Argentina. *J. Intellect. Cap.* 10 (4), 600–616.
- Fornell, C., Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* 39–50.
- Fukuyama, F., 1997. Social capital and the modern capitalist economy: creating a high trust workplace. *Stern Bus. Mag.* 4 (1), 1–16.
- Galbraith, J.R., 1973. *Designing Complex Organizations*. Addison-Wesley Longman Publishing Co., Inc.
- Gogan, L.M., 2014. A new platform to evaluate intellectual capital. In: Proceedings of the 6th European Conference on Intellectual Capital: ECIC 2014. Academic Conferences Limited (October).
- Govindarajan, V., 1988. A contingency approach to strategy implementation at the business-unit level: integrating administrative mechanisms with strategy. *Acad. Manag. J.* 31 (4), 828–853.
- Govindarajan, V., Fisher, J., 1990. Strategy, control systems, and resource sharing: effects on business-unit performance. *Acad. Manag. J.* 33 (2), 259–285.
- Gupta, A.K., Govindarajan, V., 1984. Business unit strategy, managerial characteristics, and business unit effectiveness at strategy implementation. *Acad. Manag. J.* 27 (1), 25–41.
- Gupta, A.K., Govindarajan, V., 2000. Knowledge management's social dimension: lessons from Nucor Steel. *MIT Sloan Manag. Rev.* 42 (1), 71.
- Hammad, S.A., Jusoh, R., Oon, E.Y.N., 2010. Management accounting system for hospitals: a research framework. *Ind. Manag. Data Syst.* 110 (5), 762–784.
- Henri, J.F., 2006. Organizational culture and performance measurement systems. *Acc. Organ. Soc.* 31 (1), 77–103.
- Homburg, C., Artz, M., Wieseke, J., 2012. Marketing performance measurement systems: does comprehensiveness really improve performance? *J. Mark.* 76 (3), 56–77.
- Hoque, Z., 2004. A contingency model of the association between strategy, environmental uncertainty and performance measurement: impact on organizational performance. *Int. Bus. Rev.* 13 (4), 485–502.
- Hoque, Z., James, W., 2000. Linking balanced scorecard measures to size and market factors: impact on organizational performance. *J. Manag. Account. Res.* 12 (1), 1–17.
- Huang, C.J., Liu, C.J., 2005. Exploration for the relationship between innovation, IT and performance. *J. Intellect. Cap.* 6 (2), 237–252.
- Hudson, W.J., 1993. *Intellectual Capital: How to Build It, Enhance It, Use It*. Wiley.
- Hulland, J., 1999. Use of partial least squares (PLS) in strategic management research: a review of four recent studies. *Strateg. Manag. J.* 20 (2), 195–204.
- Huselid, M.A., 1995. The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Acad. Manag. J.* 38 (3), 635–672.
- Inkinen, H.T., 2015. Review of empirical research on intellectual capital and firm performance. *J. Intellect. Cap.* 16 (3).
- Ittner, C.D., Larcker, D.F., 2001. Assessing empirical research in managerial accounting: a value-based management perspective. *J. Account. Econ.* 32 (1), 349–410.
- Jansen, J.J., Van Den Bosch, F.A., Volberda, H.W., 2006. Exploratory innovation, exploitative innovation, and performance: effects of organizational antecedents and environmental moderators. *Manag. Sci.* 52 (11), 1661–1674.
- John, G., Reve, T., 1982. The reliability and validity of key informant data from dyadic relationships in marketing channels. *J. Mark. Res.* 517–524.
- Joiner, T.A., Sarah Yang Spencer, X., Salmon, S., 2009. The effectiveness of flexible manufacturing strategies: the mediating role of performance measurement systems. *Int. J. Product. Perform. Manag.* 58 (2), 119–135.
- Jusoh, R., Parnell, J.A., 2008. Competitive strategy and performance measurement in the Malaysian context: an exploratory study. *Manag. Decis.* 46 (1), 5–31.
- Jusoh, R., Ibrahim, D.N., Zainuddin, Y., 2008. The performance consequence of multiple performance measures usage: evidence from the Malaysian manufacturers. *Int. J. Product. Perform. Manag.* 57 (2), 119–136.
- Kaiser, H.F., 1974. An index of factorial simplicity. *Psychometrika* 39 (1), 31–36.
- Kannan, G., Aulbur, W.G., 2004. Intellectual capital: measurement effectiveness. *J. Intellect. Cap.* 5 (3), 389–413.
- Kaplan, R.S., Norton, D.P., 1992. The balanced scorecard ± measures that drive performance. *Harv. Bus. Rev.* 71–79 (January/February).
- Kaplan, R.S., Norton, D.P., 1993. Putting the balanced scorecard to work. *Harv. Bus. Rev.* 134–147 (September/October).
- Kaplan, R., Norton, D.P., 1996. *The Balanced Scorecard*. Harvard Business School Press.

- Kaplan, R.S., Norton, D.P., 2001. Transforming the balanced scorecard from performance measurement to strategic management: part I. *Account. Horiz.* 15 (1), 87–104.
- Kaplan, R.S., Norton, D.P., 2004. Measuring the strategic readiness of intangible assets. *Harv. Bus. Rev.* 82 (2), 52–63.
- Kaplan, R.S., Norton, D.P., 2005. The balanced scorecard: measures that drive performance. *Harv. Bus. Rev.* 83 (7), 172–180.
- Kaplan, R.S., Norton, D.P., 2006. *Alignment: Using the balanced scorecard to create corporate synergies*. MA: Harvard Business School Press, Boston.
- Kianto, A., Ritala, P., Spender, J.C., Vanhala, M., 2014. The interaction of intellectual capital assets and knowledge management practices in organizational value creation. *J. Intellect. Cap.* 15 (3), 362–375.
- Kogut, B., Zander, U., 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organ. Sci.* 3 (3), 383–397.
- Krackhardt, D., 1992. The strength of strong ties: the importance of philons in organizations. In: *Networks and Organizations: Structure, Form, and Action*, vol. 216. pp. 239.
- Kraus, K., Lind, J., 2010. The impact of the corporate balanced scorecard on corporate control—a research note. *Manag. Account. Res.* 21 (4), 265–277.
- Kumar, N., Stern, L.W., Anderson, J.C., 1993. Conducting interorganizational research using key informants. *Acad. Manag. J.* 36 (6), 1633–1651.
- Langfield-Smith, K., Thorne, H., Hilton, R., 2009. *Management Accounting: An Australian Perspective*, 6th ed. McGraw-Hill, Sydney.
- Leadbeater, C., 2000. *New Measures for the New Economy*. ICAEW, London.
- Leana, C.R., Van Buren, H.J., 1999. Organizational social capital and employment practices. *Acad. Manag. Rev.* 24 (3), 538–555.
- Lee, J.Y., 2011. *Incremental Innovation and Radical Innovation: The Impacts of Human, Structural, Social, and Relational Capital Elements*. Michigan State University (Doctor of Philosophy Dissertation).
- Lee, C.L., Yang, H.J., 2011. Organization structure, competition and performance measurement systems and their joint effects on performance. *Manag. Account. Res.* 22 (2), 84–104.
- Lingle, J.H., Schiemann, W.A., 1996. From balanced scorecard to strategic gauges: is measurement worth it? *Manag. Rev.* 85 (3), 56–61.
- Lisi, I.E., 2015. Translating environmental motivations into performance: the role of environmental performance measurement systems. *Manag. Account. Res.* 29, 27–44.
- Maiga, A.S., Jacobs, F.A., 2003. Balanced scorecard, activity-based costing and company performance: an empirical analysis. *J. Manag. Issues* 283–301.
- Marr, B., 2012. *Perspectives on Intellectual Capital*. Routledge.
- Matilla, Anna S., Enz, Cathy E., 2002. The role of emotions in service encounters. *J. Serv. Res.* 4 (4), 268–277.
- Maurer, I., Bartsch, V., Ebers, M., 2011. The value of intra-organizational social capital: how it fosters knowledge transfer, innovation performance, and growth. *Organ. Stud.* 32 (2), 157–185.
- Mention, A.L., Bontis, N., 2013. Intellectual capital and performance within the banking sector of Luxembourg and Belgium. *J. Intellect. Cap.* 14 (2), 286–309.
- Mia, L., 1993. The role of MAS information in organizations: an empirical study. *Br. Account. Rev.* 25 (3), 269–285.
- Mia, L., Clarke, B., 1999. Market competition, management accounting systems and business unit performance. *Manag. Account. Res.* 10 (2), 137–158.
- Nahapiet, J., Ghoshal, S., 1998. Social capital, intellectual capital, and the organizational advantage. *Acad. Manag. Rev.* 242–266.
- Nonaka, I., 1994. A dynamic theory of organizational knowledge creation. *Organ. Sci.* 5 (1), 14–37.
- Novas, J.C., Sousa, A., Alves, M.D.C., 2012. On the relations between management accounting systems and intellectual capital: evidence for Portuguese companies. In: *CEFAGE-UE Working Paper*, pp. 13.
- Ordóñez de Pablos, P., 2002. Evidence of intellectual capital measurement from Asia, Europe and the Middle East. *J. Intellect. Cap.* 3 (3), 287–302.
- Pennings, J.M., Lee, K., Van Witteloostuijn, A., 1998. Human capital, social capital, and firm dissolution. *Acad. Manag. J.* 41 (4), 425–440.
- Perrin, S., 2000. *Intellectual Capital: Measure Up or Lose Out*. Financial Directorpp. 24.
- Phillips, L.W., 1981. Assessing measurement error in key informant reports: a methodological note on organizational analysis in marketing. *J. Mark. Res.* 18 (November), 395–415.
- Podsakoff, P.M., Organ, D.W., 1986. Self-reports in organizational research: problems and prospects. *J. Manag.* 12 (4), 531–544.
- Rahdari, A.H., Rostamy, A.A.A., 2015. Designing a general set of sustainability indicators at the corporate level. *J. Clean. Prod.* 108, 757–771.
- Rhodes, J., Hung, R., Lok, P., Ya-Hui Lien, B., Wu, C.M., 2008. Factors influencing organizational knowledge transfer: implication for corporate performance. *J. Knowl. Manag.* 12 (3), 84–100.
- Riahi-Belkaoui, A., 2003. Intellectual capital and firm performance of US multinational firms: a study of the resource-based and stakeholder views. *J. Intellect. Cap.* 4 (2), 215–226.
- Ringle, C. M., Wende, S., Will, A., 2005. *SmartPLS 2.0 (beta)*.
- Roos, J., Roos, G., Dragonetti, N.C., Edvinsson, L., 1997. In: Roos, J., Roos, S., Dragonetti, N.C., Edvinsson, L. (Eds.), *Intellectual Capital. Navigating the New Business Landscape*. Macmillan Press Ltd., Basingstoke and London.
- do Rosário Cabrita, M., Vaz, J.L., 2005. Intellectual capital and value creation: evidence from the por-tuguese banking industry. *Electron. J. Knowl. Manag.* 4 (1), 11–20.
- Roslender, R., Fincham, R., 2001. Thinking critically about intellectual capital accounting. *Account. Audit. Account. J.* 14 (4), 383–399.
- Said, A.A., HassabElnaby, H.R., Wier, B., 2003. An empirical investigation of the performance consequences of nonfinancial measures. *J. Manag. Account. Res.* 15 (1), 193–223.
- Scott, T.W., Tiessen, P., 1999. Performance measurement and managerial teams. *Acc. Organ. Soc.* 24 (3), 263–285.
- Segelod, E., 1998. Capital budgeting in a fast-changing world. *Long Range Plan.* 31 (4), 529–541.
- Sharabati, A.A.A., Naji Jawad, S., Bontis, N., 2010. Intellectual capital and business performance in the pharmaceutical sector of Jordan. *Manag. Decis.* 48 (1), 105–131.
- Sim, K.L., Koh, H.C., 2001. Balanced scorecard: a rising trend in strategic performance measurement. *Meas. Bus. Excell.* 5 (2), 18–27.
- Simons, R., Dávila, A., Kaplan, R.S., 2000. *Performance Measurement & Control Systems for Implementing Strategy: Text & Cases*. Prentice Hall, Upper Saddle River, NJ.
- Simsek, Z., Veiga, J.F., Lubatkin, M.H., Dino, R.N., 2005. Modeling the multilevel determinants of top management team behavioral integration. *Acad. Manag. J.* 48 (1), 69–84.
- Stede, W.A.V.D., Chow, C.W., Lin, T.W., 2006. Strategy, choice of performance measures, and performance. *Behav. Res. Account.* 18 (1), 185–205.
- Stewart, T., 1997. *Intellectual Capital: The New Wealth of Organizations*. Doubleday/Currency, New York.
- Subramaniam, M., Youndt, M.A., 2005. The influence of intellectual capital on the types of innovative capabilities. *Acad. Manag. J.* 48 (3), 450–463.
- Tayles, M., Pike, R.H., Sofian, S., 2007. Intellectual capital, management accounting practices and corporate performance: perceptions of managers. *Account. Audit. Account. J.* 20 (4), 522–548.
- Taylor, A., Taylor, M., 2013. Antecedents of effective performance measurement system implementation: an empirical study of UK manufacturing firms. *Int. J. Prod. Res.* 51 (18), 5485–5498.
- Thompson, J.D., 2011. *Organizations in action: Social science bases of administrative theory*. vol. 1 Transaction publishers.
- Tsai, W., Ghoshal, S., 1998. Social capital and value creation: the role of intrafirm networks. *Acad. Manag. J.* 464–476.
- Venkatraman, N., 1989. The concept of fit in strategy research: toward verbal and statistical correspondence. *Acad. Manag. Rev.* 14 (3), 423–444.
- Venkatraman, N., Ramanujam, V., 1986. Measurement of business performance in strategy research: a comparison of approaches. *Acad. Manag. Rev.* 11 (4), 801–814.
- Wang, W.Y., Chang, C., 2005. Intellectual capital and performance in causal models: evidence from the information technology industry in Taiwan. *J. Intellect. Cap.* 6 (2), 222–236.
- Wang, D., Chen, S., 2013. Does intellectual capital matter? High-performance work systems and bilateral innovative capabilities. *Int. J. Manpow.* 34 (8), 861–879.
- Wasiluk, K.L., 2013. Beyond eco-efficiency: understanding CS through the IC practice lens. *J. Intellect. Cap.* 14 (1), 102–126.
- Widener, S.K., 2006. Associations between strategic resource importance and performance measure use: the impact on firm performance. *Manag. Account. Res.* 17 (4), 433–457.
- Wouters, M., Kokke, K., Theeuwes, J., Van Donselaar, K., 1999. Identification of critical operational performance measures—a research note on a benchmarking study

- in the transportation and distribution sector. *Manag. Account. Res.* 10, 439–452.
- Wu, W.-Y., Chang, M.-L., Chen, C.-W., 2008. Promoting innovation through the accumulation of intellectual capital, social capital, and entrepreneurial orientation. *R & D Manag.* 38 (3), 265–277.
- Yang, C.C., Lin, C.Y.Y., 2009. Does intellectual capital mediate the relationship between HRM and organizational performance? Perspective of a healthcare industry in Taiwan. *Int. J. Hum. Resour. Manag.* 20 (9), 1965–1984.
- Yli-Renko, H., Autio, E., Tontti, V., 2002. Social capital, knowledge, and the international growth of technology-based new firms. *Int. Bus. Rev.* 11 (3), 279–304.
- Youndt, M.A., Snell, S.A., 2004. Human resource configurations, intellectual capital, and organizational performance. *J. Manag. Issues* 337–360.
- Zhao, X., Lynch, J.G., Chen, Q., 2010. Reconsidering Baron and Kenny: myths and truths about mediation analysis. *J. Consum. Res.* 37 (2), 197–206.

Kaveh Asiaei is an Assistant Professor at the Department of Accounting at Islamic Azad University, Mashhad Branch, Iran. He received his Ph.D. from the Faculty of Business and Accountancy (AACSB accredited institution) at University of Malaya. His research in progress and recent publication works cover interesting issues in social and environmental accounting, corporate social responsibility, sustainability performance measurement systems and intellectual capital. Dr. Kaveh Asiaei is the corresponding author and can be contacted at: kave.asia@mshdiau.ac.ir.

Ruzita Jusoh is an Associate Professor at the Department of Accounting, Faculty of Business & Accountancy, University of Malaya, Malaysia. Her areas of research interest include management accounting control system, performance measurement system, and environmental management accounting. She has published several articles in both local and international journals. She has been supervising several doctoral students. She can be contacted at: geee@um.edu.my.