The link between Intellectual Capital and Business Performance: a mediation chain approach

Abstract

Purpose – This study focuses on intellectual capital (IC) as a driver of better business performance. Recent studies suggest that a set of variables may mediate this relationship. This research discusses the mediating role of dynamic capabilities, network competence, technological capabilities, absorptive capabilities, and innovation performance between intellectual capital and business performance.
Design/methodology/approach – The conceptual model is tested using a sample of 533 Portuguese firms by means of a structural equation model.
Findings – It confirms that intellectual capital impacts business performance. Moreover, this only happens indirectly through the mediating chain defined by the variables dynamic capabilities, network competence, technological capabilities, absorptive capabilities, and innovation performance.
Originality/value – This study analyzes new mediator variables between the dimensions of the intellectual capital and Portuguese business performance.

Keywords: Intellectual capital, dynamic capabilities, network competence, technological capabilities, absorptive capabilities, innovation performance, business performance
Paper type: Research paper

Introduction

Intellectual capital is considered a key element in the development of organizations' overall performance (Marr and Chatzkel, 2004; Nonaka and Takeuchi, 1995), a valuable resource (Barney, 1991), and a form of dynamic and non-static capital (Bratianu, 2018; Edvinsson and Sullivan, 1996). Intellectual capital has been conceptualized in the literature from different perspectives; however, there remains little consensus since its seminal definition (Brooking, 1997). Many researchers have explored this concept and established methodologies that can be applied in a business context (Sveiby *et al.,* 1997; Verbano and Crema, 2016). Martín-de-Castro *et al.* (2011) point out that the academic debate on intellectual capital remains open and relevant.

This study focuses on micro, small, and medium-sized enterprises (SMEs), which represent the generality of Portuguese business firms. These firms have specific characteristics that make them more vulnerable. Their smaller size makes them more exposed to economic, social, political-legal changes, and internal constraints. Specific aspects may boost the performance of SMEs and it is therefore important to study the impact of intellectual capital on business performance through a set of mediating variables. Bontis (1998) and Bontis, Keow and Richardson (2000) present pioneering research on this relationship. Intellectual capital has assumed a strategic role in SMEs, but traditionally they have had limited resources to use for this purpose (Ngah and Ibrahim, 2009). Although there are many contributions to the study of the influence of intellectual capital on business performance in large firms, research on this topic has been scarce in small firms (Verbano and Crema, 2016).

This research introduces a mediation chain of constructs between intellectual capital and business performance, which increases the understanding of the causal link between intellectual capital as a propeller towards better innovation performance and, consequently, improved business performance. This article is structured in five sections. Following this introduction, Section 2 introduces the theoretical framework underpinning the study and the hypotheses to be tested. Section 3 describes the methodology, i.e., scales of measurement, data collection procedures, characterization of the sample, data analysis (reliability measures and structural equation models), and

control variables. Section 4 presents the results of the data analysis. The paper concludes with a discussion of research findings, their implications for management, specific limitations, and proposals for future research.

Theoretical framework and hypotheses

The conceptual model underlying this research is depicted in Figure 1. The research hypotheses discussed below define the relationship between intellectual capital and business performance through a set of mediators. In particular, absorptive and technological capabilities are assumed to be antecedents of innovation performance and, consequently, of business performance.

==== Figure 1 about here ====

Intellectual capital

The intellectual capital concept reflects the importance knowledge has acquired over the firm's evolution. It is recognized as a strategic factor for higher performance and firms are assumed to be true "knowledge-creating entities" (Nonaka, 1991). Stewart (1991) defines intellectual capital as the sum of existing knowledge in the firm. On the other hand, Bratianu (2018) considers intellectual capital as a non-linear entity.[1] The creation of wealth depends on how knowledge is used, which is the responsibility of not only the firm but of everyone. Hence, the firm's success depends on how they use knowledge (Fosfuri and Tribó, 2008).

Stewart (1991) defines intellectual capital as the total stocks of the collective knowledge, information, technologies, intellectual property rights, experience, learning and competence, team communication systems, customer relations, and brands that are able to create values for a firm (see Edvinson and Malone (1997), Sveiby (1997), Edvinson (2000), and Curado and Bontis (2007)). The literature supports the intellectual capital concept with three interrelated dimensions: human capital, structural capital, and customer capital (Youndt *et al*., 2004; Subramaniam and Youndt, 2005).[2] As a result, the conceptual model assumes a unidimensional approach to intellectual capital.

Dynamic capabilities

In the last two decades, the Resource-Based View (RBV) has been widely accepted as one of the most powerful and prominent theories for describing, explaining, and predicting organizational relationships (Barney *et al.,* 2011). In particular, it has been used successfully to explain and predict firms' performance. Barney's (1991) seminal work discusses the Resource-Based View. He states that firms' potential to sustain competitive advantage lies in the resources that they possess. These resources must be valuable, rare, and imperfectly imitable as well as substitutable.

The concept of RBV has evolved with the addition of new constructs such as dynamic capabilities (Teece *et al*., 1997). This latter concept stems from RBV and attempts to explain how organizations can gain a greater competitive advantage in a

[1] This research assumes that intellectual capital is exogenous to the model and the trigger of the relationship (see Figure 1). Thus, knowledge management, as an antecedent of intellectual capital (Kianto et al., 2014), is not part of the model. If intellectual capital had been a mediator or dependent variable, then a further discussion on the way it is built – linear or non-linear composition – would have been needed.

[2] The concept of customer capital and relational capital are synonymous (Subramaniam and Youndt, 2005). To avoid misunderstandings, the former term is always used herein.

rapidly changing environment. From this perspective, dynamic capabilities allow firms to create, develop, and protect resources that enable them to achieve a superior performance over time (Ambrosini and Bowman, 2009); while not directly affecting outputs, they contribute through their ability to improve operational capabilities (Teece *et al*., 1997). The evolutionary nature of dynamic capabilities becomes central to the long-term outcomes and firms' capacity to adapt to new contexts (Eisenhardt and Martin, 2000).

*Intellectual Capital and Dynamic Capabilitie*s

The best approach to the analysis of dynamic capabilities is based on their antecedents, which determine their characteristics and scope (Zahra *et al.,* 2006). Hsu and Wuang (2012) found a positive effect between intellectual capital and business performance that is mediated by dynamic capabilities. Therefore, the following hypothesis can be put forward:

H_1: Intellectual capital positively influences dynamic capabilities.

Network Competence

The concept of network competence emerged from RBV theory. It includes all resources and capabilities controlled by the firms that enable the formulation and implementation of strategies (Barney, 1991). While Hagedoorn, Nadine and van Hans (2006) focused on the definition of networking, other authors have emphasized either the external networking relationships (Ritter, 1999) or the internal networking relationships (Ritter, 1999; Ritter and Gemunden, 2004). Ritter and Gemunden (2004) found that network competence has a strong positive impact on inter-organizational technological collaborations as well as on product success and the innovation process of firms. Thus, Ritter (1999) defines network competence as the firm's ability to develop and manage relationships with their business partners (e.g., suppliers, customers) and deal effectively with interactions between them (Ritter, 1999; Ritter *et al.,* 2002). It is a relational and essential capacity developed by organizations (Ritter et al., 2002) that can be seen as an internal organizational capacity that allows relationship activities to be reconfigured in specific situations (Knight and Cavusgil, 2004).
This concept is composed of two components: the first relates to the degree of execution of the network management tasks and the second to the level of qualifications of those who manage the firm's social relationships (Ritter, 1999; Ritter *et al.,* 2002). We note that network competence, i.e., the competence of firms to create and improve their networks with partners, is strongly dependent on dynamic capabilities, in particular (organizational) management capability and the understanding of customers' and other stakeholders' needs.

Intellectual Capital and Network Competence

Intellectual capital is one of the firms' most valuable assets (Lenciu and Matis, 2011) and reflects the accumulated knowledge of their employees and their interactions (Stewart, 1991). This combination of capacities and commitments makes the knowledge unique, different, and the basis for the firms' sustainable competitive advantages (Lin and Higgins, 2016). As knowledge results from and feeds the interaction between employees (Harmaakorpi, 2004), we set the following hypothesis:

H_2: Intellectual capital positively influences network competence.

Technological Capabilities

Information technology has driven the creation, production, transmission, distribution, and exploitation of all kinds of knowledge (Nonaka and Takeuchi, 1995; Qureshil *et al*., 2009).

Technological capabilities are defined as an internal technological effort to acquire the mastery of innovative technologies, adapt them to the local reality and perfect them (Lall, 1987). In the same line, Dahlman and Westphal (1982) and Bell (1984) define technological capabilities as the technological domain, achieved through the technological effort to acquire, adapt and/or create technology. The firms' development of technological capabilities increases their ability to respond to technological changes and the identification of new trends (Berkhout *et al.,* 2010).

Dynamic Capabilities and Technological Capabilities

Dynamic capabilities are related to the ability of firms to shape themselves in response to changes in the external environment (Dosi *et al*., 2000; Teece *et al*., 1997). The firm's generated technological knowledge results from the accumulation of knowledge from previous technological learning processes in a specific context, which makes it difficult to codify and transfer (Pavitt, 1991).

These firm specific competencies facilitate market manoeuvring, which improves its performance over time, and increases the likelihood of survival in highly competitive environments (Cohen and Levintal, 1989; Dosi *et al*., 1995; Malerba and Orsenigo, 1999). In this context, firms need to search, analyze and exploit markets, strategically applying the dynamic capabilities, to establish a new resource base (Ambrosini and Bowman, 2009). Thus, the third hypothesis states that dynamic capabilities can generate the development of technological capabilities:

H_3: Dynamic capabilities positively influence technological capabilities.

Network Competence and Technological Capabilities

Network competence refers to a firm's ability to manage its network of relationships effectively, also allowing the firm to develop and use its network to acquire significant resources for innovation (Ritter, 1999).

The inter-organizational nature of network competence promotes opportunities for individuals to absorb knowledge and for new technologies to differentiate and innovate (Lawson *et al.,* 2009). Moreover, it improves external relations, which can have a strong influence on the firm's technological development (Tehseen *et al.,* 2019). Thus, we set the following hypothesis:

H_4: Network competence positively influences technological capabilities.

Absorptive Capabilities

Cohen and Levinthal (1990) introduced the concept of absorptive capabilities. This multifaceted construct captures how firms can develop important sources of sustainable competitive advantage by adapting the resources to the dynamics of the environment and, consequently, obtain a competitive advantage (Jansen *et al.,* 2005). This construct, as a dynamic capacity, influences the creation of other organizational competencies and endows firms with multiple sources of competitive advantage that improve its performance (Cohen and Levinthal, 1990; Zhara and George, 2002).

Technological Capabilities and Absorptive Capabilities

The accumulation of technological capabilities allows routines to be continually improved and transformed into new knowledge. Whenever firms create the conditions for technological capabilities to be developed, the acquired knowledge will be internalized, and ultimately will strengthen competitive advantages (Santhanam and Hartono, 2003). Tzokas *et al.* (2015) present strong evidence of the existence of a positive relationship between technological capabilities and absorptive capabilities. Thus, we add this hypothesis to our conceptual model:

H_5: Technological capabilities positively influence absorptive capabilities.

Network Competence and Absorptive Capabilities

Sharing knowledge connects network competence to the absorptive capacities; this is also important as it strengthens the acquisition of knowledge from suppliers, customer, etc. (Wang, 2013). In particular, practices aimed at improving teams' connectivity and multifunctionality positively influence the acquisition and assimilation of external knowledge (Jansen *et al.*, 2005). The relationships between the firms' internal and external actors enhance the development of new knowledge (Serenko, 2004), which is embraced and shared by the firms to boost their value creation (Chao and Clarke, 2008). Thus, we state that:

H_6: Network competence positively influences absorptive capabilities.

Innovation Performance

Innovation performance, which refers to the firm's ability to introduce new or substantially improved products, new customer services, new production methods and processes, and new management and marketing practices, leads to an improvement in the firm's performance (Ritala *et al*., 2015). Innovation performance depends not only on technical resources (e.g., individuals, knowledge and equipment), but also on how they are managed within firms by developing appropriate routines, organizational structures, tools, business mechanisms, and individual and organizational creativity (Tidd and Bessant, 2009). In particular, innovation performance, a measure of operational performance, depends on the specific dynamic capabilities needed to develop R&D (R&D innovative capability, which is part of dynamic capabilities).

Absorptive Capabilities and Innovation Performance

Absorptive capabilities are shaped by routines and organizational processes used by firms to acquire, assimilate, transform and apply the knowledge that enhances the dynamic organizational capacity (Zahra and George, 2002). The innovation process depends on the absorptive capability, where it will be possible to develop the present opportunities, putting new knowledge that can generate innovations into practice within the organization; this plays a fundamental role in business performance (Tidd *et al.*, 2001). There is evidence that supports a relationship between absorptive capabilities and innovation performance (Alegre *et al*., 2013; Kostopoulos *et al*., 2010; Tsai, 2001). By absorbing external knowledge, a firm boosts creativity, stimulates new ideas, and develops the potential for innovation (Calantone *et al*., 2002; Lau and Lo, 2019). Thus, the new hypothesis is:

H_7: Absorptive capabilities positively influence innovation performance.

The Intellectual Capital and Innovation Performance

Subramaniam and Youndt (2005) show that intellectual capital through its three components – human capital, structural capital, and customer capital –, boosts the capacity to innovate and improve performance.

Ritala (2015) defines innovation as the strategic process related to the development and renewal of products, processes, and services supplied to the market to obtain a competitive advantage over its competitors. The combination of human capital, structural capital, and customer capital is an essential condition for innovation and consequently increases innovation performance (Fórez and Camisón, 2016). Thus, we hypothesize that:

H_8: Intellectual capital positively influences innovation performance.

Network Competence and Innovation Performance

Ezuma and Ismail (2017) show that network competence has a substantial and direct positive impact on innovation performance. Networking competence can be seen as a set of tasks through which interdependent firms develop and maintain growth strategies. On the other hand, the use of technology allows network integration, which enables collaborative firms to explore areas of mutual benefit and this ultimately leads to innovation (Thornton *et al.,* 2014). The firm's information sharing with the various channels (e.g., distribution, partners, suppliers or customers) allows the coordination and optimization of resources, and decision making that enhances the fit to the customers' demands (Stank, Keller, and Daugherty, 2001). Network competence through technological capabilities enables firms to achieve greater innovation success (Ritter and Gemunden, 2003). Following these empirical studies, the following hypothesis is put forward:

H_9: Network competence positively influences innovation performance.

Business Performance

Business performance has become a core concept used by both academics and professional managers in all areas of business research, particularly in strategic management studies (Selvam *et al*., 2016). Business performance is commonly conceptualized in two distinct dimensions: financial and operational (Venkatraman and Ramanujam, 1986). Financial performance covers accounting operations and financial measures. Operational performance, the concept of which is more closely related to our research aim, connects to efficiency, i.e., technological capabilities in the management of the firm's products and human assets.

Innovation Performance and Business Performance

Innovation performance defines firms' ability to adapt to turbulent markets by innovating in products and processes, management practices, and marketing practices (Bodwell and Chermack, 2010), which improves business performance (Kirgydou and Spyropoulou, 2013). The literature has found a positive relationship between innovation performance and business performance (Calantone *et al.,* 2010; Rosenbusch, Brinckmann and Bausch, 2011; Saeed *et al*., 2015). Therefore, we added the following hypothesis to our conceptual model:

H_{10}: Innovation performance positively influences business performance.

Intellectual Capital and Business Performance

Intellectual capital has been identified as one of the most important drivers of business performance (Budiarta *et al.,* 2014; Lu, Wang and Kweh, 2014; Murthy and Mouritsen, 2011; Verbano and Crema, 2016; Youndt *et al.,* 2004; Mubarik et al., 2019).

Investors value firms with more efficient intellectual capital, i.e., firms that transfer intellectual capital into business performance (Chen, 2015). Ozer, Ergun, and Yilmaz (2015) showed evidence of a positive effect of intellectual capital on business performance. In this context, it proves to be more associated with qualitative performance (e.g., innovation performance, adaptation performance) than in quantitative performance (financial performance). This refers to the performance of innovation, the performance of adaptation, organizational performance, and performance of human resources. Intellectual capital has been shown to play a crucial role in small and medium enterprises (SMEs), but related literature is still scarce (Demartini and Beretta, 2019). Thus, we hypothesize a direct link between intellectual capital and business performance:

H_{11}: Intellectual capital positively influences business performance.

Apart from the constructs described before, the conceptual model (Figure 1) includes seven firm-level variables, namely age, size, sales volume, location, type of activity, the existence of export activity, and the development of Research and Development (R&D) activities; these are used as control variables of business performance.

Research method and data collection

Measures

The scales used to measure these constructs are based on the literature. Intellectual capital was measured by Wu's (2008) 18-item scale which results from an adaptation of the scale in Bontis (1998). Dynamic capabilities were measured by the 11-item scale in Hung, Yang, Lien, McLean, and Kuo (2010). Network competence was measured by the 11-item scale in Ritter (1999, 2002). Technological capabilities were measured by the 4-item scale in Tzokas *et al.* (2015), Tsai (2004), Ortega (2010), and Zhou and Wu (2010). Absorptive capabilities measurement is based on a scale in Roberts (2015), which is inspired in Pavlou and El Sawy (2006). The scale of Ritala *et al.* (2015), based on Weerawardena (2003), was applied to measure innovation performance. Finally, business performance was measured using the 5-item scale (Richard *et al.*, 2009).

Items in the intellectual capital scales, dynamic capabilities, absorptive capabilities, and network competence were evaluated by the respondents using a 7-point Likert scale, from 1 – "strongly disagree" to 7 – "strongly agree". Items in technological capabilities, innovation performance, and business performance scales were evaluated on a 7-point scale, where 1 corresponds to "much worse than the main competitors" and 7 to "much better than the main competitors".

Population, sample, and data collection

This research focuses on Portuguese firms and the sampling process comprises three steps: first, the characterization of the population, which resulted in definition of the target population and the reporting population; next, the definition of sample selection method; and, finally, the validation of the sample. The national database contains about

45,000 firms. A regional stratification (NUT II official statistics region) was used to ensure that the sample was representative of the population. Respondents were managers of the firm or had a good knowledge of the firm's operation. The firms were contacted directly by email and the questionnaire was filled out using the Google Forms platform. A pilot test of the questionnaire was conducted with a small number of managers, representative of the population, which led to improvements in the clarity of the questions.

We obtained a validated sample of 533 respondent firms. These data were processed through SPSS 22. Scale validation and structural modeling were performed using MPlus 6.0. The firm's characterization is based on the control variables: size, age, geographical location, sales volume, activity sector, development of R&D activities, and development of the export activity.

The size of firms in the sample is determined by the number of full-time workers. The sample is composed of 52.2% micro-enterprises (less than 10 employees), 34.2% of small enterprises (10-49 employees), and 13.6% of large firms (50 employees or more). Regarding the age of the firms, 11.8% have been in operation for less than 10 years, 39.0% for between 11 and 20 years, and 48.8% for more than 20 years (0.4% did not respond to this question). In relation to the sector of activity, 50.3% of the firms in the sample work in the services sector, 22.2% in commerce, 19.4% in industry, and 5.3% in construction (2.8% did not respond to this question). As for sales volume in 2015, 11.2% of the firms recorded sales of less than 50,000 euros, 25% between 50,000 and 250,000 euros, 32% between 250,001 and 1,000,000 euros, and 31.8% over 1,000,000 euros. In terms of location, 32.9% of the sample firms are from Lisbon and Vale do Tejo region, 38.9% from the North, 18.9% from the Center, and 11.5% from the South and Islands. It was also found that 56.8% of the surveyed firms export goods and 26.7% conduct R&D activities.

Construct validity

An exploratory factor analysis was conducted to verify the configuration validity of each construct. Specific items with low loadings were excluded as they were not reliable indicators of the construct. Thus, intellectual capital is measured by 17 items, while both network competence and absorptive capacity are measured by six items. For dynamic capabilities, technological capabilities, innovation performance, and business performance, all initial items were retained. Table 1 presents the estimates of the factor loadings of second-order latent variables.

==== Table 1 about here ====

Table 2 presents the Cronbach Alpha, the composite reliability (CR), and the average variance extracted (AVE) for all the constructs based on the estimated measurement models of each construct. Items are reliable measures of a construct whenever the Cronbach Alpha is higher than 0.80, acceptable reliability is between 0.60 and 0.80, and lower reliability below 0.6 (Hair *et al.,* 2014). We conclude that all constructs have good consistency. Although the subdimension of management capacities in the construct dynamic capabilities is an exception to this, the consistency is acceptable. The scales used also provided generally satisfactory CR and AVE; network competence was the exception with an AVE of less than 0.5. Nevertheless, this construct was maintained as in Li and Zhou (2010). Table 2 shows that CR values are between 0.802 and 0.964, while the AVE excluding the above mentioned exception was between 0.507 and 0.869; this shows the internal consistency between the multiple indicators of each variable.

==== Table 2 about here ====

Control variables

The structural characteristics of the firms that determine business performance are controlled in the conceptual model. We include the following control variables: Firm age was measured using an ordinal scale: 1 = up to 5 years, 2 = between 6 and 10 years, 3 = between 11 and 20 years, and 4 = more than 20 years (the reference is up to 5 years). Firm size was measured using an ordinal scale: 1 = less than 10 workers, 2 = between 10 and 49 workers and 3 = 50 workers or more (reference is less than 10 employees). The location was categorized into 1 = North, 2 = Center, 3 = Lisbon and Vale do Tejo, and 4 = South and Islands (reference is Lisbon and Vale do Tejo). The type of activity was categorized into 1 = industry, 2 = construction, 3 = trade, and 4 = services (reference is services). Export and R&D activities were defined as dummy variables (1 = yes, 0 = no).

Results

Structural relationships

The hypotheses underlying our conceptual model (Figure 1) were jointly tested by structural equation modeling using the maximum likelihood method. Seven control variables were added and directly impact business performance. We also tested mediator effects with indirect effects. Model fit of the conceptual model to the covariance structure of the data is good (χ^2(2013) = 3902.364, χ^2/df= 1.939, Comparative fit index [CFI] = 0.967, Tucker- Lewis index [TLI] = 0.967, RMSEA = 0.042, P [rmsea≤0.05] = 1.000, IC to 90%:]0.040; 0.044[). All item loadings are statistically significant (p<0.01) and factorial loadings greater than 0.50, which strengthens the validity and reliability of the measurement model. Table 3 reports the estimated coefficients of the conceptual model.

==== Table 3 about here ====

The first hypothesis (H_1) states that intellectual capital positively affects dynamic capabilities. We conclude that this effect is confirmed (β = 0.930, p<0.001), thus confirming H_1 (Table 3). We conclude that intellectual capital has a positive impact on network competence (β = 0.807, p <0.001). Thus, H_2 that links intellectual capital with network competence is confirmed. H_3 establishes the relationship between dynamic capabilities and technological capabilities. Dynamic capabilities have a positive impact on technological capabilities (β = 1.011, p<0.001); this hypothesis is confirmed. H_4, where the network competence has a negative impact on the technological capabilities, is also confirmed (β = 0.539, p<0.001). Technological capabilities positively influence the absorptive capabilities (β = 0.451, p<0.001) and network competence positively influences the absorptive capabilities (β = 0.757, p<0.001). Thus, H_5 and H_6 are both confirmed. The absorptive capabilities positively influence innovation performance (β = 0.849, p <0.001), thus confirming H_7. Intellectual capital has a positive impact on innovation performance (β = 0.233, p<0.05), which confirms H_8. There is an inverse relationship between network competence and innovation performance (β = -0.351, p<0.001), confirming H_9. The direct positive relationship between innovation performance and business performance (β = 0.574, p<0.001) is confirmed (H_{10}). Finally, the direct relationship between intellectual capital and business performance is not statistically significant (β = 0.020, p>0.05), which implies that hypothesis H_{11} is not

confirmed. Table 4 summarizes our hypotheses tested by the structural equation model.

==== Table 4 about here ====

Given the hypotheses confirmed, dynamic capabilities and networking skills are mediating variables between intellectual capital and technological capabilities; the technological capabilities are mediating variables between dynamic capabilities and absorptive capabilities, and between network competence and absorptive capabilities. Absorptive capabilities are mediating variables between technological capabilities and innovation performance; and between network competence and innovation performance. Innovation performance mediates the relationships between intellectual capital, absorptive capabilities, and network competence with business performance.

As a complement to the direct effects reported in Table 3, indirect relationships between the various constructs were also estimated. The absorptive capabilities (β = 0.151, p<0.001), the technological capabilities (β = 0.052, p<0.001), the dynamic capabilities (β = 0.032, p<0.001), the network competence (β = 0.233, p<0.001), and intellectual capital (β = 0.432, p<0.001) have an indirect positive impact on business performance. On the other hand, technological capabilities (β = 0.093, p<0.001), dynamic capabilities (β = 0.058, p<0.001), network competence (β = 0.422, p<0.001), and intellectual capital (β = 0.620, p<0.001) also had an indirect positive impact on innovation performance (β = 0.528, p<0.001). The same is true of the impact of dynamic capabilities (β = 0.213, p<0.001), networking competence (β = 0.528, p<0.001), and intellectual capital (β = 0.569, p<0.001) on absorptive capabilities. Finally, intellectual capital (β = 0.528, p<0.001) has an indirect positive impact on technological capabilities.

Effects of control variables

Table 5 presents the impact of the control variables on the business performance using structural equation modeling.

==== Table 5 about here ====

Regarding the sector of activity, the industrial and construction firms present a better performance than the service sector. As for the location, the firms located in the North have a better performance than those in Lisbon and Vale do Tejo. In terms of firm size, medium-sized firms perform better than micro-firms. The volume of sales, the age of the firm, the export activities, and the R&D activities show no relationship with business performance.

Discussion

This research sought to further the understanding of the direct and indirect effects of intellectual capital as the main driver of business performance. It was not enough for firms to have intellectual capital, defined by its three dimensions – customer capital, human capital, and structural capital – to achieve better performance. Firms must have a set of capabilities (dynamic, technological, absorptive) and competences (network) to enhance results. Firms with strategic capabilities, innovative R&D capabilities, and organizational management capabilities have a quicker and flexible response to technological changes; this makes them more efficient when using their knowledge to develop and produce new products and services, achieve better products and process

added-value innovation for customers, and develop management and marketing practices. Intellectual capital acquired through these capabilities and competencies increases business performance.

Additionally, specific strategic groups were identified based on the control variables. We concluded that the effect of the sector of activity on business performance is greater for industrial and construction firms than for the services sector. Our results show that the volume of sales, age of the firm, export activities, and R&D activities do not correct business performance (control variables). However, medium-sized firms perform better than micro-firms, which can be explained by the fact that they have more resources and share knowledge more (internal sharing, with stakeholders, and other firms).

Contributions

Our conclusions have scientific and managerial implications. They contribute to a better understanding of the role of intellectual capital in the firms' management as a driver of business performance. The paper bridges the gap between theory and practice by controlling a set of organizational variables that correct the link between intellectual capital and business performance. In particular, dynamic capabilities, network competence, technological capabilities, absorptive capabilities, and innovation performance are mediator variables between intellectual capital and business performance.

To improve the prosperity of Portuguese firms, managers should strive to define the correct intellectual capital mix, which together with the aforementioned skills and competences can boost the firm's value. All the hypotheses underlying the conceptual model were confirmed, with one exception. Prior studies focusing mostly on large firms found that intellectual capital directly influences business performance (Verbano and Crema, 2016). Based on a sample of (mainly) small and medium-sized firms, our study shows that this effect only occurs indirectly through a set of mediator variables. The Portuguese economy is mostly characterized by micro and medium enterprises, which is reflected in our sample as 58.7% of the firms have between 1 and 9 employees, which may make it difficult to develop network competences. As such, there is no well-founded knowledge-sharing culture. These results may help improve Portuguese firms as most do not export (56.8%) or develop R&D (70.9%).

The managerial implications of this research highlight the need for firms to boost the importance of intellectual capital and other intermediate organizational variables that mediate the relationship with business performance. Our research shows the direct impact of intellectual capital on innovation performance and an indirect impact on business performance through networking, organizational, and knowledge capabilities. In particular, this research shows that firms caring about intellectual capital, network competence, dynamic, technological, and absorptive capabilities are better prepared to innovate and improve business performance. Thus, managers should look at the set of intangible resources arising from intellectual capital as a source of value creation. On the other hand, the manager must also have a systemic vision that fosters networking and organizational capabilities to improve business performance.

This study also provides insights for Higher Education Institutions (HEIs) and policymakers. HEIs should create and implement strategies towards increasing students' awareness of intellectual capital, networking, and organizational capabilities, preparing them to contribute to better business performance. Policymakers should promote the enhancement of intellectual capital components, networking, and organizational capabilities in the organizations, supporting investments, training and other actions that can change mindsets, and improve the knowledge skills of organizational leaders and workers. These policies will foster business performance and, therefore, more value will be distributed among firms' stakeholders.

The volatility and rapidly changing global markets force firms to implement strategies that require the sharing, creation, and storing of information. Thus, a knowledge-based culture, based on technological and scientific practices, can be developed to stimulate innovations that respond to market demands.

The information available in firms is not always transformed into knowledge as managers need to encourage and provide conditions for innovation. That is, firms need to create favorable conditions for partnerships with various internal and external actors. Whenever knowledge assets are developed, firms will be more successful.

Limitations and future research

The focus on Portuguese firms in this study is a limitation. Nevertheless, our conclusions can be applied and generalized to similar contexts as the sample represents different industries and firm sizes. Future research can compare conceptual models of the impact of intellectual capital on business performance within subgroups of the sample or using a larger sample. Thus, hypotheses can be tested in a multigroup framework taking into account characteristics such as industry, age, or size.

The data collection was carried out exclusively at the firm level. This research analyzed the view of employees with management responsibility or in depth knowledge of the firm. Future research can interview other stakeholders (e.g., shareholders, customers, suppliers) to reflect other positions on the impact of intellectual capital on business performance.

This research used well-known and standard scales to measure the construct in our conceptual model. Other possibilities are available in the literature. For instance, future research may study the three-dimensional concept of organizational intellectual capital – rational capital, emotional capital, and spiritual capital –, which can be measured by rational intelligence, emotional intelligence, and spiritual intelligence, respectively (Brataniu, 2018).

This structural equation model assumes a LISREL (Linear Structural RELations) framework; it can be extended by adding non-linear (e.g., quadratic) relations between the constructs, provided that the overall model remains identified. Moreover, further extensions can be defined allowing more direct effects. For instance, additional hypotheses can be added to the model as a direct effect of technological capacities on innovation performance. This exploratory research should be conducted with care as the model may have to be changed to allow new effects and remains identified.

Overall, this study shows that access to intellectual capital in firms will lead directly and indirectly to improved business performance. In short, this study identifies the paths from intellectual capital that lead to better business results.

References

Alegre, J., Sengupta, K., and Lapiedra, R. (2011), “Knowledge management and innovation performance in a high-tech SMEs industry*”, International Small Business Journal*, Vol. 31, pp. 454-470*.*

Ambrosini, V. and Bowman, C. (2009), “What Are Dynamic Capabilities and Are They a Useful Construct in Strategic Management?”, *International Journal of Management Reviews,* Vol. 1, pp. 29-49.

Barney, J.B. (1991), “Firm resources and sustained competitive advantage”, *Journal of Management*, Vol. 17*,* pp. 99-120.

Barney, J.B., Ketchen, D.J., and Wright, M. (2011), “The Future of Resource-Based Theory: Revitalization or Decline?”, *Journal of Management*, Vol. 37 pp. 1299-1315.

Bell, M. and Pavitt, K. (1993), "Technological accumulation and industrial: growth contrasts between developed and developing countries"*, Industrial and Corporate Change, Vol. 2*, pp. 157-209.
Berkhout, G., Hartmann, D., and Trott, P. (2010), "Connecting technological capabilities with market needs using a cyclic innovation model", *R&D Management,* Vol. 40, pp. 474–490.
Bocatto, E. and Toledo, E.P. (2007), "An existential-humanistic framework to organizational learning". *Proceedings of ECKM 2007, 8th European Conference on Knowledge Management, Consorci Escola Industrial de Barcelona, Barcelona, Spain*, 6-7 September 2007.
Bodwell, W. and Chermack, T. (2010), "Organizational ambidexterity: Integrating deliberate and emergent strategy with scenario planning", *Technological Forecasting and Social Change*, Vol. 77 No 2, pp. 193–202.
Bontis, N. (1998), "Intellectual capital: an exploratory study that develops measures and models", *Management Decision,* Vol. 36*,* pp. 63-76.
Bontis, N., Keow, W.C.C., and Richardson, S. (2000), "Intellectual capital and business performance in Malaysian industries", *Journal of Intellectual Capital,* Vol. 1, pp. 85- 100.
Booth, M.E. and Philip, G. (1998), "Technology, competencies, and competitiveness: The case for reconfigurable and flexible strategies", *Journal of Business Research*, Vol. 41, pp. 29-40.
Bratianu, C. (2018), "Intellectual capital research and practice: 7 myths and one golden rule", *Management & Marketing, Challenges for the Knowledge Society*, Vol. 13, No. 2, pp. 859-879.
Brooking, A. (1997), "Management of Intellectual Capital", *Long Range Planning*, Vol. 20*,* pp. 364-365.
Brown, S.L. and Eisenhardt, K. M. (1995), "Product development: Past research, present findings, and future directions", *Acad. Management*, pp. 343–378.
Budiarta, K. (2015), "The Role of Knowledge Management, Human Capital, and Innovative Strategy toward the Higher Education Institution's Performance in Indonesia*". Information and Knowledge Management*, Vol. 5 No 5.
Cabrita, M. and Bontis, N. (2008), "Intellectual capital and business performance in the Portuguese banking industry", *International Journal of Technology Management*, Vol. 43, pp. 212-37.
Calantone, R.J., Harmancioglu, N., and Droge, C. (2010), "Inconclusive innovation "returns": A meta-analysis of research on innovation in new product development", *Journal of Product Innovation Management*, Vol. 27, pp. 1065–1081.
Chao, F., Li, M., and Clarke, S. (2008), "Knowledge, management, and knowledge management in business operations", *Journal of Knowledge Management, Vol. 12,* pp. *3-17.*
Chen, M.C., Cheng, S. J., and Hwang, Y. (2005), "An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance", *Journal of Intellectual Capital*, Vol. 6, pp. 159-176.
Chiu, Y. (2008). "How network competence and network location influence innovation performance", *Journal of Business and Industrial Marketing*, Vol. 24, pp. 46 – 55.
Christensen, C. and Overdorf, M. (2000). "Meeting the challenge of disruptive change", *Harvard Business Review*, Vol. 78, pp. 66-76.
Chung, H. and Wang, Z. (2006), "Analysis of marketing standardization strategies – A "city" market framework", *Journal of Global Marketing*, Vol. 20, pp. 39−60.
Cloodt, M., Hagedoorn, J., and Kranenburg, H. (2006), "Mergers and acquisitions: Their effect on the innovative performance of companies in high-tech industries", *Research Policy*, Vol. 35, pp. 642–654.
Cohen, W.M. and Levinthal, D.A. (1990), "Absorptive capacity: a new perspective on learning and innovation*", Administrative Science Quarterly Vol. 35, pp. 128*-152.

Cohen, W.M. and Levinthal, D.A. (1989), “Innovation and learning: The two faces of R & D”, *Economic Journal*, Vol. 99, pp. 569–596.
Crook, T.R., Giunipero, L., Reus, T.H., Handfield, R., and Williams, S.K. (2008), “Antecedents and outcomes of supply chain effectiveness: an exploratory investigation”, *Journal of Managerial Issues*, Vol. 20, pp. 161–178.
Curado, C. and Bontis, N. (2007), “Managing intellectual capital: the MIC Matrix”. *International Journal of Knowledge and Learning,* Vol. 3, pp. 316–28.
Dahlman, C.J. and Westphal, L. (1982), “*Technological effort in industrial development - An interpretative survey of research”* in F. Stewart and J. James (Eds.), The Economics of New Technology in Developing Countrie pp. 105–137.
Demartini, M.C and Beretta, V. (2019), “Intellectual capital and SMEs’ performance: A structured literature review”, *Journal of Small Business Management*, pp. 1–45.
De Man, A. and Duysters, G.M. (2005), “Collaboration and innovation: a review of the effects of mergers, acquisitions and alliances on innovation”, *Technovation, Vol. 25,* pp.1377–1387
Desarbo, W.S., Benedetto, C. A. D., Song, M., and Sinha, I. (2005), “Revisiting the Miles and Snow strategic framework: Uncovering interrelationships between strategic types, capabilities, environmental uncertainty, and firm performance”, *Strategic Management Journal*, Vol. 26, pp. 47-74.
Dosi, G., Faillo, M., and Marengo, L. (2008), “Organizational Capabilities, Patterns of Knowledge Accumulation and Governance”, Organization, Los Angeles Vol. 29, pp. 1165-1185.
Drew, S. (1999), “Building Knowledge Management into Strategy: Making Sence of a New Perspective”, *Long Range Planning*, Vol. 32, pp. 130-136.
Drucker, P. F. (1993), Post capitalist Society, New York: Herper Collins Publishers.
Dumay, J. and Cai, L. (2015), “Using content analysis as a research methodology for investigating intellectual capital disclosure: A critique”, *Journal of Intellectual Capital*, Vol. 16, pp. 121 - 155
Dzinkowski, R. (2000), “The Measurement and Management of Intellectual Capital: An Introduction”, *Management Accounting*, Vol. 78, pp. 32-38.
Edvinsson, L. (2000), “Some perspectives on intangibles and intellectual capital”, Journal of intellectual capital Vol. 1, pp. 12-16.
Edvinsson, L. and Sullivan, P. (1996), “Developing a model for managing intellectual capital”*, European Management Journal*, Vol. 4, pp. 356-364.
Edvinsson, L. and Malone, M. (1997), Intellectual Capital: Realizing Your Firm’s True Value by Finding its Hidden Brainpower, HarperCollins, New York, NY.
Edvinsson, L., and Malone, M. S. (1998), Capital intellectual. São Paulo: Makron Books.
Eisenhardt, K. M. and Martin, J. A. (2000), “Dynamic capabilities: What are they?” *Strategic Management Journal*, Vol. 21, pp. 1105–1121.
Ferenhof, H., Durst, S., Bialecki, M., and Selig, P. (2015), “Intellectual capital dimensions: state of the art in 2014”, *Journal of Intellectual Capital*, Vol. 1, pp. 58-100.
Flatten, T.C., Engelen, A., Zahara, S.A., and Brettel, M. (2011), “A measure of absorptive capacity: scale development and validation”, *European Management Journal*, Vol. 29, pp. 98-116.
Foréz, B. and Camisón, C. (2016), “Does incremental and radical innovation performance depend on different types of knowledge accumulation capabilities and organizational size?” *Journal of Business Research*, Vol. 69, pp. 831-848.
Fosfuri, A. and Tribó, J. (2008). Exploring the antecedents of potencial absorptive capacity and its impact on innovation performance. *Omega,* Vol. *36 (2),* pp. 173-187.
Galbreath, J. (2005), “Which resources matter the most to firm success? An exploratory study of resource-based theory?” *Technovation,* Vol. *25,* pp. 979–987.

García-Álvarez, M.T., Mariz-Pérez, R.M., and Álvarez, M.T. (2011), "Structural Capital Management: A guide for indicators", *International Journal of Management and Information Systems,* Vol*. 15,* No. 3, pp. 45-52.

Gemünden, H.G., and Ritter, T. (1997), "*Relationships and networks in international markets",* Oxford: Pergamon pp. 294-304.

Grant, R.M. (1996), "Prospering in dynamically-competitive environments: organizational capacity as knowledge integration", *Organization Science, Vol. 7,* pp. 375-387.

Grasenick, K., and Low, J. (2004), "Shaken, not stirred. Defining and connecting indicators for the measurement and valuation of intangibles", *Journal of Intellectual Capital,* Vol*. 5, pp*- 268–81.

Guthrie, J.P. (2001), "High involvement work practices, turnover and productivity: Evidence from New Zealand", *Academy of Management Journal*, Vol. 44, pp. 180-190.

Guthrie, J., Petty, R., Yongvanich, K., and Ricceri, F. (2004), "Using Content Analysis as a Research Method to Inquire into Intellectual Capital Reporting", *Journal of Intellectual Capital,* Vol. 52*,* pp- 282-93.

Hagedoorn, J., Nadine R., and van Hans, K. (2006), "Inter-firm R&D Network the Importance of Strategic Network Capabilities for High-tech Partnership Formation", *British Journal of Management*, Vol. 17, pp. 39-53.

Hair, J.F., Black, W.C., Babin, B.J., and Anderson, R.E. (2014), *Multivariate Data Analysis*, Pearson Edimburgh.

Ezuma, K.E. and Ismail, M. (2017), "Conceptualizing the Influence of Network Competence on Entrepreneurship Growth in Small and Medium Enterprises", *Global Business and Management Research: An International Journal*, Vol. 9 No. 2, pp. 30-44.

Hoang, H. and Antoncic, B. (2003), "Network-based research in entrepreneurship: A critical review", *Journal of Business Venturing*, Vol. 18*,* pp. 165-187

Hsu Y. H. and Fang, W. (2009), Intellectual capital and new product development performance: the mediating role of organizational learning capability, *Technological Forecasting and Social Change,* Vol. 76, pp. 664-677.

Hsu, L.C. and Wang, C.H. (2012), "Clarifying the Effect of Intellectual Capital on Performance: The Mediating Role of Dynamic Capability"*, British Journal of Management, Vol. 23, pp. 179-205.*

Hung, R.Y.Y., Yang, B., Lien, B.Y.H., McLean, G.N., and Kuo, Y.M. (2010), "Dynamic capability: Impact of process alignment and organizational learning culture on performance", *Journal of World Business*, Vol. 45, pp. 285-294.

Lenciu, N.M. and Matis, D. (2011), "A theoretical framework of intellectual capital", *International Journal of Business Research*, Vol. 11 No. 2, pp*. 166-183.*

Jansen, J.P., van den Bosch, F.A.J., and Volberda, H.W. (2005), "Managing potential and realised absorptive capacity: how do organizational antecedents' matter?", *Academy of Management Journal*, Vol. 48, pp. 999-1015.

Jaworski, B. and Kohli, A.K. (1993), "Market orientation: antecedents and consequences", *Journal of Marketing*, Vol. 57, pp. 53-70.

Kale, P., Singh, H., and Perlmutter, H. (2000), "Learning and protection of proprietary assets in strategic alliances: building relational capital", *Strategic Management Journal*, Vol. 21, pp. 217-237.

Kaplan, R.S. and Norton, D.P. (2004b), "Measuring the strategic readiness of intangible assets", Harvard Business Review pp. 52-63.

Kianto, A., Hurmelinna-Laukkanen, P., and Ritala, P. (2010), "Intellectual capital in service and product-oriented companies", *Journal Intellectual Capital,* Vol. 11*,* pp. 305-325.

Kianto, A., Ritala, P., Spender, J. C., and Vanhala, M. (2014), "The interaction of intellectual capital assets and knowledge management practices in organizational value creation", *Journal of Intellectual capital*, Vol.15, No. 3, pp. 362- 375.

Knight, G.A.G. and Cavusgil, S.T. (2004), “Innovation, Organizational Capabilities and the Born Global firm”, *Journal of International Business Studies*, Vol. 35, pp. 124-141.

Kostopoulos, K., Papalexandris, A., Papachroni, M., and Ioannou, G. (2010), “Absorptive capacity, innovation and financial performance”, *Journal of Business Research*, Vol. 64, pp. 1335-1343.

Krause, D.R., Handfield, R.B., and Tyler, B.B. (2007), “The relationships between supplier development, commitment, social capital accumulation and performance improvement”, *Journal of Operations Management*, Vol. 25, pp. 528-545.

Lall, S. (1987), *Learning to Industrialize: The Acquisition of Technological Capability by India.* London, MacMillan.

Lane, P.J.; Koka, B.R., and Pathak, S. (2006), “The reification of absorptive capacity: a critical review and rejuvenation of the construct”. *Academy of Management Review*, Vol. 31, pp. 833-863.

Lau, A. K.W., and Lo, W. (2019), “Absorptive capacity, technological innovation capability and innovation performance: an empirical study in Hong Kong”, *International Journal of Technology Management*, Vol. 80 No. 1/2, pp. 107.

Levitt, T., (1983), “The Globalization of Markets”, *Harvard Business Review*, pp. 92-102.

Li, J.J. and Zhou, K.Z. (2010), “How foreign firms achieve competitive advantage in the Chinese emerging economy: Managerial ties and market orientation”, *Journal of Business Research*, Vol. 63 No. 8, pp. 856-862.

Li, T. and Calantone, R.J. (1998), “The Impact of Market Knowledge Competence on New Product Advantage: Conceptualization and Empirical Examination”, *Journal of Marketing*, Vol. 62, pp.13-29.

Lichtenthaler, U. and Lichtenthaler, E. (2009), “A capability-based framework for open innovation: complementing absorptive capacity”, *Journal of Management Studies*, Vol. 46, pp. 1315-1338.

Lim, L.L. and Dalimore, P. (2004), “Intellectual capital: managing attitudes in service industries”, *Journal of Intellectual Capital*, Vol. 5, pp. 181-194.

Lin, S. and Higgins, A. (2016), “How dynamic capabilities affect adoption of management innovations”, *Journal of Business Research*, Vol. 69, pp. 862–876

Lin, L.H. (2015), “Innovation Performance on a Taiwanese information firms: an acquisition – learning – innovation”, *Total Quality Management*, Vol. 26 No. 1, pp. 29 – 45.

Lyn, B.E. (2000), “Intellectual capital: unearthing hidden value by managing intellectual assets”, *Ivey Business Journal*, pp. 64, 3.

Lu, W.-M., Wang, W.-K., and Kweh, K., L. (2014), “Intellectual capital and performance in the Chinese life insurance industry”, *Omega*, Vol. 42, pp. 65 -74.

Marr, B. (2005), “Perspectives on Intellectual: Multidisciplinary Insights In to Management, Measurement, and Reporting”, Elsevier Butterworth – Heinemann, Burlington, M.A.

Marr, B. and Chatzkel, J. (2004), “Intellectual capital at the crossroads: managing, measuring, and reporting of IC”, *Journal of Intellectual Capital*, Vol. 5, pp. 224-229.

Martín-De Castro, G., Delgado-Verde, M, López-Sáez, P., and Navas-López, J.E. (2011), “Towards an Intellectual Capital-Based View of the Firm”, *Journal of Business Ethics*, Vol. 98, pp. 649-662.

Mendonza, C. and R. Zrihen. (2001), “Measuring up”. *Financial Management*, pp. 26-29.

Mincer, J. (1958), “Investment in Human Capital and Personal Income Distribution”, *Journal of Political Economy*, Vol. 66, pp. 281-302.

Molina-Morales, F.X. and M.T. Martínez-Fernández (2009), “Too much love in the neighborhood can hurt: How an excess of intensity and trust in relationships may

produce negative effects on firms", *Strategic Management Journal*, Vol. 30, pp. 1013-1023.
Mubarik, S., Naghavi, N., and Mubarik, M.F. (2019), "Governance-led intellectual capital disclosure: empirical evidence from Pakistan", *Humanities and Social Sciences Letters*, Vol. 7 No. 2, pp. 141-155.
Ngah, R. and Ibrahim, A.R. (2009), "The Relationship of Intellectual Capital, Innovation and Organizational Performance: A Preliminary Study in Malaysian SMEs", *International Journal of Management Innovation Systems*, Vol. 1, pp. 1-12.
Newey, L.R. and Zahra, S.A. (2009), "The evolving firm: how dynamic and operating capabilities interact to enable entrepreneurship", *British Journal of Management, Vol. 20,* pp. 81-100.
Nonaka, I. (1991), "The knowledge-creating firm", *Harvard Business Review*, Vol. 69*,* pp. 96-104.
Nonaka, I. and Takeuchi, H. (1995), "*The knowledge-creating firm: How Japanese companies create the dynamics of innovation"*, New York: Oxford University Press
O'Donnell, D., O'Regan, P., Coates, B., Kennedy, T., Keary, B., and Berkery, G. (2011), "Human interaction: The critical source of value in the intellectual age", *Journal of Intellectual Capital,* Vol. 4 No. 1, pp. 82-99.
Ordóñez de Pablos, P. (2002), "Evidence of intellectual capital measurement from Asia, Europe and the Middle East", *Journal of Intellectual Capital*, Vol. 3, pp. 287-302.
Özer, G., Ergun, E., and Yilmaz, O.E., (2015), "Effects of intellectual capital on qualitative and quantitave performance: evidence from Turkey", *Sajems*, Vol.18, pp. 143-154.
Pavitt, C. (1991), "An analysis of artificial intelligence-based models for describing communicative choice*", Communication Theory*, Vol. 1, pp. 204-224.
Petty, R. and Guthrie, J. (2000), "Intellectual capital literature review. Measurement, reporting and management", *Journal of Intellectual Capital*, Vol. 1, pp. 155-176.
Piening, E. and Salge, T.O. (2015), "Understanding the Antecedents, Contingencies, and Performance Implications of Process Innovation: A Dynamic Capabilities Perspective", *Journal Product Innovation Management,* Vol. 32, pp. 80-97.
Porter, M. E. (2001), "Strategy and the Internet", Harvard Business Review pp. 63-78.
Qureshil, S., Kamal, M., and Wolcott, P. (2009), "Information technology interventions for growth and competitiveness in micro-enterprises", *International Journal of E-Business Research*, Vol. 5, pp. 117-140.
Quintas, P., Lefrere, P., and Jones, G. (1997), "Knowledge Management: a Strategic Agenda*", Long Range Planning, Vol. 30, pp. 385*-391.
Richard, P. and Guthrie, J. (2000), "Intellectual capital review measurement, reporting and management", *Journal of Intellectual Capital*, Vol. 1, pp. 155-176.
Ritala, P., Olander, H., Michailova, S., and Husted, K. (2015), "Knowledge sharing, knowledge leaking and relative innovation performance: An empirical study", *Technovation*, Vol. 35, pp. 22-31
Ritter, T. (1999), "The networking firm: antecedents for coping with relationships and networks effectively", *Industrial Marketing Management*, Vol. 28*,* pp. 467-79.
Ritter, T. and Gemunden, H.G. (2003), "Network competence: Its impact on innovation success and its antecedents", *Journal of Business Research*, Vol. 56, pp. 745-755.
Ritter, T., Wilkinson, I.F., and Johnston, W.J. (2002), "Measuring network competence: some international evidence", *Journal of Business and Industrial Marketing*, Vol. 17, pp. 119-138.
Rosen, S. (1983), "Specialization and Human Capital", *Journal of Labor Economics*, Vol. 1, pp. 43-49.
Rosenbusch, N., Brinckmann, J., and Bausch, A. (2011), "Is innovation always beneficial? A meta-analysis of the relationship between innovation and performance in SMEs", *Journal of Business Venturing*, Vol. 26, pp. 441-457.

Saeed, S., Yousafzai, S., Paladino, A., and De Luca, L.M. (2015), “Inside-out and outside-in orientations: A meta-analysis of orientation's effects on innovation and firm performance”, *Industrial Marketing Management*, Vol. 47, pp. 121-133.

Selvam, M., Gayathri, J., Vasanth, V., Lingaraja, K., and Marxiaoli, S. (2016), “Determinants of Firm Performance: A Subjective Model”, *International Journal of Social Science Studies*, Vol. 4, No. 7; pp. 90-100.

Sandberg, J. (2000), “Understanding human competency at work: An interpretive approach”, *Academy of Management Journal*, Vol. 43, pp. 9-25.

Santhanam, R. and Hartono, E. (2003), “Issues in Linking Information technology capability to firm performance”, *Mis Quarterly*, Vol. 27, pp. 125-153.

Santos-Vijande, M.L., López-Sánchez, Ángel,J., and Trespalacios, J.A. (2012). “How organizational learning affects a firm’s flexibility, competitive strategy, and performance”, *Journal of Business Research*, Vol. 65, pp. 1079-1089.

Schultz, T.W. (1961), “Investment in human capital”, *American Economic Review, Vol. 51*, pp. 1-17.

Seidler-de Alwis, R. and Hartmann, E. (2008), “The use of tacit knowledge within innovative companies: knowledge management in innovative enterprises”, *Journal of knowledge Management*, Vol. 12, pp. 133-147.

Serenko, A. and Bontis, N. (2004), “Meta-review of knowledge management and intellectual capital literature: citation impact and research productivity rankings”. *Knowledge and Process Management*, Vol. 11, pp. 185-198.

Serenko, A. and Bontis, N. (2009), “Global ranking of knowledge management and intellectual capital academic journals”, *Journal of Knowledge Management*, Vol. 48, pp. 105 -131

Sharabati, A.A., Jawad, S.N., and Bontis, N. (2010), “Intellectual capital and business performance in the pharmaceutical sector of Jordan”, *Management Decision*, Vol. 48, pp. 105-131.

Shuaibu, M. and Timothy, P.O. (2016), “Human Capital development dynamics in Africa; Evidence from panel cointegration and causality in 33 countries, 2000 – 2013”, *Applied Econometrics and International Development*, Vol. 1, pp. 116-133.

Song, M., Di Benedetto, C.A., and Nason, R.W. (2007), “Capabilities and financial performance: the moderating effect of strategic type”, *Journal of the Academy of Marketing Science*, Vol. 35, pp. 18-34.

Spender, J.C. (1996), “Making knowledge the basis of a dynamic theory of the firm”, *Strategic Management Journal*, Vol. 17, pp. 45-62.

Kirgydou, L.P. and Spyropoulou, S. (2013), Drivers and Performance outcomes of innovativeness: An empirical study, *British Journal of Management, Vol. 24*, pp. 281-298.

Stank, T.P., Keller, S.B., and Daugherty, P.J. (2001), “Supply Chain Collaboration and Logistical Service Performance”, *Journal of Business Logistics*, Vol. 22, pp. 29-48.

Stewart, T.A. (1991), “Brainpower: How intellectual capital is becoming America's most valuable asset”, *Fortune,* pp. 44-60.

Subramaniam, M. and Youndt, M.A. (2005), “The influence of intellectual capital on the types of Innovative capabilities”, *Academy of Management Journal*, Vol. 48, pp. 450-463.

Sveiby, K.E. (1997), *The New Organizational Wealth: Managing and Measuring Knowledge Based Assets,* Berret-Koehler Pub. Inc., San Francisco.

Szulanski, G. (1996), “Exploring internal stickiness: Impediments to the transfer of best practice within the firm”. *Strategic Management Journal*, Vol. 17, pp. 27-43.

Teece, D. J., Pisano, G., and Shuen, A. (1997), “Dynamic Capabilities and Strategic Management”, *Strategic Management Journal*, Vol. 18, pp. 509-533.

Tehseen, S., Ahmed, F., Qureshi, Z., Uddin, M., and Ramayah, T. (2019), “Entrepreneurial competencies and SMEs’ growth: the mediating role of network competence”, *Asia-Pacific Journal of Business Administration*, Vol. 11 No. 1, pp. 2-29.

Tidd, J. and Bessant, J. (2009), *Managing Innovation: Integrating Technological, Market and Organizational Change* (4 ed.), West Sussex, England: John Wiley and Sons, Ltd.

Tidd, J., Bessant, J., and Pavitt, K. (2001*), Managing innovation - integrating technological, market and organizational change* (2nd ed.), England: John Wiley and Sons Ltd.

Thornton, S.C., Henneberg, S.C., and Naudé, P. (2014), "Conceptualizing and validating organizational networking as a second-order formative construct", *Industrial Marketing Management*, Vol. 43 No. 6, pp. 951–966.

Tsai, K. (2004), "The Impact of Technological capability on Firm Performance in Taiwan's electronics Industry", *Journal of High Technology Management Research*, Vol. 15, pp. 183-195.

Tsai, W. (2001), "Knowledge Transfer in Intraorganizational Networks: Effects of Network Position And Absorptive Capacity On Business Unit Innovation And Performance", *Academy of Management Journal*, Vol. 44, pp. 996-1004.

Tsai, W. and Ghoshal, S. (1998), "Social capital and value creation: the role of interfirm networks", *Academy of Management Journal*, Vol. 41, pp. 464-476.

Tseng, C. Y. and Goo, Y.J.J. (2005), "Intellectual capital and corporate value in an emerging economy: Empirical study of Taiwanese manufacturers", *R&D Management*, Vol. 35, pp. 187-201.

Tzokas, N., Kim, Y.A., Akbar, H., and Al-Dajani, H. (2015), "Absorptive capacity and performance: The role of customer relationship and technological capabilities in high-tech SMEs", *Industrial Marketing Management*, Vol. 47, pp. 134-142.

van den Bosch, F.A.J., Volberda, H.W., and Boer, M. (1999), "Coevolution of firm absorptive capacity and knowledge environment: organizational forms and combinative capabilities", *Organization Science*, Vol. 10, pp. 551-568.

Venkatraman, N. and Ramanujam, V. (1986), "Measurement of business performance in strategy research: a comparison of approaches", *Academy of Management Review*, Vol. 11, pp. 801-814.

Verbano, C. and Crema, M. (2016), "Linking technology innovation strategy, intellectual capital and technology innovation performance in manufacturing SMEs", *Technology Analysis and Strategic Management*, Vol. 28, pp. 524-540.

Wang, C.L. and Ahmed, P.K. (2007), "Dynamic capabilities: A review and research". *International Journal of Management Reviews*, Vol. 9, pp. 31-51.

Weerawardena, J., Mort, G.S., and Salunke, S., Knight, G., and Liesch, P.W. (2015), "The role of the market sub-system and the socio-technical sub-system in innovation and firm performance: a dynamic capabilities approach", *Journal of the Academic Marketing Science*, Vol. 43, pp. 221-239.

Winter, S.G. (2003), "Understanding Dynamic Capabilities", *Strategic Management Journal*, Vol. 24, pp. 991-995.

Wu, F., Yeniyurt, S., Kim, D., and Cavusgil, S.T. (2006), "The impact of information technology on supply chain capabilities and firm performance: A resource-based view", *Industrial Marketing Management,* Vol. 35*,* pp. 493-504.

Youndt, M.A., Subramaniam, M., and Snell, S.A. (2004), "Intellectual Capital profiles: an examination of investments and returns", *Journal of Management Studies*, Vol. 41, pp. 335-361.

Zahra, S.A. and George, G. (2002), "Absorptive capacity: A review, reconceptualization, and extension", *Academy of Management Review*, Vol. 27, pp. 185-203.

Zahra, S.A., Sapienza, H.J., and Davisson, P. (2006), "Entrepreneurship and Dynamic Capabilities: A review, model and research agenda", *Journal of Management Studies*, Vol. 43, pp. 917-955.

Zéghal, D. and Maaloul, A. (2010), "Analysing value added as an indicator of intellectual capital and its consequences on firm performance", *Journal of Intellectual Capital*, Vol. 11, pp. 39-60.

Zollo, M. and Winter, S.G. (2002), “Deliberate Learning and the Evolution of Dynamic Capabilities”, *Organization Science*, Vol. 13, pp. 339-345.