Knowledge process capabilities and innovation: testing the moderating effects of environmental dynamism and strategic flexibility

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Abstract

Knowledge process capabilities are highly associated with innovation performance. Namely, firms which develop better capabilities in processing knowledge can innovate better. The Dynamic Capabilities view states that the effects of contextual variables on capability development cannot be ignored. This study seeks to examine the roles of two contextual variables; environmental dynamism and strategic flexibility on developing knowledge process capabilities and innovation performance. In parallel with this aim, a survey was conducted on a sample of 236 firms from different industries in Turkey and a number of hypotheses including the interaction effects of environmental dynamism and strategic flexibility were tested through moderated multiple regression methods. The three way interaction of knowledge process capabilities, environmental dynamism, and strategic flexibility was associated more strongly with innovation performance than the two way interactions of knowledge process capabilities and environmental dynamism, and knowledge process capabilities and strategic flexibility. Hence, the findings revealed that the effectiveness of knowledge process capabilities on the way of enhancing innovation performance in highly dynamic markets were contingent upon strategic flexibility.

Keywords: Knowledge process capabilities, environmental dynamism, strategic flexibility, innovation performance.

1. Introduction

Innovation research (Roy & Sarkar, 2016; Tanriverdi, 2005; Wu & Chen, 2014; Yayavaram & Chen, 2015) provided insightful findings that knowledge process capabilities (KPC) were highly associated with innovation performance of firms. However, several researchers (i.e., Anderson, Potočnik, & Zhou, 2014; Sirmon et al., 2011; Vera et al., 2016) state that studies which empirically examine the effects of contextual variables on this relationship are rare in the field. The Dynamic Capabilities (DC) view suggests that a specific resource and capability deployment and/or leverage can be contingent on the firms' dynamic resource management capabilities along with the nature of the external environment. Therefore, the effects of these contextual variables should not be isolated from a research model in which a resource or a capability and organisational performance relationship is existent (Schilke, 2014; Sirmon et al., 2011; Sirmon, Hitt, & Ireland, 2007; Wei, Yi, & Guo, 2014). According to the DC view, firms can adapt to a rapidly changing environment through developing strategic flexibility (Matthyssens, Pauwels, & Vandenbempt, 2005; Wu & Chen, 2014; Zhou & Wu, 2010) and the effects of environmental dynamism (ED) and strategic flexibility (SF) can be a determining factor on organisational performance (Schilke, 2014; Sirmon, Gove, & Hitt, 2008).

Innovation performance was assessed through a number of dimensions in the literature. Especially, the number of patents and/or number of new products were commonly used to assess innovation performance (Anderson et al., 2014; Latham & Braun, 2009; Wang & Libaers, 2016). Similarly, a performance measure such as the number of new product configurations was employed in this study (Terziovski, 2010). A new work method or a process should be considered as a type of innovation in manufacturing industries since a new method or a process can substantially change the way that the main product is produced (Leiponen & Helfat, 2010; Wang et al., 2016). Therefore, improvement in work methods and processes were used as another innovation dimension in this research. Performance should be associated with success. However, simply focusing on numbers of new products and processes may produce artificial results on the way of assessing innovation success. For this reason, success of new products and speed to market were also used as other dimensions for innovation performance (Anderson et al., 2014; Terziovski, 2010).

Thus, consistent with the aims of the research and through a multi-dimensional performance assessment, this study reveals the separate and combined effects of KPC, ED and SF on four dimensions of innovation performance: number of new product configurations, success of new products, speed to market, and improved work methods and processes (Liu, Chen, & Tao, 2015; Terziovski, 2010).

This research provides a number of contributions to the literature of knowledge management and innovation: First, the study generates a greater pool of complementary variables which reveals how interactive dimensions of different capabilities (KPC and SF) and ED may influence innovation performance. In this state, the interactive relations between KPC, SF, ED and innovation performance are investigated by a more integrative model. Undoubtedly, through a better understanding regarding the roles and abilities of KPC in predicting innovation performance under different levels of environmental dynamism, firms can be informed about when they should expand their knowledge base and which key capabilities should be upgraded to increase their innovativeness.

Second, this study may enhance our understanding about the effects of KPC on innovation performance by exploring performance variations in each innovation measure (e.g., number of new products, time to market and success rates) individually rather than providing a broad performance indication. Most of the studies in the area assessed the success of innovation by objective measures such as number of patents, number of registered trademarks, and number of new products (Henttonen, Ojanen, & Puumalainen, 2016; Joshi & Nerkar, 2011). However, innovation success is meaningless if the new product does not sell in the market, so apart from the absolute numbers of new products, their success rates after launch should be examined for a more accurate assessment of innovation success. In a study while the increase in the number of new product configurations can be very high, success of new products can be insignificant. Thus, innovation performance would be inflated by high scores of the "increase in number of new product configurations” construct. This result may be evaluated as an overall innovation success for the organisation which may be a misleading research finding because high numbers of new product configurations do not guarantee innovation success. Moreover, the number of studies that consider work and process improvement as a performance indicator of innovation is also limited (Leiponen & Helfat, 2010; Terziovski, 2010; Wang et al., 2016) and this study includes work and process improvement as an indicator of innovation success. The combination of different innovation constructs can provide broad performance indications but variations in each construct may imply different facts which require detailed individual analyses. Therefore, as another contribution, this study brings a greater conceptual clarity on how innovation performance should be evaluated by elaborating the different aspects of performance indication. Third, this paper provides new evidence on the relationship between KPC and innovation performance from emerging market firms. The extant knowledge and innovation literature (e.g., Liu et al., 2013; Wang & Libaers, 2016) argues that because of the unique and dynamic social, political, and economic contexts of emerging economies, emerging market firms have different priorities in their resource possessions and capability developments compared to their developed country counterparts. For example, both firms involve the acquisition of new market knowledge whereas emerging market firms need to upgrade their knowledge integration and application capabilities more rapidly and flexibly in order to adapt to dynamic environments and to enhance their competitiveness given the characteristics of emerging economies (Chen et al., 2017; Keen & Wu, 2011). Against the rising importance of emerging market firms in a global economy, their knowledge processing capacity to increase their innovation performance in particular has not been adequately studied and the majority of related empirical research has been carried out in developed countries (Keen & Wu, 2011; Ramamurti, 2016; Tellis, Prabhu, & Chandy, 2009). Therefore, this study contributes to the literature by sampling firms from a big emerging economy, Turkey and investigating the performance implication of KPC, in particular to the contextual efficacy and SF requirements of the Turkish firms.

2. Theoretical background and hypotheses

2.1.Knowledge process capabilities and innovation

The abilities of a firm to create valuable and strategic knowledge through a series of coordinated knowledge processes can be defined as knowledge process capabilities (Carnabuci & Operti, 2013; Monteiro & Birkinshaw, 2016). The consensus among scholars (e.g., Alavi & Leidner, 2001; Gold, Malhotra, & Segars, 2001; Tanriverdi, 2005) in the area offered four common knowledge processes: creation, transfer, integration and application. Appropriate combination of KPC that are operationalised through several human and technology initiatives enables firms to reveal existing embedded organisational knowledge and create new knowledge (Wei et al., 2014; Yayavaram & Chen, 2015). Besides, KPC help firms to transfer, share and transform this accumulated invaluable knowledge at all organisational levels (Easterby-Smith & Prieto, 2008; Tranekjer & Knudsen, 2012). Thus, effective functioning of KPC enhances the entrepreneurial, intellectual, and creative skills of firms yielding various innovative outcomes as well as "creating links with suppliers, universities, customers, and a wide range of actors in the innovation system" (Wang & Libaers, 2016: 570). Thus, it is hypothesised that:

H_1: KPC are significantly associated with four dimensions of innovation performance that are number of new product configurations, success of new products, speed to market, and improved work methods and processes.

2.2.Moderating effect of environmental dynamism (ED)

Environmental dynamism describes the magnitude and irregularity of changes in competition, customer preferences and technology, and uncertainty, volatility and instability in the external environment (Jansen, Vera, & Crossan, 2009; McCarthy et al., 2010; Wilhelm, Schlömer, & Maurer, 2015). In highly dynamic environments, the unpredictability of change in a firm's external environment may restrict an organisation's ability to sense opportunities and threats, to predict and respond to market demands, and to shift the existing strategic direction towards new strategic alternatives (Jansen et al., 2009; Schilke, 2014; Wilhelm et al., 2015). When a business environment is fully exposed to uncertainty, "the firm finds it hard to respond with the necessary changes, and it will experience considerable levels of volatility in firm" (Chen et al., 2017: 127).

In line with these suggestions, early literature (e.g., Eisenhardt & Martin, 2000; Rosenkopf, & Nerkar, 2001; Smith, Collins & Clark, 2005; Zahra, Sapienza, & Davidsson, 2006) prescribes conceptually the vital need of quickly acquired and/or created unique and mundane knowledge via strong market intelligence and network ties and application of this knowledge to the product and market decisions to address the hyperchanging environmental conditions. Similarly, more recent studies (e.g., Revilla, Prieto, & Prado, 2010; Wang & Libaers, 2016) suggest that fundamental characteristics of environmental dynamism compel firms to develop better KPC which enable sophisticated learning about the environment through using existing knowledge repositories more effective and integrating nonlinear learning experiences with knowledge from outside as well as within the firms. In this case, the firms can heighten the certainty of their predictions, take the right course of actions, generate new, situation-specific knowledge, and strengthen their creative thinking skills that may yield innovative product, service, and process decisions (Teece, 2007; Wang & Libaers, 2016). For example, the firms which developed stronger KPC through real-time information, cross-functional networking, and intensive communication supported by IT skills (Huang et al., 2016; Yayavaram & Chen, 2015) may adopt more innovative product strategies (e.g., sustainability-related products), develop new revolutionary technologies (e.g., energy-efficient technologies) or achieve breakthroughs in substitute input (e.g., grass fibres instead of wood pulp for paper manufacture)" (Chen et al., 2017: 127). Therefore, this study proposes that:

H_2: ED positively moderates the relationship between KPC and innovation performance, such that KPC are associated with better innovation performance in more dynamic environments.

2.3.Moderating effect of strategic flexibility

Strategic flexibility is the capability of recombining and reconfiguring the firms' resource stocks rapidly and executing the actions undertaken by teams, units, or entire firm in real-time (Teece, 2007; Vera et al., 2016). According to Matthyssens et al. (2005), and Zhou and Wu (2010), SF can be achieved through resource flexibility and coordination flexibility because SF deals with the flexible use of resources and reconfiguration of processes. Whilst resource flexibility refers to "the capabilities to accumulate flexible resources with multiple uses", coordination flexibility refers to "the capabilities to create new resource combinations through an internal coordination process" (Wei et al., 2014: 835). SF may influence innovation performance of a firm in different ways.

In the context of resource scarcity where the current resources of firms are intensely bounded to specified targets and resource flexibility is low, "it may be too hard and costly for firms to shift limited resources for other courses of actions and find complementary resources" (Wei et al., 2014: 837). Conversely, high resource flexibility may enable firms to use their internally accumulated resources more easily for new purposes in terms of reduced search time and cost for configuring internal resources (Li et al., 2017; Liu et al., 2013). For example, lack of appropriate IT-based capabilities or highly-skilled employees makes a firm which endeavours to acquire or create new knowledge on the way of enhancing its innovativeness more dependent upon other internal resources (e.g., financial, technological, and human resources). As a result, it may need to commit additional resources or change existing investment (e.g., switching the use of marketing budget to an extra IT investment or transferring some human elements from other units to R&D team, tasked with the pursuit of new knowledge) in exchange for future development of "searching and processing new knowledge beyond the domain of neighbourhood knowledge and embarking on a broader level of exploration" (Zhou & Wu, 2010: 551). Therefore, flexibility in resource allocations or portfolios, manufacturing processes, and product designs helps firms to adapt new technologies and increase the number of the new product configurations significantly (Worren, Moore, & Cardona, 2002).

Besides, SF also serves as an "organising principle for structuring and coordinating various resources and functional units" (Zander & Kogut, 1995: 79). In dynamic product markets, firms may need to reconfigure their production processes quickly, break routine inertia that obliges firms to standardisation, and change the hierarchical organisational structure where knowledge transfer across levels is limited and less space is left for employees to be creative (Gilbert, 2005; Zhou & Wu, 2010). A high level of coordination flexibility may enable firms to acquire, build, transfer and integrate new knowledge rapidly by relaxing routine and "overcoming the negative effect of 'hard to be absorbed' from resource acquisition as well as the negative effect of core rigidity associated with internal inertia" (Li et al., 2017: 477). When coordination flexibility is high, firms can break down their knowledge and institutionalised technological processes more effective and explore new alternatives easier (Gilbert, 2005; Wei et al., 2014).

Consequently, firms with strategic flexibility can reduce the response time to dynamic changes and purposefully create, extend or modify their knowledge-base which enables firms to process their knowledge resources in the most effective way, thus enhancing the value of knowledge for superior innovation performance in dynamic environments (Gilbert, 2005; Li et al., 2017; Zhou & Wu, 2010). Therefore, we suggest that:

H_3: SF positively moderates the relationship between KPC and innovation performance, such that KPC are associated with better innovation performance in firms with a high level of SF.

2.4. Combined effect of ED and strategic flexibility

In the performance creation process, several factors interact with each other (Sirmon et al., 2007, 2011) and examining "the independent or separated effect of each factor alone would be insufficient to explain the complex links between such factors" (Li et al., 2017: 477). Given the complex nature of performance creation, the impact of KPC on innovation performance should be investigated by an analysis that concerns the joint effects of other factors under specific contexts in a complementary manner.

In this sense, the joint effect of ED and SF may compound the situational efficacy of KPC that determines the level of innovation performance. We suggest that in dynamic environments, firms with a high level of SF develop more effective KPC that maximise innovation performance. Thus, it is proposed that:

H_4: There is a three-way interaction between KPC, SF, and ED, such that in the presence of a high level of ED, the innovation performance effect of KPC is stronger for firms with a high SF.

Figure 1 illustrates the framework of study concerning the hypotheses developed.

Figure 1.

3. Methodology

3.1. Sample and data collection

The survey data were collected from Turkey as one of the most dynamic economies in the world to test our hypotheses. The sample covers the largest 1,000 firms from a broad scope of industries and different districts of Turkey. The firms were selected out the list of registered corporations provided by Istanbul Chamber of Industry (ISO-1000 Database, 2015), which is a special administrative institute to take the necessary measures to develop trade and industry in the country. Given the lack of sufficient databases in Turkey, the sample that was designed for multiple research purposes could be considered as the best available and relevant sample for this research. Therefore, the largest 1000 firms of 2014 were chosen and the valid names and e-mails of senior-level executives of the companies were obtained for this study. Although the sampling method chosen seems to be convenient sampling that has sometimes been criticised about its inadequacy to represent an entire population and the creation of biased samples (Saunders, Lewis, & Thornhill, 2012), this sample comprises nearly all prominent firms competing in a variety of industries that can be investigated. The top or department managers with deep knowledge about their firms' resource base and performance issues were chosen as the key informants (Cao, Simsek, & Jansen, 2015; Menz, 2012). The questionnaires were sent to only one executive from each firm with a covering letter that explains the purpose of the study and ensures confidentiality of their replies. The final sample consisted of 236 useable questionnaires, for an effective response rate of 23.6%.

3.2.Measurement instrument

A survey questionnaire with five construct categories and a control variable category was employed as the measurement instrument. To remove whatever affect it might have on firm performance, we controlled firm age, firm size and industry structure. The dependent and independent variables were measured with 38 survey items. Table 1 reports the items of the survey and their theoretical sources. All survey items were measured on 5-point Likert scales and reliability and validity issues were assessed. This study employs perceived measures for the assessment of the constructs. Namely, subjective measures were used instead of objective measures. Perception-based construct measurement is common in organisational research (e.g., Rai, 2016; Schippers, West, & Dawson, 2015; Vera et al., 2016) and latent constructs (that is, characteristics of people such as attitudes, feelings, and opinions) are generally measured by Likert-type scales since they are very useful when "intensity" of an opinion was assessed (Saunders et al., 2012).

3.3.Reliability and validity

A number of tests for reliability, convergent validity, and discriminant validity were conducted and the presence of multicollinearity was examined by checking inter-item correlations. The reliability of the constructs was tested by Cronbach's alpha coefficients. The constructs that have alpha values equal to and higher than the minimum threshold value of 0.70 (Nunnally & Bernstein, 1994) indicated adequate internal reliability: KPC (α=0.804), ED (α=0.856), SF (α=0.789), Innovation Performance (α=0.862), and Industry Structure Forces (α=0.838).

Besides, an exploratory factor analysis with VARIMAX rotation was employed in order to assess construct validity of the scale. Factor analysis yielding five factors revealed that all items exceeded the cut-off point 0.50 to confirm construct validity (Saunders et al., 2012).

Table 1.

Independence of the predictor variables is important since highly correlated independent variables can predict each other and may cause problems with multicollinearity which influence the accuracy of the regression analysis negatively (Saunders et al., 2012). So, inter-correlations between variables were examined (Table 2). Moderate levels of correlations that were below 0.80 did not seem to create multicollinearity problem (Saunders et al., 2012).

Table 2.

Lastly, common method bias was assessed by Harman's single-factor test (Podsakoff., MacKenzie, & Podsakoff, 2003). It showed five factors with eigenvalues greater than 1, and the largest factor explained only 21.8% of the total variance. Since no single factor emerged and no primary factor explained majority of the variance, common method bias was not considered as a serious threat. The study further used a confirmatory factor analysis (CFA) to compare the fit indices of a multi-factor model and a single overall latent factor model (Anderson & Gerbing, 1988). In this approach, the fit indices of a single factor model were assessed after linking all items of the dependent and independent factors to a single factor (Wei et al., 2014). The fit indices ($\chi^2 = 173.96$, $p<0.05$; comparative fit index [CFI] = 0.76; goodness of fit index [GFI] = 0.72; route mean square error of approximation [RMSEA] = 0.146; non-normed fit index [NNFI] = 0.69) indicated that this model did not fit the data well. When all items were assigned to their theoretical factors, the multi-factor model fits the data ($\chi^2 = 119.72$,

$p<0.05$; [CFI] = 0.94; [GFI] = 0.95; [RMSEA] = 0.059; [NNFI] = 0.93) considerably better than the one-factor model, confirming the inexistence of common method variance in the study.

This study employs multiple hierarchical regression method to test the established hypotheses. In this method, each set of independent variables is entered into separate blocks for analysis and the incremental change of the R^2 statistic which is assessed as "an indicator of the fraction of the variance explained by each independent variable is calculated" (Saunders et al., 2012). Hence, the unique contribution of each independent variable in explaining dependent variable is explored. Similarly, in this research, the control variables (age and size) along with the industry structure variables of Porter's (1980) framework (Model 1), KPC (Model 2), ED and SF (Model 3), two-way interactions of KPC, ED and SF (Model 4), and three way interactions of KPC, ED and SF (Model 5) were entered into regression analysis respectively. Having calculated the contribution of each independent variable, the established hypotheses were accepted or rejected.

4. Results

Table 3 presents the results of regression analyses. In Model 1, the control variables were entered separately, but firm age, firm size and industry structure factors did not explain a significant share of the variance in all dimensions of innovation performance. In Model 2, KPC was added and a positively significant relationship between KPC and three dimensions of innovation performance was found: number of new product configurations – config. (β = .263**, $p<$ .05), speed to market – speed (β = .284*, $p<$ .01), and improved work methods and processes – impr. (β = .116***, $p<$ .001). Therefore, H_1 is supported.

The two moderators were entered in Model 3, and SF had a significant effect on three dimensions of innovation performance; config. (β = .241***, $p<$ .001), speed (β = .192*, $p<$ .01), and impr. (β = .118**, $p<$ .05), while ED had a significant effect on two dimensions of innovation performance; config. (β = .198**, $p<$ .05), and speed (β = .176**, $p<$ .05).

In Model 4, the joint effect of KPC and ED was significant on only two dimensions of innovation performance; config. (β = .293***, $p< .001$) and speed (β= .312*, $p< .01$). Similarly, the joint effect of KPC and SF was significant on config. (β = .317***, $p< .001$) and speed (β = .366**, $p< .05$). R^2 changes were also significant for only those two dimensions of performance.

Table 3.

Thus, H_2 and H_3 were partially supported. Finally, the interactive dimension of KPC, ED, and SF was significant on three dimensions of innovation performance; config. (β = .345***, $p< .001$), sucs. (β = .121**, $p< .05$), and speed (β = .378**, $p< .05$) resulting in the confirmation of the last hypothesis, H_4. Hence, based on the β coefficients and significant R^2 changes, H_1 and H_4 were supported, while H_2 and H_3 were only partially confirmed.

5. Discussion

The study contributes to the literature of knowledge and innovation in a number of ways. First, the critical role of effective knowledge processing on innovation performance was once more shown in this study (Wu & Chen, 2014). However, although the study found direct positive significant relationships between KPC and three dimensions of innovation performance, the effect of KPC was weak on improved work methods and no impact on success of new products was found. This situation shows that KPC has different impact levels on different innovation dimensions which requires further examination. Yet, it is not possible to explain why and how this happens based on the findings we have so far. Thus, this result will be elaborated in combination with the other findings of the study to provide a better explanation. Second, the study posited that the impact of KPC would be stronger on innovation performance under high levels of ED. The findings indicated partial support for this proposition since number of new product configurations and speed to market were significantly associated with KPC under high levels of ED while success of new products and improved work methods and processes were not.

This partial support can be explained better through integration of the specific economic, social and political conditions of the country in which the firms operate (Cavusgil, Ghauri, & Akcal, 2013). Rapid and discontinuous changes are common in the Turkish economy where a high ED occurs (Cavusgil et al., 2013). Moreover, related to different local cultures and varieties in lifestyles throughout the country, consumer preferences are very divergent in Turkey (Sandikci & Ger, 2007). According to Sandikci and Ger (2007: 147–148), "the consumer behaviour of Turkish people were shaped by attractive shopping malls that offer a great variety of and fast proliferating "new and improved" goods and the notion of the 'good life,' and 'modernity' was tied to the consumption of flashy, trendy and fashionable new products". Therefore, "Turkish firms may have given priority to offering as many as new product configurations rapidly to be able address the needs of this dynamic market where fast-changing consumption preferences exist" (Kamasak, Yavuz, & Altuntas, 2016: 247) and used their KPC especially for this aim. However, this strategic action does not guarantee the success of new products in the market. A number of new product configurations along with quick product offerings can be considered as positive parameters to gain competitive advantage in markets. However, the desire of over ambitious managers to increase the number of new products frantically may bring the risk of making hectic decisions with respect to new product preferences and timing to market which may lead to unsuccessful results. Another insignificant association with improved work methods and processes can also be related to the competitive strategy choices of the Turkish firms. Turbulent and competitive environment may have compelled "the firms to focus on addressing the increasing new product demands of impatient consumers rapidly and giving most of their efforts to design, creative thinking, marketing and quick production issues" (Kamasak et al., 2016: 247) rather than efficiency related issues like work methods and processes.

Improvements in work methods and processes do not offer direct value and attraction to customers but generally provide efficiencies and/or cost advantages in the firm's value chain (Liu et al., 2015; Schroeder, Bates, & Junttila, 2002).

Third, the findings revealed that SF enhanced the positive relationship between KPC and innovation on two dimensions of innovation performance, the number of new product configurations and speed to market, leading to a partial support for H_3. On the other hand, success of new products and improved work methods and processes dimensions were not significantly associated with the interactive effect of KPC and SF just like in the previous relationship (H_2). In different environmental contexts and dynamic resource management conditions, these dimensions were found insignificant in this study. Parallel to these findings, in testing the direct relationship between KPC and innovation performance dimensions (H_1), the analyses found no significant association with success of new product while a weak significant relationship was found for improved work methods and processes. Therefore, these findings may justify our suggestion that the firms under investigation focused on product issues rather than work method and process issues which may be linked to the competitive strategy choices of the firms as explained above. With respect to success dimension, again launching a high number of new product configurations may not be a premise for success since what to produce and/or modify and when to produce and/or launch are subject to prudent organisational decisions and "success" can emerge as a consequence of multitude of several factors. So, KPC and SF interaction may lead to an increase in absolute numbers of new products or a decrease in launch time of new products but to be able to have positive financial results, support from other resources and capabilities (e.g., marketing and distribution, logistics or effective leadership) may be necessary.

The study also found that SF makes the positive linkage between KPC and the dimensions of innovation stronger that ED. SF promotes the flexible use and coordination of resources to support KPC and quick decision-making thereby enables firms to assimilate and use new information better, create more new product configurations and move readily to new markets (Matthyssens et al., 2005; Zhou & Wu, 2010). In this sense, SF makes the positive impact of knowledge stronger on innovation performance by shifting or optimizing the use of other resources on the way of supporting KPC. Thus, SF "appears to be one type of dynamic capability that enables firms to achieve the potential of their KPC" (Zhou & Wu, 2010: 558).

Lastly, the interactive effects of the two capabilities (KPC and SF) on innovation performance were strongest when ED was high. Besides, the explanatory power of the interaction effects of KPC and SF under high level of dynamism was the highest for the variations in number of new product configurations and speed to market figures. The analyses indicated that three-way interactions of KPC, ED and SF provided an additional significant explanation power of 10.4% ($\Delta R^2 = .104$; $F = 3.994^{**}$, $p< .05$) for number of new product configuration and 11.5% ($\Delta R^2 = .115$; $F = 4.525^{**}$, $p< .05$) for speed to market in the regression model. A more interesting finding is that so far insignificant dimension of innovation performance, success of new products, turned out to be significant ($\beta = .121^{**}$, $p< .05$) after the entrance of three-way interactions of KPC, ED and SF in Model 5.

Thus, the combination of appropriate environmental conditions and joint effects of dynamic capabilities created a stronger synergy resulting in better innovation performance. In accordance with these findings, this study concluded that the effectiveness of KPC leading to innovation performance in highly dynamic markets was contingent to SF.

6. Managerial implications

A number of managerial implications can be derived from this research. First of all, in emerging markets where firms may face several unknowns and unexpected changes, the obligation of making quick new product decisions increases the risk of failure. Wrong new product decisions could result in non-productive investments, increase in costs, loss of opportunities in the market and damage corporate image.

As empirically confirmed in this study, SF helps firm to reorganise and recombine their knowledge base according to the type of specific knowledge required in the market and thereby SF significantly enhances the efficiency of KPC resulting to an increased innovation performance. In order for firms to achieve a high level of flexibility, hierarchical structures which imply less flexibility and more rigidity should be replaced with flatter organisational structures which include business units with self-organising teams (Zhou & Wu, 2010). Besides, flexible supply chain, logistics and manufacturing processes (Fan, Schwartz, & Voss, 2017) with modular product designs (Worren et al., 2002) should be developed and a supportive and facilitating corporate culture in favour of rapid decision making and deployment of resources to address requirements of dynamic markets should be maintained (Gilbert, 2005; Zhou & Wu, 2010). Finally, although SF was considered as a vital complementary dynamic capability, it should not be regarded as a universal, one-fits-all solution (Wei et al., 2014) given the context-specific effectiveness of dynamic capabilities (Schilke, 2014; Sirmon et al., 2008). Finally, managers should pay attention to simultaneously utilise the appropriate mixes of resources and capabilities but priority should be given to the most important ones.

7. Limitations and future research

First, the results of this study, based upon the context-specific sample from Turkey, should be considered as tentative. In order to generalise the findings, future research should be conducted in other economies. More importantly, even though our cross-sectional survey is appropriate for the purpose of this study, future research should adopt a longitudinal design which may enhance the effectiveness of the framework.

Second, in accordance with the nature of the research (i.e., gathering information about time to market) and limitation of obtaining some secondary data (i.e., number of new product configurations), a perception-based measurement was used. Objective measures, such as R&D intensity and number of patents, can be useful for validating the propositions of the study. It gathered quantitative data from one respondent each within individual firms, the results can be validated in large organizations and SMEs involving multiple respondents in a future study. The study was conducted in a developing country and therefore presents an opportunity for future research to undertake a comparison of developed and developing country contexts.

Lastly, a construct set that includes a broader but not exhaustive number of resources and capabilities might be helpful for a better investigation of resource and capability and innovation performance, given the small R^2 and R^2 changes indicating that some other influential constructs may have been omitted in the model.

More sophisticated models that use other influential factors such as learning ability, human capital, and social capital structural and other research methodologies (i.e., equation modelling to capture the whole domain of multi-item scale interaction) may provide more explanatory results for innovation performance.

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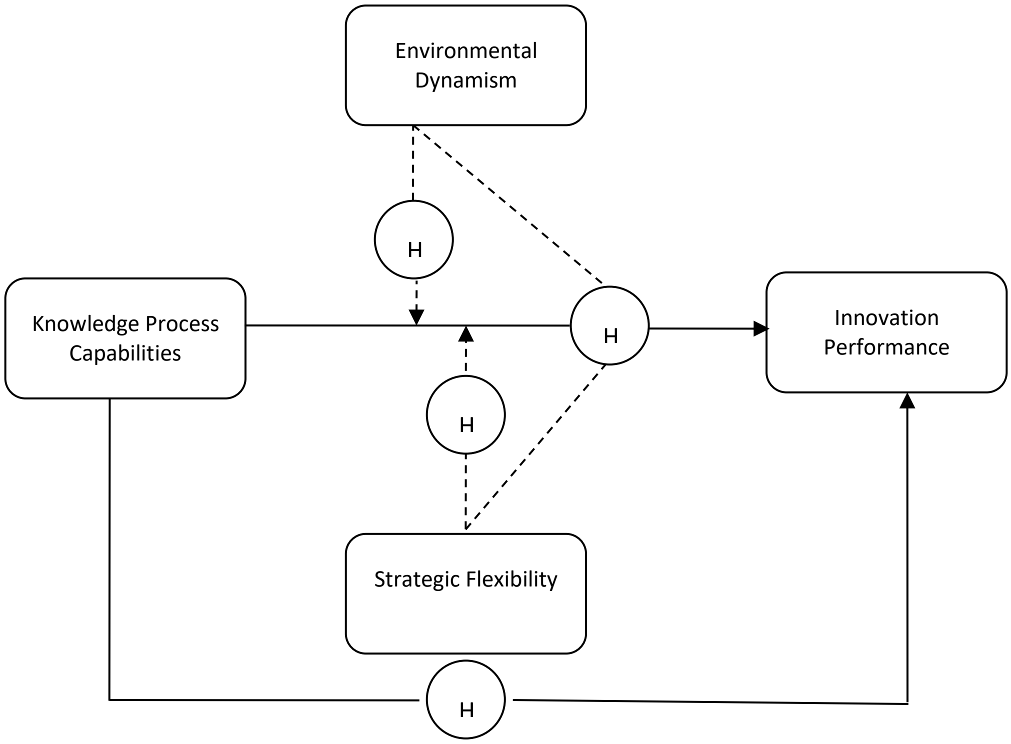

Figure 1. Conceptual Model

Table 1. Items of the questionnaire, factor loadings and Cronbach alpha coefficients

Variables	Items	Loadings	Alpha
Knowledge Process Capabilities (Alavi & Leidner, 2001; Gold et al., 2001; Tanriverdi, 2005; Wu & Chen, 2014)	Our firm has capability to distribute relevant knowledge throughout the organization (via collaborative platforms, social software, blogs, and wikis etc.).	0.934	
	Our firm has capability to share relevant knowledge among business units.	0.897	
	Our firm has capability to develop knowledge from internal and external knowledge sources (via IT systems, call centers, CRM, ERP, supply chain, and logistics systems etc.).	0.832	0.804
	Our firm has capability to transfer relevant knowledge to employees.	0.796	
	Our firm has capability to apply knowledge to develop new products/services.	0.783	
	Our firm has capability to organize and manage knowledge.	0.772	
	Our firm has capability to apply knowledge to solve new problems.	0.764	
	Our firm has capability to apply knowledge to change competitive conditions.	0.719	
	Our firm has capability to store acquired knowledge into organizational knowledge repository.	0.695	
	Our firm has capability to integrate different sources and types of knowledge.	0.628	
	Our firm has capability to codify acquired knowledge into accessible and applicable formats.	0.563	
	Our firm has capability to interpret new knowledge on the basis of prior knowledge*.	0.472*	
Environmental Dynamism (ED) (Jansen et al., 2009; Zhou & Wu, 2010)	In our local market, changes are taking place continuously.	0.912	
	Environmental changes in our local market are intense.	0.885	
	The technology in this industry is changing rapidly.	0.871	0.856
	Our clients regularly ask for new products and services.	0.799	
	In our market, the volumes of products and services to be delivered change fast and often.	0.781	
Strategic Flexibility (Zhou & Wu, 2010; Wei et al., 2014)	The time required to switch to an alternative resource use is short.	0.896	
	The costs of switching from one use of our major resources to an alternative use are low.	0.884	
	The firm often finds new resources through communication between units.	0.831	
	Internal units often collaborate with each other to find a new use for internal resources.	0.826	0.789
	There is a large range of alternative uses to which our major resources can be applied.	0.767	
	The difficulty of switching from one use of our major resources to an alternative use is low.	0.752	
	The firm often finds new resources and/or new combinations of existing resources.	0.731	
	The firm often finds new resources and/or new combinations of external resources.	0.718	
	The major resources can be allocated to develop, manufacture, and deliver a diverse line of products.	0.699	
Innovation Performance (Jansen et al., 2009; Terziovski, 2010; Wei et al., 2014)	In the last three years, compared to our major competitors, our firm is more successful in terms of:		
	Success of new products.	0.943	
	Speed to market.	0.878	0.862
	Number of new product configurations.	0.844	
	Improved work methods and processes.	0.795	
Industry Structure Forces (Porter, 1980)	The number of competitors vying for customers in our industry is (Very low – Very high)	0.913	
	How easy is it for new firms to enter and compete in your industry (Very easy – Very difficult)	0.901	
	What level of bargaining power (i.e., ability to negotiate lower prices) do you have over your suppliers (Very weak – Very strong)	0.829	0.838
	What level of bargaining power (i.e., ability to negotiate lower prices) do customers have over your firm (Very weak – Very strong)	0.817	
	To what degree is your industry threatened by substitute products/services (No threat – Extreme threat)	0.764	

*Dropped item

Table 2. Inter-correlation matrix

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	VIF
1. Firm size	403.76	391.04	1.00										1.348
2. Firm age	29.41	31.25	.06	1.00									1.879
3. Industry structure forces	3.73	1.06	-.01	-.02	1.00								2.013
4. Knowledge process capabilities	4.17	.82	.13***	.11*	-.09	1.00							1.945
5. Environmental dynamism	3.86	.69	.08	.03	.34***	.41***	1.00						1.622
6. Strategic flexibility	3.58	.74	.01	-.12**	.19*	.22**	.25*	1.00					2.284
7. Success of new products	3.29	1.08	-.04	.19**	.05	.11***	-.14**	.13**	1.00				1.396
8. Speed to market	4.87	.43	.03	.09	-.03	.18***	.11*	.38***	-.11***	1.00			1.009
9. New product configurations	4.62	.36	-.06	-.11***	.12**	.22**	.09	.29***	.07	.05	1.00		2.067
10. Improved work methods & processes	4.19	.57	.09	.08	.14*	.26**	.04	.21**	.12**	-.07	.02	1.00	1.348

*$p<0.05$; **$p<0.01$; *** $p<0.001$

Table 3. The results of regression analyses and the moderating effects (n = 236)

	Innovation performance dimensions (Number of new product configurations [Config.], success of new products [Sucs.], speed to market [Speed], and improved work methods and processes [Impr.])																			
Predictors	**Model 1**				**Model 2**				**Model 3**				**Model 4**				**Model 5**			
	Config.	Sucs.	Speed	Impr.	Config.	Sucs.	Speed	Impr.	Config.	Sucs.	Speed	Impr.	Config.	Sucs.	Speed	Impr.	Config.	Sucs.	Speed	Impr.
Controls																				
Firm age	-.101	.063	-.023	.045	-.084	.052	.054	.039	-.052	.026	.015	.048	-.073	.013	.037	.028	-.044	.091	.046	.058
Firm size	.074	.059	.032	.057	-.022	.073	.027	.063	.019	.054	.023	.077	.039	.046	.017	.032	.055	.063	.011	.049
Industry structure factors	-.083	.046	.017	.066	.015	-.018	.038	-.025	.033	-.048	-.017	.063	-.021	-.052	.024	.023	.015	-.012	.027	.034
Independent variables																				
Knowledge process capabilities (KPC)					.263**	.081	.284*	.116***	.232**	.084	.257**	.111**	.216***	.098	.195*	.083	.228***	.101**	.163**	.102**
Moderating variables																				
Environmental dynamism									.198**	-.027	.176**	.092	.215**	.072	.171*	.134**	.159**	.115**	.173*	.146**
Strategic flexibility									.241***	.033	.192*	.118**	.169*	.123**	.164**	.077	.178*	.081	.139**	-.059
Two-way interactions																				
KPC X environmental dynamism													.293***	.074	.312*	-.089	.267**	.097	.345**	.073
KPC X strategic flexibility													.317***	.098	.366**	.064	.221***	.069	.204*	-.065
Environmental dynamism X strategic flexibility													.087	-.035	.233*	.047	.094	.021	.129*	.044
Three-way interactions																				
KPC X environmental dynamism X strategic flexibility																	.345***	121**	.378**	.096
R^2	.055	.046	.036	.042	.151	.058	.174	.086	.196	.069	.231	.091	.283	.085	.324	.099	.387	.126	.439	.105
ΔR^2	—	—	—	—	.096	.012	.138	.044	.045	.011	.057	.005	.087	.016	.093	.008	.104	.041	.115	.006
F -value	1.023	1.006	.952	.964	2.351**	1.534	2.576**	2.069**	2.474**	1.749	2.502**	1.945	3.206**	1.844	3.556**	1.863	3.994**	2.447***	4.525**	1.902

*$p<0.05$; **$p<0.01$; *** $p<0.001$