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Effect of opportunity seizing capability on new market development and small and medium-sized enterprise performance: Role of environmental uncertainty in the IT industry^{☆, ☆ ☆}

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ABSTRACT

With the rapid evolution of technologies and markets in the IT industry, it is especially crucial for small and medium-sized enterprises (SMEs) in the IT sector to possess the dynamic capability of seizing opportunities. This paper adopts the concept of “opportunity–seizing capability (OSC)” from the perspective of dynamic capability, and investigates its impact on relative firm performance via new market development. Furthermore, we examine whether environmental uncertainty influences the effect of a firm's OSC. Our hierarchical ordinary least squares regression results obtained using the data of 215 IT SMEs indicate that new market development is an important link between a firm's OSC and relative performance. The positive effect of a firm's OSC on new market development is stronger under a highly uncertain business environment. The findings indicate that enhancing an IT SME's OSC is crucial for its survival, particularly under an uncertain business environment.

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1. Introduction

Several studies have explored the link between dynamic capability and firm performance (Pezeshkan et al., 2016) since the seminal work of Teece et al. (1997). Dynamic capability refers to the ability of a firm to configure its resources to adapt to a changing business environment (Pezeshkan et al., 2016). In the literature, various terms have been used for this concept, such as general dynamic capability and specific dynamic capability (opportunity recognition, seizing, and resource reconfiguration). This paper focus on the effect of opportunity-seizing capability (which is defined as the ability to seize opportunities through mobilizing resources) as it is especially crucial to the growth of IT SMEs (Lin &

Wang, 2015; Murray et al., 2011; Pezeshkan et al., 2016; Wilden et al., 2013). According to Teece (2007), the nature of opportunity seizing capability (OSC) includes addressing perceived technology/market opportunities with new products/processes/services. This is associated with selecting or inventing business models that define commercialization and investment strategies as well as deciding when, where and how to invest. OSC consists of micro-foundations involving product structure and business model selection, enterprise boundary selection, complementary asset and platform management, decision making and organizational culture management (Teece, 2007).

The reason we are particularly interested in seizing is that even if SMEs recognize business opportunities, they can fail to invest in innovation if they are not captured the opportunities in a timely and strategic way. Identifying opportunities (sensing) and actually executing them (seizing) requires distinct skills and processes. As resources of SMEs limited, the ability to prioritize investments and select business models is critical. Furthermore, reconfiguring capability is of great importance as it is a capability to maintain a strategic competitive advantage from the point of time after seizing an opportunity. However, if opportunities are not adequately seized first, the benefits that reconfiguring capability will be limited.

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Accordingly, we regarded SMEs' capability to seize opportunities as a priority in adapting and innovation, and thus we investigated this.

Dynamically changing technologies and market needs generally characterize the IT sector (Joung et al., 2014). Under an uncertain environment, capturing new opportunities promptly is crucial owing to the rapid obsolescence of existing business models (Jansen et al., 2006). This particularly applies to SMEs with limited resources, which rely on opportunities for their growth and survival (Guo et al., 2017). For SMEs operating business in the IT industry, they are more likely to use information technology to facilitate opportunity seizing. For example, they can use real-time data of asset deployment to dynamically optimize business asset composition using predictive analytics tools. In other case, they can use a statistical decision support system to create a data-driven strategy for prioritizing customer targeting by profit return (Conboy et al., 2020). Therefore, it is meaningful to identify the mechanism through which a firm's OSC enhances organizational performance and the boundary condition that reflects increased effectiveness of an IT SME's OSC.

However, existing studies have limitations. First, there is insufficient consensus on whether the relationship between OSC and firm performance is direct or indirect. There are two main perspectives that can explain how the capture of opportunities creates value. Certain scholars opine that OSC directly affects firm performance (Teece, 2007). However, not all SMEs are successful in leveraging opportunities because such opportunities are not automatically linked to firm performance. Firms must undertake market development activities to capture opportunities and thereby create financial value (Chi et al., 2016; Guo et al., 2017). Considering this, the other perspective indicates that OSC affects firm performance indirectly through marketing or other operational activities (Protogerou et al., 2011). Taking a step further from existing research, we need to understand more deeply how OSC leads to corporate-level performance through the development of new markets, which is an entrepreneurial activities. Indeed, many studies of the OSC confuses the terms of "new product" development and "new market" development, making it difficult to understand the role of new market development in relation to OSC. However, in the context of innovation, market development is a broader meaning involving product development, so the two concepts must be clearly distinguished. Market development is a more comprehensive activity that strategically deploys one product or multiple product portfolios. Therefore, it is difficult to observe all market development activities simply by investigating new product development activities. Also, not all new product developments are always innovative. For example, new product development in mature markets (e.g., smart phone market) is usually a gradual improvement to maintain the existing market. Market development, however, allows companies to more actively adapt to the environment by destroying or expanding existing markets and even creating new markets (Sulistyo, 2016).

Accordingly, this study will focus on the market development of how resource-limited SMEs achieve superior performance through opportunities seizing. This is not the first time such an attempt has been made. For example, King and Tucci (2002) suggests that the ability of companies to recognize opportunities is related to market development by providing evidence that experience in existing markets increases the likelihood of new market entry. This means that prior experience can facilitate to capture new business opportunities proactively (Zhao & Smallbone, 2019). However, empirical studies that specifically examine the role of new market development are not enough. Furthermore, because SMEs have limited resources, they may fail to develop their opportunities into markets or may give up before trying to develop opportunities. Considering these limitations, further research is needed on how

successful SMEs transform the opportunities they have gained through market development. Also, additional attention must be accorded to those contingency factors that affect the relationship between a firm's OSC and NMD in order to identify the circumstances under which a firm's adaptation mechanisms are effective. The IT sector is particularly characterized by high environmental uncertainty (EU) and R&D intensity (as defined by a firm's ratio of R&D to sales) (Corrocher et al., 2007). For those IT SMEs that lack resources, the impact of uncertainty may be crucial, as the risk of failure for such firms can be higher in relation to large companies (Ireland et al., 2003). Because SMEs rely on opportunities for survival and growth owing to their small size (Guo et al., 2017), the impact of EU on the effectiveness of OSC and NMD must be considered. Thus, the main research questions (RQs) are derived as follows.

RQ1. Does Opportunity Seizing Capability (OSC) affect the performance of IT SMEs through new market development (NMD)?

RQ2. Does environmental uncertainty (EU) affect the magnitude or direction of the effects of OSC on NMD?

This study fills the above-outlined knowledge gaps in the following ways. First, we investigate the indirect effect of OSC on firm performance by examining the mediating role of NMD. Next, we explore whether the relationship between a firm's OSC and NMD is contingent upon EU.

This study contributes to the existing literature by first making a theoretical contribution in formulating a new model depicting how opportunity-seizing enhances SME performance in an uncertain business environment. Whereas the existing literature has predominantly investigated the relationship between OSC and firm performance (Pezeshkan et al., 2016), this study explores the relatively understudied role of NMD. It makes another theoretical contribution by identifying the role of EU in enhancing an enterprise's ability to capture opportunities that, in turn, foster the development of new markets. Third, this study makes an empirical contribution by validating the OSC of IT SMEs to adapt to an uncertain business environment. This provides implications for how SMEs with limited resources can achieve superior organizational performance in the IT sector, which is characterized by a rapid pace of change and a diverse knowledge base.

2. Theoretical background

2.1. Opportunity-seizing capability (OSC) from the dynamic capability perspective

Based upon the perspective of dynamic capability, this study defines the concept of OSC and examines its impact on relative performance. The focal point of OSC is opportunity addressing and resource readiness for adaptation (Barreto, 2010). Opportunity seizing, one of the specific pillars of dynamic capabilities (Liao et al., 2009), is important for SMEs, considering the obsolescence of existing business models under an uncertain environment in which customer needs, technologies, and competing rules change unpredictably.

Opportunity-seizing is defined as the "mobilization of resources to address needs and opportunities" (Teece et al., 2016). The ability of existing firms to capture opportunities involves resource acquisition and coordination to facilitate the introduction of new business solutions. This capability is distinct from the concept of opportunity sensing, while these two capabilities are being interrelated. Seizing focuses on using new knowledge to create new products/services, while sensing focuses on gathering new market knowledge and identifying opportunities through it

(Hurley & Hult, 1998; Pavlou & El Sawy, 2011). Organizational learning occurred in the process of seizing opportunities often reinforces sensing of new opportunities (Cohen & Levinthal, 1990). Zahra and George (2002) developed the absorptive capacity as a dynamic capability, which is based on a routine of acquiring, absorbing, converting, and exploiting knowledge. According to their research, knowledge exploitation is similar to seizing opportunities through learning. Here, knowledge exploitation includes the pursuit of new initiatives and the opportunity seizing through learning. Also, Pavlou and El Sawy (2011) described learning capability as a component of dynamic capability, and stated that this capability relates to activities that address identified opportunities as new products, and these activities requires revamping existing competency with knowledge and skills. This learning capability shares common keywords with OSC. Accordingly, we define a firm's OSC as *the resource building ability of a firm for exploiting opportunities* (Teece et al., 2016). This includes the evaluation, acquisition, and integration of resources according to strategic objectives (Wilden et al., 2013).

The literature on entrepreneurship defines opportunity as an idea that has the potential to be developed into a business venture (Dimov, 2007). Specifically, an opportunity refers to a situation in which new products, services, production methods, technologies, and customer segments can be introduced through the formulation of new strategies or objectives (Shane & Venkataraman, 2000). The existing literature propounds three major perspectives: opportunities are either created, discovered, or recognized by entrepreneurs (Saravathy et al., 2003). Of these, the most relevant to this study is the perspective of opportunity-recognition. This proposes that an opportunity is distinct from its source and thus, should be recognized and then *exploited* by a firm regardless of whether it is created or discovered.

Research at the organizational level regarding a firm's OSC may also contribute to the literature on entrepreneurship. Organizational activities to capture opportunities will be governed by operational routines and organizational perceptions, rather than by the perceptions of an individual entrepreneur. Opportunity-seizing by an organization is related to the process of connecting discrete resources and knowledge to realize perceived opportunities. These activities are frequently undertaken by SMEs adapting to the business environment (Guo et al., 2017; Song et al., 2017).

2.2. New market development (NMD)

New market development (NMD) by an existing firm refers to *activities to create and improve its business models for building its customer base*. This involves the transformation of technologies and innovative ideas into a feasible business venture and has received widespread attention from studies on business model innovation (Guo et al., 2016). The activities to develop new markets facilitate the creation and expansion of the customer base of a firm through the intentional renewal of its business model (Schilke, 2014).

New market development differs from the concept of OSC. The latter enables firms to adapt to environmental changes by assimilating external information regarding opportunities, and to modify the resource composition accordingly to capture opportunities. In contrast, NMD pertains to the activity of actively combining resources to institute changes from within a firm to adapt to external conditions. Whereas the concept of NMD shares common ground with the concept of OSC in that it combines resources, its focal point (unlike that of OSC) is the generation of customer demand.

New market development is imperative for IT SMEs as it determines the economic outcome of innovation (Chesbrough, 2010; Liao et al., 2009). It contributes to value creation by promoting improvements in the business-environmental fit from the

perspective of customer needs (Protogerou et al., 2011). As a larger number of physical goods are combined with virtual goods, more opportunities for growth are created for IT firms. Meanwhile, threats such as the entry of new competitors from outside the industry, the declining costs of switching, and the intensifying competition over digital business models have also become significant (Evans, 2017). Accounting for these opportunities and threats and the development of a business model that solves customer problems and effectively satisfies market needs is essential to value creation. Although many firms invest a significant amount of resources in the opportunities that they can potentially avail of, they are generally unsuccessful in creating new value because they fail to develop relevant business models.

3. Hypotheses

3.1. Effect of OSC on performance: the mediating role of NMD

This study suggests that a firm's OSC promotes NMD activities and that NMD has important implications for firm performance.

The research on dynamic capability (including sensing, seizing, reconfiguring capability) began with an interest in its potential impact on the competitive advantage of a firm (Teece et al., 1997). A firm gains a competitive advantage upon outperforming its current and potential competitors. The relative performance of a firm over its competitors has generally been used as an empirical yardstick for competitive advantage (Schilke, 2014).

The enhancement of an IT SME's OSC can improve relative performance, the ability to adapt in an uncertain business environment successfully, and superior organizational performance (Liao et al., 2009; Murray et al., 2011; Pezeshkan et al., 2016). SMEs with limited resources rely heavily on opportunities for survival and growth (Ireland et al., 2003). Furthermore, the frequent changes in technology and markets in the IT sector may cause the rapid obsolescence of the existing business models of SMEs, which may further result in the inability of SMEs to sustain the competitive advantage that is derived from such models. Therefore, the importance of capturing opportunities to foster the growth of IT SMEs cannot be overstated. In an era where digital technology is converging with business services and various industries, IT SMEs often need to use technology to promote opportunity seizing. Indeed, IT is a core practice that contributes to the generation of organizational performance through the data fusion related to monitoring, learning, integration and reorganization (Mikalef & Pateli, 2017; Siegel, 2010). This seizing capability ensures that a firm's internal resource composition is compatible with the external business environment through the updating of existing resources (Teece & Pisano, 2003). This affects a firm's relative performance positively by improving the speed and effectiveness of its organizational response to external uncertainties and changes in market conditions (Guo et al., 2017).

H1. Opportunity-seizing capability will positively affect relative firm performance.

In an era of uncertainty, the organizational capability to seize opportunities is a crucial determinant of a small firm's new market and customer development activities (Blank, 2013). IT SMEs can either identify opportunities that arise from market inefficiencies or create opportunities by creating new resource combinations. However, SMEs generally encounter obstacles in the successful realization of new market opportunities (Ireland et al., 2003). This is because many forms of business organization can be derived depending on how similar technologies and resources are combined (Chesbrough, 2010). Consequently, a firm with the ability to effectively organize resources to avail of opportunities is more

likely to attract a broader customer market base than a firm without this ability.

Especially in the case of IT SMEs, they highly likely to use technology for exploiting knowledge in the new market developing activities. Corporate data is an important strategic asset as it is a collection of organizational experiences and a history of interactions with customers (Siegel, 2010). For example, customer reactions or non-responses, purchase decisions, customer attraction, and churn, and complaints about product defects provide a learning experience for companies. Some digital technologies such as predictive analytics and machine learning using these data enable SMEs to find the core of their experience. Indeed, companies that use IT to seize opportunities can statistically monitor and analyze information (competitor activity, customer interaction, etc.) necessary for strategic decisions (Mikalef & Pateli, 2017). IT-enabled learning as part of this dynamic capability will enable IT SMEs to expand/develop the market more effectively by using knowledge through learning outcomes from data.

H2. Opportunity-seizing capability will positively affect new market development.

Furthermore, successful NMD activities result in superior organizational performance through the fostering of effective business development. They reduce the risk and cost of market failures of firms, through repeated testing of prototypes based on information of customer needs and pains. An agile shift in business strategies based on a firm's past experiences with customer needs and pains, referred to as "pivoting," is considered a significant factor in explaining the growth of business ventures in the IT sector (Ding et al., 2019; Ries, 2011). In particular, in the case of SMEs, NMD can mitigate the problems that firms encounter while acquiring a competitive advantage (for example, business development obstacles resulting from a relatively small organizational size and a limited stock of resources) (Ramanathan et al., 2012).

H3. New market development will positively affect relative firm performance.

This study, which builds on the above arguments and applies the theory of organizational learning, suggests that market development is an important link between a firm's OSC and performance. According to the theory of organizational learning, learning organizations obtain and interpret data on the consequences of organizational behavior, and hence, choose to adopt new behavioral strategies and receive feedback on the consequences of such actions (Levitt & March 1988). Previous studies indicate that organizational learning is derived from experimentation while attempting to formulate and implement new ideas, take risks, and foster interactions with external business environments (Chiva et al., 2007).

The organizational learning perspective can be applied to a firm's process to adapt to a changing business environment. Organizational learning enables firms to either dynamically acquire or reconstruct their knowledge. Also, organizational learning often occurs as an underlying process of opportunity seizing (Pavlou & El Sawy, 2011). Scholars have suggested that organizational learning occurs when firms endeavor to adapt to a rapidly changing business environment for their survival and future growth (Jiménez-Jiménez & Sanz-Valle, 2011; Levinthal, 1991). This organizational learning process is similar to the process by which a firm recognizes business opportunities and designs a business model (information acquisition and interpretation), and thereby builds a new business and customer base (behavior) and achieves results (feedback). This implies the mediating role of NMD in the relationship between opportunity-seizing and firm performance. Therefore, opportunity-

seizing is an important factor that drives the performance of small businesses. However, limited resources can impede a SME's ability to gain adequate returns from opportunities. To solve this problem, SMEs should effectively implement the necessary market development activities to convert their opportunities into financial gains. Accordingly, other researchers have also discussed the mediating role of NMD. They report that the recognition of opportunities results in higher performance of small businesses through the implementation of business model innovation (Guo et al., 2017). Moreover, Mikalef and Pateli (2017) provide empirical evidence that agility in aspect of commercialization mediates the positive relationship between IT-enabled OSC and firm performance.

In view of this, we propose a hypothesis on the mediation effects of NMD in the relationship between a firm's OSC and organizational performance. The acquisition and interpretation of data that concerns the external environment, undertaken for opportunity-seizing, will enhance the effectiveness of a firm's investment in NMD. The results of this investment activity will be perceived as performance feedback based on metrics such as profits, market share, and growth rates. Thus,

H4. New market development will mediate the positive link between opportunity-seizing capability and relative firm performance.

3.2. Effect of OSC on NMD: the moderating role of environmental uncertainty (EU)

Furthermore, this study proposes a potentially moderating effect of EU on the relationship between a firm's OSC and NMD. A moderating variable is generally introduced owing to the inconsistent relationship between two variables as depicted in preceding studies (Baron & Kenny, 1986).

Researchers appear to hold inconsistent views regarding the relationship between OSC and NMD. Certain studies report that opportunity-seizing drives innovation in content, structure, and the governance of transactions, thereby generating value (Guo et al., 2016). For example, there is empirical evidence that a company with strong IT-based OSC has excellent agility in terms of market development (Mikalef & Pateli, 2017). By contrast, other studies report negative outcomes, wherein leading firms generally fail to secure customer bases in emerging markets notwithstanding their accumulated experiences and resources (Christensen, 2013). This ambiguity suggests the presence of a moderator between these variables.

Recent studies have examined EU as an important moderator that affects the relationship between OSC and competitive advantage (Li & Liu, 2014). Researchers have argued that the effects of OSC can exist within a stable business environment (Zollo & Winter 2002) and that its impact on competitive advantage is higher in an uncertain environment (Schilke, 2014).

Uncertainty may also affect the extent to which a firm undertakes innovative activities and the effectiveness of such activities (such as business model development), given the obsolescence of the existing business and technical assets held by the IT SME. As NMD is an activity to gain a competitive advantage, merely applying the role of EU in the context of the relationship between OSC and firm performance is inadequate. However, whether the effects of opportunity-seizing on NMD activities are contingent upon EU is unclear. The scope of the empirical studies that concern this issue has been limited to early-stage startups. Accordingly, this study validates the potential moderating effect of EU on the link between an established firm's OSC and its NMD activities.

Environmental uncertainty is defined as "the amount and unpredictability of change in customer tastes, production, or

service technologies, and the modes of competition in the firm's principal industries" (Miller & Friesen, 1983). Based on the influential concepts propounded by Miller and Friesen (1983), we define EU as *the magnitude of instability from environmental change*. An uncertain environment hastens the obsolescence of current technology and products (Jansen et al., 2006). It is therefore characterized by frequent and highly unpredictable changes. Conversely, a stable environment is less likely to change, and market participants can predict changes.

In a stable environment, a firm may avail of the relatively long-run benefits of existing business models (Park, 2005). Here, there is relatively little concern that the competitive advantage that is derived from the existing business models will be lost in the short run. Thus, the firm can take full advantage of existing business models. It can undertake exploratory innovation over a long period. Therefore, a firm may effectively satisfy its customer needs by exploiting existing business resources, rather than implementing a change in the existing business model through frequent exploration of opportunities.

By contrast, an uncertain environment increases the frequency with which a company's existing business model becomes incompatible with new business environment. Consequently, firms must continue to develop new markets by capturing business opportunities, for survival and growth. With rapid change in market needs and technologies, it becomes essential for firms to undertake NMD activities for their survival. Accordingly, even previously successful firms are likely to lose their competitive advantage. To achieve higher organizational performance, firms must develop business models that are compatible with the new business environment, through opportunity-seizing. In addition, data-driven decision-making based on Key Performance Indicators in an environment of high uncertainty allows IT SMEs to make fewer errors and failures in the process of entering a new market, leading to better creativity and cost reduction. In this situation, IT SMEs with strong OSC will be advantageous in coordinating business operations, and in commercializing through new value propositions to cope with the changing environment. Considering the above, the positive effects of a firm's OSC on NMD will be larger in a highly uncertain business environment.

This argument is also consistent with the view that a firm's OSC (as a part of dynamic capability) is closely related to exploitative and explorative innovation (Jansen et al., 2006). Firms undertaking innovation are challenged to explore new opportunities while leveraging their existing capabilities (O'Reilly & Tushman, 2004). However, the effects of exploitive and explorative innovation on performance are opposite when combined with EU (Liu et al., 2011). Scholars suggest that while EU positively moderates the relationship between exploratory innovation and performance, it negatively moderates the relationship between exploitive innovation and performance. Therefore, under an uncertain business environment, firms should explore new markets for their survival. Frequent exploration is effective because firms have a considerably shorter time to benefit from exploitation than they do in a stable environment. Conversely, the frequent exploration of new opportunities in a static environment can impede a firm's ability to expand its customer base, as exploration requires a tremendous amount of effort and cost in comparison to exploitation (Winter 2003). Thus,

H5. The positive relationship between a firm's opportunity-seizing capability and new market development is stronger for those firms that operate in a highly uncertain environment.

Fig. 1 summarizes the hypotheses of this study.

4. Methods

4.1. Data collection and sample

We surveyed South Korean IT SMEs older than three years and with over five employees. Although there is no consensus on the upper limit of the number of employees in an SME, we selected samples based on a commonly used criterion in the SME literature, namely: an upper limit of less than 500 employees (Berthon et al., 2008).

Prior to conducting the survey, we contacted the IT SMEs of our initial sample by telephone to verify firm characteristics such as age, size, and market sector. The initial sample comprised 963 Korean IT SMEs that were collectively operating in the following sectors: information and communication broadcasting device, and software (henceforth, device and software sectors). Questionnaires were sent to the appropriate IT SME managers through fax, post, or an online platform. We sent reminders through text messages and telephone calls. From July 2015 to September 2015 (31 working days), we collected 234 responses from our initial sample (a 26% response rate). From these, 215 valid responses were analyzed. The average age of the sample firms was 12.5 years, and the average number of employees was 53.1. Of the responding firms, 47% were in the hardware industry and 53% in the software industry. The average annual sales across the sample firms were US \$ 8.15 million.

4.2. Measures

Table 1 outlines the operational definitions considered and variable measurement items. All the variables included in this study were standardized before the analysis. Excluding the EU variable, all the research and control variables were measured by a five-point Likert scale (1: very low, 5: very high). The variable measurement items that were introduced from previous studies were modified to suit this study. Firm characteristics such as firm age (FA), size (FS), and R&D intensity (RDI) were controlled for. The ages and sizes of the sample firms were converted to the log form for data normalization.

This study used industry sales variability for environmental uncertainty (Boyd, 1995). Specifically, we used the annual sales data of 1999–2015 for the device and the software industries. This industrial categorization has been adopted from the Korea Standard Industry Classification. We used the Levene test for equality of variances (Brown & Forsythe, 1974) in order to identify the statistical differences between the distribution of sales data of the device and software sectors. This method uses the distance from the sample median to the observed value and does not follow a specific distribution. The results of the analysis revealed no significant difference in the distribution of annual sales across the two industries ($F = 37.61, p < 0.001$).

Next, the standard deviations were compared after dividing the total annual sales, domestic sales, and the export value of each sector by each average value. The comparisons revealed higher volatility in the software sector (as depicted in Table 2). Consequently, the firms operating in this sector were classified into a group that encounters an uncertain business environment. The companies operating in the device sector were classified into a group that encounters a stable business environment. Specifically, we coded the uncertain group as "1" and the stable group as "0," thereby creating dummy variables for use in the analysis.

This distinction is also due to some extent in different competitive environment between the two industries. In the IT device industry, competition for performance improvement based

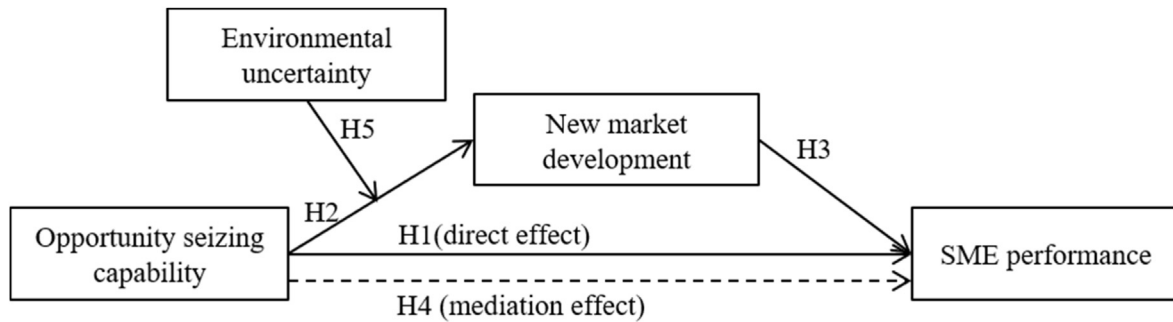


Fig. 1. Research model.

Table 1
Measurement items of variables.

Variable	Operational definition	Measure items	Source
OSC	The extent to which a firm mobilizes resources for opportunity seizing	Ability of opportunity recognition, knowledge assimilation, resource development, resource integration, resource transformation, and resource combination	Teece (2007), Pavlou and El Sawy (2011)
EU	The magnitude of instability in an industry	The variance of sales in an industry	Boyd (1995)
NMD	The extent to which a firm creates and extends market	Level of activities for differentiated innovation, improving goods, exploiting external innovation creating a customer base, creating a new market, and increasing market sales	Forsman (2011)
RFP	The extent to which a firm achieves performance compared to competitors	Relative profitability, growth rate, and market share	Calantone et al. (2002), Hult et al. (2004)

†OSC: opportunity-seizing capability, EU: environmental uncertainty, NMD: new market development, RFP: relative firm performance.

Table 2
Sales volatility by industry sectors in Korea (1999–2015).

	Device	Software
Total Sales	0.395	0.499
Domestic sales	0.370	0.499
Export	0.372	1.198

†Standard deviations are reported. *** $p < 0.001$.

on manufacturing is the mainstream. This competition is represented by Moore’s Law. Recently, as competition for performance improvement approaches its limit, competition for low-power consumption is increasing. But basically, it can be said that the key indicators (information processing speed, battery life, display quality, etc.) to improve for increasing competitive performance of an enterprise are relatively clear.

Meanwhile, in the SW industry, performance indicators are various (by product, by service, by market segment, etc.) to be considered in order to improve the competitive performance of companies. This is because the SW industry is knowledge-intensive, and thus, has a high value-added rate, and has the characteristics of increasing the added value of other products equipped with the software. Due to these characteristics, the SW industry is turning even HW products into services, and competition is focused on functions and customer experiences. Due to the diverse and changing needs of modern consumers, rapid convergence between technologies, and the emergence of disruptive new technologies, it can be seen that the period in which companies must seize opportunities in a timely manner and determine strategic positions is relatively short in SW sector.

For example, to compare the two industries, the dynamics of the two industries can be compared with the mobile phone market. Competition in the device sector is focused on incremental performance improvement or competition in the appearance of

physical products. The composition of parts mounted on mobile devices does not change significantly every year. Meanwhile, competition in the application sector is expanding into many categories such as finance/games/health/weather/education/lifestyle/maps and navigation/business and productivity/social networking, etc. In addition, according to data released by digital media marketing company DMC Media, the average period for Korean consumers to use downloaded apps is shorter than 6 months. In particular, in Korea, it is known that the average lifespan of popular mobile games is shorter than in the US and Japan. Except for applications provided by large platform companies such as Facebook and KakaoTalk, the lifespan of smartphone apps developed by most SMEs is very limited. Therefore, it can be seen that application development companies are in an environment where they must constantly seize new opportunities and develop markets.

4.3. Pre-test of the questionnaire

We modified and used the measurements suggested in previous studies to suit the purpose of this study. Since the measurements were revised, the preliminary survey was conducted to confirm whether the items adopted in this study appropriately measure the OSC, NMD, and RFP variables of the Korean IT SME. For this, 42 companies were sampled in June 2015, taking into account the distribution of industry, size and age. Data for analysis were collected using an online survey method. Among them, 32 data were used for the preliminary test, excluding unfaithful responses and missing values.

As a result of conducting exploratory factor analysis without specifying the number of factors, the items constituting each variable were extracted as one factor for each variable. There was no item with a factor loading value of 0.40 or less, and accordingly, all items were used in this survey. In addition, as a result of analyzing the reliability through the internal consistency coefficient

Table 3
Validity and reliability of variables.

Items of variables	Factor loading	Eigen value	Variance explained (%)	Reliability (Cronbach's α)
OSC1	0.85	4.43	73.84	0.93
OSC2	0.87			
OSC3	0.86			
OSC4	0.86			
OSC5	0.86			
OSC6	0.85			
NMD1	0.77	3.53	58.86	0.86
NMD2	0.83			
NMD3	0.77			
NMD4	0.76			
NMD5	0.78			
NMD6	0.69			
RFP1	0.84	2.23	74.45	0.83
RFP2	0.87			
RFP3	0.88			

(Cronbach's alpha), the reliability of each variable ranged from 0.77 to 0.91, indicating a good level.

4.4. Reliability and validity of variables

Table 3 outlines the verification of the validity and reliability of the research variables of interest. The internal consistency of each variable in the study was reasonable, as the resulting Cronbach's α for the variables ranges from 0.83 to 0.93 (surpassing the acceptable threshold of 0.60; Bagozzi & Yi, 1988). Next, the exploratory factor analysis presented in Table 3 revealed that the factor loadings of each measurement item ranged from 0.69 to 0.88, indicating reasonable validity.

Furthermore, we examined for common method bias using Harman's single factor test (Podsakoff et al., 2003) because all the measurement items were estimated through a questionnaire. Common method bias can be a serious issue when a single factor explains over 50% of the observed variance (Podsakoff & Organ, 1986). The first single factor inclusive of all the variances accounted for 28% of the total variance. This indicated that common method bias did not pose a problem in this study.

5. Results

Table 4 presents the descriptive statistics of the continuous variables and the correlation analysis results. All the correlation coefficients were observed to be positively significant.

5.1. Mediation effect of NMD

This study used a hierarchical OLS regression model to verify the mediation effect of NMD on the relationship between a firm's OSC and relative performance, in accordance with the verification procedure recommended by Zhao et al. (2010). Accordingly, this study derived the following regression equations:

$$Y_{NMD1} = \alpha_1 + \beta_{1NMD1}(\log_FA) + \beta_{2NMD1}(\log_FS) + \beta_{3NMD1}(RDI) + \beta_{4NMD1}(OSC) \tag{1}$$

$$Y_{RFP} = \alpha_2 + \beta_{1RFP}(\log_FA) + \beta_{2RFP}(\log_FS) + \beta_{3RFP}(RDI) + \beta_{4RFP}(OSC) + \beta_{5RFP}(NMD) \tag{2}$$

Table 5 summarizes the results of Equation (1). Model 1, which includes the OSC variable, exhibits a significant increase in the explanatory power ($F = 41.12, p < 0.001, \Delta R^2 = 0.41$). The OSC thus

Table 4
Descriptive statistics and correlations.

	OSC	NMD	RFP
OSC	1		
NMD	0.65***	1	
RFP	0.37***	0.52***	1
Mean	3.34	3.42	3.07
SD	0.62	0.57	0.65

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5
Results of hierarchical regression on NMD.

N = 215	Model 1		Model 2	
	β	t	β	t
log_FA	-0.12	-1.60	-0.10	-1.66
log_FS	0.04	0.50	0.12	2.06*
RDI	0.12	1.73	0.01	0.11
OSC			0.66	12.42***
ΔR^2	0.03		0.41	
R^2	0.03		0.44	
F	1.96		41.12	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. †Standardized coefficients (β) are reported. Model 1 includes only control variables, and Model 2 additionally contains OSC.

has a positively significant effect on the NMD ($\beta = 0.66, p < 0.001$), thereby supporting H2. The variance inflation factor (VIF) values of the two models are less than 1.27, implying the absence of multicollinearity (Kleinbaum et al., 1988).

Table 6 depicts the results of Equation (2). Model 3 includes only control variables, whereas Model 4 includes the OSC variable. Model 5 includes the NMD variable. The VIF values of the three models are less than 1.70, implying the absence of multicollinearity (Kleinbaum et al., 1988). In Model 4, the OSC exerts a statistically significant effect on the RFP ($\beta = 0.39, p < 0.001$), thereby supporting H1. Next, even after controlling for the effect of the OSC in Model 5, the positive effect of the NMD on the RFP remains statistically significant ($\beta = 0.47, p < 0.001$), thereby supporting H3. In addition, the effect of the OSC on the RFP was not significant after the inclusion of the NMD variable. This verified the presence of an indirect-only mediation effect.

We analyzed the size of the mediation effect by using the SPSS PROCESS macro (Table 7). The bias-corrected bootstrapping method was used with 10,000 bootstrap samples. Bias-corrected bootstrapping can provide a higher statistical power compared to other methods (MacKinnon et al., 2004). This result demonstrated that the indirect effect is positive and statistically significant because its confidence interval does not include zero ($\beta = 0.31$, standard error = 0.07, 95% bias-corrected confidence interval: [0.18, 0.46]), which supports H4.

5.2. Moderation effect of EU

This study conducted a hierarchical regression analysis to test the moderating effect of the EU (as specified by H5). The following equation includes the interaction effects of the OSC and EU:

$$Y_{NMD2} = \alpha_3 + \beta_{1NMD2}(\log_FA) + \beta_{2NMD2}(\log_FS) + \beta_{3NMD2}(RDI) + \beta_{4NMD2}(OSC) + \beta_{5NMD2}(EU) + \beta_{6NMD2}(OSCEU) \tag{3}$$

In (3), OSCEU refers to the interaction term of the OSC and EU variables.

Table 8 summarizes the results of the analysis for the NMD. Model 6 includes only the control variables. In addition, Model 7

Table 6
Results of hierarchical regression on RFP.

N = 215	Model 3		Model 4		Model 5	
	β	t	β	t	β	t
log_FA	-0.05	-0.68	-0.04	-0.52	0.01	0.11
log_FS	0.06	0.78	0.11	1.51	0.05	0.77
RDI	0.06	0.91	0.00	-0.04	-0.01	-0.09
OSC			0.39	5.89***	0.08	0.96
NMD					0.47	5.94***
ΔR^2	0.01		0.14		0.12	
R ²	0.01		0.15		0.27	
F	0.50		9.10		15.52	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. †Standardized coefficients (β) are reported. Model 3 includes only control variables, Model 4 additionally contains OSC, and Model 5 incorporates NMD.

captures the main effects of the OSC and EU variables. Model 8 includes the interaction term of the OSC and EU variables. The analysis results indicate a significant increase in the explanatory power of Model 8, which incorporates the moderating effect ($F = 29.48$, $p < 0.001$, $\Delta R^2 = 0.02$). The VIF values of the three models were at most 2.96, implying the absence of multicollinearity (Kleinbaum et al., 1988).

In Model 8, the main effect was statistically significant only in the case of the OSC. Hence, the positive coefficient of the OSC variable implies that firms with a stronger OSC will more successfully undertake NMD activities ($\beta = 0.48$, $p < 0.001$). However, the main effect of the EU was not significant ($\beta = 0.05$).

Regarding the specified hypothesis, the coefficients of the interaction term of the OSC and EU variables are statistically significant ($\beta = 0.22$, $p < 0.01$). Thus, the relationship between OSC and NMD is stronger in the group whose members operate their businesses in a highly uncertain environment. Therefore, H5 was supported.

We then identified the pattern of the moderating effect according to the method presented by Aiken et al. (1991). Fig. 2 depicts the degree of variation in the relationship between OSC and NMD across different levels of EU. Both the low-level EU and high-level EU groups exhibit significant positive OSC–NMD relationships. However, the intensity of the relationship is stronger in the group with high EU (where the gradient of the simple slope = 0.76, $t = 12.00$, $p < 0.001$). Conversely, the group with a low EU depicts a relatively gentle slope (where the gradient of the simple slope = 0.48, $t = 5.38$, $p < 0.001$).

6. Conclusion

This study provides implications by examining the mediating role of NMD in the relationship between a firm's OSC and its relative performance. This mediating effect indicates that market development is an important factor in explaining the role of an IT SME's ability to seize opportunities, in the enhancement of its performance. Furthermore, this study provides another significant insight by examining the moderating effects of environmental uncertainty on the effectiveness of a firm's OSC with regard to market development. The NMD activities undertaken by IT firms to capture opportunities are more effective in a dynamic environment. These results indicate that opportunity-seizing is more

Table 7
Results of bias-corrected bootstrapping.

Mediator	Bootstrap results for indirect effects using SPSS PROCESS		
	Boot indirect effect	Boot SE	Boot LLCI, ULCI
NMD	0.31	0.07	0.18, 0.46

Table 8
Results of hierarchical regression on NMD.

N = 215	Model 6		Model 7		Model 8	
	β	t	β	t	β	t
log_FA	-0.12	-1.60	-0.09	-1.53	-0.08	-1.46
log_FS	0.04	0.50	0.12	2.06*	0.12	2.08*
RDI	0.12	1.73	0.00	0.05	0.01	0.17
OSC			0.66	12.45***	0.48	5.48***
EU			0.05	1.04	0.05	1.06
OSC × EU					0.22	2.59**
ΔR^2	0.03		0.41		0.02	
R ²	0.03		0.44		0.46	
F	1.96		33.13		29.48	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. †Standardized coefficients (β) are reported. Model 6 include only control variables, Model 7 contains OSC and EU, and Model 8 incorporates the interaction term.

important for firms that operate in a highly uncertain business environment.

6.1. Theoretical implications

Two implications for academic research can be drawn from this study. First, we have enriched the literature on opportunity seizing by revealing that NMD entirely mediates the positive effects of a firm's OSC on its performance. Whereas previous studies have mainly examined the direct effects of a firm's OSC (Pezeshkan et al., 2016), this study has depicted that it affects firm performance indirectly through NMD. The findings of this study provide evidence that the effects of OSC are not direct but indirect, which support the claims of previous studies (Protogerou et al., 2011). This result shows how the OSC of SMEs with insufficient resources leads to performance, especially in the context of the IT sector, showing a more specific phenomenon than the results of previous studies.

Second, this study contributes to the existing literature by identifying the effects of environmental uncertainty on organizational adaptation mechanisms. Many previous studies have focused on the relationship between general dynamic capability and firm performance in examining the role of EU (Schilke, 2014; Wilden et al., 2013). This study expands our understanding about EU's role by verifying the moderating effect on the relationship between OSC as a specific dynamic capability and NMD. Specifically, the OSC is especially important under highly uncertain business environment when IT SME develops new markets and seeks an appropriate organizational adaptation mechanism. This is consistent with previous findings that reveal that OSC is more important in uncertain environments (Schilke, 2014), and that IT-enabled learning as a part of dynamic capability facilitates market capitalization under uncertain environment (Mikalef & Pateli, 2017).

Third, this study makes empirical contributions by providing evidence concerning the opportunity seizing mechanism adopted by IT SMEs to adapt to a changing business environment. Most existing research on opportunity-seizing is from the perspective of early-stage startup firms (Song et al., 2017). However, this study provides empirical evidence by examining the impact of opportunity-seizing on the performance of established firms. Compared to startups that can easily change their business models, SMEs tend to have greater path-dependence due to their already secured capabilities and management routines, while resources are insufficient compared to large companies. Therefore, in terms of survival and growth, companies that strategically conduct market development activities (using data-based predictive analysis, etc.) will be advantageous. The results of this study show that even in the case of relatively mature companies (compared to startups), entrepreneurial competence, such as seizing opportunities, is important to achieve competitive performance.

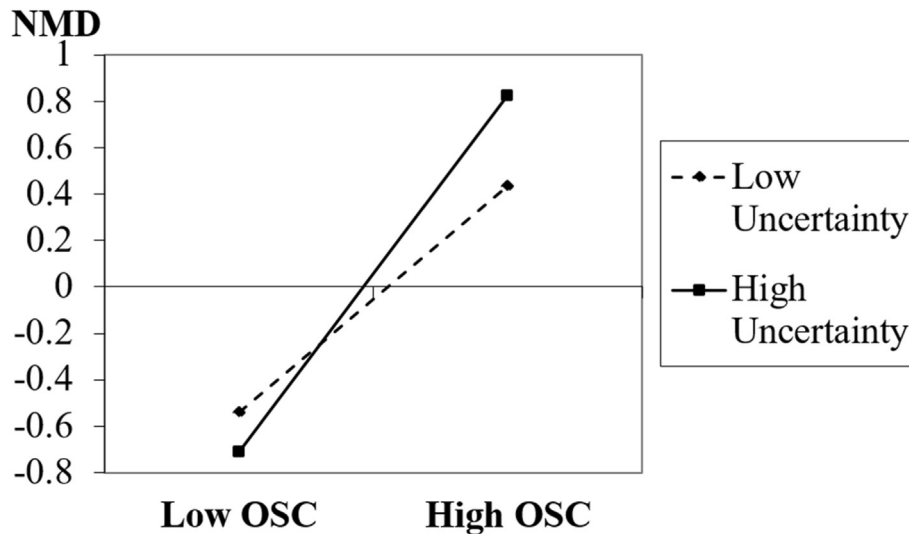


Fig. 2. Research model Moderating effect of EU on OSC–NMD relationship
 †OSC: opportunity-seizing capability, NMD: new market development.

6.2. Practical implications

In addition to the implications for academic research, practical implications can be derived from this study. Because there are 'indirect-only mediation' by NMD and non-significant direct effect of opportunity-seizing, if opportunities are not modified in consonance with business models, such opportunities will remain unrefined ideas. Therefore, the strategic integration of the process of business model development with the organizational activities undertaken for the exploration of new opportunities will be beneficial for enhancing the effectiveness of a firm's adaptation mechanism.

Then, how can managers better capture the identified opportunities? Developing OSC requires repetitive learning how to convert the discovered opportunities into products and services that generate profits. A practical way to effectively seize opportunities is as follows (Osterwalder et al., 2014). The first thing to do is to clarify what you understand about customers. Identify the specific job your target customers do, what problems they are suffering from, and what they want to achieve. Second, refine the idea of what value you intend to provide to the customers. You need to decide how your offerings will benefit the customers or alleviate their pain. Third, it is necessary to evaluate the 'fit' of your knowledge about the customers and the value you provide. Check how many of the identified knowledge in the first step were not addressed in the product/service idea developed in the second step. In addition, it is necessary to see whether the new product or service that you intend to develop will actually create customers in the market, and whether the new product or service will be well linked to the business model of the firm to generate revenue.

Managers also need to consider the factors that promote the development of OSC for IT SMEs. Recent interesting research shows that firms can deploy their IT resources to develop their ability to seize opportunities (Mikalef et al., 2020). According to this study, increasing the flexibility of IT architecture can help in the development of OSC. This flexibility can be achieved through adopting open standards, and enhancing digital accessibility and scalability. Flexibility allows IT SMEs to reduce the time and cost of building new solutions and forming new partnerships in the process of addressing new opportunities.

Another factor driving the development of OSC is the uncertain environment. In the results of this study, the value of OSC was

found to be greater in an uncertain environment. A study conducted by Wilden and Gudergan (2015) showed similar results. The positive effect of opportunity seizing capability on marketing capability is stronger in environments with highly competitive uncertainty. However, in a stable environment, the potential benefits of seizing opportunities decrease, and frequent opportunity seizing can result in low fit of the environment and business.

This moderating effect of the environmental uncertainty provides the useful implication for determining how often managers must seize opportunities and how high priority of OSC development will be. In a stable environment, external changes occur within a predictable range, and the speed of change is low (Duncan, 1972; Wilden & Gudergan, 2015). In this case, opportunity-seizing activities can be carried out, but the existing business is still generating profits. However, in a turbulent environment, the speed of external change is fast and unpredictable, thus there is a high risk that the existing business will lose its competitiveness (D'Aveni, 2010; Wilden & Gudergan, 2015). In this case, IT SME needs to seize opportunities more frequently in order to maintain its competitiveness, and the development of OSC will have a high priority for the survival and growth of the enterprise.

SMEs operating business ventures in unpredictable environments will benefit from an enhanced ability to seize opportunities for ultimately achieving better performance, on account of the stronger effect of OSC in an uncertain environment. The enhanced ability of seizing can include resource allocation optimization through big data-based predictive analysis, or data-driven business model innovation, which can be highly utilized in business. In the case of SMEs where it is difficult to secure assets and dedicated personnel for opportunity seizing, outsourcing solutions for customer relationship data analysis will be useful. In another case, SMEs could use the enterprise predictive analytics platform to identify failures, hidden benefits, and new opportunities, and then they can invest in new products/services/processes.

6.3. Limitations and future research

However, this study has the following limitations. First, because this study's sample is limited to Korean firms, additional research is required wherein samples from across various cultures and countries are used. Second, the use of cross-sectional data from this study in the interpretation of causal relationships over time should

be avoided. Third, most of the research variables that are incorporated in this study were estimated using the same method. In this regard, we verified that there are no empirical modeling issues such as common method bias and multicollinearity.

Thus, we suggest some direction for future research. First, cross-country study will aid in generalizing the results and enable a deeper understanding of the role of OSC within the IT sector. Also, further investigation other parts of dynamic capability, such as Sensing and Transforming, will provide useful knowledge on the effects of overall dynamic capability. Future research also could analyze the dynamic relationship between the research variables through a longitudinal study. Third, future studies could potentially reduce such issues by considering various data sources or by using quantitative data.

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