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The influence of the characteristics of CEO on open innovation in SMEs

Joonmo Ahn

University of Cambridge
Engineering
ja494@cam.ac.uk

Joonmo Ahn

University of Cambridge
Engineering
ja494@cam.ac.uk

Tim Minshall

University of Cambridge
Department of engineering
thwm100@eng.cam.ac.uk

Abstract

Open innovation has been defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation, respectively" (Chesbrough, 2003). With the emergence of the knowledge-based society, open innovation has become an important research theme for both academia and industry. However, most studies related to open innovation have focused on large firms especially high technology or multinational firms. In addition, there have been few attempts to understand how SMEs (small and medium size enterprises) build up their knowledge network and strategy in terms of implementation of open innovation. Recent studies have revealed how the characteristics of internal members in an organization can affect the patterns of knowledge capability building. The CEO (chief executive officer) in particular can affect the performance of collaborations with external partners. This paper aims to investigate the relationship between the characteristics of SME CEOs and open innovation performance. In this paper we explore three key characteristics of a CEO: disciplinary fitness, operational background, and the degree of entrepreneurship. This paper draws upon a survey of CEOs in SMEs in information technology (IT) and biotechnology industries in Korea. Our sample was limited to SMEs that had their own R&D department. We use the results of this survey to test a series of hypotheses. Firstly, for a disciplinary background, we assumed that the matches between the educational major of a CEO and business area would present positive

relation. We also assumed that the close relation with CEO's supervisor (e.g. whether CEO was a student of the supervisor or a CEO hired the students who were under his/her supervision) would play an important role in trust building and collaborating with the university as an open innovation partner. Secondly, we hypothesized that that working experience of a CEO in a Chaebol (a large conglomerate, usually family-owned business group in South Korea) would make it easy for the SME to enter and exploit the business network that the Chaebol has formulated. Lastly, for the degree of entrepreneurship, it was postulated that higher the entrepreneurial characteristic of a CEO, more open innovation implementation were carried out actively. Our analysis found that 1) Open innovation activities of SMEs affect the performance of a firm and 2) the impact of three key characteristics of CEOs varies in different sectors and in the size of SMEs.

Joonmo Ahn
University of Cambridge
1st year
30th, June, 2014
ja494@cam.ac.uk

**The Influence of the Characteristics of CEOs on Open Innovation
Performance in SMEs: The Case of Korea**

PAPER IN PROGRESS

Joonmo Ahn^{a, b} and Tim Minshall^{c, d}

^a Institute for Manufacturing, University of Cambridge, UK, ja494@cam.ac.uk

^b Ministry of Education, Science and Technology, Republic of Korea

^c Institute for Manufacturing, University of Cambridge, UK, thwm100@eng.cam.ac.uk

^d Institute for Technology, Competitiveness and Enterprise, Doshisha University, Japan

Abstract

With the emergence of the knowledge-based society, open innovation has become an important research theme for both academia and industry. However, most studies related to open innovation have focused on large firms especially high technology or multinational firms. In addition, there have been few attempts to understand how SMEs (small and medium size enterprises) build up their knowledge network and strategy in terms of implementation of open innovation. Recent studies have revealed how the characteristics of internal members in an organization can affect the patterns of knowledge capability building. The CEO (Chief Executive Officer) in particular can affect the performance of collaborations with external partners. This paper aims to presenting the context for a research project: the relationship between the characteristics of SME CEOs and open innovation performance. In this paper we explore three key characteristics of a CEO: disciplinary fitness, operational background, and the degree of entrepreneurship. This paper will draw upon a survey of CEOs in manufacturing SMEs in Korea. Our sample will be limited to SMEs that have their own R&D department. We will use the results of this survey to test a series of hypotheses. Firstly, for a disciplinary background, we assume that the matches between the educational major of a CEO and their business area would present a positive relation. Secondly, we hypothesize that the working experience of a CEO in a *chaebol* (a large conglomerate, usually family-owned business group in South Korea) would make it easy for the SME to enter and exploit the business network that the *chaebol* has formulated. Lastly, for the degree of entrepreneurship, it is postulated that higher the entrepreneurial characteristic of a CEO, the more open innovation implementation will be carried out actively. Our study will suggest that 1) open innovation activities of SMEs affect the performance of a firm and 2) the impact of three key characteristics of CEOs varies in different sectors and in the size of SMEs.

Keywords: Open innovation, SME, CEO, Chaebols

1. Introduction

Recent trends about technology management paradigms have stressed the notion of open innovation, given intensified global competition, shortened innovation cycles, and increased complexity of business activity. As open innovation has become a commonly observed strategy for successful companies, recent years have seen a significant increase in attempts to reveal why open innovation became popular and what benefits can be drawn from it. Until now, a variety of concepts, models, and frameworks of open innovation have been suggested from previous research, but the majority of this research has been confined to classifying the different types (i.e. modes) of openness or collecting evidence showing the advantages of open innovation. However, it has some limitations that can be summarized as follows.

First of all, in terms of the scope of the research, most previous studies have focused on open innovation in large-multinational firms (e.g., P&G, Intel, Apple, Samsung) or the software industry (e.g., open source software). In spite of the economic importance of small and medium size enterprises (SMEs), not as much attention has been paid to open innovation in them as in large firms (van de Vrande et al., 2009; Lee et al., 2010). This phenomenon may stem from the view that large firms are better equipped to benefit from open innovation. Since SMEs depend on scarce internal resources, we may be apt to think that it is difficult for SMEs to employ open innovation. However, SMEs may be more likely to benefit from open innovation because of simple decision making processes and open organizational culture. As Lee et al. (2010) have shown, SMEs could be part of a new ‘intermediated network model’ (i.e., ‘a collaborative business model based on a horizontal structure of specialized SMEs’) for the implementation of open innovation. However, so far most SMEs have not exploited - the advantages of open innovation and this may be in part a result of a lack of understanding of the opportunities that open innovation could deliver for SMEs. As a consequence, this biased understanding together with the lack of previous studies has meant that policy makers have underestimated the importance of open innovation in SMEs. This in turn may result in industrial policy failing to provide appropriate support to SMEs despite the importance of SMEs in national economies.

Secondly, and related with the first limitation, most previous studies have tried to understand SMEs using the same approach as when studying large firms. While the debate on the relationship between the size of a firm and its degree of open innovation is ongoing, addressing the particularity from the perspective of SMEs can be more significant (Maula et al, 2006). When considering the size and diversity of SMEs, the following two features will play important roles in revealing the particular features of open innovation in SMEs. The first one is the chief executive officer (CEO). As many studies on organizations (e.g. Manjit et al 2007.) have found, the smaller the firm, the greater the dominance of the CEOs. Because of their simplicity in decision making processes, their direction and style of business strategies (i.e. whether a SME prefers open innovation to closed innovation) will depend to a large degree on CEOs. The other key factor is the socio-cultural context. Unlike large, globalized firms, SMEs are relatively localized and apt to be influenced by socio-cultural factors, such as the relationship with large firms or the industrial structure of a nation. Since this socio-cultural factor varies from countries to countries, focusing on a specific country may give us a deeper understanding of SMEs.

Lastly, in terms of research methodology, most previous studies have employed qualitative approaches. This trend may be related to the selection of firms that have been the focus of prior research. Since the majority of previous studies investigated large firms, it might be difficult to gain a statistically meaningful number of samples. In addition, as previous studies focused on explaining how successfully firms employed open innovation, most of them conducted case studies (Dahlander and Gann, 2010). This approach may be appropriate in that it can elaborate firms' best practices and analyze specific cases deeply, but it is difficult to generalize research findings and expand them in different contexts excluding subjective interpretations. There are examples of open innovation research projects applying quantitative approaches (such as in Laursen and Salter (2006) or Bok and Lee (2008)) but they also have some limitations in that they typically depend on the secondary data (e.g. the Korea Innovation Survey). As such data focus on traditional innovation activities, such as process innovation and product innovation, and there is a doubt as to whether the data reflects open innovation features and excludes the effects derived from closed innovation.

Because of these considerations, this study aims to investigate key factors which influence open innovation performance in SMEs in the socio-cultural context. To delve into socio-cultural implications, we will focus on a specific case; Korean SMEs. Because SMEs formulate unique relations with large firms in the Korean socio-cultural context, it is imperative to take these relationships into considerations. In Korea, most SMEs (81.7%) are small firms with less than 10 employees, and the number of middle-size firms is considerably small when compared with that of the US and Japan (SMBA 2011). This polarization of firm size may stem from a high dependency on large conglomerates called ‘*chaebols*’. It is estimated that over 60% of SMEs are subcontractors of *chaebols*, and their revenues are highly dependent on these relationships (SMBA 2011). As most of these SMEs are established by former middle managers of *chaebols*, CEOs of SMEs can be a key linkage between SMEs and *chaebols*. Their intimate relationship with the *chaebols* may enable SMEs to access the knowledge ‘on the shelf’ in *chaebols* or to learn technological know-how from contract R&D. However, the polarization of SME firm size also implies that only a small portion of SMEs enjoy the maximum benefits from their relation with *chaebols*, while many SMEs remain as subcontractors. This suggests that other characteristics of CEOs can play important roles in crossing the threshold of continuous growth. Considering the Korean socio-cultural context emphasizing alumni relation and regional network, CEO characteristics based on a personal human network may be potential factors stimulating open innovation.

Based on these contextual issues, our main research question emerges as follows :

“How do the characteristics of CEOs influence open innovation performance in SMEs?”

To answer this question, this study will investigate how the characteristics of CEOs affect the open innovation performance of Korean SMEs. To overcome the limitations of previous studies from the research method perspective, mixed method, specifically sequential explanatory mixed method, will be employed. Firstly, we will conduct surveys based on a quantitative approach, and will implement some case studies to gain a deeper explanation of research findings. The later part of a qualitative approach will play an important role in triangulating and explaining outlier or key leverage data collected in the quantitative stage. This study is expected to provide new insight about open innovation of SMEs from the

perspective of socio-cultural context, and reveal implications in terms of science and technology policy.

The remainder of this paper consists of three sections. The following part reviews the features of open innovation, the influence of CEOs, and the Korean socio-cultural context, while section 3, formulates the research hypotheses and illustrates the research methodology. In section 4, a future plan and some expected contributions will be suggested.

2. Theoretical Background

To overcome the limitations of previous studies mentioned above and to achieve a deeper understanding, the literature review was conducted in the three areas: open innovation and SMEs, the influence of CEOs, and the Korean socio-cultural context.

2.1 Open Innovation and SMEs

There have been numerous studies on innovation, such as product innovation and process innovation; market pull and technology push, since R&D was regarded one of critical factors which stimulate continuous growth in firms. However, after Chesbrough (2003a, 2003b, 2006) coined the term, ‘open innovation’, many scholars started to turn their research interest from internal R&D to collaboration with external partners. As open innovation can provide numerous benefits, such as evaluating false negatives¹ and a new business model by exploiting broad external knowledge, it has been regarded as an imperative business norm of leading companies. However, strangely, previous studies on open innovation have focused on large firms or specific business areas (Dahlander & Gann 2010). Even though Chesbrough and Crowther (2006) showed that low-tech or mature industries (except for a few industries such as the nuclear industry) also exploit external knowledge, most previous studies investigated large firms with high technologies (e.g. Apple, Intel, P&G, Samsung) and software industries (i.e. open source, crowd sourcing) (Dahlander & Gann 2010). Open

¹ Ideas that seem to fail, but are actually valuable. For instance, one of the most profitable Pfizer’s products, ‘Viagra’ falls into this category, because it was originally a treatment for hypertension which did not receive a good clinical result (Chesbrough 2003b)

innovation studies on SMEs are very rare, confined to general trends, and depend on qualitative approaches such as case studies (van de Vrande et al. 2009; Lee et al. 2010; Dahlander & Gann 2010). The previous research findings may seem to suggest that SMEs may not be appropriate to employ open innovation. Lichtenthaler (2008) studied large to middle size firms and Van De Vrande et al. (2009) investigated SMEs, and they observed that large firms can employ open innovation relatively easily compared to SMEs. However, there are also totally conflicting findings implying that SMEs are more suitable to employing open innovation (Laursen & Salter 2004). This contradictory finding stems not only from the lack of understanding of SMEs but also from the fact that previous studies used the same framework as when they view large firms. We cannot deny that the analysis variables, such as the amount of internal R&D investment, are important indicators which will show the degree of open innovation, but it is necessary that we take into consideration other particular variables which can show the characteristics of SMEs (Maula et al. 2006) .

Apart from this conflicting argument, SMEs are still crucial in a national economy. In Korea, between 2000 and 2009, the number of SME employees increased from 8.68 million to 11.75 million, while that of large firms decreased from 2.08 million to 1.64 million (SMBA 2011). In terms of the number of firms, SMEs accounted for 99.9%(3 million), while large firms accounted for just 0.1%(3 thousands) (SMBA 2011). However, the lack of open innovation studies on SMEs and contradicting results also occur in Korea. Although Bok (2006)'s study was the first attempt to understand open innovation in Korea, he found that internal R&D is a more important factor than external cooperation by arguing trust building between companies and universities is not mature enough to stimulate open innovation. After his study, Kim (2008) did case studies on seven major large firms, and Bok and Lee (2008) and Hwang et al. (2010) analyzed 'Korea Innovation Survey' data, but focused on open innovation modes without considering firm sizes. The study of Lee et al. (2010) is meaningful in that they suggested a new model in which SMEs take a role in collaborations with other firms, but did not focus on the microscopic motivation of open innovation in SMEs. These previous studies fail to provide an important clue in understanding of how open innovation occurs in SMEs. Considering SMEs' features discussed above, such as flexibility, lack of resources and the importance of CEOs, a new approach is needed to break through the conflicting open innovation studies on SMEs.

2.2 CEO influence

Many scholars have studied CEOs as a dominant factor that determines firm performance, but previous studies have shown conflicting results (Miller and Toulouse 1986; Bantel and Jackson 1989; Lefebvre and Lefebvre 1992; Lefebvre et al. 1997; Kitchell 1997; Papadakis and Bourantas 1998; Khurana 2002; Yadav et al. 2007). Some argued that CEOs play a positive role in the firm's performance and innovation, while others claimed that CEOs are apt to miss disruptive technologies because they tend to focus on 'day-to-day' business activities rather than innovation (Yadav et al. 2007). Even though there have been some conflicting results, the literature verifies that CEOs have a strong effect on innovation (Yadav et al. 2007; Papadakis and Bourantas 1998; Lefebvre and Lefebvre 1992). Moreover, some previous studies support the importance of CEOs in open innovation implementation. Mortara et al. (2009) revealed that strong support from a CEO can formulate a positive open innovation culture within a firm, and Kim et al. (2008) observed that LG Household & Healthcare implemented open innovation very actively because its CEO worked for P&G before joining LG and recognized the importance of open innovation. Considering this CEO influence increases as the firm size decreases, the conjecture that CEO influence is one of the critical factors that determine open innovation behavior seems quite reasonable.

Although many CEO studies focused on the relationship between CEO leadership and firm performance rather than open innovation, we can draw a meaningful implication from them. In previous studies, there have been two apparent research streams based on the upper echelons' perspective (Kitchell 1997; Yadav et al. 2007). One stream was investigating the demographic features of CEOs, such as an age, the degree of formal education and tenure, and the other stream was evaluating the psychological state of CEOs that can influence firms (Kitchell 1997; Miller and Toulouse 1986). Although most research has adopted the first stream into their studies because of the ease of data collection, the literature shows that CEO personalities as well as demographic features can influence firm performances considerably. For instance, Lefebvre et al. (1997) introduced the 'prism model' by suggesting that the CEO's perception of the environment is a key factor of the technology policy of a firm, and some personal factors as well as demographic factors decide the characteristics of the prism. This may imply that some important factors based on a cultural context can play a significant role in influencing open innovation in SMEs. In this respect, our study will take the personal

characteristics of CEOs into consideration together with some demographic data. Specifically, we will look into the CEOs' personal human network and work experience in the context of their relationship with large firms ('*chaebols*').

2.3 Korean socio-cultural context

In the Korean socio-cultural context, specifically when it comes to industry, we cannot explore SMEs without considering Korean larger conglomerates, *chaebols*, because of their huge influence on the Korean economy. Most previous studies on *chaebols* have focused on their formulation, their reformation during the Asian financial crisis that occurred in the late 1990s, and their unique governance structure (Supchang 1988; Yanagimachi 2004; Kim 2003; Milliman et al. 1993; Campbell 2002). Although there is no clear cut definition of *chaebols*, 'family-owned large conglomerates which have many affiliates in diversified business areas' can be one of the appropriate definitions (Milliman et al. 1993). Among the many *chaebols*, specific large conglomerates, which are designated by the Fair Trade Commission (FTC), would be the major important *chaebols* to influence SMEs from an economic perspective. Every year the FTC designates these large conglomerates and prohibits their reciprocal shareholdings and mutual assurance. In 2011, 47 *chaebols* whose assets totaled over 5 trillion Won were classified into this category (FTC 2011a). By the investigation of the FTC, the companies had 32.2 affiliates on average, their average assets were 27.2 trillion won (about 15.3 billion GBP), their average revenue was 24 trillion won, and their net profit was 1.66 trillion won on average.

Table 1. General figures on *Chaebols* [Source: FTC 2011]

(Unit: numbers, trillion won)

Categories	Average	Top 3		
		SK (86)	Samsung (78)	LOTTE(78)
Number of Affiliates	32.2	SK (86)	Samsung (78)	LOTTE(78)
Asset	27.2	Samsung ² (230.9)	Hyundai motors (126.7)	SK (97)
Revenue	24	Samsung (209.4)	Hyundai motors (123.9)	SK(111.6)
Net profit	1.6	Samsung (21.6)	Hyundai motors (12.6)	Hyundai heavy industry (5.3)

² If we consider Samsung family groups, such as Shinsagae, Homeplus, CJ and Hansol groups, total assets exceed 340 trillion won.

These *chaebols* are the historical outcomes of Korean government development policies. In 1962, the Korean government initiated its ‘Five-year development plan’, which became the basis of the ‘miracle of the Han river’ bringing about over a 12 percent economic growth rate in the late 1980s, and these top-down plans focused on nurturing key national industries such as the petrochemical and machinery industry. Since the fundamental economy of Korea was vulnerable at that time, the Korean government selected a few entrepreneurs and fostered them by providing a variety of economic privileges, such as ‘low interest bank loans, protection from competition against other domestic firms, and speculation in the real estate market’ (Milliman et al. 1993; Chang 1988). *Chaebols* have some similarities with Japanese large firms, ‘*zaibatsu*³’, in that both enjoyed privileges given by their government, but they are different in that *chaebols* are still controlled by a few family members and their relatives, while most of the top managers of *zaibatsu* are professional managers (Milliman et al. 1993).

Although *chaebols* made remarkable economic growth, some *chaebols*’, such as Samsung and Hyundai motors, unique business style brought about some critical problems to the Korean economy. Firstly, unlike U.S and U.K firms which focus their core business areas, *chaebols*’ unrelated business diversification, known as the ‘Octopus Arms style’, infringed upon the business areas of SMEs and ‘forced out SMEs which had a considerable competitive edge’ (Milliman et al. 1993). Due to *chaebols*’ diversified business spectrum, internal transactions between *chaebols* and their affiliates have occurred frequently and in large scale. According to the FTC report, the portion of internal transactions in the total revenue was 22.59% for unlisted affiliates of *chaebols* in 2010 (FTC 2011b). This high entry barrier derived from Octopus Arms style diversification and high internal transactions may explain the reason why SMEs find it difficult to enter into the business areas on which *chaebols* focus, and entrepreneurship is not well developed in Korea.

Secondly, *chaebols*’ family oriented management style may lead young talented people to feel that it is hard to climb the career ladder in their organizations. Although some *chaebols* allow external top managers, it is true that there is still a glass ceiling for those who do not belong to the ‘inner-circle’ (Milliman et al. 1993). Because of severe competition for promotion inside *chaebols*, some middle managers chose to leave and establish small firms (Song, 2001).

³ ‘Chaebol’ and ‘Zaibatsu’ are cognate, and use the same Chinese character.

However, the problem is that some of these small firms prefer making a subcontract with *chaebols* by using their personal connections instead of pioneering a new market. Although Kumar and Subrahmanya (2010) discovered that the influence of subcontracting on innovation in SMEs can be positive, it is not clear that this finding can also be applied to the Korean context. Being one of a *chaebols*' subcontractors may guarantee the stable income of small firms, but the problems lie in that *chaebols* are criticized for exploiting their superior position when they negotiate a subcontract condition with a SME. Since SMEs are at a disadvantage in general, they can face a dilemma where their profit structure is deteriorating while net sales are increasing.

Owing to these problems, SMEs in Korea have to endure severe competition with *chaebols*, which have abundant business resources, and simultaneously they should cooperate with *chaebols* to avoid competition and to survive in the market. Since the relationship between *chaebols* and SMEs is not simple, the study on SME open innovation should be approached considering this complicated relationship. This perspective will allow us to understand how SMEs implement open innovation to compete or cooperate with *chaebols*.

3. Research Method

3.1 Research hypotheses

The main research question is 'How do the characteristics of CEOs influence open innovation performance in SMEs?', and to expand the research question more specifically, we looked into 30 SME cases which involved the Korean government R&D grant program, such as the 'Industry-University-Research Institute Joint Technology Development Grant', the 'Industry-University-Research Institute Joint Research Laboratory Supporting Program' and 'The Grant for Co-use of R&D facility', supported by the Small and Medium Business Administration of Korea (SMBA). These 30 SMEs are selected by SMBA as a best practice of open innovation, and from their cases we arrived at the conclusion that the three following CEO characteristics can be important factors that would influence open innovation performance of SMEs.

The first characteristic is a CEO's educational discipline. Since a CEO's decision making is critical in SMEs, whether a CEO's educational discipline matches with their business area

may influence open innovation, in terms of the collaboration with universities or technical decision making. We can formulate the research hypotheses as follows:

(Hypothesis 1) *A CEO's educational discipline will influence the open innovation performance of a SME.*

- **(Hypothesis 1-1) *Where a CEO's educational discipline matches the business area of the SME it will increase the opportunity for a SME to explore and exploit external knowledge.***
- **(Hypothesis 1-2) *A CEO may have a tendency to choose the university where he or she studied as an open innovation partner.***
- **(Hypothesis 1-3) *A CEO may have a tendency to hire students who studied at the university at which he or she studied and which the SME is collaborating with.***
- **(Hypothesis 1-4) *A CEO who took open innovation education will actively employ open innovation.***

The second relevant characteristic is a CEO's operational background. Since *chaebols* play an important role in the Korean economy, the previous work experience of an SME's CEO in a *chaebol* would make it easy for the SME to enter and exploit the business network that the *chaebol* has formulated. We can formulate the research hypotheses as follows:

(Hypothesis 2) *A CEO's operational background will influence the open innovation performance of a SME.*

- **(Hypothesis 2-1) *A CEO's work experience in a chaebol will increase the types of open innovation modes that a SME employs.***
- **(Hypothesis 2-2) *A CEO who worked for a chaebol will prefer a chaebol and its affiliates as open innovation partners.***
- **(Hypothesis 2-3) *A subcontractual relation with a chaebol and its affiliates will decrease the mode of open innovation.***

The last characteristic is a CEO's entrepreneurial character. Although there are a great number of personal characteristics of CEOs, a CEO's entrepreneurial character can be considered important in open innovation in that CEOs must take a risk to employ open innovation in spite of their lack of resources. We can formulate the research hypotheses as follows:

(Hypothesis 3) A CEO's entrepreneurial character will influence the open innovation performance of a SME.

- **(Hypothesis 3-1) A CEO who established a firm before will employ open innovation more actively.**
- **(Hypothesis 3-2) A CEO who favors new product development will also favor employing open innovation.**

3.2 Research methods

To test and investigate the above hypotheses, we employ the mixed method of a quantitative and qualitative approach (i.e. a sequential explanatory design).

In the quantitative stage, we will conduct a survey based on the following model.

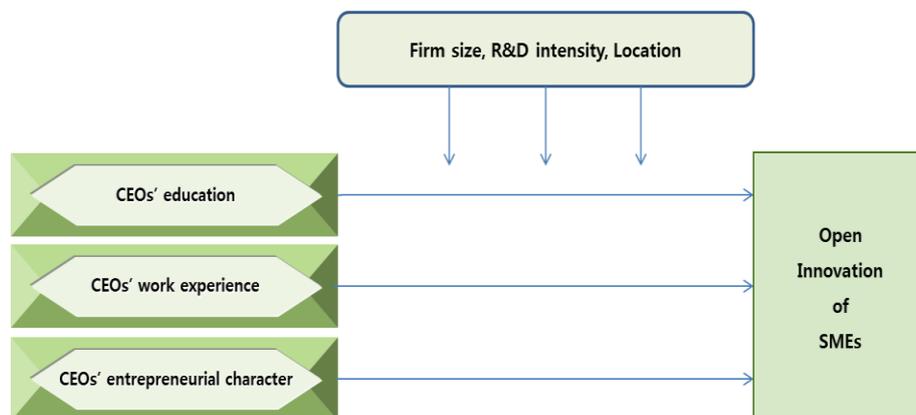


Figure 1 Research model

Here, open innovation is set as a dependent variable, and the three characteristics (i.e. CEO's education, CEOs' work experience and CEOs' entrepreneurial character) will be set as independent variables. Along with these variables, firm size, R&D intensity and location (e.g.

whether a SME is in a business cluster) will be set as moderating variables. The survey will be carried out electronically with the help of the Korea Industrial Technology Association (KOITA) which has more than 4,000 SMEs as members. In data analysis, we will conduct three levels of analysis. Firstly, Cronbach's alpha will be used to measure the internal consistency and the reliability of the hypotheses, and then we will conduct a t-test to investigate the validity of the hypotheses. Secondly, a factor analysis will be used to check the multicollinearity between explanatory variables and reduce the highly correlated variables. After this analysis, a multiple linear regression will be used to show the relation of each of the CEO characteristics and open innovation performance. Lastly, from cluster analysis, we will try to categorize the class of a CEO and investigate the frequency of each class from the data set.

In the qualitative stage, case studies will be carried out to carry out for triangulation and further explanation. For triangulation, case study samples will be selected from survey respondents. Specifically, samples that show mean (or median) value and samples which are believed to be outliers or key leverage observations will be interviewed to achieve supplementary explanations.

4. Future Plans and Expected Contributions

This study is at the initial stage and still under progression. However, a survey will be carried out and interview samples will be selected among survey respondents.

Considering there are few studies on the open innovation of SMEs, this study can provide meaningful insight to scholars as well as policy makers by suggesting a new approach to SME studies. Since a CEO is a critical factor that determines the organizational behavior of a SME, analyzing the characteristics of CEOs would help us to gain a general picture of SME open innovation. In addition, as the characteristics of CEOs came from the cultural context analysis, this study may be able to provide a deeper understanding of complex SMEs from the perspective of open innovation. In addition, this study can be meaningful in that it employs survey analysis as well as case studies based on in-depth interviews. These features of the study may provide future directions for open innovation studies on SMEs.

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