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How strategic knowledge management drives intellectual capital to superior innovation and market performance

Slaðana Cabrilo and Sven Dahms

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Abstract

Purpose – *The purpose of this paper is to explore the moderation effect of strategic knowledge management (SKM) on the relationship between three components of intellectual capital (IC) and firm innovation and market performance. The authors argue that specific combinations of IC components and SKM activities can lead to higher innovation and market performance. It is also trying to assist companies to capitalize on both their IC and SKM.*

Design/methodology/approach – *Survey data have been collected from 101 Serbian companies, and these have been analyzed by using structural equation modelling (SEM) and fuzzy set qualitative comparative analysis (fsQCA) techniques.*

Findings – *The SEM results show that structural capital and relational capital have a direct effect on innovation performance. Although, there is no significant direct effect of human capital on innovation performance, the relationship becomes significant when moderated by SKM. The effects of human and structural capital on innovation performance are negatively moderated by SKM activities, while SKM positively moderates the effect of relational capital on innovation performance, but remained insignificant. Moreover, the insights from fsQCA show a clear pattern of equifinality, in that there are multiple combinations of static and dynamic conditions that can lead to higher innovation and market performance.*

Originality/value – *Two separate research fields of "static" IC and "dynamic" knowledge management have been combined in one integrated framework. From a methodological perspective, symmetric and asymmetric statistical tools have been combined to better understand contingency and interactions. This approach contributes to the literature and potentially offers a better understanding of how static intangible assets should be enabled by dynamic knowledge-based managerial activities to achieve high performance. The paper demonstrates that SKM capability matters with only a specific constellation of IC resources and therefore suggests a novel explanation for performance variances.*

Keywords *Structural capital, Intellectual capital, Human capital, Strategic knowledge management, Relational capital, Innovation performance*

Paper type *Research paper*

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1. Introduction

In the past decade, organizations have strived to improve innovation capabilities, as innovation drives market competitiveness in today's rapidly changing environment (Ferraresi *et al.*, 2012). To be more effective in innovation, organizations have to be focused on how they manage intangibles. Intellectual capital (IC) as a bundle of intangibles is a critical resource for firm performance and firm ability to innovate, create and sustain competitive advantage (Edvinsson and Malone, 1997; Nahapiet and Ghoshal, 1998).

However, IC is a static resource that does not operate in a vacuum and independent of the management context (Wang *et al.*, 2016; Kianto *et al.*, 2014). Knowledge management (KM) should put IC as a resource into action to produce value and superior firm performance.

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Furthermore, KM needs to relate with business strategy (Heisig *et al.*, 2016) to be focused on distinctive knowledge-based competences (resources and abilities) and to fully utilize knowledge-based capacities (Grant, 1996; Zack, 1999b; Inkinen, 2016; Inkinen *et al.*, 2015). From a strategic perspective, KM refers to strategic decisions that facilitate creation, sharing and transfer, storage and protection and application of the company's knowledge base (Zack, 1999b), as well as enhance firm's ability to gain and sustain a competitive advantage (Davenport and Prusak, 1998; Heisig *et al.*, 2016).

IC and KM are two important streams of research addressing knowledge-based issues in organizations (Grant, 1996; Kianto *et al.*, 2014; Wang *et al.*, 2016; Giacosa *et al.*, 2017). IC literature explores intangibles from a static perspective – as a stock of intangible resources – whereas KM literature focuses on managerial activities for dealing with organizational intangibles (Kianto *et al.*, 2014). While IC emphasizes knowledge-based resources, their nature and different forms, KM mainly concentrates on knowledge-based processes and activities for doing what is needed to use IC effectively and efficiently in the value creation processes (Hsu and Sabherwal, 2012; Wiig, 1997; Kianto *et al.*, 2014; Wang *et al.*, 2016). IC literature considers intangibles as passive assets and the stock of knowledge resources (Stewart, 1997; Inkinen, 2015), and KM represents processes to leverage and get the most out of knowledge stocks (Wang *et al.*, 2016; Wiig, 1997). However, the analysis of such knowledge resources and management processes is not an easy task.

For instance, Allee (2008) suggested that the analysis of value creation from intangibles is a great challenge. That is because there may exist unique configurations of intangibles and their specific interactions that play a role in the value creation process. So far, no consensus has been reached on how particular IC components are related to firm performance (Wang *et al.*, 2016) and which of these components are the most valuable. Some empirical studies find that all components of IC, e.g. human capital (HC), structural capital (SC) and relational capital (RC), help enhance firm performance (Wang *et al.*, 2014; Sharabati *et al.*, 2010), while others argue that only a selected few IC components are positively associated with firm performance (Ling, 2013; Dumay *et al.*, 2013; Inkinen, 2015, Andreeva and Garanina, 2016; Cabrilo *et al.*, in press; Hsu and Fang, 2009). Wang *et al.* (2016) go even further by exploring the fit between IC components and KM strategy and its impacts on firm performance to find ideal IC profiles for certain types of KM strategies. Their findings emphasize the importance in exploring IC components individually and confirming that the better the fit of an organization's IC is to its KM strategy type, the better the operational and financial performance the company can achieve. This indicates the complexity researchers face in empirically capturing those associations.

While there have been a great number of studies that separately investigate the link between IC or KM and different performance dimensions (Youndt and Snell, 2004; Subramanian and Youndt, 2005; Wang and Chang, 2005; Cabrita and Bontis, 2008; Mention and Bontis, 2013; Kong and Prior, 2008; Roos *et al.*, 2005; Chen *et al.*, 2010; Chen and Huang, 2009; Lee *et al.*, 2013; Hurmelinna-Laukkanen, 2011), empirical evidence on how knowledge-based resources and managerial activities interact in a complementary way leading to superior performance has been scarce (Andreeva and Kianto, 2011; Hsu and Sabherwal, 2011; Kianto *et al.*, 2014; Seleim and Khalil, 2011; Wang *et al.*, 2016). According to Roos (2017), in the most recent phase of IC research, the interest of researchers moves on from causality relationships between IC and financial and other performance dimensions to managing IC and its managerial implications. Recent literature (Inkinen, 2015; Wang *et al.*, 2016; Jordão and Novas, 2017; Kianto *et al.*, 2014) suggests that improvements of firm performance originate from the joint effect of IC and managerial activities (KM practices). KM can be considered as the "motor of growth and development of IC" (Jordão and Novas, 2017, p. 669). According to Prahalad and Hamel (1990), it is not enough for an organization to have a certain group of assets (tangible and/or intangible), but to have the ability to mobilize, develop and maintain these assets, or according to

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Kianto *et al.* (2014) and Novas *et al.* (2017), to have adequate KM aligned with business strategy and strategic objectives to be able to create and maintain a competitive advantage. Static IC assets and dynamic KM activities could be coupled in the same analysis to comprehensively show how organizational outcomes result from knowledge-based assets and activities (Kianto *et al.*, 2014).

Although it is noteworthy that KM and IC have been considered closely and deeply related in recent literature, both concepts and their relationships require further conceptual development (Kianto *et al.*, 2014, Jordão and Novas, 2017; Novas *et al.*, 2017). The complexity of causal relationships between IC, KM, and performance means that IC and KM may have different roles in creating and maintaining firm performance and interact in multiple ways. This complexity requires advanced research models that include mediator and moderator variables (Kianto *et al.*, 2014) which has stimulated popularity of mediator and moderator models (Wu *et al.*, 2007; Yang and Lin, 2009; Mehdivand *et al.*, 2012; Ling, 2013). The most intuitive option might be that KM moderates the effect of IC components on innovation and market performance (Kianto *et al.*, 2014), which is also analyzed in our model.

As for firm performance, both financial and non-financial performance have been connected to a firm's IC (Youndt and Snell, 2004; Subramanian and Youndt, 2005; Wang and Chang, 2005; Cabrita and Bontis, 2008; Mention and Bontis, 2013) or implementation of KM (Lee and Choi, 2003; Darroch, 2005; Andreeva and Kianto, 2012). Firm performance is a broad concept (Ferraresi *et al.*, 2012), and although performance measurement is frequently discussed in the literature (Inkinen, 2016), there is no consensus on what has to be specifically included in its measurement (Neely *et al.*, 1995), except measures of effectiveness and efficiency (Porter, 1985). In our proposed model, innovation and market performance are discussed as outcome variables for the following reasons: studies and research models in IC and KM field are in need of gaining a broader understanding of value beyond financial benchmarks (Roos, 2017; Dumay, 2009). Further, innovation is a topical issue in social science (Sveiby *et al.*, 2009) worthy of further study, and there is empirical evidence regarding the relationship between IC, KM and a firm's innovation performance (Subramanian and Youndt, 2005; Cabello-Medina *et al.*, 2011; Delgado-Verde *et al.*, 2011b; Wang and Chen, 2013; Inkinen *et al.*, 2015; Donate and Canales, 2012; Andreeva and Kianto, 2012). Finally for the sake of completion, a further relationship examined in this study is the link between innovation and market performance, as this relationship appears to have been fairly well established in the extant literature (Han *et al.*, 1998; Manu and Sriram, 1996; Vázquez *et al.*, 2001).

The discussion has so far revealed an important research gap, in that holistic models that combine different streams of literature, different methods and tools and include moderator or/and mediator variables to deepen our understanding of contingency and complex interrelationships are absent from the IC and KM literature. This paper aims to fill this research gap by proposing a model that combines IC and KM perspectives. In doing so, we unpack the composition of IC by investigating IC components (HC, SC and RC) to reveal their particular effects on innovation and market performance. Furthermore, we include not just direct effects of dynamic SKM activities on innovation performance, but its moderation role on the relationship between static IC components and innovation performance. The purpose of our research is to investigate how strategic KM (dynamic intangible-based value creation capability) moderates the effects of IC components (groups of static intangible resources) on innovation and market performance aiming to discover specific combinations of IC components and SKM activities that can lead to higher innovation and market performance. We have tested this model in the Serbian business environment to better explain the complex configurational impact of knowledge-based resources and strategic KM capability on innovation and market performance. Serbia is a transitional economy with ongoing reforms in the public sector (Veselinović, 2014) and a not

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yet completed privatization process. There is limited empirical evidence on IC, SKM and innovation and market performance in the Serbian context (Cabrilo, 2015) to support knowledge-based economic development. Only few studies have so far explored how IC components affect innovation performance (Cabrilo *et al.*, in press) or more specifically the influence of HC on effective innovation strategies (Cabrilo *et al.*, 2014).

This study is expected to make six contributions. First, the paper contributes to the literature on knowledge-based issues by combining static and dynamic perspectives on intangibles in an integrated framework and by providing theoretical and empirical support for the link between IC, KM and innovation and market performance. Second, on the methodological level, we combine symmetric and asymmetric statistical tools to better understand contingency and interactions between IC, strategic KM and innovation and market performance. Third, our study demonstrates that strategic KM capability matters only when combined with a specific constellation of IC resources for superior innovation and market performance, and that neither IC nor strategic KM is sufficient on their own to explain high innovation or market performance. The paper therefore potentially offers a theoretical and empirical grounding for many empirical and theoretical future studies. Fourth, our findings guide managers how to combine IC resources and SKM initiatives to capitalize on both and create and maintain superior innovation and market performance. Unlike other studies that guide practitioners to ensure a perfect IC–KM fit, we suggest to managers to properly adjust dynamic and changeable SKM initiatives to the static IC setting, which makes our fifth contribution. Finally, we empirically test our model in the Serbian business context because little work has so far has been done in transitional economies.

The paper is divided into five sections including this "Introduction" that gives a relevant theoretical background, identifies a gap in the literature and draws special attention to the purpose of the paper. Section 2 discusses the conceptual aspects of IC and SKM and highlights studies dealing with the complex interrelationships between innovation and market performance. Section 3 presents the research method and data analysis. The findings are discussed in Section 4. Finally, conclusions, the theoretical and managerial implications of the study are set out, and research limitations and future research avenues are provided in Section 5.

2. Conceptual framework and hypotheses development

2.1 Intellectual capital and innovation performance

The field of IC is interdisciplinary and characterized by a great number of frameworks, definitions and classifications (Cabrilo, 2015; Inkinen, 2015; Wang *et al.*, 2016). In the literature, IC has mostly been defined as intangible knowledge-based resources that can be converted into profit (Sullivan, 1998), brands, trademarks and processes (Roos *et al.*, 1997), value (Edvinsson and Sullivan, 1996) and help companies to achieve and sustain competitiveness (Stewart, 1997; Sveiby, 1997; Sullivan, 1998). IC exists in all organizations as a stock of knowledge-based resources that can potentially be used in the value creation process (Kianto *et al.*, 2014).

Although there are various IC classifications in the literature, we follow the three-dimensional categorization of IC: HC, SC and RC (Roos *et al.*, 1997; Stewart, 1997; Tovstiga and Tulugurova, 2007; Hsu and Fang, 2009; Cabrilo, 2015). This is because the tripartite IC taxonomy appears to be an emerging standard (Inkinen, 2015), and it is useful in a large number of countries and business contexts.

In this paper we consider innovation, as a process of introduction and application of new ideas, processes or procedures, designed to significantly benefit the individual, the group, organization or wider society (West and Farr, 1990; Cabrilo and Grubic-Nesic, 2013). Intuitive reasoning that all IC components positively affect innovation process has been recently challenged by studies questioning the contribution of all IC components to different

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types of innovation performance (Ling, 2013; Dumay *et al.*, 2013; Sveiby *et al.*, 2009; Andreeva and Garanina, 2016; Cabrilo *et al.*, in press). Therefore, in this section, we focus our analysis on how different IC components separately affect innovation performance.

HC is embodied in people who make up organizations and it includes various human-based resources such as employee competence, experience, skills, innovativeness, creativity, motivation, attitude, intuition and leadership abilities (Bontis, 2002; Roos *et al.*, 1997). HC has been found to be the most important for organizations to innovate, as the amazing capacity of the human mind – including creativity, innovativeness, intuition, and expertise – is essential for the innovation process (Marvel and Lumpkin, 2007; Bontis, 2002; Cabrilo *et al.*, 2014; Cabello-Medina *et al.*, 2011). Innovation is a process of creating and disseminating new ideas and putting them into action (Cabrilo and Grubic-Nesic, 2013). HC provides the main source for developing new ideas and knowledge (Snell and Dean, 1992). Creative, highly motivated and trained employees may question the already established organizational routines, and they have a critical role in creating new knowledge through the learning process and innovations (Nonaka and Takeuchi, 1995; Weggeman, 1997).

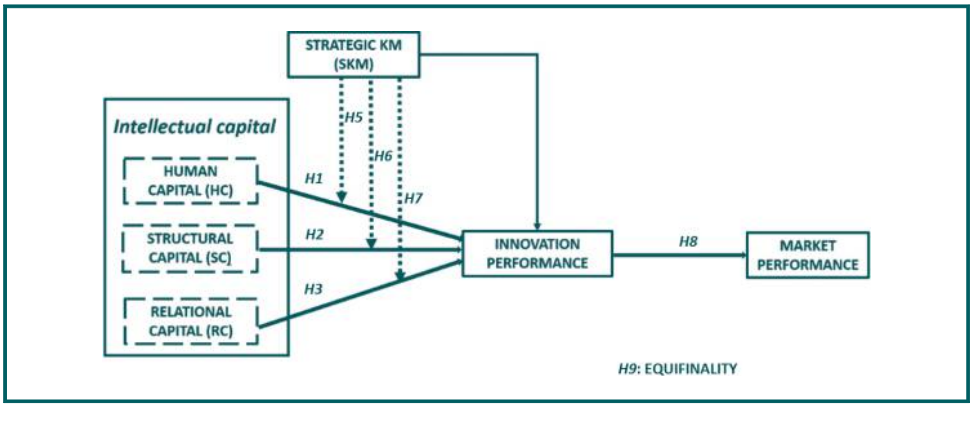
While a number of studies have provided evidence about positive and direct associations between HC and innovation performance (Wu *et al.*, 2007; Marvel and Lumpkin, 2007; Santos-Rodrigues *et al.*, 2011, Andreeva and Garanina, 2016), some research findings challenge the mainstream literature in reporting non-significant direct links (Bontis, 1998; Stewart, 1997; Cabrita and Bontis, 2008) or even that HC negatively affects innovation performance (Cabrilo *et al.*, in press; Inkinen *et al.*, 2014).

However, authors from all these studies have agreed, in that having a brilliant, motivated and experienced HC is the base of innovation process and that HC directly or indirectly affects organizational ability to innovate (Delgado-Verde, 2011a; Laursen, 2002; Anker, 2006; Cabello-Medina *et al.*, 2011; Bontis, 1998; Cabrita and Bontis, 2008; Shipton *et al.*, 2005). In this paper, we choose the most intuitive and logical relation between HC and innovation performance and argue that creative, experienced and skillful employees accelerate the innovation process and positively affect innovation performance. Building on the reasoning presented above, we formulate our first hypothesis:

H1. Human capital positively affects innovation performance.

Besides HC, another important part of the knowledge and abilities for successful innovations lies inside the organization, in its SC (Delgado-Verde, 2011a). Structural capital (SC) includes knowledge that lies in organizational processes, procedures and routines, culture, databases, information systems, patents, brands, trademarks, copyrights and other intellectual property (Bontis *et al.*, 2000; Edvinsson and Malone, 1997; Stewart, 1997;

Figure 1 Conceptual framework



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Karagiannis *et al.*, 2008). At the organizational level, innovations are the collective achievements of employees (Van de Ven, 1986) and therefore HC, need organizational support in process of transforming individual tacit knowledge into codified and explicit organizational knowledge (Adamides and Karacapilidis, 2006) and organizational property (Pitt and MacVaugh, 2008). Supported by SC, HC may be more efficient and effective in creation, dissemination and implementation of new ideas within the company. Organizational processes, information systems, organizational culture, internal organization structure, routines and administrative systems are parts of SC that fosters accumulation, preservation and improvement of collective knowledge (Delgado-Verde, 2011a).

This has been expanded when researchers started to explore the association between SC and innovation performance. Studies showed that SC plays an important predictive role in innovation performance (Aramburu and Sáenz, 2011; Delgado-Verde *et al.*, 2011a; Cabrilo *et al.*, in press). Most findings indicated a positive influence of SC on innovation capability and innovation capital (Delgado-Verde *et al.*, 2011a; Cabrilo *et al.*, in press; Tseng and Goo, 2005). However, Inkinen *et al.* (2014) found no significant effect on innovation performance in the context of Finnish companies. Other studies Bozbura (2004) pointed out that SC can provide the supporting infrastructure that enables creative activities and allows HC and RC to contribute to innovation performance. Although the results of previous studies point to the multifaceted aspects of the interaction between SC and innovation performance, we believe that having efficient organizational processes and routines, effective information systems and databases or/and organizational culture that promotes commitment to innovation as the main value can constitute important sources for innovative success. Given the above considerations, we hypothesize that:

H2. Structural capital positively affects innovation performance.

Finally, RC typically refers to a company's relations with its external stakeholders such as customers, suppliers, competitors, investors or partners (Sveiby, 1997; Bontis, 1998; Wu *et al.*, 2007). This IC dimension encompasses actual and potential knowledge-based resources embedded within, available through and derived from the network of firm's social relations (Nahapiet and Ghoshal, 1998; Reed *et al.*, 2006). As conceptualized in previous studies (Hormiga *et al.*, 2011; Namvar *et al.*, 2010), we include internal relations between employees or internal movement of knowledge between employees into RC. Both internal and external relations are important sources of new knowledge and novel ideas and insights, and these can therefore accelerate innovation (Hsu and Fang, 2009; Martín-de Castro *et al.*, 2013). External relations become even more crucial in the emerging context of open innovation, which relies on different external stakeholders, such as suppliers, customers, universities or competitors (Chesbrough, 2003). Moreover, a company's image, connectivity and accessibility from its external networks facilitate sales and market performance. However, empirical evidence has been mixed. For instance, while some found that RC positively affects different firm performances (Bozbura, 2004; Mehdivand *et al.*, 2012; Delgado-Verde *et al.*, 2011b), other studies found that RC does not as such influence innovation performance (Andreeva and Garanina, 2016). Nevertheless, based on the conceptual arguments, we hypothesize that:

H3. Relational capital (including internal and external relationships) positively affects innovation performance.

2.2 Strategic knowledge management and innovation performance

According to Penrose (1959), it is never the resources that create value. Even a large stock of IC will not be able to create a great value without managerial activities and processes which support knowledge productivity (Teece *et al.*, 1997). Recent studies propose that IC needs to be explored together with KM activities and processes to better understand how intangibles drive innovation performance (Kianto *et al.*, 2014; Wang *et al.*, 2016; Ling, 2013;

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Hsu and Sabherwal, 2011; Seleim and Khalil, 2011). Therefore, we consider knowledge-based resources (such as IC) to be static assets that have to be dynamically managed to be transformed into value. In particular, we combine static and dynamic perspectives on intangibles to explore how SKM influences innovation performance and moderates the relationships between IC components and innovation performance.

KM is a dynamic interpretation of intangibles (Kianto, 2007) and can be defined as a set of systematic managerial activities and processes focused on effectiveness and efficiency of firms' knowledge resources (Davenport and Prusak, 1998; Heisig, 2009; Andreeva and Kianto, 2012). KM includes abilities to use and develop IC for value creation. IC (i.e. knowledge resources) and KM (i.e. knowledge abilities) are what really produce value for the company.

At the strategic level, SKM refers to strategic planning related to the crafting and implementing of a knowledge strategy (Skyrme and Amidon, 1997; Zack, 1999a; Inkinen *et al.*, 2015). SKM activities are focused on knowledge-based distinctive competences – the most valuable knowledge abilities and processes and the most value-creating knowledge assets for competitive advantage creation (Grant, 1996; Zack, 1999b; Inkinen, 2016; Inkinen *et al.* 2015). Furthermore, they enable making strategic decisions of generation, allocation, sharing, protection and utilization of the firm's knowledge base (Zack; 1999b), as well as the creation of a knowledge-friendly organizational culture to facilitate knowledge productivity.

The link between KM and innovation has probably been the most frequent area of research (Nonaka, 1991; Andreeva and Kianto, 2011; Zhou and Li, 2012; Xu *et al.*, 2010, Inkinen *et al.*, 2015). Although the importance of KM for innovation has been substantiated in recent studies (Costa and Monteiro, 2016; Lee *et al.*, 2013; Zhou and Li, 2012), there is still a lack of understanding on how specifically strategic orientation in KM affects innovation performance (Al-Hakim *et al.*, 2013), which is one of our research objectives.

For instance, Inkinen *et al.* (2015) found that SKM was positively associated with innovation performance in Finnish companies. Additionally, Ferraresi *et al.* (2012) showed that effective KM positively influenced innovativeness only when mediated by strategic orientation, but the direct effects were not significant in their study. New knowledge is essential for organizational innovation, and SKM refers to the process and infrastructure organizations use to acquire, create, share and use knowledge in making strategic decisions and formulating strategies (Zack, 2002). Moreover, according to Theriou *et al.* (2011), strategic attitude and leadership pertaining to knowledge processes are crucial to gain and sustain a firm's competitive advantage (Theriou *et al.*, 2011).

More studies have looked at the relationship between KM strategies and innovation performance, showing that such strategies had a significant and positive association with innovation capabilities and innovation performance (Choi *et al.*, 2008; Keskin, 2005), or that innovation performance partially mediates the effect of SKM on firm performance (Al-Hakim *et al.*, 2013). Based on this argumentation, we suspect that the more effectively an organization formulates and implements SKM, the higher the innovation performance it is likely to attain. Therefore, we posit the following hypothesis:

H4. Strategic knowledge management positively affects innovation performance.

2.3 Strategic knowledge management as a moderator of IC components effects on innovation performance

Both IC (stocks of knowledge) and KM (abilities in using these stocks) drive innovation performance (Kogut and Zander, 1992; Spender and Grant, 1996; Grant, 1996; Kianto *et al.*, 2014). There is a substantial body of research on several types of relationships involving IC, KM and innovation performance (Inkinen, 2015; Inkinen, 2016; Wang *et al.*,

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2016), but there are hardly any studies that analyze all of them simultaneously. What seems to be lacking is empirical evidence of how IC and KM jointly drive innovation performance. The reason for such a comparatively small number of comprehensive research models exploring causal interactions between IC, KM and innovation performance may be the complexity of their interrelationships and different roles that IC components and KM may take in creating and maintaining organizational outcomes.

Kianto *et al.* (2014) presented a theoretical model for the connections between IC, KM practices and firm performance. The authors suggested four conceptual models on how IC and KM practices interacted in affecting firm performance, but did not empirically test these models and did not include innovation performance explicitly. Wang *et al.* (2016) explored the impact of IC–KM strategy fit on firm performance trying to find ideal IC profile (composition of IC components) for a given KM strategy, but they did not investigate the effect on innovation performance. Although most studies confirm that KM provides a framework for managing IC (Housel and Nelson, 2005; Shih *et al.*, 2010; Jordão and Novas, 2017) and converts IC into values (Brooking, 1997; Housel and Nelson, 2005; Ling, 2013); surprisingly, few studies have empirically investigated the potential moderating effect of KM on the relationship between IC (especially IC components) and innovation performance (Ling, 2013).

Ling's (2013) study of Taiwanese firms indicated that the KM strategy moderates the relationship between IC components and global innovation. Ferraris *et al.* (2017) found positive evidence in favor of a moderator effect of KM capabilities on the relationship between external sources of knowledge and innovation performance in MNCs' subsidiaries. One of Kianto *et al.*'s (2014) conceptual models suggested that IC stocks had a positive effect to innovation performance, and that this effect was positively moderated by certain KM practices.

In general, firms need to continuously generate new knowledge to innovate (Ferraris *et al.*, 2017; Nonaka and Takeuchi, 1995). However, innovative outcomes are determined by not only the quantity and quality of new knowledge but also the speed at which the firms create new knowledge through the learning process (Senge, 1990) and develop their knowledge base (Del Giudice and Maggioni, 2014). Therefore, innovative firms are more able to create and use knowledge rapidly and effectively than those that do not (Cavusgil *et al.*, 2003).

By facilitating knowledge creation, sharing, transfer, storage, protection and implementation, strategic KM capabilities allow the company to better apply knowledge in problem-solving, strategic planning and decision-making (Sveiby, 1997), and in this way, improve innovation outcomes (Ferraris *et al.*, 2017). Developing IC through KM practices helps in generating new ideas and supports the development of innovation capacity (Lichtenthaler and Lichtenthaler, 2009). Valuable knowledge assets (such as IC) are wasted unless the management supports and encourages efforts to create, gather, sort, store, share, transform and apply knowledge (Scuotto *et al.*, 2017; Sala *et al.*, 2016).

Although the nature of interaction between IC, strategic KM and innovation performance can be interpreted in various ways, the most intuitive explanation is that companies with greater strategic KM capabilities are able to benefit more from their IC components (HC, SC and RC) in terms of innovation performance. We believe that through SKM processes and tools, companies may better create new knowledge, diffuse and apply it within the company and better capitalize on HC, SC and RC in the innovation process. Without SKM orientation, they could underutilize these IC components, reducing the firms' innovative performance (Darroch, 2005; Ferraris *et al.*, 2017). Based on the discussion above, we hypothesize that:

H5. Strategic knowledge management positively moderates the effect of human capital on innovation performance.

H6. Strategic knowledge management positively moderates the effect of strategic capital on innovation performance.

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H7. Strategic knowledge management positively moderates the effect of relational capital on innovation performance.

2.4 The link between innovation and market performance

Assuming that strategic KM is built on practices that enable companies to create, develop and apply IC effectively, both IC and SKM are theoretically correlated with patterns of innovative behavior and superior performance. Performance is a multidimensional construct and may be characterized in a number of ways (Jaworski and Kohli, 1993; Neely *et al.*, 1995). Some of the most commonly used definitions refer to performance as measures of the achievement of organizational objectives (Daft, 2009) or a judgmental assessment of the firm's overall performance relative to major competitors over the past year (Jaworski and Kohli, 1993). In this paper, we are interested in how effectively an organization is able to achieve innovation and market goals compared to its competitors, by using its IC and implementing SKM.

For the reason of completion of our model, we consider further relationships between IC, SKM, innovation performance and market performance. Innovativeness is intuitively related to business performance (Ferraresi *et al.*, 2012). However, a research gap remains in the identification of the relevant factors that have a direct effect on organizational innovation to improve other performance dimensions (Camisón, and López, 2010; Calantone *et al.*, 2002; Al-Hakim *et al.*, 2013). Based on strong empirical evidence on how innovations drive competitiveness and market performance (Avlonitis and Gounaris, 1999; Vázquez *et al.*, 2001; Banbury and Mitchell, 1995; Chaney and Devinney, 1992; Jancenelle *et al.* 2017), a direct link between innovation and market performance stands as concordantly documented part of our IC–SKM–innovation–market performance model. For instance, previous research has demonstrated how new products and technologies can enhance market share and stock market value (Banbury and Mitchell, 1995; Chaney and Devinney, 1992). While investigating the effects of a company's entrepreneurial tendency on market performance, Jancenelle *et al.* (2017) found that some dimensions of innovativeness had a positive effect on market performance.

In our model, we did not consider straightforward effects of IC and SKM practices on market performance following the findings from some previous studies. For example, Ferraresi *et al.* (2012) showed that KM has no direct effect on business performance, but this effect becomes significant and positive when mediated by strategic orientation and innovativeness. Their discussion is based on studies that pointed out that direct relationships between strategic orientation and firm performance are too simplistic (Nazdrol *et al.*, 2011; Slater *et al.*, 2006, Han *et al.*, 1998) and often include various constructs, particularly related to innovation (Ferraresi *et al.*, 2012; Han *et al.*, 1998). Additionally, Darroch (2003) argues that knowledge (here defined as IC) needs a strategic direction (here defined as SKM) and abilities for knowledge application (here defined as innovation performance) to generate competitiveness and other business results for the company (here defined as market performance). These studies suggest the existence of complex interactions involving the various constructs and predictor variables for consideration of effects on different business performance (Nazdrol *et al.*, 2011; Slater *et al.*, 2006, Han *et al.*, 1998).

We follow the findings of Ferraresi *et al.* (2012) and Slater *et al.* (2006) who have pointed out that the strength of relationships between predictor variables and performance varies according to strategic orientation. In other words, a direct link between SKM and IC and market performance in our model is unlikely to exist, instead a link between innovation performance and market performance seems the most pertinent and is the focus of our last hypothesis.

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In accordance with the aforementioned discussion and in line with previous studies (Aragón-Correa *et al.*, 2007; Al-Hakim *et al.*, 2013), in this study, we believe that through the strategic management of relevant knowledge flows, companies become more innovate and are better able to create competitive advantage (Ferraris *et al.*, 2017). We expect that the resulting innovation performance plays a significant role in market performance development. Therefore, we hypothesize that:

H8. Innovation performance has a positive effect on market performance.

2.5 Equifinality

The discussion so far showed that there is a strong interrelationship between the concepts covered in this study. This indicates that several ways to achieve high innovation and market performance in the context of IC and SKM may exist. This seems to be in particular the case when we consider the IC components. For instance, previous studies show that HC supports other IC components, which in turn may have an additional influence on innovation performance (Bontis, 1998; Jardón and Martos, 2012; Cabrita and Bontis, 2008). Other empirical findings indicate that SC has better explanatory power for market performance compared to HC and RC (Yang and Lin, 2009; Andreeva and Garanina, 2016; Bontis *et al.*, 2000). Interestingly, SC has been found in some studies to allow HC and RC to contribute to innovation and market performance (Bozbura, 2004; Jardón and Martos, 2012).

This complex interrelationship hints toward equifinality (Fiss, 2011). That means that there are several ways to achieve high innovation and market performance. We therefore suggest as our final hypothesis that:

H9. Several equifinal causal configurations will lead to high innovation and market performance.

3. Method

3.1 Data collection and sample

This research is based on survey data collected as part of a large-scale international intellectual capital research project from companies located in Serbia. Serbia provides an interesting research context because many previous studies focus on developed countries only (Andreeva and Garanina, 2016; Inkinen *et al.*, 2014; Inkinen *et al.*, 2015; Mention and Bontis, 2013; Tovstiga and Tulugurova, 2007). Using Serbia allows us to test established theories in the context of a transition economy. This is important because theories need to hold in various contexts to prove their worth. Furthermore, as part of the transition economies cluster in south-eastern Europe, Serbia, as well as other economies, are struggling to keep up with innovation performance of competitors from other parts of the world, most notably Asia. Hence, understanding the innovation performance in Serbia can also provide more general insights for economies at similar development stages in the region.

The sample universe consisted of all companies in Serbia with at least 100 employees. We ignored smaller companies, as we believe that this better fits with our goal to understand the link between strategic KM, IC and sustained innovation performance in firms. The sample universe has been compiled from publicly available data such as Statistical Office of the Republic of Serbia, Chamber of Commerce and Industry of Serbia and Serbian Business Registers Agency. This left us with 2,500 eligible companies out of which 250 have been contacted. Similar to adjacent studies in the field (e.g. Wang *et al.*, 2016), was the selection process based on convenience sampling method. In particular, the 250 companies were known to the university research team through institutional agreements with the companies and previous research and consultancy projects. This approach was

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justified because the research targeted the CEO and other top management team members, who are notoriously difficult to contact (Cycyota and Harrison, 2002, 2006). The top-level managers are, however, due to the virtue of their position, most likely to have the required information (John and Weitz, 1988). The survey design and administration followed Dillman's tailored design method to increase the response rate (Dillman, 2000). Accordingly, the CEO of each company has been initially contacted via email and phone in which the survey objectives have been explained and confidentiality ensured. The second contact then initiated the data collection via online survey. Over a period of three months we collected a total of 101 responses.

The sample can be deemed as an appropriate reflection of the country's economy. For instance, 55 of our companies were from manufacturing and related industries and 46 from service and related industries. The largest manufacturing sector subgroup was manufacturers of food and beverage and the largest service subgroup was from information and communications services. The size of the firms reached from 100 to 9,061 employees (standard deviation = 1,128). Furthermore, 37 have less or equal to 249 employees and can be considered of medium size according to number of employees. The companies have an average age of around 18 years with a standard deviation of 12.1. The largest group of companies, 42 in total, are located in the metropolitan region of Belgrade, which is also the capital and economic hub of Serbia. In our sample, there are 34 foreign-owned companies. All the respondents were members of or closely aligned with the top management team. In particular, 88 questionnaires were filled in by the company's CEO and other members of executive board such as HR managers, the remainders were filled in by company-affiliated experts and other advisors and board members. Furthermore, we conducted *t*-tests to assure that non-response bias does not impact our results. We tested for industry and location, which are data available from the other databases, the results showed that non-response bias is not a threat.

In order to minimize ex ante common-method bias, several steps have been taken in the research design stage. First, the constructs have been distributed in a non-systematic manner across the questionnaire. This, in combination with our complex moderation effects, makes it hard for the reader to guess our model (Chang *et al.*, 2010). Second, we also varied the anchoring of our constructs for instance "1 = very poorly, 5 = very well" or "1 = completely disagree, 5 = completely agree". Third, we also clearly separated the constructs spatially on the questionnaire (Podsakoff *et al.*, 2003). Furthermore, we used ex post tests to detect common method bias, which are reported below.

3.2 Construct development

Keeping in mind the relative recent development of research in innovation performance and the relatively novel research context of Serbia, we used well-established constructs to measure our key variables. This contributes to the rigor of our research design and increases comparability of our findings with adjacent studies.

Our key outcome variables are innovation performance and market performance. Innovation performance (INNOPER) is based on a five-item construct adapted from Weerawardena (2003). Market performance (MARKPER) is based on subjective measures adapted from Delaney and Huselid (1996). Researchers who have analyzed the influence of KM on market performance typically have used subjective performance measures (Payal and Debnath, 2015) to capture the whole essence of the ambiguous KM phenomenon (Lönnqvist, 2004). Subjective performance measures are not without shortcomings; however, they have been shown to increase response rates. This is especially crucial in our context given that firm-level surveys are still rather uncommon in Serbia. Second, subjective performance measures have been shown to be a reliable indicator for firm performance (Singh *et al.*, 2015).

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Strategic knowledge management (SKM) serves, in this study, as a dynamic moderator and a direct influence on innovation performance. The measure is based on a five-item scale adapted from McKeen *et al.* (2005), Kianto *et al.* (2013) and Boumarafi and Jabnoun (2008). HC and SC have been adapted from Kianto *et al.* (2010). Internal RC and external RC have been adapted from Kianto (2008). For the purpose of our study, we have aggregated the latter two into one general RC construct. The full questions and items can be found in Table I.

3.3 Analysis and results

3.3.1 Partial least square-structural equation modeling. We analyses the data based on a partial least square (PLS) approach to structural equation modeling (SEM). A PLS approach is helpful because, in the light of the mixed empirical evidence reviewed earlier, we believe that theory building is as important as theory testing alone, which could be more appropriately done using a covariance-based SEM method (Van Reijsen *et al.* 2015). A PLS approach is also appropriate for this study because it has lower sample size requirements (Roxas *et al.*, 2014) and it is less sensitive to data inadequacies compared to traditional ordinary least square regression techniques for example (Hair *et al.*, 2012). Lastly, PLS is also able to handle multiple latent and manifest variables as required to test our proposed model (Van Reijsen *et al.* 2015).

Each SEM-PLS model contains two set of equations, the first is a measurement model and the second a structural model. The measurement model is necessary to indicate if the subsequent structural model is feasible. The structural model analyzes the relationships between the latent variables and the relevant manifest variables. To test our framework, we used WarpPLS 5.0 software (Roxas *et al.*, 2014; Van Reijsen *et al.* 2015).

3.3.2 Measurement model. In the first step, the measurement model is assessed. The measurement model is the basis for the subsequent structural model analysis (Hulland, 1999). We used confirmatory factor analysis to establish construct reliability and validity. The full results are presented in Table I.

We find good support for our measurement model indicators. The factor loadings are well above the commonly applied threshold of 0.5 (Hair *et al.*, 2012). This also meant that we did not have to drop items from our initial constructs. Composite reliability and Cronbach's alpha for all items are above the required 0.7 threshold (Hair *et al.*, 2012). Composite reliability values reach from 0.888 for market performance to 0.921 innovation performance. As a final indicator, the average variance extracted was above 0.5 and can hence be deemed satisfactory as for convergent validity (Chin, 1998).

Following Fornell and Larcker (1981) we assessed discriminant validity by ensuring that the square root of the average variance extracted (AVE) is higher than the correlation between the constructs. This is the case for all six constructs. We can also report that none of the variance inflation factor values was alarmingly high, suggesting that multicollinearity is not a major issue for our data set. In sum, our measurement model results suggest that the analysis of our structural model is feasible (Table II).

3.3.3 Structural model. The structural model is used to test the hypothesized relationships. Given the sample size, a stable method has been used to assess statistical significance of the path coefficients (Kock, 2011). A stable method is different from simple bootstrapping, in that it does not rely on the replication of samples alone and produces more stable path coefficients (Kock, 2014).

We report the path coefficients and *p* values. Kock (2016) argues that the use of *p* values in PLS is beneficial because, in addition to indicating the relationship strength (which is also given in the path coefficients), it also indicates the power of the test. For instance, lower

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Table I The measurement model and constructs

Constructs	*Factor loadings*	*Composite reliability*	*Cronbach's. alpha*	*AVE*
Innovation performance (INNOPER)				
Compared to its competitors, how successfully has your company managed to create innovations/new operating methods in the following areas over the past year? (1 = very poorly, 5 = very well)				
Products and services for customers	0.806	0.921	0.893	0.700
Production methods and processes	0.858			
Management practices	0.850			
Marketing practices	0.811			
Business models	0.858			
Market performance (MARKPER)				
Compared to other companies in its sector, how do you think your company has succeeded in the following areas over the past year? (1 = very poorly, 5 = very well)				
Net sales growth	0.895	0.888	0.811	0.727
Profitability	0.855			
Market share	0.805			
Strategic management of knowledge (SKM)				
To what extent do the following statements on strategic knowledge and competence management apply to your company? (1 = completely disagree, 5 = completely agree)				
Our company strategy is formulated and updated based on company knowledge and competences	0.915	0.916	0.881	0.690
Our company strategy addresses the development of knowledge and competences	0.920			
Our company systematically compares its strategic knowledge and competence to that of its competitors	0.775			
Our knowledge and competence management strategy is communicated to employees clearly and comprehensively	0.888			
In our company, the responsibility for strategic knowledge management has been clearly assigned to a specific person	0.613			
Structural capital (SC)				
To what extent do the following statements on internal structures apply to your company? (1 = completely disagree, 5 = completely agree)				
Our company has efficient and relevant information systems to support business operations	0.789	0.904	0.858	0.702
Our company has tools and facilities to support cooperation between employees	0.842			
Our company has a great deal of useful knowledge in documents and databases	0.873			
Existing documents and solutions are easily accessible	0.844			
Human capital (HC)				
To what extent do the following statements on employee competence apply to your company? (1 = completely disagree, 5 = completely agree)				
Our employees are highly skilled at their jobs	0.872	0.904	0.841	0.759
Our employees are highly motivated in their work	0.886			
Our employees have a high level of expertise	0.855			
Relational Capital (RC)				
To what extent do the following statements on internal cooperation apply to your company? (1 = completely disagree, 5 = completely agree)				
Different units and functions within our company – such as R&D, marketing and production – understand each other well	0.774	0.917	0.891	0.648
Our employees frequently collaborate to solve problems	0.831			
Internal cooperation in our company runs smoothly	0.768			
To what extent do the following statements on external cooperation apply to your company? (1 = completely disagree, 5 = completely agree)				
Our company and its external stakeholders – such as customers, suppliers and partners – understand each other well	0.804			
Our company and its external stakeholders frequently collaborate to solve problems	0.796			
Cooperation between our company and its external stakeholders runs smoothly	0.852			

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Table II Discriminant validity and descriptive statistics

No.	Variable	Mean	SD	1	2	3	4	5	6
1	*MARKPER*	3.56	0.73	*0.852*					
2	*INNOPER*	3.53	0.70	0.807**	*0.837*				
3	*HC*	3.82	0.74	0.544**	0.547**	*0.871*			
4	*SC*	3.97	0.75	0.521**	0.614**	0.502**	*0.838*		
5	*SKM*	3.34	0.92	0.474**	0.572**	0.625**	0.681**	*0.83*	
6	*RC*	3.89	0.70	0.602**	0.681**	0.804**	0.663**	0.722**	*0.805*

Notes: Diagonals in italic are the square roots of the average variance extracted and off-diagonal are the bivariate correlations between the constructs. AVE in italic shown on diagonal; **Correlation is significant at the 0.01 level (two-tailed)

path coefficient values can still be statistically significant in data sets with smaller sample size.

The R^2 values for innovation performance was 0.63 and 0.65 for market performance. Both indicate a strong explanatory power in our model. Our hypotheses have been largely supported. *H2* was supported, showing a positive (β = 0.363) and significant ($p < 0.001$) path coefficient between SC and innovation performance. The path coefficient between RC and innovation performance was positive (β = 0.246) and significant ($p < 0.001$). *H3* is supported. The path coefficient between SKM and innovation performance was positive (β = 0.196) and significant (p = 0.002). *H4* is supported. SKM negatively moderates the association between HC and innovation performance and SC and innovation performance. Hence, we found no support for *H5* and *H6*. The path coefficient between innovation performance and market performance was positive (β = 0.805) and significant ($p < 0.001$). Hence, *H8* is supported. No support has been found for *H1* and *H7*. The full results can be found in Table III.

Lastly, we also assessed the overall fit of our model. The commonly applied indicators are all well within the range of usually applied thresholds. For instance, the average block variance inflation factor is 3.331. This is close to the ideal value of smaller than 3.3 (Kock, 2011). The same holds for the average full collinearity variance inflation factor which is 3.522 in our model. Both results indicate low overall multicollinearity. The Tenenhaus goodness-of-fit index is 0.650 in our model, which indicates a large explanatory power.

Furthermore, in line with Roxas *et al.* (2014) we also conducted a Harman single-factor test for common-method bias. The results showed that no single factor explained more than 50 per cent of the variance, which indicated that the common-method bias is not a huge threat to our data.

Table III PLS tests

Hypotheses	Path coefficient	p-value	Hypothesis supported
H1: HC and INNOPER	0.051	$p = 0.233$	No
H2: SC and INNOPER	0.364	$p < 0.001$	Yes
H3: RC and INNOPER	0.246	$p < 0.001$	Yes
H4: SKM and INNOPER	0.196	$p = 0.002$	Yes
H5: SKM × HC on INNOPER	−0.097	$p = 0.082$	No
H6: SKM × SC on INNOPER	−0.200	$p = 0.002$	No
H7: SKM × RC on INNOPER	0.078	$p = 0.131$	No
H8: INNOPER and MARKPER	0.805	$p < 0.001$	Yes

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3.4 Equifinality hypothesis

To test the equifinality of innovation and market performance, we conducted a fuzzy set qualitative comparative analysis (fsQCA). fsQCA is a relatively recent method (Ragin, 2008); however, it has been successfully applied in the KM literature, for instance, by Lowik *et al.* (2016) or Martín-de Castro *et al.* (2013). It is also seen as a complementary approach to SEM methods because it allows for alternative and multidimensional solutions to emerge (Woodside, 2013).

In particular, fsQCA provides configurations of conditions that emerge from its algorithm. Configurations can be seen as outcome variables, and conditions somewhat resemble explanatory variables. The key difference between fsQCA and other symmetric methods is that fsQCA allows for conditions to be part of several configurations, i.e. outcomes. In other words, while symmetric methods allow variables to have only a one-sided effect, fsQCA removes that restriction. For instance, while our SEM results suggest that HC is negatively associated with innovation performance, fsQCA investigates if there are cases in which HC as a condition is part of a configuration for some cases which show high innovation performance. More detailed discussions on fsQCA can be found elsewhere (Ragin, 2008; Wagemann and Schneider, 2010).

The first step we need to take is to calibrate our data into fuzzy sets. That means we distinguish cases that are either fully in, fully out or in between of certain sets. Our data show conditions that can take intermediate values. Hence, in line Lowik *et al.* (2016), we divide our values in 25 percentiles in which the 25th percentile is fully out = 0, the 50th percentile is the 0.5 cut-off point and the 75th percentile is 1 = full membership.

We are interested in two different yet related outcomes:

1. on the one hand, we want to understand the determinants of innovation performance; and
2. on the other hand, we are also interested in the effects all conditions have on market performance.

Therefore, we will run two fsQCA models.

After the calibration, we analyze the necessary and sufficient conditions. Necessary condition analysis is presented in Table IV. None of the conditions reaches a consistency value of >0.9, which indicates that none of the conditions is necessary (Ragin, 2008). That means that none of our conditions by itself is able to explain innovation or market performance.

Table IV Necessary conditions

	INNOPER		*MARKPER*	
Conditions	*Consistency*	*Coverage*	*Consistency*	*Coverage*
INNOPER	–	–	0.818	0.808
~INNOPER	–	–	0.275	0.266
SKM	0.730	0.684	0.682	0.631
~SKM	0.388	0.406	0.387	0.401
HC	0.688	0.711	0.688	0.702
~HC	0.441	0.418	0.402	0.377
SC	0.695	0.742	0.662	0.698
~SC	0.436	0.401	0.427	0.389
RC	0.748	0.742	0.735	0.721
~RC	0.368	0.362	0.361	0.351

Note: ~ = stands for "NOT"

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In the next step, we analyze the sufficient conditions. fsQCA provides truth tables according to which causal combinations are evaluated along their consistency level. In line with Fiss (2011) and Martín-de Castro *et al.* (2013), we chose a consistency level of 0.75 and a frequency threshold of 1 as cutoff points. The complete truth tables are available on request from the author.

Last, we assess the intermediate solutions that emerge from the Boolean algorithm to gain an understanding of sufficient conditions that lead to the desired outcomes. In our case, the outcomes are high innovation performance and high market performance. Both are presented as intermediate solutions (Ragin, 2008) in Tables V and VI. Using the conventions introduced by Lowik *et al.* (2016), ● means the condition is present, ⊗ means the condition is absent and "blank space" means do not care.

Table V shows the result for the configurations that predict high innovation performance. First we should note that there are in total six different paths that can lead to high innovative performance. This is a clear indication for equifinality (Fiss, 2011). Solution 2, for instance, has the highest raw coverage (55 per cent of the cases analyzed). The solution means that high HC, high RC and high SKM capability lead to high innovation performance. This is in itself an interesting finding because it goes beyond the non-significant and negative association that we found in using the SEM method. Also of interest is Solution 6. It indicates that SC might serve as a substitute for firms that lack other capital sources, as well as SKM

Table V fsQCA results' innovation performance

Condition \ Solution	*Configurations for high* innovation performance 1	2	3	4	5	6
HC		●	●	●	⊗	⊗
SC	●		●	●	⊗	●
RC	●	●	●		●	⊗
SKM	●	●		●	⊗	⊗
Consistency	0.84	0.81	0.82	0.81	0.78	0.81
Raw coverage	0.51	0.55	0.50	0.48	0.12	0.15
Unique coverage	0.05	0.09	0.03	0.02	0.04	0.04
Overall solution consistency			0.7613			
Overall solution coverage			0.7599			

Notes: Intermediate solution; consistency cutoff: 0.776; frequency cutoff: 1. ⊗ =absent, ● = present, blank space = "do not care". Consistency reflects the sample supports the solution, coverage reflects the power of the solution, as the "R" in regression method

Table VI fsQCA results' market performance

Condition \ Solution	*Configurations for high* market performance 1	2	3	4	5
HC	⊗	⊗		●	●
SC	⊗		●		●
RC		⊗	●	●	●
SKM	⊗	⊗	●	●	
INNOPER	●	●	●	●	●
Consistency	0.82	0.84	0.85	0.86	0.87
Raw coverage	0.16	0.19	0.44	0.48	0.44
Unique coverage	0.02	0.02	0.03	0.08	0.03
Overall solution consistency			0.8370		
Overall solution coverage			0.6779		

Notes: Intermediate solution; consistency cutoff: 0.818; frequency cutoff: 1. ⊗ =*absent*, ● = present, blank space = "do not care". Consistency reflects the sample supports the solution, coverage reflects the power of the solution, as the "R" in regression method

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capability. However, that solution covers only about 15 per cent of all the cases that show high innovation performance.

Table VI contains five different configurations that can lead to high market performance. We show that HC can be a condition that fosters market performance (in Solutions 4 and 5) but also a condition that can be completely absent for high market performance (Solutions 1 and 2). Additionally, in line with our expectations, innovation performance is present in every solution. It is also the only condition present in the parsimonious solution (available on request from the author). This indicates that innovation performance is a "core condition" (Ragin, 2008; Fiss, 2011) for companies in Serbia to achieve high market performance. We should also note that innovation performance is only a poor substitute for the lack of other capital sources and SKM. Although Solutions 1 and 2 suggest such substitutability, their raw coverage is relatively low (i.e. 16 and 19 per cent of the cases each).

4. Discussion

In this study we explored how SKM processes and activities drive IC for superior innovation and market performance in the Serbian business context. We conceptually grounded our framework on the resource-based and dynamic capabilities-based views of the firm. We also investigated the configurational impact of intellectual capital resources and KM capabilities on innovation and market performance.

Examining the direct influence of IC components (HC, SC, and RC) on innovation performance, we found SC and RC to be positively associated with innovation performance. However, we could not confirm the direct significant influence of HC on innovation performance. While adjacent studies showed similar patterns (Cabrilo *et al.*, in press; Santos-Rodrigues *et al.*, 2011), we believe that our results could also be explained by the research context. In transitional economies, there might be a general dearth of HC that is directly relevant to innovation performance. One of the reasons might be that the south-eastern European economies (SEE) typically have had large labor outflows and their emigration has been persistent and dominated by educated and young people (Atoyan *et al.*, 2016). Instead, our results seem to indicate that firms somewhat substitute the lack of relevant HC with other IC components. For instance, other studies found that some organizations perform stronger in innovation by having more SC and better relations with their stakeholders (Aramburu and Sáenz, 2011; Delgado-Verde *et al.*, 2011a; Cabrilo *et al.*, in press; Inkinen *et al.*, 2014). While Stewart (1997) argued that HC needs other IC components to be fully utilized during the value creation process, other authors found that only some (not all) of IC components directly help to enhance innovation performance (Ling, 2013; Dumay *et al.*, 2013; Inkinen, 2015, Andreeva and Garanina, 2016; Cabrilo *et al.*, in press; Hsu and Fang, 2009). It is therefore likely that as such HC might be a valuable factor that drives other IC components, such as RC or SC, but it has by itself no direct symmetric impact on innovation performance. Similar patterns have been identified in adjacent studies. For instance, Jardón and Martos (2009) in Argentina, and Cabrita and Bontis (2008) in Portugal, found that HC supports other IC components, which can be drivers of innovation and market performance.

Furthermore, our results provide empirical support for a direct positive influence of SKM on innovation performance (Inkinen *et al.*, 2015; Donate and Canales, 2012; Rhodes et al, 2008). This finding indicates that Serbian companies that have knowledge-based strategic orientation, build and implement KM strategy, design organizational structures that promote knowledge and recognize the importance of a knowledge friendly culture, will have higher innovation performance.

From our theoretical position, and in line with relevant literature (Kianto, 2007; Kianto *et al.*, 2014; Wang *et al.*, 2016; Ling, 2013; Inkinen, 2016), we contend that IC, seen here as a set of resources, requires managerial capabilities to enhance firm performance. Therefore,

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drivers of innovation performance cannot be identified by focusing on direct relationships alone (Kianto *et al.*, 2014; Wang *et al.*, 2016). For that reason we incorporated SKM as moderator and hence contingent variable (Wang *et al.*, 2013).

Our findings from the moderating *H5* to *H7* show a mixed combined effect of IC and SKM on innovation performance. In particular, the effects of HC and SC on innovation performance are negatively moderated by SKM activities. At the same time, SKM positively moderates the effect of RC on innovation performance, but it remained not significant. This somewhat unexpected result indicates the complexity of the issue at hand. Reasons might be found in previous studies exploring the fit between IC and SKM (Wang *et al.*, 2016, Ling, 2013). For instance, IC components can be combined synergistically according to KM strategy requirements. Sometimes, more management initiatives may incur rigidities that hinder innovation performance (Leonard-Barton, 1992). This is especially important for the HC dimension.

In particular, while we, and previous studies (Kianto, 2007; Kianto *et al.*, 2014), initially argued that KM is a management capability required to access the IC resources, this seems not to be uniformly the case. This could be because existing SKM capabilities are not *per se* sufficient to access and utilize distinct IC resources. That means that neither the resource ownership nor the capability of SKM is sufficient on its own to achieve high innovation performance. We confirm that in the configurational analysis that has been utilized to understand potential equifinality.

From the configurational analysis, we deduct that none of the conditions, that is neither IC-based resources nor SKM-based capabilities, is sufficient to explain high innovation or market performance on their own. Instead, our strongest solution for high innovation performance (Solution 2 in Table V) indicates that for over half of the firms in our sample, high HC, RC and SKM lead to high innovation performance. This finding tells us that the surveyed companies deliver value through competent employees (HC) who use their expertise, skills and experience to create and develop relations with external stakeholders (RC) in combination with appropriate SKM initiatives. Hence, a firm's internal expertise combined with external relations and supported by SKM initiatives can accelerate innovations even without strong support of SC (Inkinen, 2015; Martín-de Castro *et al.*, 2013; Hormiga *et al.*, 2011).

The second highest solution shows that high SC, RC and SKM also lead to high innovation performance. For instance, knowledge databases with a standardized firm's business processes and management infrastructure (SC) combined with superior relations with external stakeholders (RC) and appropriate SKM initiatives help companies to achieve high innovation performance (Stewart, 1997; Roos *et al.*, 2001; Ling, 2013) even without strong support of HC. That means that to achieve high innovation performance, SKM capability matters with only a specific constellation of IC resources. Our results are in line with previous studies that emphasized that organizations with different SKM orientation deliver value through different specific constellation of IC resources (Sveiby, 1997; Roos *et al.*, 2001; Ling, 2013). While innovation performance in a people-centered company is delivered through HC and RC, process-oriented companies place more emphasis on SC and RC in the value creation process (Roos *et al.*, 2001).

This finding expands previous studies (Wang *et al.*, 2016), in that we not only show that certain IC components matter more than others, we also show that it is their simultaneous combination that matters. The presence of equifinality, which is slowly gaining momentum in the wider management literature (Fiss, 2011), can be found in our case in the context of resource and capability combinations that can lead to high innovation performance and has not yet been discussed in the SKM literature.

Our non-symmetric fsQCA results for market performance offer similar insights. While innovation performance is a core condition for explaining market performance in all our

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solutions, we can provide more detail concerning the resource and management capability nexus. On the one hand, SKM leads to high market performance in combination of HC and RC. On the other hand, a combination of the resources SC and RC and SKM capability also lead to high market performance. We can even go beyond that, Solution 5 in Table VI indicates that for 44 per cent of cases the resources of HC, SC and RC, as well as high innovation performance can be sufficient for high market performance. In other words, SKM capability is not relevant for high market performance if a strong IC resource base is present and the firm shows already high innovative performance.

Lastly, we also elaborate on the static and dynamic nexus that we have addressed throughout the paper. We found that the static IC components and the dynamic strategic KM components are sufficient on their own in only few cases to predict innovation and market performance outcomes. Instead, most cases that scored high in both performance outcomes require a combination of static IC components and dynamic KM capability. This implies that companies cannot rely on their own on high IC stocks but those stocks require careful dynamic management skill to positively affect market and innovation performances.

5. Conclusions

In this article, we investigated the complex relationships between a company's IC, SKM and innovation and market performance. To test our framework, we surveyed companies from Serbia. The data have been analyzed using symmetric SEM-PLS and asymmetric fsQCA techniques. The SEM results show that SC and RCs have a direct effect on innovation performance. Although, there is no significant direct effect of HC on innovation performance, the relationship becomes significant when moderated by SKM. The effects of HC and SC on innovation performance are negatively moderated by SKM activities. Moreover, the insights from our application of fsQCA technique show a clear pattern of equifinality. In particular, we show that there are multiple combinations of static and dynamic conditions that can lead to higher innovation and market performance. Our article contributes to existing literature on several levels as discussed below.

5.1 Theoretical contribution

On the theoretical level, we show that the interrelationships between IC as resources and SKM as managerial capability are more complex in nature than suggested by literature on innovation and market performance. While previous research suggests a straightforward link between resource stock embedded in IC and the capability of SKM to use those (Kianto, 2007; Kianto *et al.*, 2014; Wang *et al.*, 2016), our study suggests that only certain combinations of IC resources can be exploited by specific SKM capability to achieve high firm performance.

Our study discloses that SKM leverages IC to superior innovation and market performance, but to maximize this effect, it is essential to fit constellation of IC resources and specific SKM orientation. Our results imply for further theoretical development that each side on its own only explains a small set of high performing companies. Instead, it is required that both perspectives need to be taken into consideration simultaneously to more accurately reflect the empirical realities in conceptual form.

5.2 Methodological contribution

From a methodological perspective, we believe that our study contributes towards an existing trend observed in other fields, such as marketing (Woodside, 2013) or management (Fiss, 2011), to combine symmetric and asymmetric statistical tools to further develop our understanding of organizational issues. For instance, we add to existing organizational fit studies in providing with fsQCA the appropriate analytical tool to better

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understand contingencies and interactions that might not be immediately obvious from the use of traditional symmetric methods alone (Ling, 2013).

5.3 Managerial and policy implications

Our study also has managerial implications. Innovativeness tends to be seen to improve when firms focus on knowledge assets and SKM orientations (Inkinen *et al.*, 2014). We show that this is contingent on specific resource and SKM combinations. In other words, Serbian companies are generally speaking more innovative when they are able to identify strategic knowledge gaps within the organization, and then close these gaps with appropriate managerial activities and initiatives while taking differing IC resource combinations into account. It is especially the last point which provides guidance for managers to capitalize on both IC and SKM. As in Wang *et al.* (2016), who have explored the fit between IC profiles and KM strategy, our findings guide managers to emphasize more on the IC–SKM combinations, to have IC and KM experts working together in order to better understand synergy effects of different IC components and strategic KM, and to ensure properly aligned strategic KM initiatives with IC components to achieve superior innovation performance. However, unlike Wang *et al.* (2016) practical recommendation that IC components should be aligned to meet requirements of KM strategies, we guide managers to align and adjust strategic KM processes to the IC setting. From our point of view, it is easier for managers to change and adjust dynamic strategic KM to the static IC setting than to ensure that IC components are properly aligned to fit strategic KM. In particular, our results indicate that the IC setting of organizations needs to be well understood before strategic KM processes are being implemented. While managers can substitute the absence of certain IC components, not all of them can and managers need to be aware of that in their strategic decisions. For instance, some firms that are interested in achieving higher innovation performance might be able to compensate for the absence of HC by increasing their managerial efforts to nurture SC and RC instead. This is also important for policymakers. Our study in a cash-strapped transition economy implies that economic development budget needs to be tailored to have the desired impact of the innovation behaviour of the firms. For instance, a too broad focus on SKM in firms alone might not have the desired effect if the required resource combinations are not present within the firms of the region itself.

5.4 Limitations and further research

This study is one of the first to combine symmetrical and non-symmetrical methods in the SKM field of research. We believe that future studies could gain from also applying this approach. However, this lack of study also limits the comparability of our findings with other studies. Furthermore, while there is a general lack of studies in transition economies such as Serbia, we believe that more such studies would help validate our results. For instance, it would be helpful to identify resource combinations in other research contexts, as they might not be the same. Lastly, we only focused on larger firms in Serbia. It might well be that smaller companies, which rely more on individual entrepreneurial efforts (Jordão and Novas, 2017), require different IC combinations to successfully exploit gains arising from strategic KM practices.

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