

## **Intellectual, Psychological, and Social Capital and Business Innovation: The Moderating Effect of Organizational Culture**

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### **Abstract**

The recent research has highly examined innovation of businesses to improve their competitive advantages and the probability of their success. This study aimed to examine the association between intellectual, psychological, and social capital and business innovation in knowledge-based and high-technology businesses in Iran and if organizational culture moderates the relationships between the variables. Of the 182 knowledge-based and high-technology businesses located in Science and Technology Parks in Tehran, 126 were selected using the stratified random sampling method. A questionnaire was administered and the data were analyzed using the Structural Equation Modeling and PLS. The results indicated that intellectual, psychological, and social capitals significantly affect business innovation. Furthermore, organizational culture moderated the impact of intellectual and psychological capital on business innovation. The implications of the findings are discussed.

### **Keywords**

Innovation, Intellectual capital, Organizational culture, Psychological capital, Social capital.

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## **Introduction**

Innovation of organizations has recently attracted attentions of researchers, practitioners, and policy makers (Roy & Sivakumar, 2012; Jong & Hartog, 2010; Koc & Ceylan, 2007). This is due to the influential impact of innovation on managers', employees', and organizations' performance and success (Gong et al., 2013; Yuan & Woodman, 2010). Innovation has also been highlighted as to be influential on a business success to gain competitive advantages (Amado et al., 2010; Bergek et al., 2007; Hult et al., 2004).

Particularly, in developing countries (Elsetouhi et al., 2015) including Iran, the performance and success of organizations and businesses highly depends on their innovation (e.g., Maroofi, 2016; Sharifirad, 2013; Niknami et al., 2009). However, our knowledge about the factors that construct a business innovation capability is limited (Massa & Testa, 2009; Hult et al., 2004; Sharma & Chrisman, 1999). In Iran, only few studies investigated the factors affecting business innovation and how moderating factors such as organizational culture influences the relationships between business innovation and its antecedents. Particularly, there is limited knowledge on the factors influencing innovation in knowledge-based and high-technology businesses where innovation plays vital roles in the survival and competitiveness of the business (Mahdavi et al., 2011). To narrow the gaps, the current research aimed to examine the impact of psychological, intellectual and social capital on knowledge and technology-based businesses. Among the various variables affecting innovation, we focused on exploring only these factors due to their significant impact on constructing individual employee-related capabilities that influence innovation in knowledge-based and high-technology businesses (Wang et al., 2015). Furthermore, these factors are more malleable than other organization related factors that require long-term planning and processes to be changed (Forsman, 2011). In addition, it explored the moderating effect of organizational culture on the relationships between the variables. By this, our study highly contributes to the body of literature that explored the factors shaping

innovation of knowledge-based and high-technology businesses (Wang et al., 2015; Forsman, 2011; Massa & Testa, 2009) specifically in Iran (Torkiantabar et al., 2016; Alem Tabriz et al., 2009).

We organized this paper in three sections. We present the theoretical background of the research and propose the hypotheses based on the literature reviewed. Subsequently, we present research methodology and findings. Finally, we discuss the findings and suggest their implications to improve the performance of employees and businesses.

### **Theoretical Background**

In this section, we explain the literature on business innovation and the factors that construct and enhance innovation behavior particularly in knowledge-based and high-technology businesses.

#### **Business Innovation**

Current organizations operate in highly turbulent environments and are facing with growing challenges such as fierce competitors, market uncertainties, short product life cycles and rapid technology changes (Roy & Sivakumar, 2012; Madrid-Guijarro et al., 2009; Dinopoulos & Syropoulos, 2007). This is not limited to organizations but there are serious competitions among countries all over the world due to the globalization of economies and growing progresses in technologies (Bruque & Moyano, 2007). In such a highly competitive environment, innovation becomes a fundamental requirement to help organizations cope with emerging external and internal contingencies (Walker et al., 2015), and consequently achieve sustainability, survival, and growth (Atalay & Anafarta, 2011; Bohlmann et al., 2012; Gumusluoglu & Ilsev, 2009). Therefore, only those firms having the capabilities to create competitive advantages over their rivals can successfully survive and grow (Amado et al., 2010; Koc & Ceylan, 2007; Hult et al., 2004; Sharma & Chrisman, 1999).

Innovation has been considered as a vital element of gaining a competitive advantage (Bergek et al., 2007). Specifically, for the organizations operating in a knowledge-based economy, innovation is

critical and mainly supported by various sources of knowledge (Atalay & Anafarta, 2011; Forsman, 2011; Yang & Lin, 2009; Lev & Daum, 2004).

Various definitions have been proposed for innovation. The early definitions considered the creation or purchasing of new devices, systems, policies, programs, products or services for and/or in an organization as innovation (Damanpour, 1991). Others (e.g., the Oslo Manual published by OECD; Eurostat, 2005) focused on the adaptation of products (both goods or services), processes (that may have already been implemented by other organizations, but it is new to one specific organization), a new marketing method (an organization is the first to introduce it in the market or all markets and organizations in the world), or a new organizational method.

However, recent definitions of innovation not only included creation of new ideas by an organization but also looked at the outcomes of the innovation adaptation for the organization. These definitions highlighted the activities of organizations to improve their products, services, and processes and to successfully gain competitive advantages and survive (Baregheh et al., 2009). Research findings also highlighted the significant outcomes and advantages of innovation for both the generators and adopters (Gunday et al., 2011; Tidd et al., 2001; Borins, 1998; Ittner & Larcker, 1997). Therefore, innovation is a broad and multi-faceted construct used to improve both the strategic and operational performances of a business including policies, strategies and approaches, processes, products, services, competitors, and customers (Dumay et al., 2013). Furthermore, whether innovation introduces a new product, service, or process to the external market or one or more internal units (Walker et al., 2011; Klein & Sorra, 1996), novelty is a fundamental and inseparable element of the definitions across different disciplinary fields. Though, novelty creation highly depends on change in terms of the subject of change and its outcomes (Kesting et al., 2015).

### **Intellectual Capital**

Intellectual Capital (IC) has also been suggested as a key asset of an organization to create and enhance innovation (Elsetouhi et al., 2015).

IC has been defined as the total capabilities, knowledge, culture, strategies, processes, and relational networks of an organization to create value and competitive advantages (Hsu & Fang, 2009; Stewart, 1997; Nahapiet & Ghoshal, 1998). Such knowledge accumulates over time and is inherent in an organization's people, structures, systems, processes, and databases (Youndt et al., 2004; Dierickx & Cool, 1989).

Several studies scrutinized the categorization of intellectual capital components, most of them showed almost the same results. The early classifications concentrated on the human, structural and relational dimensions of the concept (Steenkamp & Hooks, 2011; Edvinsson & Malone, 1997; Stewart, 1997; Brooking, 1996; Kaplan & Norton, 1992). Sveiby (1997) suggested employees' competence and internal and external structures of the organization as the dimensions of IC. Stewart (1997) defined the notion through a broader view including human capital, structural capital, and customer capital. In Edvinsson and Malone's (1997) opinion human capital differs from structural capital, the latter being divided into organizational capital and customer capital. Therefore, intellectual capital not only determines employees' knowledge, skills and experiences of employees and applied organizational knowledge, but it also includes the information related to customers, suppliers and stakeholders. Using the broad definition, Elsetouhi et al. (2015) found that human capital and customer capital have both direct and indirect effects on innovative behavior of managers. While human capital refers to the individuals' capabilities, knowledge, skills, and experiences, structural capital reflects using highly effective ways to collect, test, organize, integrate and subsequently disseminate the existing knowledge. Relational capital demonstrates the relationships between a certain organization and the people such as customer satisfaction, customer retention rate, and customer loyalty (Moon & Kym, 2006). Therefore, we hypothesized:

**H1:** Intellectual capital of knowledge-based and high-technology businesses has a significant impact on their innovation.

### **Social Capital**

Social capital is a concept widely used by economists, sociologists and management researchers referring to the benefits that individuals gain from social relationships (Akram et al., 2017; Bhatt & Altinay, 2013). Individuals with a variety of social networks, connections with different people and interactions with people from different backgrounds have a strong social capital (Dekker & Uslaner, 2001). Social capital has long been considered to be impactful on a business performance and success. Adler and Kwon (2002) presented twenty definitions of social capital to reflect the diversity of conceptualizations. The definition of social capital adopted in a study highly depends on the discipline and the level of analysis (Robison et al., 2002). The definitions can be classified based on the core elements, origins and consequences of social capital (Adler & Kwon, 2002; Field et al., 2000). Therefore, social capital is a highly context specific and multidimensional concept that represents the advantages offered by connections and relationships (Robison et al., 2002).

Empirical studies have shown that social capital affects innovation processes in organizations (Moran, 2005; Obstfeld, 2005; Rodan & Galunic, 2004; Ahuja, 2000). The recent research has also highlighted the significant and positive impact of organizational social capital (i.e., structural, relational and cognitive) on employees' innovative work behavior in small firms (Akram et al., 2017). The association between social capital and innovative behavior of managers has also been suggested in service sectors (Elsetouhi et al., 2015). The value created by networks and relationships for individuals and groups are at the heart of social capital that connects different people together (Tata & Prasad, 2015). By these connections, people with different experiences, values, skills, and background formally or informally exchange their information, knowledge, ways of thinking, and behavior and create new ideas (Conway, 1995). Novel ideas mostly emerge in science and technology when different people contribute in networks (Bougrain & Haudeville, 2002). Accordingly, the following hypothesis was tested in this study:

**H2:** Social capital of knowledge-based and high-technology businesses has a significant impact on their innovation.

### **Psychological Capital**

Exploring the factors affecting business innovation has recently received increasing attentions of policy makers, researchers and practitioners (Newman et al., 2014). The recent research has mostly suggested psychological capital (PsyCap) as the critical strategic resource that highly enhances innovation and consequently performance of an organization (e.g., Rego et al., 2012; Abbas & Raja, 2011; Ardichvili, 2011; Sweetman et al., 2011). The influential impact of PsyCap is not limited to the organization level (Luthans & Youssef, 2004), but it also encompasses employees' innovation capabilities through influencing their attitudes, behavior and performance (Newman et al., 2014). In this sense, PsyCap is a type of individuals' capability distinctive from other human-related qualities (e.g., human and social capitals). Importantly, PsyCap can be assessed and developed in order to promote innovation behavior among employees (Luthans & Youssef, 2004). Previous researches suggested four main resources that originate from the positive psychology literature and shape employees' innovation (Luthans & Youssef, 2004). Employees' innovation reflects their self-efficacy, hope, optimism, and resilience in generating and implementing new ideas (Luthans & Youssef, 2007; Luthans et al., 2007).

Self-efficacy is a key component of the Social Cognitive Theory (Bandura, 1997, 2012). Self-efficacy reflects ones' perceived capabilities that they can successfully perform a task and achieve a goal in a particular setting (Stajkovic & Luthans, 1998). Individuals with high self-efficacy possess the abilities to direct the consequences of their actions and overcome the complex challenges in the process of their task performance (Bandura, 1997). As Scheier, Carver and Bridges (2001) highlighted, optimism shows individuals' expectancy of positive outcomes of their task fulfilment. Having high optimism, individuals pursue their goals with strong beliefs in that their efforts lead to the desired outcomes and persist in facing difficulties. Hope creates the

energy and tendency to put efforts and achieve a specific goal in a particular context (agency) and regulates the selection of means and procedures among the alternatives to successfully perform the required tasks (pathway) to achieve the goal (Seligman, 1998; Snyder et al., 1996; Luthans et al., 2008; Koc & Ceylan, 2007). Finally, resilience indicates ones' abilities to encounter difficulties, lack of certainty and risks and adjust to the challenging demands and complexities of life (Tugade & Fredrickson, 2004; Masten & Reed, 2002). Therefore, resilience creates successful performances in challenging settings (Luthans et al., 2006).

Empirical studies have also suggested a significant association between components of PsyCap and employees' innovation behavior. Barron and Harrington's (1981) study indicated that confident employees have better innovation performance. Luthans and Youssef (2007) found a significant relationship between employees' optimism and self-confidence and their capability to generate and propose new ideas as well as put the ideas into practice. Sweetman et al.'s (2011) research showed that both components of PsyCap (hope, self-efficacy, optimism, and resilience) and overall psychological quality of employees affect their innovation performance. In addition, their study suggested that PsyCap significantly improves employees' innovation performance and its dimensions. PsyCap and particularly tolerance, courtesy, and modesty also enable employees to present and implement their new ideas with less persistence and obtain higher recognition and supports from others (Qiu et al., 2015).

Based on the above research findings, this study proposed that:

**H3:** Psychological capital of knowledge-based and high-technology businesses has a significant impact on their innovation.

### **Organizational Culture and Business Innovation**

Organizational culture has long been used to indicate the climate, practices, values, and beliefs that organizations develop through handling their people (Schein, 2004). Culture of an organization is the common values, beliefs, norms, and procedures that regulates



behaviors and performances in the organization. Organizational culture creates identity among the members of an organization and is mostly considered by the members as an accepted fact.

Watson (2006) argued that the concept of culture originally derived from a metaphor of the organization as ‘something cultivated’. The crucial role of organizational culture in the development of innovation has been emphasized by several studies (i.e., Gomez-Haro et al., 2011; Gupta et al., 2004). A recent research in Iran also demonstrated the significant influence of organizational culture on innovation behaviors of top managers in law firms (Maroofi, 2016). Specifically, research findings showed that certain kinds of cultures correlate with economic performance of an organization (Denison, 1990; Kotter & Heskett, 1992; Sorensen, 2002). An organization with a predominantly internal process culture is more resistant to promote innovation.

Scholars postulated that culture can act as both a facilitator and/or an impediment of organizational transformation and change (Zalami, 2005). Change and innovation initiatives are facilitated and supported by the culture particularly when it is in agreement with the current organizational culture (O’Donovan, 2006). In Moon and Kym’s (2006) model for intellectual capital, organizational culture plays a critical role in shaping structural capital of organization. Accordingly, we suggested the following hypotheses:

**H4.1:** Organizational culture moderates the relationship between intellectual capital and business innovation.

**H4.2:** Organizational culture moderates the relationship between social capital and business innovation.

**H4.3:** Organizational culture moderates the relationship between psychological capital and business innovation.

## **Methodology**

This study aimed to examine the impact of intellectual, psychological and social capital on business innovation and if organizational culture moderates the relationships between the variables. We included only knowledge-based and high-technology businesses based on the assumption that knowledge intensive businesses are more engaged and

have higher propensity to invest in innovative activities (Wang et al., 2015; Doloreux & Melancon, 2008). Therefore, this research is placed among the studies which have fundamental implications for small businesses established based on knowledge and high technologies in Iran.

Regarding data collection techniques and methods, this descriptive study examined the current status of innovation behavior in businesses established based on knowledge and high technologies and the impact of intellectual, psychological, and social capital on innovation behavior. The target population for this research included 182 knowledge-based and high-technology businesses located in three Science and Technology Parks (Pardis, University of Tehran and Tarbiyat Modares University) in Tehran, Iran. The sample size was determined 126 participants using the Cochran's formula. The stratified random sampling method was employed to select the participants from the Science and Technology Parks (STPs). This sampling method ensured using specific criterion to choose the sample in each stratum and a proportional selection of the participants in the strata. Pardis is the largest and most advanced STPs in Iran which includes 112 businesses, highly active in various areas such as chemistry, bio-technology, Nano-technology, mechanics and automation, telecommunication, bio-medicine, engineering, oil, gas and petrochemical products, information technology and electronics. University of Tehran's STP includes 37 knowledge-based businesses in high-technologies and the STP of Tarbiyat Modares University has 33 businesses currently active in various high-technology areas. Therefore, from Pardis STP 77, university of Tehran STP 26, and Tarbiyat Modares University STP 23 top and middle managers were involved in this study. Of the managers 90 (71.4%) were male and 36 (28.6%) were female. Regarding education qualifications, majority of the managers had Master degree (60, 47.7%) followed by Bachelor (48, 38%), and Ph.D. (18, 14.3%). Most of the managers had above seven years of experience (48, 38%), 42 (33%) had less than 3 years of experience, and 36 (29%) had between 3 and 7 years of business experience. The businesses mostly aged less than five years (54,

42.8%), between 5 and 10 (42, 33.4%), and above 10 years (30, 23.8%) respectively.

## **Measures**

We employed a questionnaire with six sections and 67 items to measure the variables examined in this study. The first section of the questionnaire encompassed items on demographic information of the participants includes their gender, education, business experience, and age of the business. The second section contained 14 items of the psychological capital questionnaire developed by Luthans et al. (2007). The items measured perceptions of the participants towards the four dimensions of their psychological capital (self-efficacy, 3 items; hope, 4 items; optimism, 4 items; and resilience, 3 items). The third section of the questionnaire included 28 items developed by Moon and Kym (2006) to measure perceptions of the participants towards the three dimensions of intellectual capital (7 items on human capital, 13 items on structural capital, and 6 items on relational capital). Additionally, we used 10 items of the social capital questionnaire (Nahapiet & Ghoshal, 1998) which assessed the participants' perceptions towards structural (4 items), cognitive (2 items), and relational (2 items) capital of their business. Subsequently, 9 items developed by McGuire (2003) were utilized to measure organizational culture. These items measured perceptions of the participants towards the dominant culture in their business. Finally, we measured business innovation using 6 items developed by Scott and Bruce (1994). The items also assessed the participants' perceptions towards the supports and encouragements they receive from their business to develop new ideas and engage in innovation activities. The final version of the questionnaire was translated from English to Persian and back translated to ensure the accuracy of the items regarding their cultural meanings (McGorry, 2000). We employed 5-point Likert scale for the items (1=strongly disagree to 5=strongly agree). The Cronbach's alpha values for all scales used in this study indicated high reliability of them (Table 1).

Table 1. AVE, C.R and Cronbach's Alpha for the constructs and sub-constructs

Construct/Sub-constructs	AVE	CR	$\alpha$
Intellectual capital	0.78	0.93	0.91
Human	0.64	0.89	0.85
Structural	0.50	0.92	0.91
Relational	0.67	0.91	0.88
Social capital	0.70	0.88	0.85
Relational2	0.72	0.88	0.80
Cognitive	0.65	0.84	0.72
Structural2	0.58	0.85	0.76
Psychological capital	0.66	0.85	0.81
Self-efficacy	0.72	0.89	0.82
Hope	0.62	0.83	0.69
Optimism	0.84	0.91	0.81
Resilience	0.68	0.71	0.54
Business innovation	0.67	0.92	0.90

### Data Collection and Analysis

The participants' involvement in this study was entirely voluntary and the questionnaires were completed anonymously. Data collection was conducted from April to July, 2015. A letter was sent to the manager of each business that described the research purposes and asked his/her permission to collect the data. Of the 150 questionnaires administered (20% more than the sample size to avoid reduction of the questionnaires if not fully being completed), 126 were used in the final analysis (a response rate of 84%).

### Measurement Model

In order to examine simultaneous and complicated relationships between the variables in our study and test the validity and structure of the proposed relationships, we employed the Structural Equation Modelling (SEM) techniques. Partial Least Square (PLS) was also used to analyze the data because it does not need a large sample size and presumption of normality of the data (Ringle et al., 2012). Analysis of the data was performed using the two-step technique proposed by Hair et al. (2012). Accordingly, we performed a Confirmatory Factor Analysis (CFA) for each construct and examined the structure and loadings of the factors and the items that threatened

the convergent validity of each construct (psychological, intellectual, social capital, and business innovation). The items having low factor loadings to their construct ( $<0.4$ ) were deleted. Table 1 presents the Composite Reliability (CR), Average Variance Extracted (AVE) and Cronbach's alphas for the constructs and dimension of each construct under this investigation. As the table shows, convergent validity for each construct in the scale was higher than 0.50 indicating the items of each construct explain majority of its variance. Additionally, we examined the discriminant validity to ensure the items related to each construct only measure that construct (Kline, 2016). All of the items of the constructs had the highest loadings to their construct and were not highly correlated with items of other constructs. Therefore, all the constructs in the scale have a high convergent and discriminant validity.

### Structural Model

In the second step of data analysis, we examined the impact of psychological, intellectual, and social capital on business innovation in a structural model. Table 2 shows that t-values for the impact of the independent variables on business innovation are higher than the threshold 1.96 (intellectual capital=7.52; social capital=7.99, and psychological capital=5.27) indicating the significance of the effects. Furthermore,  $R^2$  for the dependent variable (business innovation) in the model was 0.87 which confirms the model fits the data well. Finally, we measured global goodness of fit (GOF) to ensure a good fitness of the model (Wetzels et al., 2009). The GOF obtained for the model is 0.69 which shows a high fitness of the model.

Next, we tested the hypothesized moderating effect of organizational culture on the relationships between psychological

Table 2. Path coefficients, t-values, and test of hypotheses

Hypothesis	Path coefficients	t-values	Confirmed / Rejected
1. Intellectual capital on business innovation	0.50	7.52**	Confirmed
2. Social capital on business innovation	0.21	7.99**	Confirmed
3. Psychological capital on business innovation	0.36	5.27**	Confirmed

\*\*Indicates correlation is significant at the 0.01 level (2-tailed)

capital, intellectual capital, social capital and innovation (Fig. 2). Our results indicated the significant moderating effect of organizational culture on the relationships between social capital (0.01), psychological capital (0.13), and intellectual capital (-0.17). This model had also a global goodness of fit (GOF= 0.67). Therefore, organizational culture significantly moderates the impact of social, psychological, and intellectual capital on innovation. However, the moderating effect of organizational culture on the association between intellectual capital and innovation has a negative direction (Table 3).

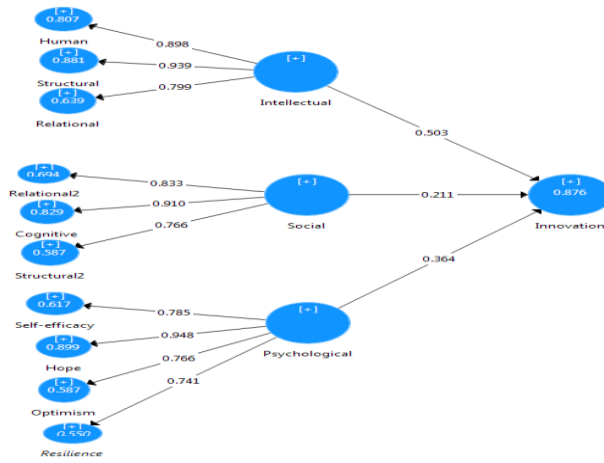


Fig. 1. Structural model for the impact of psychological, intellectual and social capital on business innovation

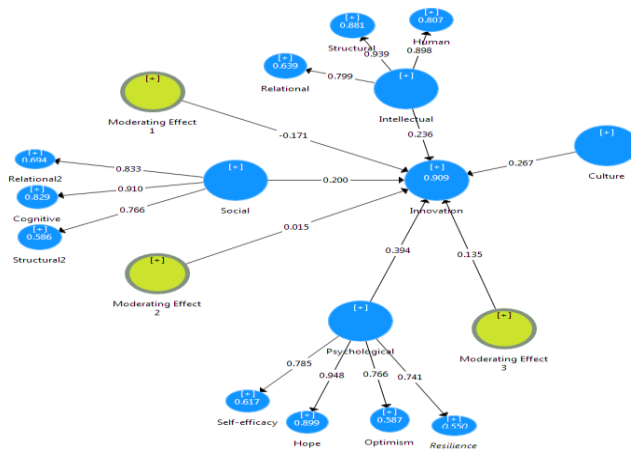


Fig. 2. Structural model for moderating effect of organizational culture

**Table 3. Path coefficients, t-values, and test of hypotheses for the moderating effect of organizational culture**

Hypothesis	Path coefficients	t-values	Confirmed / Rejected
1. Organizational culture on the association between intellectual capital and business innovation	-0.17	3.33**	Confirmed
2. Organizational culture on the association between social capital and business innovation	0.01	0.36	Rejected
3. Organizational culture on the association between psychological capital and business innovation	0.13	2.01**	Confirmed

\*\*Indicates at the 0.01 level, the correlation is significant and 2-tailed

## Results

To test the proposed relationships between the constructs, we analyzed the path coefficient and t-value for each path from independent to dependent variable. Table 2 depicts path coefficients, t-values, and hypothesis confirmation/rejection. As the table shows, all the proposed relationships between the variables are confirmed. More specifically, intellectual capital was the strongest factor affecting business innovation so that it explained 50% of the variance of the construct followed by psychological capital and social capital (36% and 21% respectively).

We also examined which dimension of each construct in this study has stronger effect on its construct and thereby on business innovation (Table 4). The structural component of intellectual capital had the strongest effect on its construct followed by human and relational elements. Cognitive ability had the highest contribution to social capital followed by relational and structural components. Finally, hope had the strongest impact on psychological capital followed by self-efficacy, optimism, and resilience.

**Table 4. Path coefficients and t-values for sub-constructs**

Constructs	Path coefficients	t-values
<b>Intellectual capital</b>		
Human	0.90	35.86**
Structural	0.94	76.60**
Relational	0.80	18.53**
<b>Social capital</b>		
Relational 2	0.83	47.96**

Continue Table 4. Path coefficients and t-values for sub-constructs

Constructs	Path coefficients	t-values
Cognitive	0.91	66.64**
Structural 2	0.77	15.44**
<b>Psychological capital</b>		
Self-efficacy	0.78	26.09**
Hope	0.95	50.60**
Optimism	0.77	13.66**
Resilience	0.74	14.85**

\*\*Indicates a significant 2-tailed correlation at 0.01

We also examined if culture of the businesses in this study plays a moderating role in the relationships between psychological, intellectual and social capital and business innovation. Table 3 demonstrates the path coefficients, t-values and confirmation/rejection of the hypotheses. According to the table, the moderating role of organizational culture on the association between psychological and intellectual capital (0.13, -0.17 respectively) and business innovation was confirmed but for social capital (0.01) and business innovation rejected. However, organizational culture improves the association between psychological capital and business innovation. While organizational culture affects the relationship between intellectual capital and business innovation in a negative direction.

## Discussion

This research investigated the effects of psychological, intellectual and social capital on business innovation. Furthermore, it examined if organizational culture plays a moderating role in the association between the variables. Our findings suggested a significant and positive relationship between psychological, intellectual, and social capital and business innovation. Specifically, intellectual capital of a business (human, structural and relational) has the strongest effect on its innovation. This result confirms previous studies (Elsetouhi et al., 2015; Mention & Bontis, 2013; Koc & Ceylan, 2007) that found a significant relationship between the variables. It contributes to the literature by highlighting intellectual capital as the strongest factor affecting knowledge-based and high-technology businesses'



innovation. Therefore, due to the critical roles that these businesses play in knowledge-based and developing economies including Iran, more attentions need to be given to the intellectual capital of the businesses (Khavandkar et al., 2009). In accordance with previous researches (Forsman, 2011; Atalay & Anafarta, 2011; Luthans et al., 2007; Larson & Luthans, 2006), our findings suggested psychological capital as a significant factor influencing innovation in knowledge-based and high-technology businesses. This finding emphasizes the fundamental impact of personal qualities of top and middle managers such as self-efficacy, hope, optimism and resilience on a business for innovation. This finding suggests the importance of using intellectual capital as an indicator when recruiting and/or promoting top and middle managers and improving intellectual capital of current top and middle managers by training (Forsman, 2011).

Our findings also revealed a significant impact of social capital as perceived by top and middle managers on business innovation. This finding emphasizes that social capital of organization contributes in shaping innovation of businesses and specifically those established based on knowledge and high-technology (Akram et al., 2017; Elsetouhi et al., 2015; Forsman, 2011; Pérez-Luño et al., 2011). Furthermore, our findings suggested that structural factor in intellectual capital, cognitive ability in social capital and hope in psychological capital had the strongest effect on innovation. Therefore, these factors need to be improved if knowledge-based and high-technology businesses aim to improve their innovation. Finally, we found the moderating impact of organizational culture on the association between psychological and intellectual capital and business innovation. This finding contributes to the few studies that investigated the impact of organizational culture on innovation behavior of top managers in Iran (Maroofi, 2016). These finding provides a high contribution to our knowledge and understanding on the mechanism through which intellectual and psychological capital influence business innovation. Therefore, managers of knowledge-based and high-technology businesses need to create and disseminate the organizational culture that improves intellectual and psychological

capital of top and middle managers. This study also found that organizational culture did not significantly moderate the association between social capital and business innovation. Furthermore, organizational culture has a negative moderating impact on the relationship between intellectual capital and innovation. This finding may partially stem from our small sample size and the correlations among variables in our structural model.

### **Conclusions**

Based on the findings of this study, we can conclude that a combination of personal, structural, social and cultural factors shape knowledge-based and high-technology businesses' innovation. This study provides several contributions to the research and practice. First, the set of factors examined in this study builds a foundation for further research on the factors that create and enhance innovation of businesses. As far as we know, this study is among the first researches that explores these factors in knowledge-based and high-technology businesses particularly in Iran (Torkiantabar et al., 2016; Alem Tabriz et al., 2009). Current and prospective managers of businesses launched based on knowledge and high-technologies could apply these factors as a platform to create and improve their business innovation. Second, the structure of the factors emerging from this study may assist researchers to construct the basis for developing theories about business innovation improvement. Business managers also need to decisively consider these factors and specifically intellectual capital as the strongest factor influencing business innovation as well as provide business managers with purposeful and encouraging training programs to improve their intellectual qualities. Finally, this study contributes organizational culture to be the factor that strengthens the impact of psychological capital on business innovation and researchers may need to include this factor when conducting a research on business innovation. Business managers need to create a highly encouraging organizational culture that assists them in improving their psychological capital as along with their businesses' intellectual and social capital.

### **Limitations and Future Research**

This study has some limitations that should be acknowledged. First, it focused on knowledge-based and high-technology businesses located in STPs. Future research should be undertaken including a variety of these businesses in other contexts than STPs. Second, we only examined the STPs in one province that is Tehran. Due to the variety of STPs and the businesses supported by them around the country, future research projects could be undertaken on different provinces to explore differences among the provinces in terms of business innovation and the factors that shape it. Third, this study is limited regarding its sample size and only involved top and middle managers. Future researches should be done using a larger and more various samples (e.g., operational managers, employees, customers).

In addition, we only included organizational culture as the moderating factor in our model. Exploring other moderating and mediating factors that influence the relationships between psychological, intellectual, and social capital and business innovation has a high potential for future investigation. Finally, this study found a negative moderating effect of organizational culture on the relationship between intellectual capital and business innovation and could not find a moderating influence of organizational culture on the relationship between social capital and business innovation. This needs to be further examined in the future studies.

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